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# Scientific English in a French University: from students' attitudes and motivation to pedagogical practices in cultural contexts

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Toulouse Midi-Pyrénées

# THÈSE

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Délivré par l'Université Toulouse 2 - Jean Jaurès

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**Manlu CHENG**

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Motivation to Pedagogical Practices in Cultural Contexts**

**Tome I**

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**UNIVERSITE TOULOUSE – JEAN JAURES**

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THÈSE

Pour l'obtention du grade de

Docteur de l'Université Toulouse - Jean Jaurès

en Didactique des langues

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**Tome I**

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## **Abstract**

The present exploratory research is designed to explore students' attitudes and motivation towards scientific English learning and teaching in a scientific university context. It focuses on the current situation of scientific English learning and teaching at Paul Sabatier University, a French university in science and technology. A cohort of students in scientific domains, language teachers and associate professors, and science associate professors and professors have participated in the research. To probe into learners' attitudes and motivation in the context of plurilingual English class, we have also investigated language teachers and associate professors, and science associate professors and professors' representations of scientific English, as well as the relations mentioned above. A mixed-methods approach combining quantitative methods and qualitative methods was employed in the current study. This exploratory investigation was first undertaken through a questionnaire to students on their attitudes and motivation towards scientific English and a questionnaire to students on the current situation of scientific English teaching and learning at Paul Sabatier University. Meanwhile, students, language teachers and associate professors, science associate professors and professors were interviewed, respectively. Data processing made it possible to cross-check students' and teachers' representations of scientific English. The results highlight the relatively negative attitudes and low motivation in scientific English learning, as well as the vague representation of scientific English among both students and teachers, pointing out the lack of "disciplinary dialogue" between language teachers and associate professors as well as science associate professors and professors at Paul Sabatier University. Finally, some recommendations were proposed to improve the current situation of learning and teaching scientific English in French universities.

Keywords: Scientific English, attitudes and motivation, representation, French university, cultural contexts

## Résumé de la thèse

Cette recherche exploratoire a été conçue pour identifier les attitudes et la motivation des étudiants dans le cadre de l'apprentissage et l'enseignement de l'anglais scientifique dans un contexte universitaire scientifique. Celle-ci s'est focalisée sur la situation actuelle de l'apprentissage et de l'enseignement de l'anglais scientifique à l'Université Paul Sabatier, une université française en sciences et technologie. Une cohorte d'étudiants dans des domaines scientifiques, des enseignants et enseignants-chercheurs de langues, ainsi que des enseignants-chercheurs de sciences ont participé à la recherche. Afin de sonder les attitudes et la motivation des étudiants dans le contexte d'une classe d'anglais plurilingue, nous avons également étudié les représentations de l'anglais scientifique des enseignants et enseignants-chercheurs de langues et des enseignants-chercheurs de sciences, ainsi que les relations mentionnées ci-dessus. Une approche mixte combinant des méthodes quantitatives et qualitatives a été employée dans la présente étude. Cette enquête exploratoire a d'abord été menée par un premier questionnaire destiné aux étudiants sur leurs attitudes et motivations concernant l'anglais scientifique et d'un second questionnaire distribué aux étudiants sur la situation actuelle de l'enseignement-apprentissage de l'anglais scientifique à l'Université Paul Sabatier. Parallèlement, des étudiants, des enseignants et enseignants-chercheurs de langues ainsi que des enseignants-chercheurs de sciences ont été interviewés. L'analyse des données a permis de confronter les représentations de l'anglais scientifique des étudiants et celles des enseignants et des enseignants-chercheurs. Les résultats mettent en évidence des attitudes relativement négatives et une faible motivation de l'apprentissage de l'anglais scientifique, ainsi qu'une représentation peu précise de l'anglais scientifique tant chez les étudiants que chez les enseignants, ce qui souligne l'absence de « dialogue disciplinaire » entre les enseignants et enseignants-chercheurs de langues et les enseignants-chercheurs de sciences de l'Université Paul Sabatier. Enfin, quelques recommandations ont été proposées pour améliorer la situation actuelle de l'apprentissage et de l'enseignement de l'anglais scientifique dans le contexte universitaire français.

Mots clés : anglais scientifique, attitudes et motivation, représentation, université française, contextes culturels

## 摘要

本研究为探索性研究，旨在探索科学大学背景下学生对科学英语学习和教学的态度和动机。它关注的是法国理工科大学 Paul Sabatier 大学的科学英语学习和教学的现状，一批科学领域的学生、语言教师和副教授，以及科学副教授和教授参与了研究。为了探究学习者在多语种英语课堂中的态度和动机，我们还探索了语言教师和副教授以及科学副教授和教授对科学英语的表征，以及他们间的合作关系。在目前的研究中，我们采用了定量方法和定性方法相结合的方法。这一探索性调查首先通过对学生进行问卷调查，了解他们对科学英语的态度和动机，并调查保罗萨巴蒂尔大学科学英语教学的现状。同时，作者分别对学生、语言教师和副教授、科学副教授和教授进行了访谈。数据处理使得交叉检查学生和教师及研究人员对科学英语的表征成为可能。研究结果表明，学生在科学英语学习中态度相对消极，缺乏学习动力。同时，学生和教师对科学英语的模糊表征，以及对教师的采访表明在保罗-萨巴蒂尔大学的语言教师和副教授以及科学副教授和教授之间缺乏“学科对话”。最后，本研究提出了一些建议以改善法国大学科学英语的学习和教学现状。

关键词：科学英语，态度和动机，表征，法国大学，文化背景

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# **Introduction**

## **Introduction**

Despite France's stated intention to encourage plurilingualism in order to keep up with the demands of globalisation (Piquemal & Renaud, 2006), language teaching is nevertheless taught separately in pedagogical practices. Although numerous languages are spoken in France, it is not considered as a multilingual society (Gadet & Varro, 2006).

Nonetheless, most people on the planet live in multilingual societies where languages enable cross-cultural interactions (Jessner, 2006). Plurilingual school settings are becoming increasingly popular in order to secure international students, teachers and researchers, which is also in response to the trending process of internationalisation.

### **1. Multilingualism and Plurilingualism in France**

Plurilingualism has been emphatically studied in the language learning field in Europe and in other areas where many languages are inextricably linked to each other (Coste, 2001). Since the 1990s, fundamental concepts such as bilingualism, plurilingualism, language, language use and discourse have been reconsidered in light of research on second language acquisition (SLA), developmental psychology, sociolinguistics and psycholinguistics (Castellotti & Moore, 2011; Gabillon, 2022; Moore, 2020; Narcy-Combes & Narcy-Combes, 2014).

There are numerous definitions regarding multilingualism and plurilingualism. Consequently, we will employ the definition from the Council of Europe (2001, p. 168). Multilingualism refers to the presence in a geographical area, large or small, of more than one 'variety of language', i.e. the mode of speaking of a social group whether it is formally recognised as a language or not. In such an area, monolinguals may speak only their own variety. Plurilingualism is the ability to use languages for communication and to take part in intercultural interaction, where a person, viewed as a social agent, has proficiency of varying degrees in several languages and experience of several cultures. This is not seen as the superposition or juxtaposition of distinct competences, but rather as the existence of a complex or even composite competence on which the user may draw (Narcy-Combes et al., 2019).

## **2. An Overview of the Current Study**

The research into “English for science”, a construct created by Chaplier (2017), in such a plurilingual university context was motivated by the author’s background studies in the domain of English for Specific Purposes and normal education at a normal institute in China. Currently, “scientific English” that is English for students specialised in sciences (chemistry, maths, etc.) at Paul Sabatier University (UPS) is taught by teachers who have no real expertise or experience in science and/or the didactics of foreign languages. Their teaching approach mainly relies on the Anglophone tradition of English for Specific Purposes (ESP), which is purposive instead of focusing on specialised domains: the emphasis is on language objectives, while professional and disciplinary objectives are either ignored or just apposed without any real articulation with language.

The present exploratory research is designed to explore students’ attitudes and motivation towards scientific English learning and teaching in a scientific university context. The present study also explores the relationship among learners’ attitudes and motivation, language teachers and associate professors and science associate professors and professors’ representations of scientific English, and scientific English teaching and learning. Theories such as Serge Moscovici’s social representations theory (Castellotti & Moore, 2002), Complex dynamic systems theory (CDST) (Ushioda, 2015), the Douglas Fir Group’s transdisciplinary framework for Second language acquisition (SLA) in a multilingual world (Group, 2016), Claire Chaplier’s interacted model of representations (Chaplier, 2017) and her proposal of “common knowledge” (Chaplier, 2017, p. 72) are employed to interpret the research results.

Rather than attempt to criticise or give recommendations, the ultimate goal of our research was to understand the phenomena (comprehensive approach) that emerge in teaching-learning situations of English in a scientific context in the case of Paul Sabatier University, which is a university dedicated to science mainly.

In the current thesis, a mixed-methods approach combining quantitative methods and qualitative methods was employed. This exploratory investigation was first undertaken through a questionnaire to students on their attitudes and motivation towards scientific English and a questionnaire to students on the current situation of scientific English teaching and learning at Paul Sabatier University. Meanwhile, students, language teachers and associate professors, science associate professors and professors were interviewed, respectively. Data processing made it possible to cross-check students’ and teachers’ and researchers’ representations of



scientific English. The results highlight the relatively negative attitudes and low motivation in scientific English learning, as well as the vague representation of scientific English among both students and teachers, pointing out the lack of “disciplinary dialogue” between language teachers and associate professors as well as science associate professors and professors at Paul Sabatier University. Finally, some recommendations were proposed to improve the current situation of learning and teaching scientific English in French universities.

### **3. Obstacles**

Undeniably, it is suboptimal for a PhD candidate from China to undertake research regarding language teaching and learning based on the French context in France. Given my cultural background, it is hard to follow and picture English teaching and learning in French higher education initially. Moreover, my working language is English, while carrying out the research, I could not exchange in French. I am aware that it is contradictory to have interviewed participants in English instead of in their native languages (e.g. French). The inadequate level of French greatly hindered my exploration of French literature while building the theoretical framework despite a volume of excellent historical and ideological heritage in French.

The primary challenge we faced during our research was related to the data collection process. Our study focused on students in the science domains at Paul Sabatier University, which presented some obstacles in obtaining a suitable sample. Due to strict privacy regulations, it required significant effort to reach out to these students online and gather a sufficient amount of questionnaire data. Fortunately, our investigation has received a lot of attention among secretaries, science associate professors and professors in a variety of faculties as well as language teachers and associate professors at Paul Sabatier University. Thanks to their assistance, we were able to obtain responses from students with the help of them.

Additionally, the COVID-19 pandemic that erupted in late 2019 had a significant impact on communication and meetings, making them infrequent and notably challenging. The pandemic reached France in January 2020, leading to the closure of all schools and universities. This posed a challenge to the ongoing classroom observations that were set as a complementary method for the research. It is worth noting that the research was not authorized to incorporate classroom video observation due to ethical restrictions in the French higher education system. Therefore, the observations were manually recorded on paper grids. The classroom observation took place from September 2019 to February 2020 and covered three L3 classes and four M2

classes in various fields. The L3 classes consisted of students in physics, computer science, and biology, while the M2 classes included students in mathematics, biology, real-time system engineering, and statistics and business intelligence. The whole observation session lasted over two semesters for more than 100 hours, which could be very time-consuming.

Due to the pandemic and the need to maintain social distancing, interviews with both learners and teachers were conducted via video conferencing platforms such as Skype or Zoom in 2020 and 2021. However, it was challenging to reach participants, especially teachers.

Furthermore, the data processing and analysis were a tremendous amount of work. I conducted interviews with 14 teachers and 12 students, resulting in a transcript of 114 pages with more than 50,000 words. I transcribed the interviews manually, which was a very time-consuming and laborious task.

#### **4. Presentation of the document**

The whole thesis is divided into five chapters. A brief introduction of each chapter is present as follows:

The first chapter describes the research background of the current study. Chapter 1 gives the educational context at the French tertiary level. To begin with, we describe the spiking trend concerning internationalisation of higher education in France. A detailed description of the current situation regarding English language education in French universities and language policy in France is given. Some factors at the national level that had impacts on the current language teaching and learning situation are mentioned. In the second part of the chapter, the focus shifts to the location of the case study: Paul Sabatier University, which is primarily dedicated to science. This section provides a detailed account of the current state of internationalisation at the university, as well as an overview of the current practices in English language teaching.

In chapter 2, the theoretical framework of attitudes and motivation mainly based on Gardner's Socio-educational Model of SLA and the Attitude/Motivation Test Battery (AMTB) (Gardner, 2004). The section also covers representations, based on Serge Moscovici's social representations theory (Castellotti & Moore, 2002) as well as Claire Chaplier's interacted model of representations (Chaplier, 2017), including the definition, and the relation between attitudes and motivation, representations and their significant role in language teaching and learning. Key definitions, including "attitudes and motivation" "representations" and "beliefs", are

discussed. Literature reviews on second language acquisition (SLA) are also discussed, covering the major trend of second language acquisition from cognitive to social change, and individual learner differences background, which is the theoretical source of the design of interview questions to students. Complex Dynamic Systems Theory (CDST) (Ushioda, 2015) and the Douglas Fir Group's transdisciplinary framework for Second language acquisition (SLA) in a multilingual world (Group, 2016) are the focus of the current study. Thus, its implication in English teaching and learning and its relation with English learning in France are also discussed. The third section of Chapter 2 discusses the interaction between English language and science. It starts with literature reviews on the major trend of worldwide English, including English as a Lingua Franca (ELF), English as an international language (EIL) and World Englishes (WE). Then it comes to introduce the dominance of English in science, as well as English for Specific Purposes (ESP) and ESP teaching and learning over the world. The introduction of Langue de Spécialité (LSP)/Languages for Specific Purposes in French context is targeted for particular focus in the current study, including key components of Anglais de spécialité (ASP)/Specialised English and the teaching sector of Langues pour Spécialistes d'Autres Disciplines (LANSAD)/ Languages for specialists of other subjects. The chapter ends with the constructs of scientific English. A historical perspective of Latin roots that originated scientific English, as well as common features of scientific English are mentioned. Claire Chaplier's construct of "common knowledge" (Chaplier, 2017, p. 72) makes it fundamentally conducive to the interpretation of the research results.

Chapter 3 provides an overview of the methodology used in this study. The setting of the university chosen for the study, the student participants and the teacher participants are described. The chapter then goes on to detail the data collection and analysis procedures employed for the questionnaires and interviews.

Moving on to Chapter 4, we present and comment upon the results of the students' questionnaires carried out during the academic year of 2019 to 2020. In addition, we discuss the correlations observed between key components in the questionnaire. We then delve into the findings of the student and teacher interviews, which were conducted during the final stage of data collection. Furthermore, we explore the intersection between the interviews of language teachers and science teachers.

Chapter 5 is the main discussion of the results. We examine the findings with respect to students' attitudes and motivation, the collaboration between language teachers and science teachers, the

role of cultural contexts, as well as the representations of students, language teachers, and science teachers.

In the conclusion, we summarise the most significant findings of the study and provide recommendations for improving scientific English teaching.

# **Chapter 1 Context**

## **Part 1 Presentation of France**

Context, which is a non-negligible element in the research field of Languages for Specific Purposes (LSP), composes the prerequisite for language teaching and learning. “Sensitivity to language in context” has always been an underlying strength of LSP, but what is meant by context has also evolved (Upton, 2012, p. 18). As accentuated by Narcy-Combes et al. (2019, p. 14), the complexity of multilingual, diglossic or monolingual contexts and their effect on language development are such that they must be analysed with well-adapted tools in order to go beyond traditional analyses based on one or two clearly defined languages. Alternatively stated, implementing language instruction means that the context has to be comprehended and dealt with, in the teaching and learning process.

The Douglas Fir Group (2016) proposes the framework which regards L2 learning as an ongoing process that begins at the micro level of social activity (the smallest concentric circle), together with meso contexts of sociocultural institutions and communities and the macro level of ideological structures (see chapter 2). Context can comprise the subject matter, the institution in which it is implemented, teacher training, exposition to the target language, duration of the exposition and so on (Chaplier & O'Connell, 2015). In terms of the perspective of CDST (see Chapter 2), the first issue to be addressed is defining context. The relationship between learner and context is not flowing in one direction, thus learner and context cannot be regarded individually. As Ushioda (2015) explains, if language input is regarded as a feature of context in L2 learning, we recognise that learners act upon their contexts. Learners are also seen to contribute to shaping their contexts through how they interact with input.

Comprehending and analysing the context can be a task with complexity. Context refers to a plurality of things. It consists of all the situational factors that are pertinent to understanding language (and learning) behaviour, but it can also be more practical and refer to the everyday environment of the learners and of the teaching institution (Narcy-Combes et al., 2019, p. 56).

In this study, the context refers to the supra level which is the level of internationalisation, the macro level which means French institutional contexts on language and the meso level which appertains to Paul Sabatier University as well as English teachers' education.

This part pictures the fundamental research background of the current study in France, including internationalisation of higher education in France, the language policy in France, the current status of English language education in French universities and teacher's training as English teachers in France. This part provides a general context of this study.

## **1.1 Internationalisation of Higher Education in France**

According to Guy Rocher, a Canadian sociologist, “internationalisation” refers to “the exchanges of various types, be it economic, political and cultural, that take place between nations and to the resulting relations that can be peaceful or conflictual, complementary or competitive” (Rocher, 2001, p. 19). Being the important bases of economic, political and cultural exchanges among various nations, universities are very important places to undertake the on-going process of the internationalisation. Language teachers, who are directly engaged in this continuous process of internationalisation, are impacted by internationalisation of training in their own courses. Therefore, where language teaching is provided should be treated as a privileged place of reflection for internationalisation, relating to professionalisation (Terrier, 2019).

Internationalisation has gained a prominent and key concern in institutional policies (Beacco & Messin, 2010). The French higher education is trending in the direction of internationalisation, with more and more Master’s degrees being taught in a foreign language (Derivry-Plard et al., 2013). In particular, higher education courses taught in English come under the spotlight at this point due to the predominance of English throughout the world. This tendency can be attributed to the increasing need of attracting international students and talents, which obviously benefits students since it tends to contribute to an international and close-knit community not only in Europe but also throughout the world.

Nevertheless, internationalisation means more than just courses in a foreign language. It is also embedded with the requisite of pedagogical adaptations and additional cognitive cost generated in the learning process (Roussel, 2019). Therefore, theoretical reflection and continuous collaboration between teachers and researchers from diverse disciplines are indispensable to the success of this system. The realisation of internationalisation training cannot rely solely on language departments and language teachers. Meanwhile, the support from the institution, remarkably on the financial level, is also crucial.

As Roesler (2019) stresses, internationalising higher education cannot be achieved in a monolingual version, but by respecting the inherent value of all cultures. Internationalising is not only as a result of language but also of culture and the issues of internationalisation of training are shared across borders (Barrault-Méthy, 2019). A major challenge of internationalisation is to develop students’ intercultural competence, preparing them for a globalised professional world.

## **1.2 Language Policy in France**

In 2001, the European Year of Languages, the Common European Framework of Reference for Languages (CEFR) was published in official English and French versions (Council of Europe, 2001), and the European Language Portfolio was launched at the first of a series of European seminars (Little, 2001).

In France, language education policy is determined at the national level, being generated and published in official bulletins by the Ministry of Education. France does not have a language policy that specifically instructs the pedagogical practices of the English language. On the contrary, the policies are only formulated and presented in relation to the French language (Hofstee & Cultuur, 2014). Furthermore, the threat of English is permanently mentioned in public discourse and the media, eventually led to a number of organisations whose mission has been to preserve the French language since the 16th century (i.e. «Défense et illustrations de la langue française»). A language policy back then was regarded as the means to solve the conflicts in political communities.

## **1.3 Language policy at the level of university**

Currently, each university institution determines the foreign language policy. However, Poteaux (2014) fires a series of questions: Languages for what? General culture or professional project? Compulsory or optional? Included in the TU (Teaching Units) of 30 semester credits or in addition, excluding models? Subject to compensation between teaching units or independent and self-sufficient? Are they the sole decision of each component or are they part of a general policy that is reflected in all training models? In close connection with the specialised disciplines or general language as an extension of secondary education? Predominant English or diversified offer? What certifications to choose or impose on students and who finances them?

Attitudes towards these questions are disparate and sometimes contradictory. As Poteaux (2014) explains, the essential question consists in positioning the relationship to foreign languages and cultures of the institution concerned.

Is it the mission of the university to make up for the shortcomings of high school? Should language modules be reserved for students who want them and include them in their studies or professional project? Some university presidents believe that the study of languages is the



business of secondary education and that it no longer enters into the training missions of the university except obviously as specialist disciplines.

Others are attached to competence in foreign languages as an integral part of the diplomas and degrees delivered by the establishment, with a connotation of specialised language according to the sectors. The geographical location of the university can influence the language policy, as border regions have privileged relations with their close neighbours.

To sum up, there is still no real language policy at universities that requires rethinking the ways of learning languages (Rivens Mompean, 2014), except at the European level (Common European Framework of Reference for Languages and European Language Portfolio).

#### **1.4 English Language Education in French Universities (current status)**

The emergence of English as the international language of scientific communication has been so amply documented that its dominance is hardly disputed empirically even by those most critical of this state of affairs (Ferguson, 2007, p. 7). The global networks of academic publishing, the overlap among researchers and institutes as well as the merits of reference resources give rise to the growing significance of the English language in science. Moreover, it serves as the major force for communication among scientists who have published their research primarily in English or know less about local languages.

Meanwhile, the internationalisation of business and industry lead to the continuing employ of English as lingua franca in France. In the French labour market, an advanced mastery of English is highly acclaimed and there is a growing demand for overall expertise in English (including communication and intercultural skills) (Chancelade et al., 2015).

Despite the fact that English learning is compulsory in each level beginning at primary school, English proficiency outcomes remain disappointing. According to the European Survey on Language Competences (European Commission, 2012), which conducts a large-scale comparison concerning the English proficiency of students whose average age is 16, revealed that only 14% of French students reach B1 or above on the Common European Framework of Reference for Languages (CEFR). This fact leads to the conclusion that 86% of French students pursuing higher education studies are non-proficient speakers of English. Most recently, 2018 edition of the EF English Proficiency Index ranked adult English proficiency in 88 countries and regions all over the world. The results suggest that France positioned 35<sup>th</sup> with

a score of 55.49, indicating moderate proficiency. Meanwhile as a comparison, Sweden scored 70.72 and indicating a very high proficiency in English (Zoghiami, 2020).

The low English proficiency of French students can be attributed to several reasons. As indicated in the ESLC report (European Commission, 2012), National protection of the French language, insufficient English exposure in everyday life, as well as the ineffective teaching approaches in developing communication skills in English all contributed to the situation in French higher education. Additionally, no clear language policy exists in this on-going internationalisation of training.

Rather than the mastery of basic grammar and vocabulary, there is rising needs for enhanced soft skills in the workplace, which are also indispensable in comparison with hard skills. As a consequence, fostering learners' intercultural competence, critical thinking, problem-solving abilities, and capacity to communicate and fully participate in current networked world has targeted for particular focus (ACTFL, 2011).

Today's higher education institutions is starting to be challenged by the issues of how to foster students' professional development and equip them with skills for a successful launch of new careers. It is well acknowledged that French universities should 'professionalise' students (Labetoulle, 2020). The notion of professionalisation is progressively raised in the particular context of LANSAD (*Langues pour spécialistes d'autres disciplines*) courses in French higher education.

90% of students enrolled in French higher education were estimated to attend LANSAD classes (Mariella & Derivry-Plard, 2013). LANSAD courses appertain to languages courses for specialists in other disciplines (see Chapter 2). The research on this new sector meets the vast demand of teaching and learning languages for non-specialists in diverse fields.

However, the expectation towards a LANSAD course is still not explicit. Moreover, there is no training in French higher education, let alone training for teachers in LANSAD sector. Science professors and associate professors seem invisible in the whole LANSAD course system and language teachers are getting very little support. In this regard, language teachers perpetually have to explore the objectives, content, and teaching methods of the course on their own (Van der Yeught, 2014).

Moreover, according to Van der Yeught (2014), due to shortage of language teachers at the national level, LANSAD courses are often conducted by temporary teachers who are not capable of properly structure courses in the long term. There are also differences regarding

teachers' statuses (Enseignant-chercheur in French-associate professors and professors in English, PRAG<sup>1</sup>, PRCE<sup>2</sup>, lecturer, part-time). Pedagogical practices are thus varied. They depend on the teacher: their status but also their professional experience. Most have followed the traditional French language-training path at university (master, doctorate) and competitive examinations (agrégation, CAPES) and consequently have a disciplinary professional loyalty that tends to frame teachers' educational responsibilities. In practice, they are unprepared to teach in this context. Most often, they have trained themselves on the job (Chaplier, 2019, p. 4).

### **1.5 Teacher's Training as English Teachers**

In spite of the growing acknowledgement of the essential role language learning plays at all educational levels, there are not many Master's degree particularly devoted to the specificity of teaching a foreign language for specific/special purposes in higher education (Masters of ASP / 'anglais de spécialité') (O'Connell & Chaplier, 2015). Rather than professionalisation on teaching one of the variety of the specialised languages that the LANSAD sector requires, these Master programmes offer merely general training. For instance, the Master "ASPECTS" co-founded by ENS (Ecole Normale Supérieure) Cachan and Université Paris Diderot prepares students to major in the areas of English for Specific Purposes (scientific, legal, economic and medical English), but without specialising in one particular area (Van der Yeught, 2010, para.12). We can mention the Master DIDALAP (Didactique des langues dans les activités professionnelles) at the INSPE of Toulouse as its title indicates that clearly focuses on teaching "langues de spécialité" in the professional world.

Notably, the France's educational system is entirely different from any other place in the world. Take the institutional recruitment in French higher education for example; people with doctorate degrees can be recruited on their academic merit by universities after being "qualified" by the national institution of the CNU section 11's peers.

However, these candidates may not recognise ASP as one of their fields of interest at the very beginning. They have probably turned from their initial research in literature, civilisation, or linguistics towards didactics in LANSAD despite a lack of research background in the field (O'Connell & Chaplier, 2015). Consequently, ASP has become the field of substitution for them.

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<sup>1</sup> PRAG : professeurs agrégés affectés dans un établissement d'enseignement supérieur.

<sup>2</sup> PRCE : professeurs certifiés affectés dans un établissement d'enseignement supérieur.

Another kind of recruitment most often occurs among teachers who are sophisticated in teaching but not experienced in research, for instance, PRAG, PRCE. These teachers are likely to adopt the traditional ESP approach in teaching.

Therefore, the current status in teacher's training as English teachers and the way teachers are recruited in universities, as well as the lack of language policy give rise to the various teaching approach and outcomes in the LANSAD sector.

## **Part 2 : Case Study: Paul Sabatier University**

This part starts by introducing Paul Sabatier University (in French : Université Toulouse III - Paul Sabatier-UPS), which is a typical scientific university. Then we discuss the issues concerning the language department and language teaching at Paul Sabatier University.

### **2.1. Paul Sabatier University: A Scientific University**

Paul Sabatier University is a French public university, which locates in a southern city of France, Toulouse. The name of the university pays homage to Paul Sabatier, a scientist born in Carcassonne in 1854. Nobel laureate in chemistry in 1912, Paul Sabatier was dean of the Faculty of Sciences of Toulouse and a member of the Academy of Sciences. It is under the aegis of this scientist that the Paul Sabatier University is proud to welcome more than 35,000 students and to host 64 research structures.

Paul Sabatier University finds its origins in the 13<sup>th</sup> century and was officially born in 1969 from the merger of the faculties of medicine, pharmacy and science. The diversity of its laboratories and the quality of its training in science, health, sport, technology and engineering have ensured its scientific influence for more than 50 years and place it among the world's leading universities. It is recognised among the top 300 institutions for its scientific performance by the international ranking of the National University of Taiwan (NTU ranking).

Being regarded as a university at the heart of science, Paul Sabatier University is a public institution of a scientific, cultural and professional nature (EPSCP), endowed with legal personality as well as pedagogical, scientific, administrative and financial autonomy. The university is placed under the a posteriori control of the rector of the Toulouse Academy, representing the minister in charge of higher education, research and innovation. The university is made up of governing bodies, components, directorates and services.

### **2.2 Internationalisation at Paul Sabatier University**

The diversity of laboratories and the quality of training in science, health, sport, technology and engineering have ensured the scientific influence of the university for nearly 50 years. It thus ranks among the world's leading universities.

The university have nearly 4,000 students from all over the world, including approximately 16% of doctoral students, 5% of students, students in joint thesis supervision, relying in particular on 126 international cooperation agreements and 700 Erasmus<sup>+</sup> bilateral agreements. The international mobility of students is one of the establishment's priorities.

In this 2021 edition of the Leiden bibliometric ranking, the university is ranked 7<sup>th</sup> among the 30 French institutions ranked and 276<sup>th</sup> out of the 1225 global universities from 69 countries. It is also the 6<sup>th</sup> French university for the gender diversity of its authors.

This ranking by the Centre for Science and Technology Studies (CWTS) at Leiden University is based on publications referenced in the Clarivate Analytics Web of Science database. The universities selected all have at least 800 scientific publications to their credit over the period 2016-2019. Thus, Paul Sabatier University comes in 7<sup>th</sup> position in the national ranking with 4,699 publications listed over the period. Of all these publications, 574 are in the top 10% of the most cited publications in the world.

### **2.3 English Teaching at UPS**

In French higher education, the majority of specialised language courses are taught by linguists. Pedagogical practices mainly depend on the teacher, not only their status (associate professor/professor), higher education professor, reader, temporary staff) but also their professional experience (Chaplier, 2019). There is a variety of teaching practices. This variety depends on the teachers: different statuses (EC, PRAG, PRCE, lecturer, part-time) but also their representations from different professional experiences.

The Language Department in Paul Sabatier University is designated originally as *Département Langues Vivantes et Gestion* (Modern Languages and Management), which pertains to the *Faculté des Sciences et Ingénierie* (The Faculty of Sciences and Engineering). The Language Department became *the Département des Langues of Université Toulouse III* in December 2021. The Language Department of UPS (since Dec. 2021) is transversal to all the Faculties of the University (Dental, Pharmacy, Medicine Rangueil, Medicine Purpan, which became in 2022, UFR de Santé, and FSI and F2SMH) and intervenes in all training and all the semesters. UPS has more than 32,000 students to date. The Board of Directors voted in September 2021 the creation of an inter-component Language Department (DDL in French).

The Faculty of Sciences and Engineering is a Training and Research Unit of Paul Sabatier University, which is composed of 13,154 students and 1,250 teachers and professor/associate professors. There are nine departments in the faculty, including Biology-Geosciences, Chemistry, Upssitech (engineering school), Electronics, Electrical Energy and Automatic (EEA), Computer science, Languages, Mathematics, Mechanic, and Physics.

Concerning the Language Department itself, there are 61 teachers (PRAG, PRCE, lecturers/vacataires) and associate professors (MCF). There is only a document designed as '*Informations Pratiques*' (useful information) from the language department. This document is designed to provide teachers with essential information for their entries into the establishment as well as the main documents useful for organising their lessons. The outline of this document is shown in the following figure:

Figure 1 - The Outline of the <Useful Information>

<b>Sommaire</b>	
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<i>Introduction</i>	3
<i>Annuaire FSI</i>	4
<i>Organigramme du Département LVG</i>	6
<i>Plan de l'UT3</i>	7
<i>Liste des personnels du Département LVG</i>	8
<i>Liste des coordinateurs Langues Vivantes</i>	10
<i>Gestion des vacataires</i>	17
<i>Calendrier universitaire 2020-2021</i>	19
<i>CRL</i>	22
<i>MCC – Syllabus L1</i>	23
<i>MCC – Syllabus L2</i>	25
<i>MCC – Syllabus L3 anglais scientifique</i>	29
<i>MCC – Syllabus M1 &amp; M2</i>	31
<i>MCC – Langues à l'UPSSITECH</i>	34
<i>MCC – Langues en faculté de Médecine</i>	40
<i>MCC – Langues en F2SMH</i>	43
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<i>Attestation de niveau de langue EUROPASS</i>	55
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Most of the teachers in the Language Department have followed the traditional French route of language training. They are therefore in practice never prepared to teach in this context (scientific context, medical domain, sports). In most cases, they have trained themselves by their own means and by teaching. The teaching content is mainly the teachers' responsibility and is the result of their professional experience. The type of institution (e.g. university, IUT (National Pedagogical Programme), engineering school) and the existence of/ no language



policy (e.g. distinction between general and specialised English courses) also have inescapable function in the language education.

Here, we present one typical example of Master's degree in a science university - Paul Sabatier University -, rather than carry out a comprehensive review of different pedagogical practices. The following TU concerns the objectives and contents of language teaching (mainly English) for the first year of all Master's degrees at UPS.

Objectives:

- Develop the key competences students need to integrate into professional life.
- Perfect the communication tools that make it possible to express oneself in today's international context and acquire the linguistic autonomy necessary for this integration.

Contents:

- Scientific writing communication tools (e.g. project reports, summaries).
- Tools required to make an oral presentation or contribute to a critical discussion in the scientific domain.
- Linguistic foundations for discussing a project on a specific theme in the specialised domain.
- Communicative and linguistic structures used in the simulation of a work-related task.

Certainly, some constituent elements remain unchanged as defined by the CEFRL: this is the case for language activities and language skills. However, the purpose of the English course remains vague. Students have been learning English since secondary school and at university, they repeat the same language activities (oral and written competence and production) and continue to review grammatical lexical and phonological basics based on general scientific themes (e.g. climate change). In relation to the student's overall training, the articulation between language and science lacks consistency.

## **Chapter 2 Literature Review**

## **Chapter 2 Literature Review**

This part discusses the theoretical framework of attitudes and motivation, representations and language teaching, including the definition, and the relation between attitudes and motivation, representations and the significant role they play in language teaching and learning. Some key definitions such as “attitudes and motivation” “representations” and “beliefs” are discussed. Beforehand, a literature review is presented on second language acquisition (SLA), including the major trend of second language acquisition which is from cognitive to social change, and individual learner differences background, which is the theoretical source of the design of interview questions to students. Complex Dynamic Systems Theory (CDST) and the transdisciplinary framework for SLA in a multilingual world are the focus of the current study. Thus, its implication in English teaching and learning and its relation with English learning in France are also discussed.

### **Part 1 Second Language Acquisition**

Second language acquisition (SLA) is a voluminous part that cannot be addressed extensively in this work. Nevertheless, it should never be overlooked. As a roof fits over a house, SLA composes the prerequisite for either theoretical or empirical studies in second language learning activities. Therefore, in this work, crucial aspects of social context and individual learner difference in SLA come under the spotlight at this point. As an established discipline, SLA finds its position in programmes in Applied Linguistics, Teaching English to speakers of other languages (TESOL) and foreign language education (Ellis, 2010).

In this part, it begins by discussing some key terms in second language acquisition like “language”, “second language”, “acquisition” respectively. Then it turns to the major trends of the social turn of SLA research, leading to the fundamental base of the study and the discussion between context and learner. CDST is subject to special concern, which is the theoretical support of the diversification in the interrelated relation between context, learner and motivation. Lastly, the issue of individual difference (ID) is addressed, which is the theoretical source of designing the questionnaire of learners’ background part.

## 1.1 Introduction

*Understanding Second Language Acquisition* (Ellis, 1989), which is a popular work of Rod Ellis, is dedicated to a comprehensive introduction and analysis of current research in the field of SLA. This work constitutes a big leap forward in explicitly understanding the language learning process and enriching teachers' theories engaged in the language learning process.

Initially, Rod Ellis makes a distinction between 'second language acquisition' (henceforth 'L2 acquisition') and the field in which this is studied, which he refers to as 'SLA' (Ellis, 1989). To be more specific, L2 acquisition is a complex process whereas SLA is a relatively new academic discipline. Scholars sometimes use 'SLA' to refer to 'L2 acquisition', making it conducive to distinct precisely between the issue and the discipline researching into it.

Afterwards, L2 acquisition is defined by discussing concepts of "language", "second language" and "acquisition" respectively. As R. Ellis (1989) puts forward, competence and performance are always distinguished regarding the term "language". The former cannot be directly observed but only be inferred by inspecting how learners use the second language, while the latter can be investigated and it involves much more than grammar, leading to vibrant investigations into the use of language for social purposes in connected discourse other than traditional language area.

The word "second" is defined subsequently. In the field of SLA, 'second language (L2) acquisition' is regarded as an all-inclusive term for learning any language after the first language. The word "second" will make more sense when we discuss learning a "third" language in a multilingual world in the chapter of multilingualism.

There is also a mild difference between "second" and "foreign language acquisition" on learning context. As R. Ellis (1989) further explains:

*'Second language acquisition' refers to the learning of another language in a context in which the language is used as a means of wider communication—for example, the learning of English in the United States or the United Kingdom. The assumption is that learners will 'pick up' the language as a result of the everyday communicative situations they experience. 'Foreign language acquisition' refers to the learning that typically takes place in a classroom through instruction where there are no or only limited opportunities to use the second language in daily life. However, 'L2 acquisition' has come to be used to refer to the learning that takes place in both contexts. There is a good reason for this: while the contextual difference is very real, we cannot take it for granted that the process of acquiring a second language is different in these different contexts (Ellis, 1989, p. 18).*

The term “acquisition” is distinguished with “learning” constantly. It seems that the difference lies in this, acquisition occurs naturally during communication using L2 in a second language context while learning involves intentional effort to study and learn a language with instruction in foreign language contexts (Ellis, 1989). However, Ellis (1989) also points out that both acquisition and learning can take place in both contexts. ‘L2 acquisition/learning’ can be adopted interchangeably as cover terms for both naturalistic ‘acquisition’ and instructed ‘learning’.

After the exploration of each concept accordingly, the definition of learning a second/foreign language through instruction is employed in this study. L2 acquisition is regarded to foreign language acquisition/learning as well.

## **1.2 The Major Trend of Second Language Acquisition: From Cognitive to Social Change**

Zhang (2020) conducted a systematic study to examine the major trends of SLA field between 1997 and 2018 by using the bibliometric method. The findings presents a clear pattern showing that the cognitive SLA approach dominated the field in the 1997–2007 period and has remained to be the mainstream approach to SLA during the 2007–2018 period. It also reveals that a heated cognitive-social debate arose around 20 years ago, leading to the positive change of the field and opening up new opportunities for alternative approaches. Now the field has been far expanded.

Defined as an interdisciplinary field with widely varying elucidations, SLA has been developed and enriched continuously by individuals from diverse disciplinary backgrounds with varying demands(Long, 2017). Diversified, broad and expanding, these are the exact words that can be used to describe the field of SLA.

Last three decades have witnessed the drastic increment of theories and production in SLA. Its heterogeneity of interdisciplinary can be glimpsed from researchers of various disciplines, for instance applied linguistics, psychology, education, anthropology, etc. As Long (2017) explains, the prolific outcomes are also employed in interdisciplinary fields, including psychology, neurolinguistics, language teaching, education, etc.

Given this huge heterogeneity, it is no easy way to cover all SLA theories and perspectives. Nevertheless, knowing its tendency and new navigation makes it fundamentally conducive to our research, in which CDST is subjected to special concern.

Larsen - Freeman (2018) summarises three stages in the developing history of the SLA field: a cognitive beginning, a social challenge and a sociocognitive process.

### **1.2.1 A Cognitive Beginning**

The articles published by Corder (1967) and Selinker (1972) are believed to have signalled the establishment of modern SLA research. As Corder (1967) proposes, it is strongly suspected that a “built-in” learner syllabus existed. Selinker (1972) raises an intriguing term of the interlanguage, which refers to a language spoken by learners that is intermediate between their first language (L1) and the second language (L2). Meanwhile, Chomsky (1965) suggests the existence of a universal grammar (UG). Thereafter during the cognitive revolution, scholars endeavoured to make enhanced progress in searching for common acquisition orders and sequences of development, leading to Krashen (1982)’s hypothesis of the existence of a natural acquisition order (Larsen - Freeman, 2018).

### **1.2.2 A Social Challenge**

As Hymes (1972) puts forward, competence was made up not only of grammatical knowledge but also of social knowledge—knowing how to use utterances appropriately. In 1997, controversy emerged and was reflected from the publication of Firth and Wagner (1997) on *Modern Language Journal*. There were those who favoured the extant cognitivist focus on SLA and those who advocated that the process was essentially a social one. As implied by Larsen - Freeman (2018), despite the controversy, the field of SLA has altered its navigation towards the recognition of the prominence of the social perspective.

### **1.2.3 A Sociocognitive Process**

In spite the key concern gained by social direction, the cognitive approaches were not neglected. A combination, namely sociocognitive theories of SLA theories occupied researchers’ attention. These sociocognitive theories focused not only on the simple combination but also on the interrelation between cognitive involvement and social interaction. CDST, which refers to that language development occurs at the nexus or intersection of the cognitive involvement and social interaction (Cameron & Larsen-Freeman, 2007).

Likewise, R. Ellis (2020) also points out that the research of SLA has two new developments. The first one is Complex Dynamic Systems Theory (Cameron & Larsen-Freeman, 2007; De Bot et al., 2007), which highlights the need to take account of the interconnectedness of social, cognitive and psychological factors and thus offers an all-embracing framework for investigating both the use and acquisition of an L2 and individual learner differences. The second development is the ‘multilingual turn’(May, 2013). This perspective led to proposals for redirecting SLA to the investigation of multicompetences and the *translanguaging* that occurs amongst mixed groups of language users who draw on multiple linguistic resources. R. Ellis summarises the developing period of SLA field in the following tables (Ellis, 2020):

Table 1 - The Developing Period of SLA Field (Ellis, 2020, p. 2-6)

Area of interest	Period	Key studies	Key findings	Theoretical influences
Order and sequence of acquisition	1960s and 1970s	Dulay and Burt (1973) and Cancino, Rosansky, and Schumann (1978)	Just as children acquiring their first language went through clearly marked stages of development, so too do child and adult L2 learners acquire the grammar of an L2 in a more-or-less universal and fixed way. This finding challenged behaviourist accounts of L2 learning and the audiolingual method of teaching.	L1 acquisition research (e.g. Klima & Bellugi, 1966; Brown, 1973).
Language transfer	1980s	Kellerman (1983) and Ringbom (1987)	Language transfer was reconceptualized as a cognitive rather than behaviourist phenomenon; the emphasis was now on the conditions that governed negative and positive transfer and avoidance.	Reaction to both behaviourist accounts (e.g. Lado, 1957) and the minimalist position (Krashen, 1983).
Linguistic universals Universal Grammar (UG)	1980s	Gass (1984), White (1989) and Eckman, Bell, and Nelson (1988)	Researchers tested hypotheses drawn from linguistics – in particular whether L2 learners had access to UG. Markedness and universal principles governed both order of acquisition and language transfer.	Linguistic theory: Typological universals – (Comrie, 1984); Generative grammar – (Chomsky, 1965).
Second language pragmatics	1980s	Thomas (1983) and Blum-Kulka, House, and Kasper (1989)	The focus was on the comprehension and production of speech acts such as requests and apologies and the identification of pragmatic and pragmalinguistic differences between native and non- native speakers.	Speech act theory (Searle, 1969); politeness theory (Brown & Levinson, 1987).
Input and interaction	1980s	Krashen (1985), Long (1983) and Swain (1985)	Researchers addressed how the linguistic environment influenced L2 acquisition. Three influential hypotheses: (1) the Input Hypothesis, (2) the Interaction Hypothesis and (3) the Comprehensible Output Hypothesis.	Research on foreigner talk – (Ferguson, 1975); L1 acquisition research on caretaker talk – (Wells, 1985); discourse analysis – (Coulthard, 1977).

Area of interest	Period	Key studies	Key findings	Theoretical influences
The Social Turn	Late 1990s onwards	Firth and Wagner (1997), Block (2003) and Norton (2000)	Learners have agency and actively construct their own learning contexts; social identity is crucial; learner-learner interactions are common; learners have local agendas.	Socialization theories e.g. Community of Practice Theory (Lave & Wenger, 1991); Poststructuralist theories (Bourdieu, 1986).
Sociocultural SLA	1990s onwards	Lantolf (2000) and Swain (2006)	Learning commences externally WITHIN interaction. Key constructs – mediation; private speech; zone of proximal development; internalisation; collaborative dialogue; 'languaging'; dynamic assessment.	Sociocultural theory – (Vygotsky, 1978, 1986). Sociocognitive theory (Atkinson, 2014).

Area of interest	Period	Key studies	Key findings	Theoretical influences
Complex Dynamic Systems Theory	2000s onwards	Larsen-Freeman (1997), Larsen-Freeman and Cameron (2008) and de Bot et al. (2007)	Combines social and cognitive perspectives on L2 acquisition; views learning as individualistic and non-linear; interconnectedness of multiple variables; predictions about how learning will occur not possible.	Originated in mathematics and science – e.g. Catastrophe Theory and Chaos Theory; also influenced by emergentist theories of learning.
The multilingual turn	2010s	Cook (1992), May (2013) and Ortega (2009, 2019)	Rejects viewing bilingualism in terms of the development of monolingual competence; makes multilingualism the central area of enquiry and emphasizes the multiple competencies of bi/multilingual learners; translanguaging.	Transdisciplinary

### 1.3 Complex Dynamic Systems Theory

In this study, we adopted the perspective of Complex Dynamic Systems Theory (CDST) (Ushioda, 2015) in exploring the interrelated relationship between context learner and teacher, as well as the diversification of motivation in the learning process.

#### 1.3.1 Context

Context, which is a non-negligible element in the research field of Languages for Specific Purposes (LSP), composes the prerequisite for language teaching and learning. “Sensitivity to language in context” has always been an underlying strength of LSP, but what is meant by context has also evolved (Upton, 2012, p. 18). Comprehending and analysing the context can be a complex task. Context refers to a plurality of things. It includes all the contextual elements



important for comprehending linguistic (and learning) behaviour, but it can also be more pragmatic and refer to the students' and the institution's everyday environment (Narcy-Combes et al., 2019, p. 56).

Context can comprise the subject matter, the institution in which it is implemented, teacher training, exposition to the target language, duration of the exposition and so on (Chaplier & O'Connell, 2015). Within the research of SLA, contexts have traditionally been referred to fairly generic terms, such as cultural or linguistic setting, type of learning environment (e.g. formal versus informal, home versus study abroad), or input and instructional conditions (e.g. focus-on-form, task-based learning) (Ushioda, 2015). Learners are placed “in” some certain kind of context, which has positive or negative impact on learners. In this conventional view, learners and contexts are viewed in isolation, with the latter impacting the former one normally.

The first problem to be dealt with in CDST is determining context. The learner and context do not interact in a linear fashion, nor can they be seen as distinct entities. As Ushioda (2015) explains, if language input is regarded as a feature of context in L2 learning, we recognise that learners act upon their contexts. Through their interactions with input, learners are also observed to contribute to shaping their surroundings.

In this regard, there exists a dynamically growing relationship among learners, teachers and the context they are placed in. More importantly, there is certainly adaptation that echoes with the interaction in between, making learners an irreplaceable role lively engaged in shaping the context around them.

### **1.3.2 Complex dynamic systems theory (CDST)**

CDST is a scientific paradigm that has developed in the natural and social sciences during the past several decades and that views diverse phenomena—including, for example, the weather, the brain, ecosystems, the economy, locomotion, language, programmes, families, education, culture, personality, emotion, cognition, motivation, development—as complex dynamic systems: networks of interdependent elements whose continuous, iterative, interaction give rise to the system's behaviour (Bar-Yam, 2019).

As Ushioda (2015) puts it, CDST is transdisciplinary centring in *change* and *emergence*, which means change that arises from the interaction of the components of the system, just like a bird flock emerges from the interaction of individual birds.

“Essentially, nothing in its [a complex dynamic system] environment is fixed” (Waldrop, 1993). This emphasis makes it clear that CDST is a theory of process rather than state. As Ushioda further expounds:

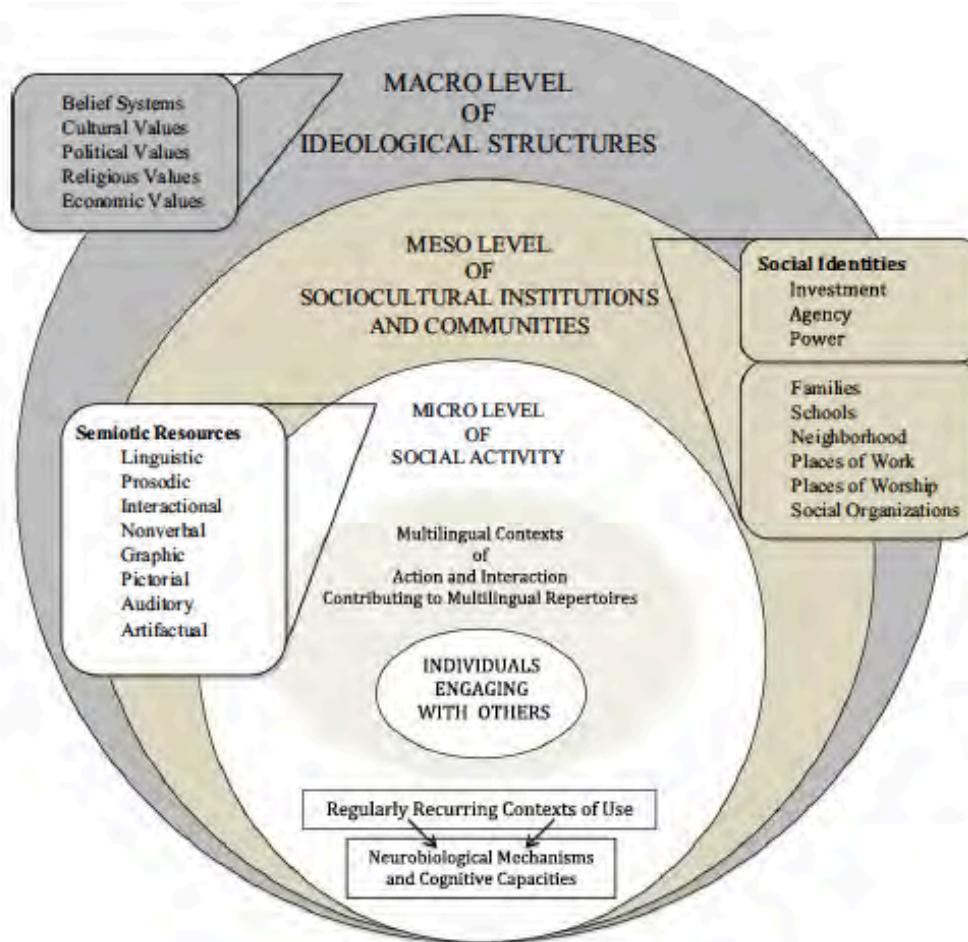
*motivation is dynamic. Periods of stability may be reached, but motivation undeniably changes, sometimes often and certainly over time. If we really want to understand motivation, and other aspects of second language development(SLD) for that matter, we must conceive of them more as processes than states(Ushioda, 2015, p. 12).*

#### **1.4 A Transdisciplinary Framework for SLA in a Multilingual World**

The Douglas Fir Group (2016) proposes the framework which regards L2 learning as an ongoing process that begins at the micro level of social activity (the smallest concentric circle), together with meso contexts of sociocultural institutions and communities and the macro level of ideological structures.

As shown in Figure 2, the framework proposed by the Douglas Fir Group (2016) regards L2 learning as an ongoing process that begins at the micro level of social activity (the smallest concentric circle), with individuals recruiting their neurological mechanisms and cognitive and emotional capacities and engaging with others in specific multilingual contexts of action and interaction, resulting in recurring contexts of use that contribute to the development of multilingual repertoires.

Figure 2 - The Multifaceted Nature of Language Learning and Teaching (Group, 2016, p. 25)



As the Douglas Fir Group (2016) points out, the institutions and communities at the meso level are powerfully characterised by pervasive social conditions (e.g., economic, cultural, religious, political), which affect the possibility and nature of persons creating social identities in terms of investment agency, and power.

### 1.5 The Role of Technology in SLA

*The application of social strategies: The platform of Moodle*

In this globalised world, language teaching and learning has increasingly rested on the shoulders of Web 2.0 technology, which is deemed to be a general trend. Web 2.0 technology broke through the obstacle of Web1.0 technology, which is visual elements and text only and not allowing content creation (Jeng et al., 2012).

Web 2.0 technology is increasingly applied in education crossing multiple disciplines since it can foster the possibility of communication, interaction, information sharing, easy access to

information, content creation, content storage and sharing, evaluation and visualisation (Ajjan & Hartshorne, 2008; AŞIKSOY, 2018; Grosseck, 2009).

According to Etxebarria et al. (2012), the applications of Web 2.0 technology is consistent with the benefit of using social strategies, as they propose in the following diagram:

Figure 3 – Web2.0 Technology and Social Strategies (Etxebarria et al., 2012, p. 276)

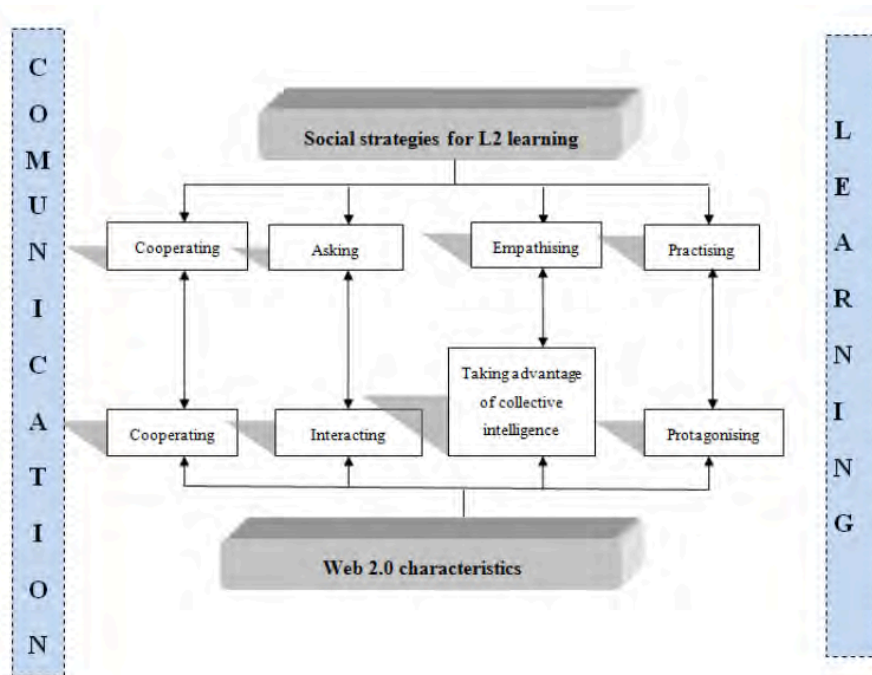


Figure 3 indicates that four categories of social strategies mentioned before are corresponding to characteristics of Web2.0 technology, including cooperating, interacting, using collective intelligence, protagonising. Learners are driven to be real protagonists and the role of teachers have become guides and motivators instead of the only sources (Etxebarria et al., 2012).

The applications of Web 2.0 technology exhibit numerous merits. The first advantage of using these online tools is that they help develop a greater sense of community (Faizi, 2018) Thus collaborative learning is greatly impelled rather than individual learning. The frequent recourse to group work enhances students’ motivation, self-confidence, self-esteem and success (Hillyard et al., 2010). It also offers copious materials during teaching and learning activities, including videos, audios, images and text documents.

Moreover, in the coronavirus pandemic, online tools have played increasingly active roles as never seen before. The spread of the coronavirus has led to sequential lockdowns, disrupting

fundamental activities of the school education. During this special occasion, online tools like Moodle (Modular Object-Oriented Dynamic Learning Environment), Mooc (Massive Open Online Course) and Zoom (online meetings), etc. are prevailing and widely adopted.

Moodle, which was founded by Martin Dougiamas in 2002, is a virtually learning platform altering existing learning environments online. Moodle is an ideal platform owing to its easy interaction and cooperation among teachers and students. North also claims that treating learners as social agents includes “involving them in the learning process, recognizing the social nature of language learning and use” (Gadomska, 2013).

## **1.6 Individual Learner Differences**

In this study, the background part of the questionnaire of attitudes and motivation enquiring students’ family and language background is based on theoretical sources of individual learner differences and external factors. Individual learner differences like attitudes, beliefs and motivation will be respectively discussed in detail in the next part.

The issue of individual variations have been targeted for particular focus in the research of SLA, since language learning process varies on individual characteristics. Its centrality has been acknowledged by scholars and intensively explored in the framework built by Dörnyei (2005a) concerning “Individual difference (ID)” concerning “Individual difference (ID)”.

The research of Individual Difference (ID), as Dörnyei (2017) puts it, has been focused entirely on exploring the parallel occurrence of the *uniqueness* and the *general aspects* of the human mind, and this complex duality has not been limited to personality psychology but has also been found to apply to the nature of language development and use. Pawlak (2017) stresses that individual difference (ID) variables are likely to play a vital role, impacting both the process of language learning and the outcomes of this process. Dörnyei (2017) also states that ID factors in SLA research have been well established as constituting a relatively straightforward concept involving background learner variables that modify the general language acquisitional processes. Undoubtedly, ID variables contribute much to the interaction in which learners engage, causing diversified learning process and learning outcome.

ID variables can vary on specific classifications. Such ID variables can be sociocultural (e.g., beliefs, attitudes, experience), cognitive (e.g., age, aptitude, working memory, cognitive styles, learning strategies), and affective (e.g., anxiety, personality, motivation, willingness to communicate) in nature, with some IDs cutting across clear-cut categories, themselves being

affected by each other and a host of other variables (Dörnyei & Ryan, 2015; Gregersen et al., 2014; Pawlak, 2012).

Learner differences research is old, whereas it is also new with increasing understanding of how much their application can increase the success margin of our teaching and can enhance learner autonomy through appropriate metacognition and targeted learning strategies (Ehrman et al., 2003). Some key aspects are discussed respectively.

### **1.6.1 Learning Styles**

The term *learning style* refers to the general approach preferred by the student when learning a subject, acquiring a language, or dealing with a difficult problem (Oxford, 2003a). As Ehrman et al. (2003) state, learning style is often used rather loosely and often interchangeably with other terms like *learning style*, *cognitive style*, *personality type*, *sensory preference*, *modality*, and others. Oxford (2003a) illustrates that each individual, within the area of learning styles, reflects sensory style dimensions (visual/auditory/hands-on) and social style dimensions (extroverted/introverted). Individuals also have preferences along cognitive style dimensions, among which are concrete-sequential/abstract-intuitive, closure-oriented/open, detail-focused/holistic (sometimes called particular/global), and analysing/synthesising.

### **1.6.2 Learning Strategies**

Learning strategies are seen interrelated with learning styles, manifesting styles over learning behaviours.

According to Ehrman et al. (2003), a strategy is useful under these conditions: (a) the strategy relates well to the L2 task at hand, (b) the strategy fits the particular student's learning style preferences to one degree or another, and (c) the student employs the strategy effectively and links it with other relevant strategies.

Six major groups of L2 learning strategies are proposed by Oxford (1990):

*1. Cognitive strategies enable the learner to manipulate the language material indirect ways, e.g., through reasoning, analysis, note-taking, and synthesizing.*

2. *Metacognitive strategies (e.g., identifying one's own preferences and needs, planning, monitoring mistakes, and evaluating task success) are used to manage the learning process overall.*
3. *Memory-related strategies (e.g., acronyms, sound similarities, images, keywords) help learners link one L2 item or concept with another but do not necessarily involve deep understanding.*
4. *Compensatory strategies (e.g., guessing from the context; circumlocution; and gestures and pause words) help make up for missing knowledge.*
5. *Affective strategies, such as identifying one's mood and anxiety level, talking about feelings, rewarding oneself, and using deep breathing or positive self-talk, help learners manage their emotions and motivation level.*
6. *Social strategies (e.g., asking questions, asking for clarification, asking for help, talking with a native-speaking conversation partner, and exploring cultural and social norms) enable the learner to learn via interaction with others and understand the target culture (Oxford, 1990, p. 17)*

Uslu et al. (2016) carry out a research aiming at exploring the relationship between learning strategies and academic achievement. Findings imply that there is a positive and meaningful relationship between strategy use and academic achievement, in which *memory strategies, metacognitive strategies, affective strategies, social strategies* showing positive and meaningful relationship with academic achievement. Afterwards, social strategies will be discussed exclusively.

### **1.6.3 Social Strategies: Crucial Components in Language Learning**

Social strategies are of importance and beneficial if used by learners, since learners are learning the target language not only within but beyond classrooms. Therefore, the interaction with the surrounding and the culture of the target language should not be ignored.

Social strategies are defined by Oxford (1990) as following:

*Language is a form of social behaviour; it is communication, and communication occurs between and among people. Learning a language thus involves other people, and appropriate social strategies are very important in this process (Oxford, 1990, p. 144).*

She also proposes three groups of social strategies: 1) the actions used for asking, like asking for explanations and/or checking them and asking someone to correct mistakes; 2) the actions aimed at cooperation, carrying out activities with a classmate or native; 3) those actions which enable us to use empathy, being open to culture and to the way of thinking and feeling of other people.

Subsequently, “the search for situations in which a second language can be practiced “ was added (Ellis, 1997). Social strategies were simplified and enriched into four categories: asking, cooperating, empathising and practicing.

These four strategies imply a nexus of actions occur with surrounding: teachers, friends even just classmates who are learning the same target language. Social strategies have principally two characteristics: on the one hand, they encourage feedback and interaction; on the other hand, they are actions carried out with the help of others and are useful for understanding, learning or keeping information (Etxebarria et al., 2012).

#### **1.6.4 Learners’ Socio-cultural Autonomy and Social Strategies**

The conception of Learner autonomy (LA) is proposed by Holec (1979), which refers to the learners’ ability to take charge of their own language learning. Later, Oxford (2003b) proposes a more comprehensive systematic model for LA including four perspectives: technical perspective, psychological perspective, socio-cultural perspective, and political-critical perspective, leading to the component of Socio-cultural Autonomy (SA). Oxford’s model underlines four main themes in each perspective: context, agency, motivation, and learning. Strategies (Alzubi & Singh, 2018). Language learners’ communication within the socio-cultural context is believed to be facilitated by using social strategies. In this regard, the difficulty of English language teaching and learning is maybe due to a lack of language exposure.

Murase (2007) divides the definition of socio-cultural perspective into social and cultural. The social aspect is about the role of social interaction in developing SA that may include interdependence where learners cooperate with teachers, peers, and people. As Alzubi and Singh (2018) state, the cultural aspect inspects the cultural features where SA occurs. The context of learning in SA refers to the presence of society and culture among a group of individuals at a given historical time. The context of autonomy hypothesises that the community in which the relationship and social and cultural environment can help learners receive insider knowledge, cultural understanding, practice, and strategies through interaction (Oxford, 2003b).



### **1.6.5 The Role of Family Background and Socio-economic Factors**

Multilingualism is now widespread in the world; more and more students tend to study in tertiary education. In particular, France is a multicultural country that encourages individuals to preserve their own cultural identity.

Owusu et al. (2015) point out that one vital external factor that has not received much attention is the family background of the second language learner. This variable has the proclivity of affecting the academic writing of the second language learner at the tertiary level in several ways. Some sub-factors of the family background are: the attitudes of parents, the educational background of parents, the culture of the family, and the language(s) spoken at home. The family is a powerful tool that could exert influence on the social, economic, cultural, and educational lives of the second language learner.

Nikolov (2009) observes a tendency that indicates a strong link between parents' level of education and students' achievement in language learning in Hungary. The Programme for International Student Assessment (PISA) Report in 2003 showed that students whose parents had higher qualifications performed significantly better in the language proficiency test administered to European school age children (Kormos & Kiddle, 2013). PISA Report in 2015 showed that students who spoke English at home most of the time performed significantly higher in scientific literacy and reading literacy than students who spoke a language other than English at home most of the time. PISA Report in 2018 also indicates that pupils who spoke a language other than English at home scored significantly less well in the reading assessment than pupils who spoke English at home (Sizmur et al., 2019).

A six year follow-up study on a group of children and their migrant families, which examined the effects of a parent involvement programme on kindergarten children's families, suggests that equipping migrant families with new abilities to nurture their children's language skills leads to positive and lasting reading outcomes for their children (St Clair et al., 2012).

The study conducted by Howard et al. (2014) explores how the role that socioeconomic status (SES), home and school language and literacy practices, and oral vocabulary play in the development of English reading skills in Latino English language learners (ELLs) and how these factors contribute differentially to English reading. The study points to the importance of looking closely at the texture of children's lives in coming to an understanding of second-language literacy development. Scheele et al. (2010) also demonstrate that children from high

SES families by comparison with children from low SES families have more opportunities to experience language input that stimulates language development.

In conclusion, it is mentioned that the research focus in second language acquisition (SLA) has shifted from cognitive to a social transformation after providing a bird's-eye view of SLA. Such a social trend continues to be at the forefront of SLA growth, making context an essential component in English learning. Individual learner differences (ID), family background and socio-economic factors are also suggested to be playing an increasing part in the process of learning English. In the section that follows, we will focus on attitudes and motivation at the micro level and how they relate to teaching languages.

## **Part 2 Attitudes and Motivation**

In this part, some key concepts like attitudes and motivation, representation, beliefs are presented representatively, as well as their related empirical studies and significances. Then we turned to the Socio-educational Model of SLA and the Attitude/Motivation Test Battery (AMTB), which are the foundation of designing the questionnaire of attitudes and motivation. At last, motivation theories in second/ foreign language learning context are introduced and explored in a sequence of time.

### **2.1 Attitude, Representation and Beliefs**

This part provides a detailed description of the notion of attitude, representation and beliefs, highlighting their significance in language learning process, and explains how they are correlated with culture in intercultural studies.

#### **2.1.1 Attitudes and Motivation**

The research effort into the significance of factors like attitudes and motivation during the process of learning a second language can date back to the 1940s (Gardner, 2001b). An interesting question raised by Gardner in the first place is that how one could genuinely learn a second language if they did not like the group who spoke the language.

There are many different situations in which second language acquisition can take place, and it is reasonable to assume that the context will have an influence on the relative degree of success of the individual concerned (Gardner, 2001b). As previously discussed in Part 1, this is also covered in CDST, in which learners are also seen to contribute to shaping their contexts through how they interact with input.

The social, attitudinal and emotional factors that are present in the process of learning a foreign language are known as ‘language attitudes’, such attitudes were originally limited to language learners’ perceptions of the target language community and target language itself (Gardner, 1985). The concept of attitude has expanded to include stereotypes and mental images that language learners hold about the target language countries, their cultures and people (Nikitina et al., 2020).

Gardner (1960) conducts an empirical test measuring achievement in French language aptitude, attitudes towards the parents, home background characteristics, and other variables hypothesised to measure an integrative motive in second-language study, As he puts forward:

*just as the complex of variables which comprise “aptitude” were determined by analyses of the important intellectual variables associated with second-language achievement, the complex of variables relating to motivation must be similarly investigated. It is not sufficient to consider motivation merely as some vague urge to work diligently in a foreign-language course Gardner (1960, p. 2).*

Gardner's construct of motivation has three components: motivational intensity, desire to learn the language, and, an attitude toward the act of learning the language (Gardner, 1985). The motivation factor was found to be correlated to the achievement with other components engaged in the activity (skills, attitudes, anxiety, desire to learn foreign language, parental, ethnocentrism, etc.). In his study, Gardner also viewed these attitudes and the integrative motive of students as seen as densely interwoven while they study foreign languages (Softa, 2019).

#### *Instrumental orientation and integration orientation*

Gardner and Lambert (1972) add two orientations of attitudes and motivation in learning a foreign language, namely the instrumental orientation and integration orientation. As (Gardner, 2001a, p. 4) further states:

*Motivation in learning a foreign language is a very broad concept; one learns language for integrative or functional reasons. Integrating motives do not imply being part of the group, but being open to its culture, while the instrumental orientation of the language implies the practical benefits that the individual likes (Gardner, 2001a, p. 4).*

Clément and Kruidenier (1983) add three more orientations: *knowledge, friendship, and travel*, which could either, be considered variants of integrative orientation or as distinct orientations. These three orientations were common among majority and minority language groups.

Attitudes can vary in numerous orientations. For instance, there can be attitude to the variation of language, attitude to foreign and second language, attitude to a specific language, attitude to minority language and dominant language, etc. (Al Mamun et al., 2012). Despite the nature of attitude, two components are involved: instrumental and integrative (Baker, 1992). Instrumental attitude refers to showing attitude to a particular language for self-achievement and recognition.

Integrative attitude, on the other hand, concerns someone's attachment with a particular speech community.

### *Cultural Context*

Gardner (2007) also indicates that social context has an impact on individuals in language learning. Cultural belief is related to learners' learning efficiency, language-learning goals, family history background characteristics, peer pressure, etc. Gardner states that "all these traits are expressed in individual attitudes, beliefs, ideals, expectations, etc., in relation to language learning" (Softa, 2019).

Based on all the theories mentioned, considering learners with numerous backgrounds of languages and cultures in France, we targeted constructions of motivation and attitudes towards scientific English in French higher education. It is important to discover how the students in science fields of universities to learn English are motivated, what their attitudes are towards the community that speaks English and culture of the community, and how their own culture affects them to learn English language.

#### **2.1.2 Social Representation**

The term "social representation" originates from the social representation theory, which is first formulated by Serge Moscovici and impacted researchers from varying disciplines (Höijer, 2011). The concept of the social representation is adapted from Durkheim's concept of "collective representations" (Durkheim, 1894, 1898; Durkheim, 1893). Serge Moscovici first introduced the social representation of psychoanalysis in his thesis in 1961 (Moscovici, 1961). Being heir to a strong French sociological tradition, social representation theory assumes one of the most significant theories in social psychology (Rateau, 2011). It was initially prevalent in European, and then swept the globe mainly in the field of social psychology, but also in all else social sciences. Social scientists from diverse fields are inspired by Moscovici and conduct extensive studies on the social representation of illness, the human body, biotechnology and the environment, etc. (Figari & Skogen, 2011).

A social representation can be shortly explained as a processes of collective meaning-making resulting in common cognitions which produces social bonds uniting societies, groups and organizations (Höijer, 2011) According to Rateau (2011), during the constantly repeated

process of reconstruction from our young age, our perception of the world is shaped through exchanges and communications. In the path of our multiple involvements and contacts with various social groups, we ourselves acquire and transmit knowledge, beliefs, and values that enable us to share a common conception of things and of others. The well acknowledged characteristics of social representation are *shared, collective produced, of organization and socially useful* (Duveen et al., 1990; Moscovici, 1991; Rateau, 2011). As Jodelet (1989) states, a social representation is “a form of socially developed and shared knowledge, with practical implications, which contributes to the construction of a common reality for a social group” (Castellotti & Moore, 2002, p. 8).

### *Objectification and Anchoring*

Two processes are designated in the formation and operation of social representations by Moscovici (2000), which are *objectification* and *anchoring*: The first mechanism strives to *anchor* strange ideas, to reduce them to ordinary categories and images, to set them in a familiar context. The purpose of the second mechanism is to *objectify* them, that is to turn something abstract into something almost concrete, to transfer what is in the mind to something existing in the physical world (Moscovici, 2000).

### *Representations in Language Learning Contexts*

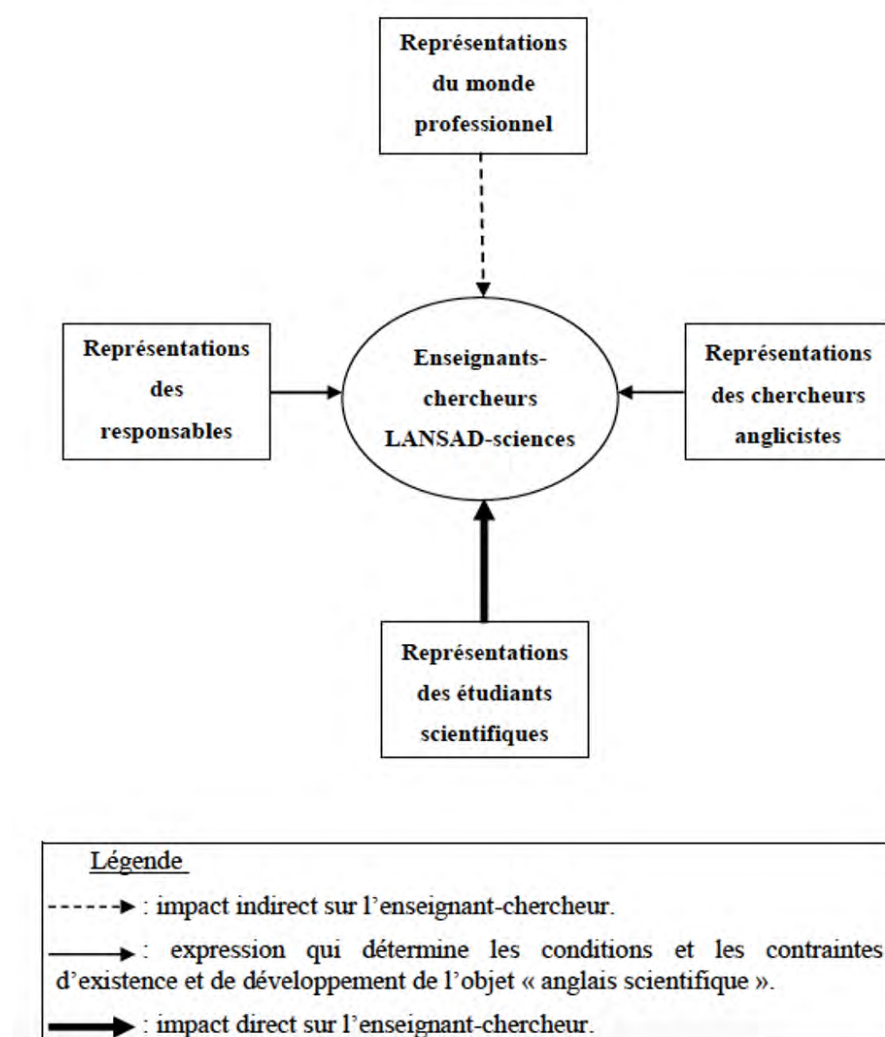
In an educational context, social representations serve to establish a relation of consent among participants engaged in a learning process. Directing the process of communication within the learning context, social representations are also of prominence in framing the conducts and behaviours of participants. Castellotti and Moore (2002) presume the usage of the term representation in referring to common knowledge or cultural beliefs such as stereotypes, attitudes, prejudices, and images.

Representations are also employed in the field of teaching language for science. The survey conducted by Chaplier (2017) among master students in University Paul Sabatier from 2013 to 2015 implies that teacher and student have their own representation of knowledge in scientific English. They take different perspectives in viewing and evaluating the outcomes of learning. As she further explains, teachers verify in terms of pre-defined objectives for normative assessment. On the other hand, students, who have greater expertise in the scientific field, will assess the relevance of this "knowledge taught" according to criteria such as the appropriateness

of the teaching to professional requirements, the appropriateness of the language course in the scientific context, and the assurance that the teacher can serve as a reference.

Students in science may appreciate English, but it may not be the case with the English language course, which depends on the teacher (cognitive and affective aspects) and which does not always correspond to the students' expectations. This is the reason why it is difficult to communicate between students and teachers who do not have the same representations and the same knowledge bases.

Figure 4 – Network of Representations (Chaplier, 2017, p. 53)



A network of representation is presented by Chaplier (2017) showing that language teachers' representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of researchers in English studies; representations of science students.

### *Representations of Countries and Speakers*

Numerous researchers in France, as listed by Castellotti and Moore (2002), have demonstrated the pivotal role assumed by learners' representations of languages, the people who speak those languages and the countries in which those languages are spoken (Berger, 1998; Cain & De Pietro, 1997; Candelier & Hermann-Brennecke, 1993; Muller Mirza, 1998). Embedded with the power either to enhance or to inhibit learning, these highly stereotyped images emerge, perpetually root in society through numerous channels, including the media, literature, occupational manuals even tourism brochures (Castellotti & Moore, 2002).

Muller Mirza (1998) once probes into representations of the German language among Swiss students who speak French, and how the nexus is related to their representations of Germany, which are linked to their representations of German-speaking Switzerland and its inhabitants instead. Castellotti and Moore (2002) also indicate that a negative representation of Germany links to the perception that learning German is difficult and unsatisfying, which is a common example that emerges in France and French-speaking Switzerland. Sometimes this idea is transmitted by teachers. A learner's representations of a country and the representations the individual constructs regarding one's own learning of that country's language are seen as densely interwoven (Muller Mirza, 1998)

### *Cultural Representations*

Cultural representations, which comprise mental and public representations, characterise a specific group or subgroup within a community (Sperber, 1996). According to Gohard-Radenkovic et al. (2004), cultural representations can either be positive (xenophilic) or negative (xenophobic), indicating open and accepting attitudes, or rejection and refusal toward the other group.

Given the link between language learning and positive cultural representations, Rubenfeld et al. (2006) make the hypothesis that positive interrelations between the contact with the L2 community, confidence when speaking the L2, and identification with the L2 community would lead to more positive cultural representations instead. Moreover, confidence is hypothesised to serve as a precursor to contact.

Results of the study (Rubenfeld et al., 2006) imply that contact with/or confidence in an L2 leads individuals to identify with the L2 community. This process then guides individuals to more positive representations of the L2 culture. In daily life, this research proposes that learning



an L2 might positively influence intergroup relations. According to Rubinfeld et al. (2006, p. 627), “in the context of learning an L2, we see greater identification with that community, which, in turn, leads us to feel more positively about the community”.

### *Intercultural Stereotypes*

The perspective is increasingly emphasised by numerous scholars in the understanding of interculturality that each individual simultaneously belongs to different cultural groups and mediates his or her identities in interaction with others (Hahl & Löfström, 2016; Holliday, 2010; Piller, 2017)

Stereotypes are normally considered of as a specific expression of attitudes; they entail an agreement between members of a single group on certain characteristics, which are accepted as a valid, discriminating means of describing the difference of other groups (the outsider) (Castellotti & Moore, 2002). It hints that stereotypes possess the solid characteristic, not easy to change and normally occurs among certain groups.

As Lippmann (1922, p. 96) suggests “a pattern of stereotypes is not neutral... The stereotypes are ... highly charged with the feelings that are attached to them”. Several empirical research has established this proposition:

It was found that children as young as 4 years old exhibit attitudinal reactions toward people of other nationalities (Klineberg & Lambert, 1967; Piaget & Weil, 1951). Interestingly but not surprisingly, children tend to view their own national group in a more positive light compared to their perceptions of other nations. It was also found that the Swiss children in their study possessed predominantly negative attitudes toward and stereotypes about various foreign countries and people (Nikitina, 2017).

Nikitina (2017) indicates that research on country and national stereotypes held by language learners has considerable pedagogical implications. Negative stereotypes held by students about speakers of a target language could be “a stumbling block” to mastering a foreign language, as Gardner and Lambert (1972) also accentuate. In this regard, studies on stereotypes can be of prominence for pedagogical implications.

Schools that are increasingly multicultural lead to teachers’ preparation to deal with complex and sensitive issues related to equality and social justice, diversity and discrimination (Banks, 2008). Abdallah-Preteille (2006) points out that researches concerning the notion of culture

always focus on the differences of various group, whereas the diversity within each individual and among individuals belonging to the same cultural groups is ignored. Holliday (2010) accentuates the challenge for teachers and students to identify the diversity in individual characteristics, dispositions, and behaviour while avoid culturalism, i.e. merely turning knowledge about various cultures, nation-states or different nationalities into stereotypes. He also highlights that stereotypes may harm people's interactions despite their being useful in realizing the world. Stereotyping usually comprise a negative connotation when the 'Other' is considered inferior to 'Self' and one's own group.

### **2.1.3 Beliefs**

Self-beliefs that learners develop and hold about their capabilities and skills they possess are regarded to have an immediate impact on their learning behaviours (Pagares & Schunk Dale, 2001). Therefore, beliefs should be covered in this study in order to understand why students achieve or fail to achieve and students' choosing or avoiding certain activities (Pajares & Schunk, 2002).

According to Gabillon (2005), language learners' beliefs have appeared under different rubrics and categories such as: a) L2 learners' metacognitive knowledge; b) self-beliefs such as self-concept beliefs, and self-efficacy beliefs; c) control-beliefs, such as self-regulatory beliefs, locus of control-beliefs; d) attributions.

#### *Metacognitive Knowledge*

Originated from Flavell's metacognitive theory, the term metacognitive knowledge is used by the individual to guide his/her cognitive activities. As Flavell (1979, p. 908) states:

*Metacognitive knowledge consists primarily of knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises. There are three major categories of these factors or variables—person, task, and strategy (Flavell, 1979, p. 908).*

To specify, the variable of *person* indicates that individuals possess beliefs about oneself or others; the variable of *task* suggests that individuals have knowledges about certain tasks they are distributed; the variable of *strategy* implies that individuals' selection of a proper cognitive processes or strategies in order to achieve the task (Gabillon, 2005).

### *Self-beliefs*

Much research effort has been placed on the relationship between self-beliefs and achievements. Self-beliefs—which learners create, develop, and hold to be true for themselves—are considered to play a vital role in their successes and failures (Pajares & Schunk, 2002). Self-beliefs are categorised into three dimensions:

*Self-worth belief refers to the perception the individual has about oneself, which is assumed to be influenced by society and culture, school achievement, and opinion of others).*

*Self-concept belief is “a self-descriptive judgement that includes an evaluation of competence and the feeling of self-worth associated with the judgement in question.” “Self-concept beliefs reflect questions of ‘being’ and ‘feeling’.”*

*Self-efficacy beliefs refer to personal beliefs (judgements) about one's capabilities to engage in an activity or perform a task at a given level. “Self-efficacy beliefs revolve around the question of ‘can’ (Pajares & Schunk, 2002, p. 21).*

### *Control-beliefs*

Ajzen (2002) refers to control-beliefs as the ability to influence what is happening and/or what will happen, which are factors that individuals perceive as being present that may facilitate or impede performance of their behaviour. Learners' control-beliefs together with self-efficacy beliefs have proved to play an vital role in self-regulation during L2 learning process (Dörnyei & Ottó, 1998).

### *Attributions*

Proposed by Weiner (1985), attributions are much beliefs related with causes (internal & external) of outcomes. In daily social interactions, people make certain explanations, consciously or unconsciously, for various social behaviours that occur in their surroundings in order to effectively control or make adaptations to their environment.

What makes the attribution theory attracting is that people analysing their own or others' behaviour and deduce the reasons for those behaviours affects the way in which subsequent behaviour is carried out and also strength of motivation.

#### **2.1.4 The Attitude/ Motivation Test Battery (AMTB)**

R. C Gardener's Attitude/ Motivation Test battery Questionnaire was adapted for conducting the quantitative survey. Gardner (2004) was also instrumental in creating the attitude/motivation test battery (AMTB) –a questionnaire distributed to teachers and students in order to assess student motivation and attitudes toward language learning. The survey was adapted further to meet the needs of the current study. The AMTB is primarily used to assess second-language learners' (a) integrativeness, (b) attitudes toward the learning situation, and (c) motivation. Taken together, these three categories constitute a measure of a student's "integrative motivation," with the overall goal of assessing a student's ability to integrate the aforementioned specified characteristics. The Attitude/ Motivation Test Battery (AMTB) (Gardner, 2004) is the foundation of designing the questionnaire of attitudes and motivation. Here we present a few pages of AMTB (see Appendix 3 the full version).

## Figure 5 – The Attitude/Motivation Test Battery (AMTB)

Following are a number of statements with which some people agree and others disagree. Please circle one alternative below each statement according to the amount of your agreement or disagreement with that item. The following sample item will serve to illustrate the basic procedure.

- a. Spanish football players are much better than Brazilian football players.
- |          |            |          |          |            |          |
|----------|------------|----------|----------|------------|----------|
| Strongly | Moderately | Slightly | Slightly | Moderately | Strongly |
| Disagree | Disagree   | Disagree | Agree    | Agree      | Agree    |

In answering this question, you should have circled one alternative. Some people would have circled “Strongly Disagree”, others would have circled “Strongly Agree”, while others would have circled any of the alternatives in between. Which one you choose would indicate your own feeling based on everything you know and have heard. Note: there is no right or wrong answer.

1. I wish I could speak many foreign languages perfectly.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
2. My parents try to help me to learn English.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
3. I don't pay much attention to the feedback I receive in my English class.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
4. I don't get anxious when I have to answer a question in my English class.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
5. I look forward to going to class because my English teacher is so good.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
6. Learning English is really great.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree
7. If Japan had no contact with English-speaking countries, it would be a great loss.
 

Strongly	Moderately	Slightly	Slightly	Moderately	Strongly
Disagree	Disagree	Disagree	Agree	Agree	Agree

8. Studying English is important because it will allow me to be more at ease with people who speak English.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
9. I have a strong desire to know all aspects of English.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
10. My English class is really a waste of time.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
11. I would get nervous if I had to speak English to a tourist.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
12. Studying foreign languages is not enjoyable.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
13. I make a point of trying to understand all the English I see and hear.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
14. I don't think my English teacher is very good.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
15. Studying English is important because I will need it for my career.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
16. I never feel quite sure of myself when I am speaking in our English class.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree
17. Knowing English isn't really an important goal in my life.  
Strongly Disagree    Moderately Disagree    Slightly Disagree    Slightly Agree    Moderately Agree    Strongly Agree

The purpose of this part of the questionnaire is to determine your feelings about a number of things. We want you to rate each of the following items in terms of how you feel about it. Each item is followed by a scale that has a label on the left and another on the right, and the numbers 1 to 7 between the two ends. For each item, please circle any one of the numbers from 1 to 7 that best describes you.

1. My motivation to learn English in order to communicate with English speaking people is:  
WEAK \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 STRONG
2. My attitude toward English speaking people is:  
UNFAVOURABLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 FAVOURABLE
3. My interest in foreign languages is:  
VERY LOW \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 VERY HIGH
4. My desire to learn English is:  
WEAK \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 STRONG
5. My attitude toward learning English is:  
UNFAVOURABLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 FAVOURABLE
6. My attitude toward my English teacher is:  
UNFAVOURABLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 FAVOURABLE
7. My motivation to learn English for practical purposes (e.g., to get a good job) is:  
WEAK \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 STRONG
8. I worry about speaking English outside of class:  
VERY LITTLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 VERY MUCH
9. My attitude toward my English course is:  
UNFAVOURABLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 FAVOURABLE
10. I worry about speaking in my English class:  
VERY LITTLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 VERY MUCH
11. My motivation to learn English is:  
VERY LOW \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 VERY HIGH
12. My parents encourage me to learn English:  
VERY LITTLE \_\_\_1:\_\_\_2:\_\_\_3:\_\_\_4:\_\_\_5:\_\_\_6:\_\_\_7 VERY MUCH

## 2.2 Motivation Theories

### 2.2.1. What is Motivation?

The term motivation originates from the Latin word *movere*, which means ‘to move’. Mystery that drives people to make certain decisions, to get involved in actions paying effort and perseverance is always in the core position of motivation research and theory (Dörnyei & Ushioda, 2013). Known as a psychological phenomenon, motivation has been a hotpot of study in psychology, which has sparked an abundance of research and established varieties of models over decades. It has experienced a long-term process of formation, development, and improvement from volition or “will”, “drives” and “needs” to a term that now being addressed in many other psychological contexts going far beyond the explanation of actions and learning outcomes. There are numerous perspectives in term of motivation, thus making it no easy task to indicate in a straightforward definition.

Motivation is used to describe component or process that regulates the commitment of an individual for a specific activity. More generally speaking, it attempts to explain human behaviour. What is common to all these attempts is that they seek to establish the reasons for actions; their individual differences; and for the activation, control, and persistence of goal-oriented behaviour (Heckhausen & Heckhausen, 2008). As psychologists (Heckhausen & Heckhausen) describes, motivation is the “whys” and “hows” of activities that reflect the pursuit of a particular goal. Schunk et al. (2012) define motivation as the process whereby goal-directed activities are energised, directed, and sustained.

Motivation theories were also widely adopted in the field of second language acquisition. As psycholinguists Dörnyei and Ushioda (2013) point out, perhaps the only thing about the term motivation most researchers would agree on is that it, by definition, concerns the direction and magnitude of human behaviour. Stated differently, the *choice* of a particular action, the *persistence* with it and the *effort* expended on it. Gardner (1985) defines motivation as the combination of effort and desire to achieve the goal of learning the language and favourable attitudes toward learning the language as well. Thus a common understanding can be defined on the term motivation, which mainly concerns the question of “*why* people decide to do something, *how long* they are willing to sustain the activity, and *how hard* they are going to pursue it” (Dörnyei, 2000, p. 8).





*Will is no more than a specific course of intellectual processes, converting our assent to a goal into action. They permit the purely internal psychological experiences to become externalized operators on the environment. (Meumann, 1908, p. 347)*

Ernst Meumann proposes this intellectual theory that can be called a cognitive theory now. It has become increasingly popular to offer cognitive explanations for motivational phenomena and, since the “cognitive revolution” in psychology, efforts have been underway to derive dynamic processes of motivation and volition from the very associative network models that were originally postulated to explain the structure and application of knowledge (Anderson, 1983; Norman, 1980). Dörnyei and Ushioda (2013) suggest that cognitive theories of motivation focus on the instrumental role of mental structures, beliefs and information-processing mechanisms in shaping individual behaviour and action. The theoretical framework of cognition can be divided into three major parts, namely 1) Expectancy Value Frameworks 2) Goal Theories 3) Self Determination Theory, of which each has several theories and numerous elements. It can be a book length discussion. Consequently, we will review some key cognitive theories related to learning activities in order to impel a better understanding of students’ motivation.

According to expectancy-value theories, as Dörnyei and Ushioda (2013) put forward, motivation to perform various tasks is the product of two key factors:

- *the individual’s expectancy of success in a given task and the rewards that successful task performance will bring.*
- *the value the individual attaches to success on that task, including the value of the rewards and of the engagement in performing the task. (Dörnyei & Ushioda, 2013, p. 13)*

They further explain that the better expectancy of success and the value individual attaches on the task, the better he or she is likely to be highly engaged in the task. If there is any one of the key poles missing, the individual is unlikely to be motivated despite great effort paid. Stated differently, expectations as well as values affect subsequent behaviour.

There are several theories involved in this framework. 1) Achievement Motivation (Atkinson, 1964), 2) Attribution Theory (Weiner, 1985), 3) Self-efficacy Theory (Bandura, 1986), 4) Self-worth Theory (Covington, 1992), 5) Task-value Theory (Wigfield & Eccles, 2000), among which, attribution theory is one of the few cognitive models of motivation to integrate emotions, in terms of the specific emotional consequences of particular causal attributions (Weiner, 1986). Atkinson's achievement motivation theory (Atkinson, 1964) was the first comprehensive model of achievement motivation that has dominated the field for decades, which consists of two aspects, namely need for success and fear for failure. It is an intrinsic driving force that motivates individuals to engage in what they consider to be important or valuable to strive for success. Self-efficacy theory has been developed by Albert Bandura and it refers to people's judgement of their capabilities to carry out certain specific tasks and, accordingly, their sense of efficacy will determine choice of activities attempted, along with level of aspiration, amount of effort exerted and persistence displayed (Dörnyei & Ushioda, 2013). When the individual is convinced that he or she is capable of undertaking a certain activity, he will possess a high degree of "self-efficacy" and will be highly engaged in the activity. Self-worth theory, as it is apparent from the name highlights the critical significance of a person's perception of ability or competence. Task-value Theory has been developed by Wigfield and Eccles (2000), which involves four integral components, 1) attainment value, 2) intrinsic value, 3) extrinsic utility value and 4) cost. These four components constitute the overall achievement of a task and thus determine the intensity and persistence of behaviours.

Goal theories include three major areas, goal-setting, goal-orientation, and goal content and multiplicity, in which goal-orientation is specifically developed to explain children's learning and performance in learning contexts (Dörnyei & Ushioda, 2013). Mastery orientation and performance orientation are mainly concerned in this theory. Students hold the former orientation tend to devoted themselves in tasks attribute to their own improvement and growth, whereas the latter, performance orientated students are likely to embark on a path which leads to public recognition and achievement instead of interests in learning itself.

Intrinsic and extrinsic motivation are well-known and one of the most discussed issues within self-determination theory (SDT) (Deci & Ryan, 1985). Intrinsic motivation involves doing an activity owing to its being an interesting and enjoyable experience. In contrast, extrinsic motivation refers to doing an activity because it leads to rewards or accolades. There is a third concept in this model called amotivation referring to a lack of any kind of motivations mentioned above. This theory proposes that the individual tend to be more self-determined in

performing a particular task when the social environment supports the fundamental human needs like autonomy, competence and relatedness, thus highlights the significant role of social influences.

### **2.2.3 Motivation in Second/ Foreign Language Learning Context**

It is quite an interesting issue that students sitting in same classes end up with totally different learning proficiency. Despite the recognised importance of such factors as intelligence, auditory memory, analytical ability, and skill in mimicry, it has been acknowledged that motivation is one of the most essential elements to be taken into account when it comes to second/foreign language learning. As Dörnyei (2003) states, learning a second language differs from learning other school subjects because of its social nature. Therefore, many theories regarding learning motivation are social-psychological. Second language learning motivation theory is acknowledged to have originated from Gardner and Lambert in 1960's. Dörnyei (2005b) enumerates three distinct phases of second language learning research, which are:

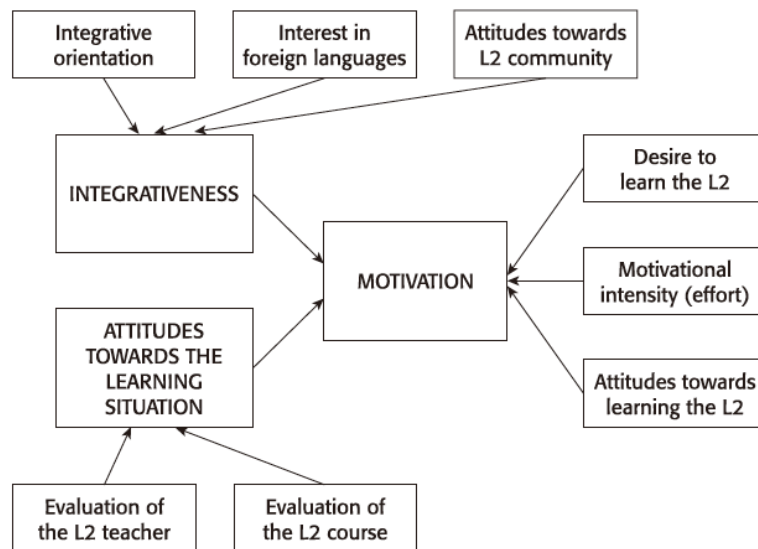
1. The social psychological period (1959–1990)
2. The cognitive-situated period (during the 1990s)
3. The process-oriented period (the turn of the century) which developed into a new phase called socio-dynamic period.

#### **The Social Psychological Period (1959–1990)**

Research interest in second language learning motivation initiated from Wallace Lambert and Robert Gardner, who are social psychologists in Canada. Individuals' attitudes towards the second language learning itself, as well as the specific language community are strongly centred in this theory. Given the learning process end up not only limited with obtaining knowledge of the certain language, but an identification of another ethnolinguistic group, it distinguishes second language learning motivation from other learning motivations(Gardner, 1985).

As noted, Gardner's Socio-educational Model is regarded as the most influential one among all motivation theories, including attitudes, motivations and anxiety variables (Gardner, 1988). Gardner (1985) defines second language learning motivation as "the combination of effort plus desire to achieve the goal of learning the language plus favourable attitudes toward learning the language".

Figure 7 – Gardner’s Conceptualisation of the Integrative Motive (Gardner, 1985, p. 82-3)



He introduces three integral components in his theory motivational intensity or effort, desire to learn the language and attitudes towards learning the language. Moreover, he accentuates the integrality of these three since highly motivated individuals normally possess all of them. The relationship between motivation and orientation (goal) is the key issue involved in Gardner’s theory, in which the two orientations labelled integrative and instrumental are concepts that attracted most attention, as shown in Figure 7.

Integrative orientation refers to a ‘willingness to be like valued members of the language community (Gardner & Lambert, 1959) , while instrumental orientation is more pragmatic such as getting well-paid or a decent job. Gardner further describes integrative motive as a pluralistic compound conception, including three components:

- *Integrativeness, which subsumes integrative orientation, interest in foreign languages, and attitudes towards the L2 community, reflecting the ‘individual’s willingness and interest in social interaction with members of other groups’.*
- *Attitudes towards the learning situation, which comprises attitudes towards the language teacher and the L2 course.*
- *Motivation, that is, effort, desire, and attitude towards learning the L2 (Gardner, 1985, pp. 82-83).*

Despite the dominance of Gardner's theory, it faces criticism and challenges mainly regarding the conceptual definition of "integrative" and the strong role of integrativeness (Dörnyei, 1994b). Given the internationalisation of English learning, the application needs to be considered.

There were other frameworks of significance other than Gardner's theory in the social psychological period. According to Clément et al. (1977), the notion of linguistic self-confidence can be a powerful mediating process in multi-ethnic settings that affects a person's motivation to learn and use the language of the other speech community. Clément moves contact among different language communities to centre-stage. It is also considered to be a major motivational element in learning the other community's language and identification with the L2 group. By emphasising the indirect contact with the L2 culture through the media, Clément et al. (1994) further confirms the applicability of self-confidence framework.

### **The Cognitive-situated Period (during the 1990s)**

In 1990's, during the second period, namely cognitive-situated period, scholars are increasingly aware of the immediate classroom application of motivation sources, thus there is a boosting need of extending the existing theoretical framework of second language learning motivation. During the expanding period, a wealth of theories concerning new perspective were generated as following:

- need theories,
- expectancy-value theories,
- equity theories,
- reinforcement theories,
- social cognition theories,
- achievement goal theory,
- Piaget's cognitive developmental theory,
- Vygotsky's sociocultural theory.

(Dörnyei & Ushioda, 2013)

Dörnyei (1994a) proposes a three-level framework of L2 motivation in response to calls for a shift in focus of motivation in the first place. It presented a framework of three relatively distinct levels: The Language Level, the Learner Level, and the Learning Situation Level (see Table 2)

Table 2 – Dörnyei’s Framework of L2 Motivation (Dörnyei, 1994a, p. 78)

LANGUAGE LEVEL	Integrative motivational subsystem Instrumental motivational subsystem
LEARNER LEVEL	Need for achievement Self-confidence <ul style="list-style-type: none"> <li>• Language use anxiety</li> <li>• Perceived L2 competence</li> <li>• Causal attributions</li> <li>• Self-efficacy</li> </ul>
LEARNING SITUATION LEVEL	
<i>Course-specific motivational components</i>	Interest (in the course) <i>components</i> Relevance (of the course to one’s needs) Expectancy (of success) Satisfaction (one has in the outcome)
<i>Teacher-specific motivational components</i>	Affiliative motive (to please the teacher) Authority type (controlling vs. autonomy-supporting) Direct socialisation of motivation <ul style="list-style-type: none"> <li>• Modelling</li> <li>• Task Presentation</li> <li>• Feedback</li> </ul>
<i>Group-specific motivational components</i>	Goal-orientedness Norm and reward system Group cohesiveness Classroom goal structure (cooperative, competitive or individualistic)

Another important model is the social constructivist model proposed by Williams and Burden (1997), which accentuates the social and contextual influences. (see Table 3)

Table 3 – Williams and Burden’s Framework of L2 Motivation (Williams & Burden, 1997, p. 20)

INTERNAL FACTORS	EXTERNAL FACTORS
Intrinsic interest of activity <ul style="list-style-type: none"> <li>● arousal of curiosity</li> <li>● optimal degree of challenge</li> </ul>	Significant others <ul style="list-style-type: none"> <li>● parents</li> <li>● teachers</li> <li>● peers</li> </ul>
Perceived value of activity <ul style="list-style-type: none"> <li>● personal relevance</li> <li>● anticipated value of outcomes</li> <li>● intrinsic value attributed to the activity</li> </ul>	The nature of interaction with significant others <ul style="list-style-type: none"> <li>● mediated learning experiences</li> <li>● the nature and amount of feedback</li> <li>● rewards</li> <li>● the nature and amount of appropriate praise</li> <li>● punishments, sanctions</li> </ul>
Sense of agency <ul style="list-style-type: none"> <li>● locus of causality</li> <li>● locus of control re: process and outcomes</li> <li>● ability to set appropriate goals</li> </ul>	The learning environment <ul style="list-style-type: none"> <li>● comfort</li> <li>● resources</li> <li>● time of day, week, year</li> <li>● size of class and school</li> <li>● class and school ethos</li> </ul>
Mastery <ul style="list-style-type: none"> <li>● feelings of competence</li> <li>● awareness of developing skills and mastery in a chosen area</li> <li>● self-efficacy</li> </ul>	The broader context <ul style="list-style-type: none"> <li>● wider family networks</li> <li>● the local education system</li> <li>● conflicting interests</li> <li>● cultural norms</li> <li>● societal expectations and attitudes</li> </ul>
Self-concept <ul style="list-style-type: none"> <li>● realistic awareness of personal strengths and weaknesses in skills required</li> <li>● personal definitions and judgements of success and failure</li> <li>● self-worth concern</li> <li>● learned helplessness</li> </ul>	
Attitudes <ul style="list-style-type: none"> <li>● to language learning in general</li> <li>● to the target language</li> <li>● to the target language community and culture</li> </ul>	
Other affective states <ul style="list-style-type: none"> <li>● confidence</li> <li>● anxiety, fear</li> </ul>	
Developmental age and stage	
Gender	

### The Process-oriented Period (2000s)

It was not until within the last decade or so did specific research regarding the dynamics of L2 motivational change emerge. Williams and Burden (1997) were pioneers to impel conceptual distinction between motivation for engagement and motivation during engagement, which can be summarised in separated stages, namely ‘Reasons for doing something’ → ‘Deciding to do something’ → ‘Sustaining the effort, or persisting’.

Another contribution in this period is proposed by Ushioda (1998), which focuses on the temporal perspective of motivation. She summarises a schematic in which learners motivated by positive experiences to motivational pattern primarily goal-directed.

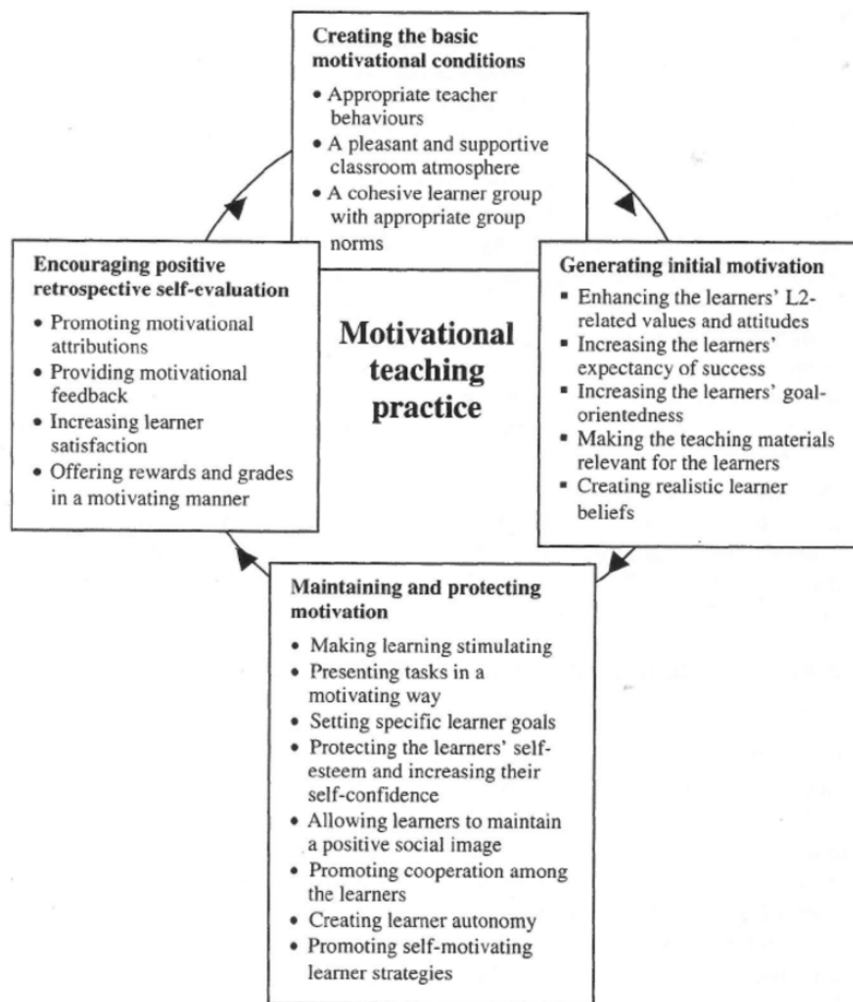
The most integrated model in this period is developed by Dornyei and Ottó (1998), who divide the L2 motivation in two major dimensions: action sequence and motivational influences.



Action sequence refers to the behavioural process in which initial desires sequenced into goals, intentions, action, accomplishment of goals and evaluation. Motivational influences can be regarded as fuel to the behavioural process. Dörnyei and Ottó further develop the motivated behavioural process into three main phases: 1) preactional stage, 2) actional phase, and 3) post-actional phase.

Dörnyei (2005b) later proposes the Motivational Teaching Practice Model comprising four main dimensions: 1) creating the basic motivational conditions, 2) generating initial student motivation, 3) maintaining and protecting motivation, 4) encouraging positive retrospective. (see Figure 8)

Figure 8 – The Components of the Motivational Teaching Practice (Dörnyei, 2005b, p. 112)



All these models reported in this period stimulated the awareness of relationship between learners and their learning contexts and prior experience. The discussion regarding these central

components such attitudes and motivation, representations, beliefs comprises the fundamental elements in the current study. We will be interested in seeing how the overlap between English language and science is. In the following chapter, the interaction between English and science of the present study will be presented.

## **Part 3: English Language and Science**

This part begins by presenting the diversity of English used for various purposes from the worldwide perspective. Special attention is given to the project of English as an academic lingua franca (ELFA), which gives an overview of English used in academia, showing the dominance and the essential role English plays in science. Then it will turn to the background of English for specific purposes (ESP) and Langue de spécialité (LSP) as well as Anglais de spécialité (ASP) applied in French context, particularly in French higher education. This also “places” the study in French university context. Lastly, the constructs of scientific English in French context will be presented.

### **3.1 English as a Lingua Franca (ELF), English as an International Language (EIL) and World Englishes (WE)**

Globalisation may be thought of initially as the widening, deepening and speeding up of worldwide interconnectedness in all aspects of contemporary social life (Held et al., 2000). As Dewey (2007) states, this description indicates that a prominent effect occurs with accelerating globalisation towards the social and cultural realms as well as in economics and politics, in which language is unavoidably involved in this worldwide interconnectedness. English secures its fundamental role with regard to three aspects, namely its geographically omnipresent diffusion, its users of immense cultural diversity and voluminously transdisciplinary purposes it serves.

International communication has altered its navigation from plurilingual to clearly English-centred throughout the 20<sup>th</sup> century, in the field of science particularly. According to Hamel (2007), among international periodical publications, over 75 percent of the articles in social sciences and humanities and more radically over 90 percent in natural sciences are written in English.

Despite its dominance in academia, Mauranen, Hynninen, et al. (2010) propose that the most notable characteristic of English, being predominantly used by non-native speakers, has not seriously been taken on board in ESP descriptive studies. Moreover, English as an academic lingua franca (ELFA), which is a project probes into academic discourses based at the University of Helsinki, is divided into two parts, namely the ELFA (English as a Lingua Franca

in Academic Settings) corpus project and SELF (Studying in English as a Lingua Franca). The former achieves primarily 1-million-word ELFA corpus of spoken academic discourse and the latter emphatically researches participant experience of ELF in a university environment(ibid).

In this study, participants are non-native speakers in a university environment; ELF composes the prerequisite for a development in the theoretical framework. Research into English as a Lingua Franca (ELF) emerged in the latter of 1990s and remarkably expanded in the early 21st century, forming ELF as an ignorable field in applied linguistics. Despite the fact that ELF is a relatively recent activity, English itself has served as a lingua franca ever since the countries of the OUTER CIRCLE (Kachru, 1985) which were first colonised from the late sixteenth century (Jenkins et al., 2011).

Literally, the term lingua franca means "language of the Franks" in late Latin, and referred to the language that was used around the Eastern Mediterranean Sea as the main language of commerce in the very beginning. It is usually taken to mean “any lingual medium of communication between people of different mother tongues, for whom it is a second language” (Ammon et al., 1984). Mauranen further explains:

*The term lingua franca is normally used to mean a contact language, that is, a vehicular language between speakers who do not share a first language. Although the term lingua franca is today commonly used for natural languages that are particularly widespread, especially, sometimes even exclusively, English, it is worth keeping in mind that any language, however small, can equally well be used as a lingua franca. Lingua francas need not even be ‘living’ languages: ‘dead’ languages also serve as vehicular languages, usually for a limited range of purposes like religion or learning, as in the cases of classical Arabic or mediaeval Latin (Mauranen, 2018, p. 7).*

Having stood out of other lingua francas like Spanish, French, Greek, Arabic, and Turkish, English appeared to be the universal language not only for international communication, but to enhance economic and trade cooperation and enrich exchanges in science and technology. English is obviously the global language being used by people as a second or foreign language more than that as the mother tongue, with 375 million people using English as their first language and one in four of the world’s population speaking it as a second/foreign language Crystal (2012). The controversy is all along with regard to ELF researches despite abundant achievements, since most ELF interactions take place among ‘non-native’ speakers of English (Seidlhofer, 2005). As Firth (1996) puts forward, what is distinctive about ELF is that, in most

cases, it is ‘a ‘contact language’ between persons who share neither a common native tongue nor a common (national) culture, and for whom English is the chosen foreign language of communication’. Meanwhile, terms as English as an international language (EIL) as well as World Englishes were also used alternately.

World Englishes (WE) can be approached from three perspectives (McKay, 2018). To start with, a broad concept of World Englishes refers to all varieties of English spread over the world, including Englishes spoken in what Kachru (1985) refers to as the Inner Circle (where English is spoken as a first language), the Outer Circle (where English is one of several official languages of the country) and the Expanding Circle (where English is required as a foreign language but has no special status as an official language). Similarly, there are alternatives as international English and global English (Jenkins, 2006). The second and third perspectives appear to be partially overlapping in the narrow definition of nativised English used in what Kachru (1985) refers to as the Outer Circle, examples are varieties as Nigerian English, Jamaican English and Malaysian English. The major difference of third perspective is an extra emphasis on the pluricentric view of English in which all varieties of English are given equal respect.

World Englishes (WE) research highlights diverse varieties of English, defining peculiar features of varieties of English. While EIL, according to McKay (2018), insists on certain principles when using English for international communication. Some major principles are illustrated as followings:

- 1. Given the varieties of English spoken today and the diversity of L2 learning contexts, all pedagogical decisions regarding standards and curriculum should be made in reference to local language needs and local social and educational factors.*
- 2. The widely accepted belief that an English-only classroom is the most productive for language learning needs to be fully examined; in addition, careful thought should be given to how best to use the L1 in developing language proficiency.*
- 3. Attention to the development of strategic intercultural competence should exist in all EIL classrooms.*
- 4. EIL is not linked to a particular social/cultural context in the same way that French, Korean or Japanese are intricately associated with a particular culture. In this way EIL is or should be culturally neutral (McKay, 2018, p. 11).*

Notably, EIL is in isolation from a particular social/cultural context. It also differs from ELF in the learning context and the use of L1. In this regard, when English is chosen as the means of communication among people from *different* first language backgrounds, across linguacultural boundaries, the preferred term is ‘English as a lingua franca’ (Seidlhofer, 2005). Consequently, in this study, after viewing different definitions and research emphases of WE, EIL and ELF, we target ELF as a particular focus in the theoretical background.

ELF has been extensively studied during last two decades, achieving abundant research resources. The orientation of ELF research has shifted continuously. ELF, however conceptualised, is not only a highly complex phenomenon, but also one whose diversity is currently constantly increasing as more people from different language backgrounds engage in communication using English as one of their mediums (Jenkins, 2015). Given the contradictory reality that English is being shaped at least as much by its non-native speakers as by its native speakers (Seidlhofer, 2005), the systematical study of the nature and its implication and practice in language learning and teaching have been unprecedentedly advocated. The dimensions of linguistic levels, namely phonology (Jenkins, 2000), pragmatics (Meierkord, 1996), and lexicogrammar (Seidlhofer, 2004) have been investigated. Two research teams regarding ELF corpora, which are English as a lingua franca in Academic settings (ELFA) corpus (Mauranen, 2003) and the general Vienna-Oxford International Corpus of English (VOICE) (Seidlhofer, 2004), attracted wide interest.

### 3.2 English as an academic lingua franca: The ELFA project

The project *English as an academic lingua franca* ([www.eng.helsinki.fi/elfa](http://www.eng.helsinki.fi/elfa)) is a project led by Professor Anna Mauranen based at the University of Helsinki started in 2001. The project consists of two parts: an ELFA (English as a Lingua Franca in Academic Settings) corpus project, the 1-million-word ELFA corpus of spoken academic discourse and SELF (Studying in English as a Lingua Franca), a project with a micro-analytic orientation, which aims at capturing participant experience of ELF in a university environment (Mauranen, Hynninen, et al., 2010).

Universities have been developing all along trends of integration, diversity, international orientation and network orientation. Internationalization has become a pivotal role in the development framework of universities. According to the statistics given by the website campus France ([campusfrance.org](http://campusfrance.org)), French higher education involves 2.5 million students. 12% of them are from abroad. All of them are benefiting from highly diversified training, and they are enrolled in every field, at every level. Embedded with the consolidation nature of teaching and learning as well as scientific research, university is thus regarded to be the cradle of talent with abilities of research and innovation.

Scholars around Europe formed close-knit networks for sharing thoughts and discoveries dates back to the Middle Ages, which was facilitated by a common lingua franca, Latin (ibid). A lingua franca is the prerequisite allowing these exchanges that across linguacultural boundaries to happen. English, functioning as the universal language of academia, has long been neglected due to unduly stress of perfect English language polished by native speakers before the publication of a scientific work. This raises an interesting issue, according to Mauranen, Hynninen, et al. (2010), if the vast majority of readers and writers are not native speakers of English, perhaps qualities such as clarity and effectiveness in communication should be considered from their perspective rather than that of the native speaking minority?

The problem is that academic discourse socialisation of individuals requires to be achieved in academic settings. Language correcting or polishing will not make this essentially happen. As Mauranen, Hynninen, et al. (2010) put it:

*Since understanding English in its contexts of professional and academic use is one of our major goals, it is crucial that we investigate its current manifestations in complex international circumstances. How do academics and students manage demanding intellectual tasks using a second language? What discourse features are so vital to*

*academic communication that they accompany successful academic exchanges even when speakers use a lingua franca – in short, what is the ‘academic’ in English for Academic Purposes? (Mauranen, Hynninen, et al., 2010, p. 184)*

It is a top priority to investigate how speakers achieve communicative effectiveness in spoken academic settings. Björkman (2010) conducts an investigation regarding the effectiveness of spoken ELF from a Sweden higher education setting. Content courses including 21 lectures and 24 group-work sessions were analysed. The finding as Björkman (2011) puts forward, suggest that the effectiveness of a speaker of English in similar ELF settings is determined primarily by the speaker’s pragmatic ability and less by his/her proficiency. In settings where English is used as a vehicular language, communicative effectiveness takes precedence over accuracy, fluency and language complexity. Native speaker practices may actually be less effective than such ELF practices in ELF settings. Björkman (2011) also illustrates the main findings from ELF research carried out in academic settings as shown in table below. The ELFA project gives a worldwide view of ELF research in academic settings, which serves as the fundamental scene for our study.

Table 4 – The Main Findings from ELF Research Carried out in Academic Settings (Björkman, 2011, p. 86)

MAIN FINDINGS IN SPOKEN LINGUA FRANCA USAGE IN ACADEMIC SETTINGS			
MORPHOSYNTAX	Devices that increase comprehensibility and create extra explicitness	Double comparatives and superlatives	Björkman, 2009, 2011
		Unraised negation	Björkman, 2009, 2011
		Vocabulary-related explicitness	Seidlhofer, 2004
	Reductions of redundancy	Not marking the plural on the noun	Björkman, 2008
		Subject-verb agreement issues	Seidlhofer, 2004; Breiteneder, 2005; Cogo & Dewey, 2006; Björkman, 2009
		NonS analytic comparative	Björkman, 2010
	Other non-standardness	Non-standard question formulation	Björkman, 2009, 2010, 2011
		Tense and aspect	Ranta, 2006; Kirkpatrick, 2008; Björkman, 2010
		Article usage	Seidlhofer, 2004; Björkman, 2011
	Pragmatic fluency	1. Appropriate use of routine pragmatic phenomena	
2. Ability to initiate topics and topic change, making use of appropriate routines			
3. Ability to “carry weight” in a conversation			
4. Ability to show turn-taking, replying/responding			
5. Appropriate rate of speech, types of filled and unfilled pauses, frequency and function of repairs			

The emergence of English used as the international language in spoken academic settings makes us interested in exploring the dominance of English in science. In the following part, the dominance of English is discussed statistically.



### 3.3 The dominance of English in science

For most of the past millennium, the sciences in the Occident were primarily articulated in a single language, from Sumerian to Greek, Arabic, and Latin. However, with the arrival of modernity, French, English, and German gradually replaced Latin as the dominant languages used to express scientific ideas, marking a significant departure from tradition (Walter, 1996). As Hamel (2007) explains, at an early stage of 20<sup>th</sup> century, three languages, English, French and German, held a central and fairly balanced position in science with disciplines differentiated. Due to socio-economic and political factors, this kind of balance gradually vanished. International communication has shifted from a plural use of several languages to a clear pre-eminence of English, especially in the field of science throughout the 20<sup>th</sup> century (Hamel, 2007).

Figure 9 – Proportional Language Use in Scientific Publications in the Course of One Century in American, German, French and Russian Bibliographies (Hamel, 2007, p. 56)

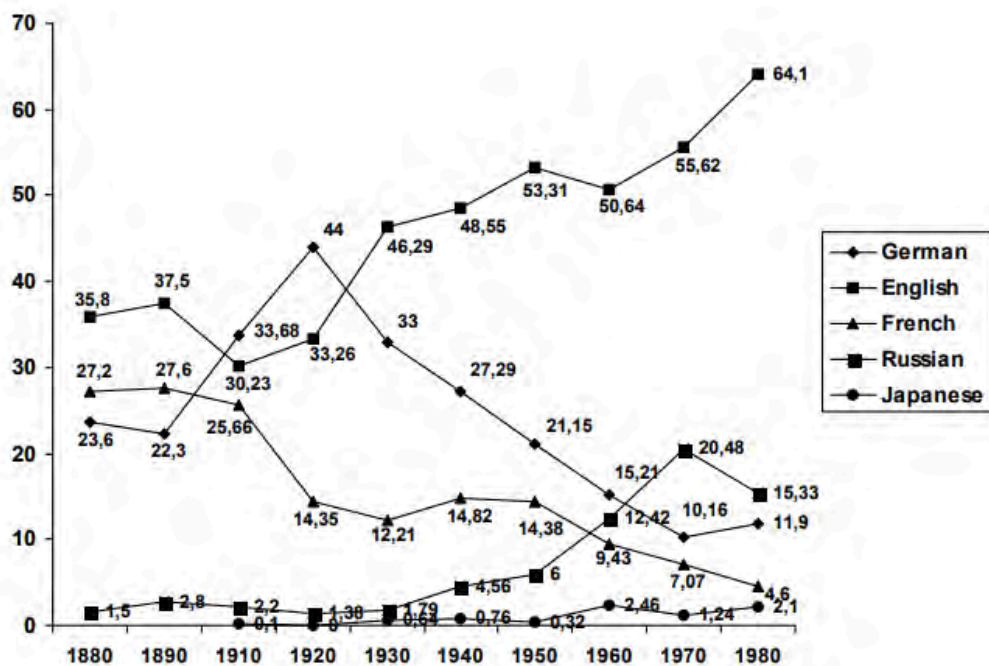


Figure 9 shows a language use trend from 1880 to 1980 based on publications in American, German, French and Russian bibliographies. It is apparent that there was a sharp increase in language use of English starting from 1920, reaching 64.1% of all publications in 1980.

Figure 10 – Share of Languages in Natural Science Publications Worldwide 1880–1996 (Hamel, 2007, p. 57)

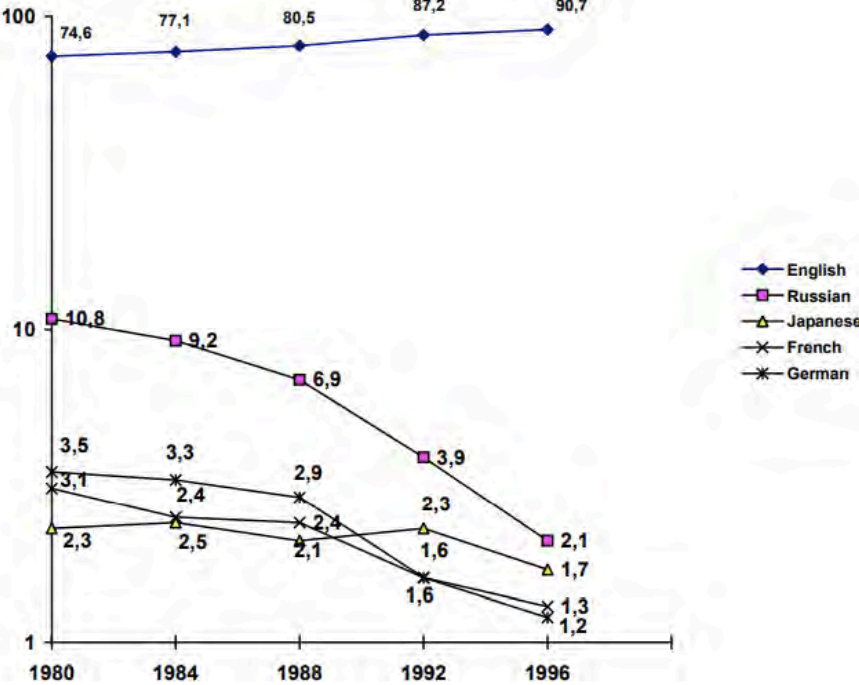


Figure 11 – Share of Languages in Social Sciences and Humanities Publications Worldwide 1997–1995 (Hamel, 2007, p. 58)

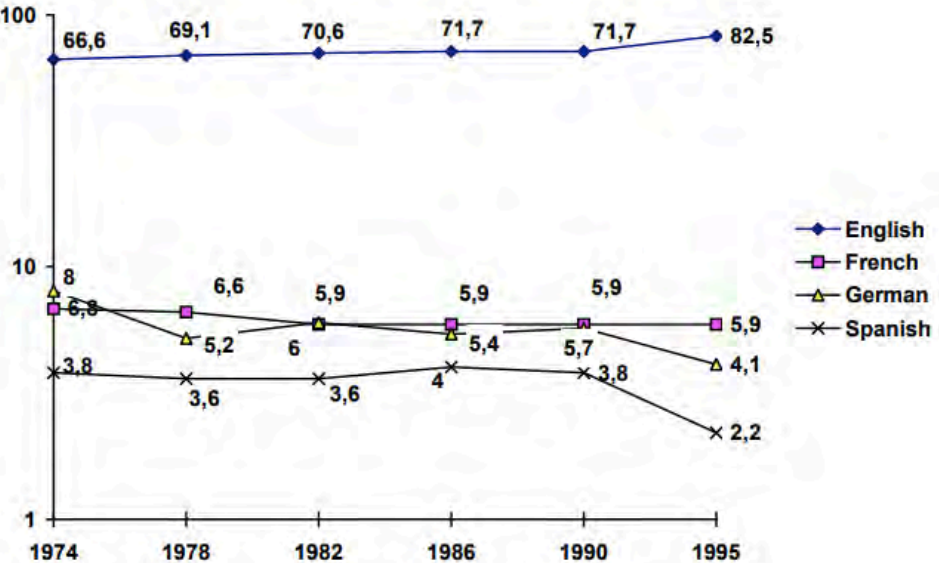


Figure 10 and Figure 11 show proportional language use in natural science and social sciences and humanities publications worldwide respectively. Both figures demonstrate an ultimate dominance of English language use, particularly up to 90.7% in natural science. Other languages such as French, German and Spanish contribute a minuscule proportion in both natural science and social sciences and humanities. However, it is notable that these language account for a relatively higher slice in social sciences and humanities than that in natural science. English for Specific Purposes (ESP), which is diffusely discussed and adopted as a pragmatic approach, is discussed in the following part.

### **3.4 English for Specific Purposes (ESP) and ESP Teaching and Learning**

ESP courses are now widely provided in higher education in Europe and throughout the world. Sarré and Whyte (2017) address that research in ESP teaching and learning has often been criticized for a lack of theoretical underpinning, making findings difficult to generalize to new contexts (Sarré, 2017) or for lack of applicability to actual language teaching (Master, 2005; Widdowson, 2017) Therefore, setting the scenario of ESP first is needed to enhance better understanding of its application in French context. Current perspectives in French higher education and new directions of ESP research will be presented as well.

#### **3.4.1. Introducing ESP**

English for Specific Purposes (ESP) teaching research originated in the 1960s. Barber (1962), Halliday (1964), Herbert (1965) and Ewer and Latorre (1969) were typical representatives of ESP research in the 1960s. In the past 60 years, the scope of ESP research has expanded significantly. ESP refers to the teaching and learning of English as a second or foreign language where the goal of the learners is to use English in a particular domain (Paltridge & Starfield, 2014), which consists of two main poles: English for Academic Purposes (EAP) and English for Occupational Purposes (EOP) (Dudley-Evans et al., 1998). ESP does not maintain particularly a certain kind of language, teaching material or methodology, but can be regarded as a broad approach (Hutchinson & Waters, 1987). Strevens (1988) defines ESP with variable characteristics:

- 1) designed to meet specified needs of different learners;*
- 2) related in content to particular disciplines, occupations and activities;*

3) *centred on language appropriateness;*

4) *useful in the analysis of discourse (Strevens, 1988, pp. 1-2).*

following the pattern of Strevens, Dudley-Evans et al. (1998) modifies the definition of ESP into two categories, which are absolute characteristics and Variable Characteristics.

#### *Absolute Characteristics*

1. *ESP is defined to meet specific needs of the learners*
2. *ESP makes use of underlying methodology and activities of the discipline it serves*
3. *ESP is centred on the language appropriate to these activities in terms of grammar, lexis, register, study skills, discourse and genre.*

#### *Variable Characteristics*

1. *ESP may be related to or designed for specific disciplines*
2. *ESP may use, in specific teaching situations, a different methodology from that of General English*
3. *ESP is likely to be designed for adult learners, either at a tertiary level institution or in a professional work situation. It could, however, be for learners at secondary school level*
4. *ESP is generally designed for intermediate or advanced students.*
5. *Most ESP courses assume some basic knowledge of the language systems (Dudley-Evans et al., 1998, p. 4).*

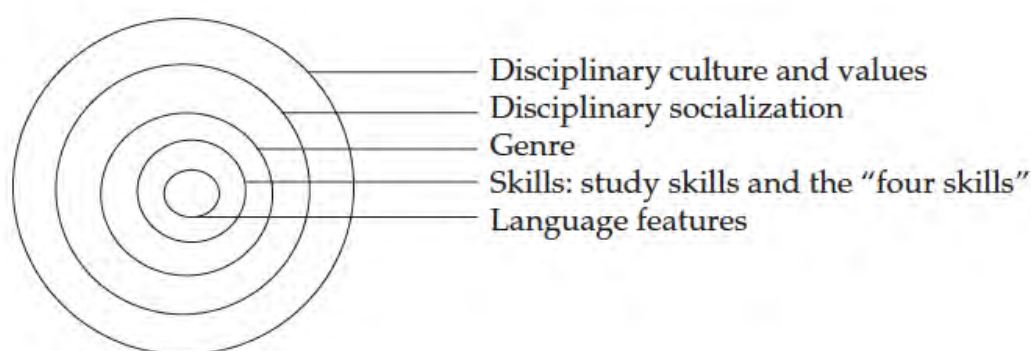
According to these two definitions, ESP should be seen simple as an 'approach' to teaching, or what Dudley-Evans describes as an 'attitude of mind'. Such a view echoes that of Hutchinson and Waters (1987) who state, "ESP is an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning" (Anthony, 1997).

The research field involves ESP classification (Hutchinson & Waters, 1987; Jordan & Jordan, 1997) teaching methods (Arani, 2005), needs analysis (Berwick & Johnson, 1989; Brindley, 1989; Brinton et al., 2003), textbook design (Krahnke, 1987), teacher training (Zoumana, 2007), evaluation testing (Sherkatolabbasi & Mahdavi-Zafarghandi, 2012) and corpus research (Milizia, 2007), and has gained many valuable results. The research subjects are rich and diverse, forming a systematic theoretical framework.

### 3.4.2 The Expanding Focus and New Directions in ESP

During the rapid expansion of ESP research, its navigations have altered several times, yet the latter did not replace the prior but in a way of comprehension. As Parkinson (2013) summarises, the initial interest of English for science and technology (EST) teachers and researchers was on linguistic forms, with later emphasis on skills. Focus that is more recent has been on disciplinary socialisation, and most recently a critical perspective, which considers how literacy practices express societal or disciplinary power differences. Parkinson (2013) proposes his new expanding focus of ESP as shown in Figure 12:

Figure 12 – The Expanding Focus of ESP (Parkinson, 2013, p. 156)



It is common for an article to be recognised as scientific article simply owing to its specialized vocabulary and scientific features. Whereas according to Parkinson (2013), characteristic forms and vocabulary of science or technology cannot be segregated from the genres of science and technology, which constitute the various disciplines. Paltridge (2012) contends:

*Being a member of a discourse community involves using its characteristic language and genres, and also sharing its values (which are reflected in its language and genres), and taking on a role recognized by other members of the discourse community (Paltridge, 2012, p. 15).*

Apparently, this perspective is difficult to achieve since EST teachers are mostly trained in the field of humanities and social science fields with no scientific background.

Multiple researchers have noted this obstacle in ESP practice. Spack (1988) is the one who proposes that disciplinary discourse is too diverse and complex for EST teachers to provide this access. Mackiewicz (2004) suggests it may be inappropriate for EST teachers to give advice to science and technology students. Various solutions have been suggested with regard to the

embarrassment of EST teachers' role in discourse community as following according to Parkinson (2013):

- *Training discipline insiders in writing instruction to circumvent EST teachers' lack of insider knowledge (Taylor 2007)*
- *The importance lies not only in working with discipline specialists in designing EST interventions, but working towards a shared understanding with discipline specialists of what is valuable to them in writing, (e.g. content accuracy) (Stoller, Horn et al. 2007).*
- *Teaching the literature review to graduate students, suggest that ESP instructors facilitate students' own investigation of disciplinary discourse (Swales and Lindemann 2001)*
- *Considering the teaching of reading to engineering students with greater disciplinary knowledge than their ESP reading teachers, suggest that students become informants to the teacher and classmates (Pritchard and Nasr 2004).*
- *Collaborative approaches with disciplinary experts have been a key element in ESP methodology (Hyland 2007)*

*(Parkinson, 2013, pp. 156-157)*

Collaborative approaches with disciplinary experts can be exchanges on teaching materials and meetings concerning access to and familiarise with disciplinary content. Collaborative approaches are also implemented among the group of EST teachers, who share the experience and disciplinary content and teaching material in the same discipline of students.

### ***Disciplinary Culture and Values***

Disciplinary cultures, such as those found within the natural, engineering and social sciences as well as the humanities, are given a special attention. In a more general understanding, culture “embodies the traditional and social heritage of a people; their customs and practices; their transmitted knowledge, beliefs, law and morals; their linguistic and symbolic forms of communication and the meanings they share” (Becher, 1994). An intriguing case comparison proposed by Gnutzmann and Rabe (2014) involving researchers from different disciplines showed very differently results in perceiving the writing challenges, despite the fact that the physicist and the political scientist both had considerable experience in writing and publishing articles in English during longer stays in English-speaking countries.

*Physicist :*

*There are of course certain **fixed phrases** that one uses all the time. Basically, you could see them as **text modules** where you only replace the content and, of course, the discussion.*

*Political scientist:*

*It is much, much harder to write a historical, theoretical article including **subtleties** and such, if you are not a native speaker (Gnutzmann & Rabe, 2014, p. 33).*

It is noticeable that the two researchers above show dramatically different perceptions concerning the writing difficulties. Many efforts have been made to explore the close relation between languages and the different epistemological frameworks of the disciplines as well as the way they understand the world (Hyland, 2013; Mauranen, Pérez-Llantada, et al., 2010).

According to Gnutzmann and Rabe (2014), the term “disciplinary culture” encompasses more than the term “discipline”; it includes a social dimension among its members that is not contained in the notion of “discipline”. This comprises commonly held attitudes and beliefs, ideologies and everyday acculturation practices.

Students enter universities with vastly diverse language and educational backgrounds. In universities, they will have disciplinary lessons, lectures and scientific activities in disciplines, forming various discourse communities gradually. The concept of “social groups that share discourse practice” is first proposed by Nystrand (1982) and is later developed by Swales (2017) from six components:

*(1) a set of common public goals*

*(2) mechanisms of intercommunication among members*

*(3) the ability to provide information and feedback*

*(4) the possession of genres of communication*

*(5) the acquisition of a specific lexis*

*(6) a group of members with similar levels of expertise about a subject*

*(Swales, 2017, p. 471)*

It is acknowledged that enabling students to recognise, identify, and navigate through their specific discourse community and teaching them discourse communities are of preeminent value (Beaufort, 2008; Wardle & Downs, 2014). Students’ understanding of discourse communities enables them to navigate conversation within various genres and utilise specific

language, and most importantly, it helps them to become a member of the discourse (King et al., 2020).

A discipline's culture may vary between countries too (Parkinson, 2013). According to Artemeva (1998), the different values in a North American and a Russian engineering company resulted in different views of rhetorical purpose, audience, organisation, all expressed at the levels of sentence and paragraph organisation, thematic structure and even content of periodic progress reports.

### **3.4.3 An Overview of ESP in French Higher Education**

An overview of ESP in French higher education is provided briefly, as it will be expanded upon in part 3.8.1. When entering the world of teaching specialised English in French context, various key concepts need to be distinguished in the first place. Unlike English for Specific Purposes (ESP) in Anglo-Saxon countries, *Langue de spécialité* (LSP) is the French term used to refer to specialised languages and *Anglais de spécialité* (ASP) is the term employed when referring to specialised English in the French context (see definitions in 3.8.1.). The relationship between professional development and specialised languages in higher education is gaining increasing interest. Various perspectives including linguistics, didactics, pedagogy, civilization and culture are involved in the study of ASP field (Chaplier, 2016a). ASP in French higher education, as she suggests, is more studied as a cultural object rather than a tool for language acquisition and is continually pursuing recognition among academics. Thus, a controversy emerged that ASP is supported by researchers whereas teachers who need directly efficient approaches in language teaching, whereas classroom development favour ESP.

In the 1970s, a new area led by Professor Perrin combining research into ASP and the didactics of language teaching was built. The field has expanded and developed for the last half decade, yet it continues to suffer from a lack of epistemological foundations (Van der Yeught, 2014). The acronym of this new sector is proposed as *Langues pour spécialistes d'autres disciplines* (*LANSAD*), meaning languages for specialists in other disciplines than English. The research on this new sector meets the vast demand of teaching and learning languages for non-specialists in diverse fields. According to Mariella and Derivry-Plard (2013), the workforce in this sector represent 90% of students enrolled in higher education.



Whyte (2016) makes a distinction among key terms of Modern language studies, Languages for specific purposes and Second language teaching, which clearly differentiate learners' fields, instructors' background and students' certificate.

Table 5 – Teaching Programmes in Language Education (Whyte, 2016, p. 31)

	MFL		LSP	SL teaching
<b>institutional affiliation</b>	modern language departments	CLIL	<i>Lansad</i>	language centres (L2 French, self-access centres)
<b>French acronyms</b>	LCE, LLCE	DNL ( <i>Emile</i> )	<i>Lansad</i>	FLE, CRL
<b>linguists as opposed to</b>	historians, philosophers, (L1) literary scholars	second school mathematics, history, biology teachers	medical, law, science faculty members	(L1/L2) literary scholars
<b>instructor background</b>	degree in modern languages	teaching qualification in school subject	degree in modern languages	degree in language sciences or FLE/EFL
<b>student certification</b>	national entrance exams for secondary teachers ( <i>Capes, Agrégation</i> )	baccalaureate	degree in specialist domain	FL certification (DELF, CLES)

Despite the comparison among Modern language studies, Languages for specific purposes and Second language teaching, Table 5 shed lights on the current situation of the teacher training as English teachers in the *LANSAD* sector. It also illustrates students' certification who receive *LANSAD* courses. Apparently, from the table above, teachers in the *LANSAD* sector are not trained for teaching degrees in specialist domains in the first place. Most often, they have to deal with students in specialist domains and science faculty members without any relative backgrounds. It reveals the pronounced gap between instructors' background with the degree.

### 3.5 Teaching English in Science Education

In this part, we turn to explore the perspective of teaching English in science education. Considering the fact that research work on teaching English in science is very rare in the research domain of *Anglais de spécialité (ASP)* in France, we veer into ESP works on that topic.

As globalisation continues to develop, as well as the rapid development of information and technology, students in science education are facing challenges of solving scientific problems and probing new knowledge and technologies. Teaching science is to give experience of discovering science concepts through the scientific process, connecting the science with technological advances and their impact on environment and society (Mansour, 2009).

As previously reported, the dominance of English language in science indicates that teaching English in science education is of paramount importance. As the language competence needed by engineers and scientists should be related to their professional field there is no longer need to ask if their English language skills must be improved, the question is how teachers should go about improving these skills (Talberg, 2006).

According to Ono and Morimura (2007), it is important learners acquire knowledge within an ESP course:

- *An English proficiency that is sufficiently good for them to exchange with worldwide English-speaking specialists*
- *A global cosmopolitan vision*
- *Experiences that enhance their communication with other nations on equal terms outside their own country*
- *Creative skills and self-motivation for exploring solutions to problems related to their professional domains*
- *An appreciation of diverse cultures in the world.*

In addition to the skills mentioned above, three other components are discussed subsequently. These three components are taking an increasingly dominant position in the skills expected of university students, including intercultural communicative competence (ICC), literacy in science, and critical thinking.

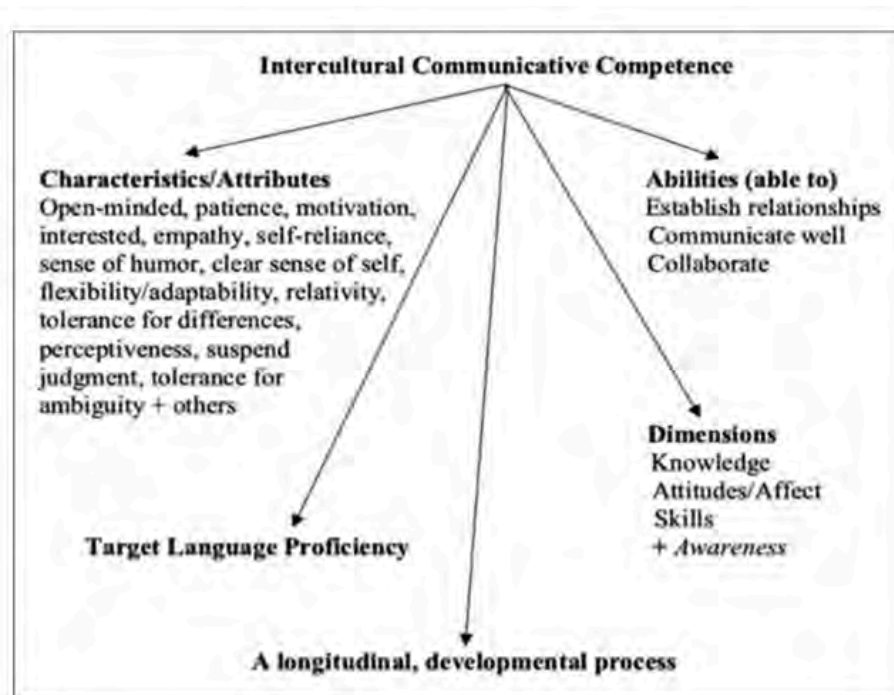
### *Intercultural Communicative Competence*

One's intercultural competence, according to Fantini (2020), is directly related with ability in the host language, aside from the humility and affective dimensions experienced when attempting to communicate in someone else's terms.

As Byram (1997) states, the interculturally competent speakers can be considered as those who are able to effectively exchange with individuals of the target culture, showing curiosity with open attitudes and tolerance. The interculturally competent speaker are supposed to possess skills of interpreting and relating, demonstrating knowledge of how language and culture are related in the target culture. Moreover, they are expected to interact with non-native interlocutors with distinct cultures combining proper real-time knowledge, skills, and attitudes.

Being aware of the discrepancy in sociocultural background as well as the linguistic practices employed to convey that background or culture composes the prerequisite for maintaining conversational involvement among interlocutors (ibid). Successful communication that takes place among interlocutors requires an enhanced understanding with regard to the differences in interactional norms between different speech communities and the ability to "reconcile or mediate between different modes present" (Byram & Fleming, 1998, p. 12). ICC comprises not only an understanding of the culture and language being studied but also "the readiness to suspend disbelief and judgment about the other culture and the willingness to reflect on one's own culture and question the values and presuppositions in one's own cultural practices" (Chun, 2011, p. 393). Fantini (2020) also proposes a model presenting components and aspects of ICC, as shown in Figure 13.

Figure 13 – Components and Aspects of Intercultural Communicative Competence (ICC)  
(Fantini, 2020, p. 55)



As Fantini (*ibid*) underlines, ICC development is important for all parties: students, sojourners and hosts in field contexts, and staff and faculty. ICC development is not only link to be academic and cognitive activities, but also experiential and affective activities. Specifically, ICC development is for all: ourselves and others; English-speakers and other language-speakers; and important for diversity, at home and abroad; and for internationalisation<sup>3</sup> and internationalism (Fantini, 2020, p. 4).

Therefore, ICC development is fundamentally conducive to achieve intercultural communication for all parties, particularly in the trending process of internationalisation in worldwide higher education.

### *Developing Literacy in Science*

From the perspective of functional linguistics, learning the specialized language of science is synonymous with learning science (Fang, 2005). “Language is the essential condition of learning, the process by which experience becomes knowledge” (Halliday, 1993, p. 94).

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<sup>3</sup> Internationalisation refers to the internationalisation of higher education.

Learning science means learning to control the unique linguistic forms and structures that construct and communicate scientific principles, knowledge, and beliefs.

Scientific literacy, which means “the ability to read and write”. The French expression is *culture scientifique*. According to Chaplier (2016b), science forms a common language that provides benchmarks to scientists in the same way as local elements provided common benchmarks to all villagers. *Culture in science* should be reintegrated as a common culture even for non-specialists in science and in courses-in science or English.

Thus, developing literacy in science is fundamentally a semiotic process involving systematic remodelling of everyday grammar and concomitant reconstrual of everyday ordinary life experiences (Wells, 1994).

Scientific literacy is a key component of science education that aims at preparing future generations to function as responsible citizens for the advancement of the world affected by science and technology and to understand its impact (Wicaksono & Susilo, 2019). Kek and Huijser (2011) suggest that scientific literacy and critical thinking trigger the development of knowledge, attitudes/values, thinking ability, and fostering the ability to take responsible actions in the context and circumstances by their lives and social environment.

### *Foster Critical Thinking*

The role of education in fostering critical thinking in students has been underscored since the time of (Dewey, 1910). In Europe, the reform in science education in 2011 has made the teaching of critical thinking the main aim of undergraduate teaching (Forsthuber et al., 2011). In the same vein, US and Australia researchers have recognised the vital role of critical thinking in higher education, despite various understanding on what critical thinking is. It is well acknowledged that students do not have much experience in critical reading and thinking before entering higher education. There were various debates on connections with various components. Some have explored the influence of culture on critical thinking (Grosser & Lombard, 2008), Others have explored the relationship of critical thinking with motivation, learning strategies and classroom experience (Garcia & Pintrich, 1992).

In a review study of El Soufi and See (2019), 36 studies are examined towards effective approach of fostering critical thinking in higher education. Findings suggest that nearly all of the studies report favourable results on the instruction approach, only with a distinction on ratings. The authors demonstrate that teaching *general critical thinking skills* is proven to be

effective on learners' critical thinking despite that the evidence is not so strong due to a small sample or a lack of comparison groups. Other approaches with limited proof of effectiveness are also listed and discussed in the study, such as *debate, assessment techniques as an instructional approach, literary and narrative texts, brainstorming techniques, journal writing, scaffolding and active learning strategies* (El Soufi & See, 2019, p. 149).

In the following part, we turn to the perspective of teaching English for Research Publication Purposes (ERPP). Some issues such as ERPP pedagogical approaches, specialised and specialist knowledge, the role of ERPP instructors are discussed, which shed some lights on teaching in the LANSAD sector in French context.

### **3.6 English for Research Publication Purposes (ERPP)**

Academic writing for research publication takes place around the globe, involving, according to a recent account, 5.5 million scholars, 2,000 publishers and 17,500 research/higher education institutions (Lillis & Curry, 2010). According to Lillis and Curry, Ulrich's Periodicals Directory (Directory, 2009), which is the most comprehensive listing of journals, indicates that 67% of the 66,166 academic periodicals included are published using some or all English. Likewise, as reported by some sources of bibliometric statistics like Institute for Scientific Information (ISI), more than 95% of indexed natural science journals and 90% of social science journals use all or some English, implying the near-complete integration of English into journals of certain disciplines (Lillis & Curry, 2010). Notably, more and more research is being published by non - Anglophone scholars, or alternatively stated, scholars who use English as their second or professional language, referring to as EAL (English as an additional language) writers sometimes.

This publishing phenomenon, as Flowerdew (2013) states, is coined by several factors. On the one hand, more findings of research are expected to be published with high hopes by faculty members and students in universities. Held up as a strong expectation, international publication is a prerequisite for proceeding to the next research degree programme (thesis submission or doctoral even Master's degree graduation) or in the process of academic appointment, contract renewal, tenure, or promotion (Li & Flowerdew, 2020). On the other hand, English being a widely acknowledged international language in research, or rather a lingua franca also impels this process.

Given the dominance of English in academia, as well as the invisibly growing pressure of producing international publications in universities, there is an increasing interest in developing the field of research, a new specialist term coined as English for Research Publication Purposes (ERPP). In the *Journal of English for Academic Purposes*, ERPP is defined as follows:

*English for Research Publication Purposes (ERPP) can be thought of as a branch of EAP addressing the concerns of professional researchers and post-graduate students who need to publish in peer-reviewed international journals. It is now almost a truism to say that the vast majority of these journals are published in English, and that this presents considerable challenges to users of English as an Additional Language (EAL), regardless of the field in which they work. While EAP programmes in universities can address some of these needs in a general way, the real-life, specific issues for academics whose L1 is not English wishing to publish in English are often broader and more complex (Cargill & Burgess, 2008, p. 75).*

#### Teaching English for Research Publication Purposes: Preparation for ERPP

The growing pressure of producing international publication increasingly causes a requirement that not merely faculty members, but doctoral or even masters-level candidates sometimes are expected to publish in international indexed journals as a condition of graduation. Accounting for this pressure among international scholarship, it appears necessary for programmes preparing international scholars to perform to satisfactory levels in their individual fields (Flowerdew, 2015).

In this regard, pedagogical ERPP interventions are of prominence for scholars, or rather “potential scholars”. Nevertheless, the pedagogical concerns of ERPP is firstly noticed by English for Academic Purposes (EAP) practitioners quite recently. For instance, Swales (1990) addresses issues that EAL doctoral students encountered and how the problems were handled by him via pedagogical interventions in Genre analysis: English in academic and research settings. It is only in the early 2000s that further published reports of pedagogical ERPP interventions started to emerge. With regard to the vast demand for ERPP intervention, the field is still shrouded in darkness and considered as underdeveloped (Li & Flowerdew, 2020).

Li and Flowerdew (2020) conduct the research of a review programme concerning 31 targeted articles aiming at revealing the status of ERPP pedagogies, deriving seven categories of meaning: rationales and local contexts, theoretical underpinnings and pedagogical approaches,

writing tasks, instructor and peer feedback, language focus, challenging issues, and specialized vs. specialist knowledge.

### *Rationales and Local Contexts*

As previously mentioned, the pressure to produce publication in high-impact English medium journals for undergraduates or academic staffs is highlighted. The requirement of publications appears to be the natural precondition of admission and graduation. Doctoral candidates are expected to acquire the skills to naturally exchange research in English.

Whereas with this worldwide publication pressure, it seems to be controversy and irrational to see the lack of ERPP instruction in traditional pedagogy.

Li and Flowerdew (2020) point out that rather than language teachers being the key agents, content specialists lead the process initially. Language teachers are invited by academic departments or individual content specialists to offer an ERPP course for graduate students or novice researchers in their disciplines (Aranha, 2009; Arnbjörnsdóttir, 2019; Feak & Swales, 2010; Swales & Luebs, 2002). Meanwhile, they also state that administrative and funding support can be an important precondition to hinder the schedule and duration.

### *Theoretical Underpinnings and Pedagogical Approaches*

The research finding implies that a number of features of ERPP teaching incorporates genre pedagogy (Li & Flowerdew, 2020). Notably, the IMRaD (Introduction, Methods, Results, and Discussion) structure is widely adopted in teaching. Moreover, the sequences and selection may differ according to students' competence and the course duration.

A genre-based ERPP course is likely to be task-based (Swales, 1990) or in conjunction with rhetorical consciousness raising such as Analysis, Awareness, Acquisition, and Achievement (Swales & Feak, 2012). ERPP pedagogy sometimes adopt a critical pragmatic" approach (Englander & Corcoran, 2019; Flowerdew, 2007).

### *Writing Tasks*

According to Li and Flowerdew (2020), during writing tasks, participants are given different tasks and materials. For instance, writing related text of genre set like abstracts, reviews, conference papers, designing questionnaires, or submitting an early draft manuscript. However,



some participants with low English proficiency may fail to achieve the given tasks. Likewise, it seems rather logical that participants achieved publication after attending an ERPP programme had relatively high English proficiency in general.

#### *Instructor and Peer Feedback*

Writing tasks are characterised as comprising teacher instruction and feedback, either during class or afterwards. Rather than the disciplinary content (specialist knowledge), as Ferguson (1997) notes, EAP practitioners should be familiar with the discourse of the students' discipline (specialised knowledge). Nevertheless, it needs to be acknowledged that EAP teachers' lack of specialist/content knowledge can interfere with their attempts to provide meaningful feedback on students' writing (Li & Flowerdew, 2020). Cargill et al. (2018) reported the difficulty of marking science students' drafts of discipline-specific article introduction sections, due to their own lack of content knowledge.

#### *Language Focus*

Of all review articles in the programme (Li & Flowerdew, 2020), a focus on language is a norm since scholars are continually facing the linguistic obstacle. EAL scientists advocate a lack opportunities to develop this language ability. The emphasis is perhaps more on helping participants to become more self-sufficient in developing their linguistic competence rather than teaching them particular language features.

#### *Challenging Issues*

Various pedagogical strategies are applied by language teachers in tackling challenges during teaching process (Li & Flowerdew, 2020).

One challenge that ERPP instructors encounter can be the diversity in the participants' disciplines. Some scholars report on the value of ERPP instructors' positive attitudes toward it, in recognising that the diversity can be taken advantage of (Douglas, 2015; Goryanova et al., 2015; Leydens & Olds, 2007; Muresan & Bardi, 2013). Interaction among participants in diverse disciplines can facilitate extensive and mutual understanding of the research process and discourse community differences and similarities (Leydens & Olds, 2007).

The second challenge, according to Li and Flowerdew (2020), is language teachers' lack of content knowledge in course participants' disciplines. Various cases indicate an effective

measure of content specialists engaged in the instructional process, or achieving a collaborate partnerships between language and content specialists (Cargill et al., 2018; Cargill & O'Connor, 2006; Corcoran, 2017). Complementary feedback from both language and content teachers can be rather beneficial for participants. It should also be noted that participants may be experts who are more familiar with content knowledge in course participants' disciplines than ERPP instructors, making it advantageous for instructors to learn from participants.

The third challenge can be pointed to the limited instruction time. Two hours a week appears not enough. Therefore, promoting participants' autonomy and facilitate peer feedback can be essential. Meanwhile sufficient resources and well-organized schedule are of important for participants' self-autonomy. In this regard, the platform Moodle is beneficial either during or after classroom teaching.

### *Specialised and Specialist Knowledge*

Given the differential education background of ERPP instructors, strategies and method they applied in tackling the lack of content knowledge can differ. Some may introduce their own reading/writing/publishing experience as researchers or experience as manuscript reviewers or journal editors in their teaching. Some link the discussion of the issue of language choice in publication with their own research on professional researchers. Some have a relate background may bring in relevant content expertise or specialist knowledge (Li & Flowerdew, 2020).

It worth mentioned that ERPP teachers are unlikely to achieve the same content expertise as their content teacher counterparts, even ERPP teachers are embedded in content faculties or departments and thus may be well familiar with the relevant content.

Cadman (2017) proposes to create “a dialogic classroom environment”. As she states, the aim is not to imprint or demand adherence to its assumptions and its logic, but rather to learn more about how mutually acceptable social research may be conceptualized and practically carried out in their learner-researchers' own contexts.

Swales and Feak (2012) propose a non-linguistic dimension of ERPP teachers' role, namely the concept of “academic socialization”. Hyland (2007) points out the need for both the linguistic and the non-linguistic levels in courses aimed at preparing novice writers. He suggests drawing on the literature on the characteristics of published articles in different disciplines, focusing on key features of these texts and making them explicit to writers, including “both raising awareness of the ways language is used to most persuasive effect and encouraging reflection on writers' own preferred argument practices”. Meanwhile, Hyland (2007) believe it is vital “to

assist novice writers with the strategies they might employ in the publication process itself, giving particular attention to the analysis of their target publications and the navigation of the revision process”.

In conclusion, many close parallels emerges between teaching in the LANSAD sector and teaching ERPP. As we developed in Chapter 1, there are differences (EC, PRAG, PRCE, lecturer, part-time) regarding teachers’ statuses. Pedagogical practices are thus varied. They depend on the teachers: their statuses (associate professor/professor, higher education professor, reader, temporary staff) but also their professional experience. Most have followed the traditional French language training path (European Credits Transfer System) and consequently have a disciplinary professional loyalty that tends to frame teachers’ educational responsibilities. In practice, they are unprepared to teach in this context. Most often, they have trained themselves on the job. After the discussion of the important issues in ERPP pedagogical practices, we will continue to examine the role of an ESP practitioner, taking a close look at ESP practitioner in pedagogy.

### **3.7 The Role of an ESP Practitioner**

English teachers in the French context can be considered as ESP practitioner, since they are most often not researchers in the research domain of ASP in France, they are closer to the pedagogical ESP. In the English-speaking world, rather than ESP teacher, as Dudley-Evans et al. (1998) put it, “ESP practitioner” is the term better suited. They demonstrate that there are five diverse roles for an ESP practitioner to perform: 1) Teacher, 2) Collaborator, 3) Course designer and materials provider, 4) Researcher 5) Evaluator. The notion of ESP practitioner is widely used in the field of ESP when referring to teachers or instructors.

#### *The ESP Practitioner as a Teacher*

The first role of an ESP practitioner is the role as a teacher, which is synonymous with teacher of General English. Performing a teachers’ role requires ESP practitioner to play an active role in the teaching and learning process, as well as fostering students’ motivation by adapting proper materials and teaching strategies that suits learners’ needs.

#### *The ESP Practitioner as a Collaborator*

In order to meet the specific needs of the learners and adopt the methodology and activities of the target discipline, the ESP Practitioner must first work closely with field specialists (Anthony, 1997). Close collaboration with field specialists not only enriches ESP practitioner's knowledge and teaching materials adopted during teaching practices, but also develop ESP practitioner's awareness of what they are receiving and involving in professional classes. Consequently, ESP practitioner can make connection when designing courses, thus enhancing teaching effectiveness and motivating learners with topics they are engaged in.

As Johns and Dudley-Evans (1988) propose, this collaboration, however, does not have to end at the development stage and can extend as far as team teaching. Dudley-Evans et al. (1998) state three levels of cooperation for subject-specific work: *Cooperation, Collaboration and Team-Teaching*. *Cooperation* is lower-level advice and guidance from the subject teacher. Language teachers ask and gather information about the students' subject course. *Collaboration* involves ESP teachers in consulting subject teachers about different aspects of the academic field and working together to design appropriate syllabuses and teaching and learning activities. In *team-teaching*, both English and subject teachers are together in the same ESP classroom and teach the material simultaneously. Likewise, Barron (1992) proposes a four-point continuum according to the extent of subject teachers' contribution: informant—consultant—collaborator—colleague.

This cooperation can take place in groups with field specialists or with experienced colleagues who are teaching students in the same or similar fields. When team teaching is not a possibility, the ESP Practitioner must collaborate more closely with the learners, who will generally be more familiar with the specialised content of materials than the teacher him or herself (Johns & Dudley-Evans, 1988).

### *The ESP Practitioner as a Course Designer and Materials Provider*

Given the reality that learners are in diverse fields, ESP practitioner should have enough autonomy and capacity of designing his/her own syllabus based on the curriculum and certain teaching aim. An ESP practitioner is also required to provide teaching materials. However, a controversy emerges regarding how specific those materials should be. Unfortunately, with the exception of textbooks designed for major fields such as computer science and business studies, most tend to use topics from multiple disciplines, making much of the material redundant and perhaps even confusing the learner as to what is appropriate in the target field. Many ESP

practitioners are therefore left with no alternative than to develop original materials (Anthony, 1997). The autonomy of ESP practitioners designing their own courses definitely impel enrichment of teaching and learning, yet create a problem of various evaluating standard and teaching content for learners.

#### *The ESP Practitioner as a Researcher*

With regard to the controversy mentioned above, it is vital for ESP practitioners to adapt to themselves as a role of researcher as well. Being researchers means they have to continually adopt novel teaching materials to specific fields they are teaching, as well as renewing teaching content up to date and employ multimedia courseware in preparation of lessons. Syllabus and evaluation need to be updated every few years to adapt to new learners and new eras.

#### *The ESP Practitioner as an Evaluator*

For an ESP practitioner, it is no new term as an evaluator, since it is the same with teachers of General English. As Dudley-Evans et al. (1998) put forward, the evaluation system should be an on-going process (i.e. during the course; at the end of the course, and after the finishing of the course). This process of evaluation makes the syllabus valid and up-to-date. The ESP practitioner should be familiar with the evaluation process and how to assess the learners accordingly. He/she should check the syllabus effectivity for the learners as a prior attempt to its use.

In this part, we examine the role of ESP practitioner and the collaboration between ESP practitioner with field specialists or with experienced colleagues who are teaching students in the same or similar fields. We also discuss the collaboration with the learners, all of which raise our interest into the collaboration takes place among learners, language teachers and science teachers in this study.

### 3.8 Constructs of Scientific English

Scientific English has long been envisioned as a focused domain on linguistic aspects. As a matter of fact, scientific English must be broadened and enriched, as well as its limited scope (Chaplier, 2016a). Another notion is required and such a need motivates the development of English for science. By crossing boundaries that limit an epistemological approach, the meta-concept of English for science has been forged to bridge these gaps. The method of setting the boundaries for the new territory of language teaching and learning, which overlaps two domains - English and science - to develop a new domain - English for science - must then be traced (*ibid*). The construct of scientific English is centred because it involves a multifaceted object, including scientific content that must be appropriated by student-learners and expressed in a foreign language, making each aspect significant and non-neglected. This section begins with specialised language/*anglais de spécialité* and then moves on to science definition, historical perspective with the aim to understand how language was used in science.

#### 3.8.1 Langues de Spécialité et Anglais de Spécialité

The research of specialised languages has yielded rich harvest since Michel Perrin highlighted the “réalité bien vivante et polymorphe” and “terrain puissamment labouré” of “La langue de spécialité (LSP)” during a conference (Perrin, 1994) in the Association des Professeurs de Langues des Instituts Universitaires de Technologie (APLIUT) congress. APLIUT was founded in 1977 at the Institut Universitaire de Technologie (IUT) of Paris V, and became an association in May 1978. It was ten years after the lecture presented as “ESP comes of Age? 21 years after 'some Measurable Characteristics of Modern Scientific Prose’” by John M. Swales at the 4th European Symposium on Specialised Languages in 1983, in which he presented an retrospective of specialized English (Perrin, 1985).

In order to probe into what scientific English is, specialised language must first be defined.

According to Mémet (2007), the very first definition widely publicised in France is in *Dictionnaire de didactique des langues* by Robert Galisson and Daniel Coste entitled as “spécialité, langues de spécialité”:

*Langues de spécialité (ou langues spécialisées) : expression générique pour désigner les langues utilisées dans des situations de communication (orales ou écrites) qui impliquent la transmission d’une information relevant d’un champ d’expérience particulier (Galisson & Coste, 1976, p. 511).*

Afterwards in 1982, the issue of languages was intensively discussed in the journal *Langues modernes*, in which the term was used by Bernd Spillner:

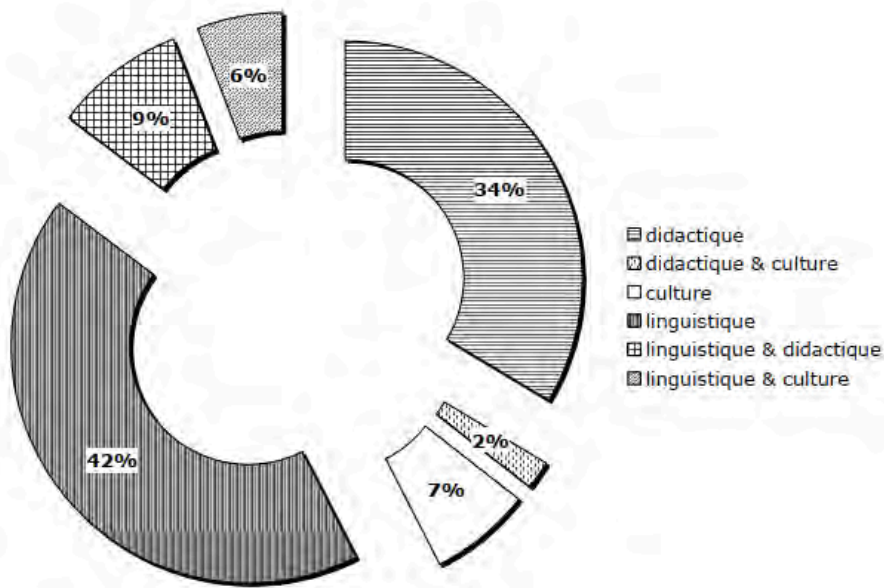
*Par « langue de spécialité » nous entendons l'ensemble des éléments linguistiques qui peuvent se manifester, dans une situation donnée, lors de la communication entre des spécialistes d'une discipline scientifique ou technique sur un sujet de leur discipline (Spillner, 1982, pp. 19-27).*

As Van der Yeught (2016) states, what makes specialised language different from general language is “the intentional universe conveyed by the discourse”. As long as the intentionality and its purpose are specialised, the language expresses the related domain and serves its purpose. Eventually a clear definition of “l’anglais de spécialité” was proposed by Michel Petit in 2002, which is well acknowledged and integrated:

*l’anglais de spécialité est la branche de l’anglistique qui traite de la langue, du discours et de la culture des communautés professionnelles et groupes sociaux spécialisés anglophones et de l’enseignement de cet objet (Petit, 2002, p. 2).*

The study of anglistics (anglistique) in France is historically divided into three strands, Tardieu (2008) identifies “three traditional fields in English studies: linguistics, literature, culture”, now four with the more recent inclusion of specialised English.

Figure 14 – Axes D'étude Des Thèses (Mémet, 2007, p. 19)



Mémet (2007) groups the theses between 1986 and 2007 into several categories: didactique, didactique et culture, culture, linguistique, linguistique et culture, ainsi que linguistique et didactique. The figure indicates a proportion of 42% of theses in linguistics compared to a proportion of 34% of theses in didactics.

Perrin (1994) addressed the inception and growth of specialised languages in France during the conference. He highlighted that specialised languages has been increasingly presenting at the crossroads of three main currents, which indicates that linguistic features of languages, the implementation of pedagogy, other cultures as well as the main fields of learners should be all included:

*Ces trois fleuves, et leurs multiples affluents, sont :*

- *La langue, ou plutôt, les langues : l'étude de la langue, tout ce qui se rattache à la linguistique;*
- *Le didactique, la mise en œuvre d'une pédagogie-andragogie ; y compris le fleuve annexe du technologique;*
- *Le spécifique, qui est aussi la culture des autres : champ d'application pour nous, champ principal d'étude pour les apprenants (Perrin, 1994, p. 14).*



He also highlighted the role of the teacher, which can be a linguist, a lexicologist, a terminologist, a grammarian, an analyst, an adapter, a designer, a evaluator, but also facilitator, animator, even administrator, and also researcher. In short, teachers in specialised languages should be versatile, spreading culture as generalists in one or more professions and open to the contemporary world.

This raises the concern of defining specialised languages, or rather specialised discourse, which is always aims at certain audiences. It should be regarded as a language “for a purpose”, which is therefore vital to analyse needs and demands. Though it is not reflected in the French equivalent “de spécialité” (Perrin, 1994). It should also be noted that it is always related to professional activities.

After ten years of continuing development, a well-established definition of specialised English was achieved by one researcher (Petit, 2002). Research of specialised English in France is anchored in the context of the wider domain known as Langues pour Spécialistes d’Autres Disciplines (LANSAD)/Languages for specialists of other subjects that emerged in the 1970s (Chaplier, 2016a). Despite its leading a clear scientific and educational path along with a series of teaching practices, LANSAD has yet failed to evolve into a field of scientific research (Van der Yeught, 2014).

According to Mémet (2007), the number of students in the LANSAD sector has long exceeded that of Anglicist students, which maintains the present status in the 21st century. The number of senior lecturer positions in English assigned to the LANSAD sector is 20 to 30% per year and that of PRAGs has been around 60% from statistics since 2005.

### **3.8.2. “Anglais de spécialité” in the Science Domain**

When referring to scientific English, it seems overbroad even though it is limited in the range without human sciences taken into account, since the sciences encompass enormous domains and various disciplines, including physics, mathematics, chemistry, geology, biology, computer science, etc. (Trouillon, 2014). Hence, it is obviously impossible to deal with scientific terminology extensively.

Trouillon (2014) also proposes that the approach regarding scientific English should be done in a comprehensive manner in order to understand at what level common traits can be identified, despite the diversity observed even beyond the disciplines. He also accentuates that there is a necessity to start from a proper and clear definition. In this regard, this part discusses both some

definitions of specialised English and also the inceptive concern on the definition of "science" itself.

### **3.8.3 Content and Language Integrated Learning (CLIL)**

Teaching in the LANSAD sector in science shares many characteristics with Content and language integrated learning (CLIL) and other types of bilingual education. Therefore, a classification of CLIL courses and the problem of CLIL are also investigated.

The past three decades have witnessed the rising institutional concern regarding the prominence of the internationalisation at the university level globally, which also echoed with the employ of English as the language of instruction in non-English speaking countries (Arnó-Macià & Mancho-Barés, 2015). The ongoing turn to teaching programmes conducted in English at the university level contributes to the further research towards the integration of language and content.

The term Content and language integrated learning (CLIL) was introduced in Europe and was then trending up since the 1990s (Dalton-Puffer, 2007). Owing to its features combining cognitive theory and pedagogical practices, CLIL has been targeted for central focus in the research field of language teaching and learning. Its wide adoption makes it one of the most significant development in language teaching and learning (Ioannou Georgiou, 2012). The main appeal CLIL holds for language teachers is that scientific background (e.g. physics, chemistry) is no longer in demand for its implementation. Despite the fact that it does not lead to students' automatic mastery of a language, CLIL gives more force to students since it destines for imitating real life experience of language use, thus highlighting the significance of context in the learning process (Chaplier & O'Connell, 2015).

There are a number of definitions regarding CLIL. Dalton-Puffer et al. (2010) defines CLIL as follows:

Content and language integrated learning (CLIL) can be described as an educational approach where subjects such as geography or biology are taught through the medium of a foreign language, typically to students participating in some form of mainstream education at primary, secondary but also tertiary level (Dalton-Puffer et al., 2010, p. 1).

Greere and Räsänen (2008) highlight the dual integrative focus of CLIL on content and language, which is delivered by content specialists or cooperative teaching. This draws a main distinction between CLIL and other approaches.

Ioannou Georgiou (2012) also refers CLIL to a dual-focused approach in which a non-language subject is taught through a foreign language. The dual focus remains on students' acquiring subject knowledge and competences in the foreign language at the same time.

### *A Classification of CLIL Courses*

Greere and Räsänen propose a classification of CLIL courses in Europe in a report on a LANQUA Subproject in 2008. Greere and Räsänen also stress that CLIL should be regarded as a continuum of various pedagogical approaches which aim to facilitate learning. According to Greere and Räsänen (2008), CLIL courses are categorised into five categories, ranging from the absence of the integration of language and content to full collaboration between language and discipline specialists. It certainly appears so that the differentiation serves as a new highlight in analysing CLIL programmes with regard to language and content as well as the roles they play. Greere and Räsänen (2008) refer these five categories to:

1. Non-CLIL: the non-integration model, involving independent content and language courses (less than 25% of exposure to English in content courses);
2. LSP/ Discipline-based language teaching: It is similar to the theme-based model above (i.e., subject-matter exposure through LSP subjects);
3. Pre-CLIL (language/content): It involves LSP courses preparing for content courses (similar to the CBI adjunct model) or content courses taught through the foreign language;
4. Adjunct-CLIL: It tailors language instruction to disciplinary needs, based on the collaboration of language and subject specialists
5. CLIL: It involves the team-teaching of dual programmes catering for language and content.

### *The Problem of CLIL*

The difference between English for Specific Purposes (ESP) or Languages for Specific Purposes (LSP) and CLIL is that the ESP or LSP holds its main aim of teaching and learning the foreign language, whereas the content remains the priority in CLIL, which is the same level

as the language (Fortanet-Gómez & Bellés-Fortuño, 2008). In Europe, most universities offer programmes or courses in Languages for Specific Purposes (LSP).

The widespread of CLIL contributes to the increase in CLIL programmes and decrease in LSP courses in training (Räisänen & Fortanet-Gómez, 2008). There is an increasing replacement of LSP courses with courses in non-language disciplines in English. Moreover, Content and language integration is seen as densely interwoven with ESP, especially English for Academic Purposes (EAP), which is expanding into universities as English has become the language of instruction and research around the world.

### **3.8.4 Defining Science**

A widely held common sense view of science is that science is derived from facts. Science is highly esteemed. Apparently it is a widely acknowledged that there is something special about science and its methods (Chalmers, 2013). Science is claimed to be special given that it is based on the facts. Science is bound to be based on what we can see, hear and touch instead of personal opinions or speculative imaginings. Science is defined as "knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method" in the Webster Dictionary of the English language.

The scientific method is a process than cannot be ignored. It allows new knowledge of natural or physical phenomena to be acquired, gaining explanations by sifting the truth from the false, rather than by guesswork or by something supernatural or from beyond the bounds of nature (Trouillon, 2014).

As Chalmers (2013) further explains, it is necessary to conduct experiments to acquire facts relevant for the identification and specification of the various processes at work in nature.

The process of scientific method can be divided into several stages as follows:

- observation of a natural phenomenon;
- development of a hypothesis to try to explain this phenomenon;
- experimentation with the aim of validating or even invalidating hypothesis; analysis and evaluation of the results of the experiment.

After analysing and evaluating the results, researchers get to validate or invalidate their hypothesis. The results can be positive or negative or even do not differ significantly. In spite of what results they obtain, it normally can be developed into a publication drawing worldwide

attention from scholars in international scientific community. In this manner, the complete experimental process can be repeated and acknowledged by worldwide scholars. As Trouillon (2014) states, the theory proposed by the researcher will in fact be accepted by the community, thus going beyond the stage of theory to become a fact. Diffusion is therefore essential.

As mentioned in the part concerning the role of English, English has dominated the scientific community and has become the international language for science. During international conferences, researchers always communicate and deliver presentations in English regardless of their own language backgrounds and geographical origins.

### **3.8.5 Latin Roots of Scientific English – Historical Perspective**

According to Halliday (1988), Newton's *Opticks* signifies the birth of scientific English. The controversy of his paper "A new theory of light and colours", which was published in the *Philosophical Transactions* of the Royal Society in 1672, led to the late publication of the book until 1704. It was this period of controversy that contributed to the pursuit of convincing and incontrovertible ways of expressing arguments by Newton (Banks, 2005).

Latin has long been the scientific language before English took the dominance. Whereas the fact that these scientists were familiar with Latin and that many of them used it as a language of communication is virtually never taken into account when discussing the features of scientific writing (Banks, 2005). There was only one researcher that was a pioneer to recognise the specifically linguistic bond between Latin and scientific English, who claims that use of the passive in scientific writing is, in part, derived from Latin:

The scientific paper, a new literary form which was to be the typical vehicle of scientific information, inherited the passive from general English and from science Latin, but had yet to develop characteristic uses of it (Turner, 1962).

Human beings are of paramount importance in prompting the development of languages. As major blocks to build a city, "stones" are also brought by human beings to build languages. It should be noted that it is an interaction rather than a one-way activity. Languages, when shaped by human beings, are also responsible for shaping peoples' perspectives and the concept of the world.

It is well recognised that Latin was the robust tool in scientific discourse before the 16th century (Graddol et al., 2020). As Fransen (2017) puts it, education organised by the Catholic Church

throughout the Middle Ages, with Latin as the language of learning, leads to the preeminent role of Latin in scientific discourse. During the late sixteenth and early seventeenth century, whoever went to school had to learn Latin. No matter where did the school locate, England, Italy or German, most students received the whole education in Latin, which is also the language used in their books and during their communication with their parents and teachers. Gradually, curriculums of Latin concerning reading, grammar and rhetoric, etc. have engendered, even in universities. Apparently, scientific practices conducted among educated individuals were also in Latin.

Despite the dominance of Latin in education, the enriched lexicon of Latin made it possible for recording and exchanging findings in the field of science. Latin also allowed scientists to deliver their findings in impersonal way through nominalisation (Banks, 2005). During the 15<sup>th</sup> century to the 17<sup>th</sup> century, diverse European vernaculars were used in publications including French, Germany, English, etc., which was not surprising given that various European vernaculars were adopted in onward articles addressing scientific issues since the 13<sup>th</sup> century.

Along with the notion that one's mother tongue is better for understanding and addressing opinions and also the development of diverse European vernaculars, Latin was not spoken as the mother tongue any more. Translation occurred between Latin and vernaculars. Authors are free to choose the language for scientific writing the late sixteenth- and early seventeenth-century (Fransen, 2017). During this period, Latin served as the vehicle language among people from different countries whereas vernaculars were also used among people from the same region of vernaculars.

According to Fransen (2017), it was not until the 17<sup>th</sup> century that things changed completely when two institutions of scientific investigation founded in the 1660s: the Royal Society in London and the Académie des Sciences in Paris decided that the vernacular would be the medium of communication. Latin would slowly take on a more passive role in the circulation of knowledge. There was an increasing need of English being used in scientific publications since many people in England did not understand Latin.

Nevertheless, English was insufficient to deliver scientific arguments for being not eloquent enough (Putra, 2015). As Graddol et al. (2020) state, English lacked the necessary technical vocabulary and grammatical resources required to represent the world in an objective and impersonal way, and to discuss the relations, such as cause and effect, that might hold between

complex and hypothetical entities. Consequently, lexical borrowing and grammatical metaphor in the form of nominalisations occurred during the contact between Latin and English.

### 3.8.6 Common Features of Scientific English

Despite that the sciences encompass enormous domains and various disciplines, common features can be found in texts and discourses in scientific community. These common characteristics are what we intend to reveal about international form of scientific English. Scientific English is the language of a discourse community (Trouillon, 2014).

As Trouillon (2014) points out, regardless of the fact that English is the representative of a community of discourse, this community does not necessarily have English as its language. In this regard, simplification of the discourse is essential for both readers and authors, in particular the latter.

As Petit (1997) cited from Higham (1993) in his book *Handbook of Writing for the Mathematical Sciences*:

*The most fundamental tenet of technical writing is to keep your prose simple and direct. Much of written English is unnecessarily complicated. In writing up your research you are aiming at a relatively small audience, so it is important not to alienate part of it with long-winded or imprecise text. English may not be the first language of many of your readers - they, particularly, will appreciate plain writing (Higham, 1993, p. 3).*

Not only does scientific English has the characteristic of simplification of the discourse, it also shares the similar structure in research articles. It is noted that each scientific disciplines has their own academic journals. The explosion of research articles has been an enormous motivating factor LANSAD teachers and researchers to consider this genre.

John Malcolm Swales, who was a pioneer in the field of English for Academic Purposes, rhetoric and discourse analysis, etc., is best known for his work *Genre analysis: English in academic and research settings* Genre Analysis by Swales (1990) is the first landmark work in the English-speaking world.

Regardless of the existed variations that depend on the editorial policy of different journals, the main features identified by Swales can be illustrated into four sections: problem, method, results, and conclusion. It is also similar to what we known as “IMRaD” format, which refers to an article that is structured in four main sections.

There are other main characterisation criteria summarised by Trouillon (2014) :

1. *Elements included in the header of the article*
2. *The length of the paper according to the editorial policy of journals*
3. *References to previous work done by other researchers*
4. *Graphs, tables or photographs that illustrate the text.*
5. *The subdivision of the text using various marks*
6. *The layout such as the choice of the font, the size and the weight of the latter according to the editorial policy of journals*

*(Trouillon, 2014, pp. 97-134)*

The discourse of the scientific research article was observed and analysed from a purely linguistic angle, both synchronic and diachronic (Salager-Meyer, 1999).

The pursuit of objectivity is the first most remarkable aspect. Scientific writing is believed to be purely impersonal and objective that deals with facts. While Hyland (1996) proposes the importance of hedging, claiming that effective academic writing always carries the individual's point of view. Hedging devices are a major pragmatic feature of effective scientific writing, which should be taught to students to recognise and use in their own work. Writers need to present their claims cautiously, accurately and modestly to meet discourse community expectations and to gain acceptance for their statements with cross-cultural differences.

A research has been conducted by Laffont and Trouillon (2013) regarding the publications in the journal *ASp* (GERAS – Groupe d'étude et de recherché en anglais de spécialité) since 1993, reviewing twenty years' publications from 1993 to 2012 with regard to the field of ESP and particularly scientific English. During last twenty years, there were eighty-two articles out of 120 dealing with science in general, in which computer science (17 articles out of 120) is the field remained a majority interest among authors until 2000. Biology is the field that slightly stands out with six articles. Disciplines like physics or chemistry apparently falls out of favour among scholars. The finding suggests an imbalance of scientific English research among disciplines.



### 3.8.7 The Teaching-learning Situation of Scientific English

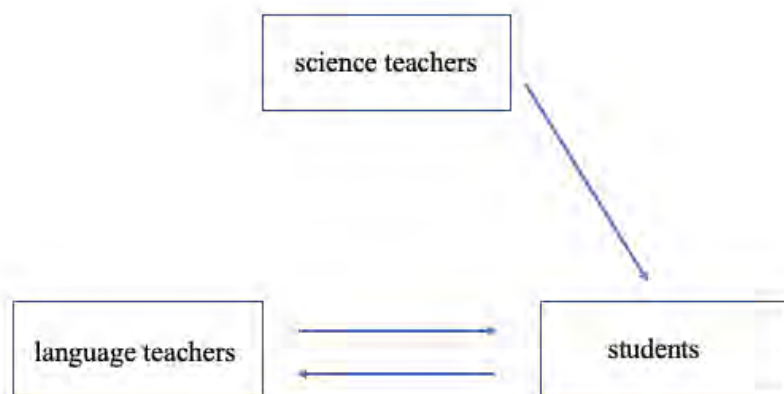
#### *The Absence of “Disciplinary Dialogue”*

According to Chaplier (2017), due to the lack of a common knowledge basis of science students and English teachers, teaching-learning scientific English does not foster the understanding in the science field. Therefore, there is no “disciplinary dialogue” or cooperation between LANSAD and science professors and associate professors within university courses.

Nevertheless, teaching English to students in the scientific community is not the same case as teaching general English. The teaching-learning activity takes place in two teaching communities, thus science teacher-researchers should be taken into account.

If we consider the nexus between language and science teacher-researchers with students as a triangle, science teacher-researchers play a very limited role in the scientific English teaching-learning.

Figure 15 – Teaching-Learning of Scientific English



#### *Different Representations*

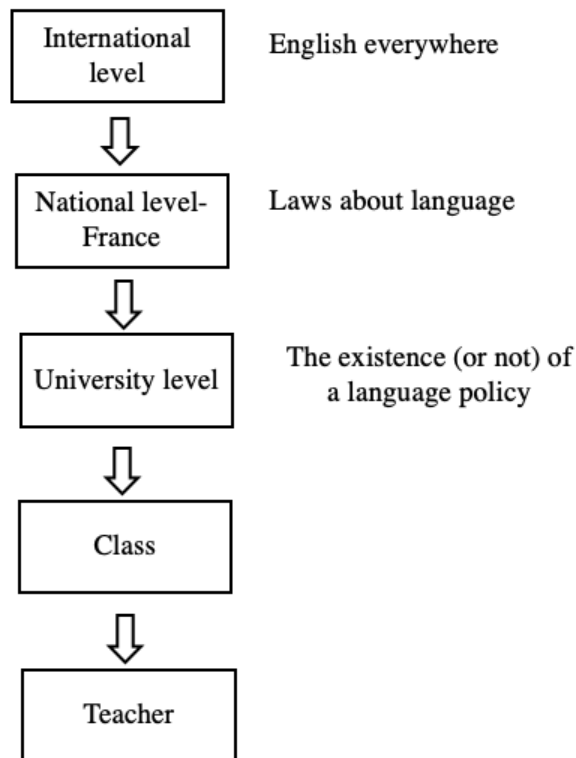
As previously covered in the part of representations, teachers and students have their own representations in teaching-learning activities. They take different perspectives in viewing and evaluating the outcomes of learning. As Chaplier (2017) puts it, the English language course which depends on the teacher (cognitive and affective aspects) does not always correspond to

the expectations of students in science. Therefore, it is very difficult to communicate between students and teachers who do not have the same representations and the same knowledge bases. Meanwhile, the network of representations (see Figure 4) also indicates that language teachers' representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of researchers in English studies; representations of science students. In this regard, it is pivotal to take the part of the science teachers and administrators into account, which are not included in the current situation.

#### *The Existence (or not) of a Language Policy*

As Chaplier (2019) puts it, pedagogical practices are varied depending on the teacher: their status (associate professor/professor, higher education professor, reader, temporary staff) but also their professional experience. However, course content is mainly a result of their professional experience, particularly on the basis of a) the type of institution (e.g. university, engineering school); and b) the existence (or not) of a language policy. Therefore, the pedagogical practices are normally conducted as shown in Figure 16, indicating the effect is rippling through the system.

Figure 16 – Pedagogical Practices in France



### 3.8.8 Chaplier’s Construct of “English for Science”

Chaplier (2017) proposes an approach of building *common knowledge* to teaching scientific English. *Common knowledge* initially takes its meaning based on the meaning of logic: « on dit qu’il y a connaissance commune de  $p$  dans un groupe d’agents  $G$  quand tous les agents de  $G$  savent  $p$ , et tous savent qu’ils savent tous  $p$ , et tous savent qu’ils savent tous qu’ils savent tous  $p$ , etc. » (Osborne & Rubinstein, 1994).

There is another definition in English which refers to logic and which reads as follows:

*Common knowledge* is a special kind of knowledge for a group of agents. There is *common knowledge* of  $p$  in a group of agents  $G$  when all the agents in  $G$  know  $p$ , they all know that they know  $p$ , they all know that they all know that they know  $p$ , and so on ad infinitum

Without common knowledge, language teachers and students may not understand or even oppose each other, "even when we 'know  $p$ ' and each other, we may not know that the other 'knows  $p$ ' too, even if he knows it, etc." (Chevallard, 2016). It is then possible that each person's

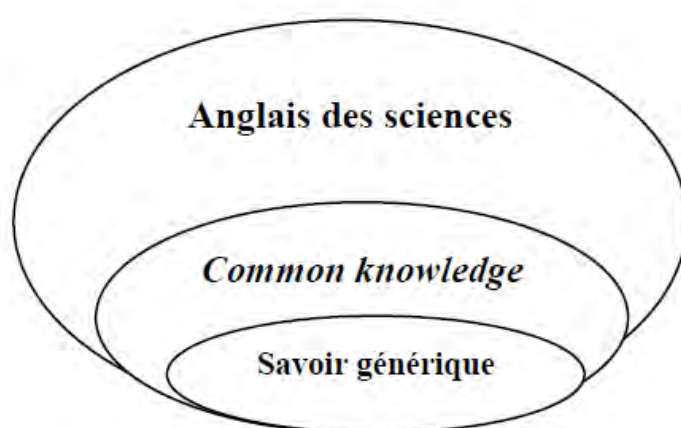
words may seem allusive, even obscure. Finally, "we can misunderstand what we can take for granted between us" (*Ibid.*).

Chaplier points out that the second definition shows not only that individuals gather around a common knowledge, but also that each individual is aware that the other possesses the knowledge that is indispensable for understanding and communication.

Chaplier (2017) builds on this second definition. Common knowledge is not the same as common knowledge in the most common sense of the term in French. For Chaplier, common knowledge is both a knowledge common to English teachers and a knowledge shared at two levels: on the one hand, between English teachers and scientists and, on the other hand, between the English teacher and the scientific students.

Acquiring *common knowledge* allows the teacher to remain in his or her field of competence, as well as to approach several types of content in science. For instance, an interdisciplinary approach in the history and philosophy of science (historical perspective, critical thinking) whose object is based on science is a possible entry point. At some point, the teacher of English for science is also a learner and the students are also “teachers” in scientific contents.

Figure 17 – Structure of Concept of English for Science (Chaplier, 2017, p. 71)



She also proposes the elaboration of *common knowledge*. To begin with, as shown in the Figure 17, *savoir générique* means generic knowledge. She makes the distinction between English for science, generic knowledge and *common knowledge*. As she emphasises, *common knowledge* is a foundation of knowledge, which is accessible to linguists and can be understood by

scientists. Generic knowledge and common knowledge are essentially the responsibility of the "teacher" pole, but the "learner" and "knowledge" poles are taken into account in their design.

*Pour construire le common knowledge, il faut donner un outil à l'anglisticien : le savoir générique en science. De manière plus fine, l'analyse didactique se poursuit à deux niveaux : celui de l'outil lui-même et celui de son Interaction avec les étudiants et l'enseignant qui sera l'objet de la troisième partie. Il faut pour cela élaborer une méthodologie qui requiert de réfléchir à des méthodes théoriques qui justifieront et détermineront le « savoir générique » : comment l'établir ? Grâce à l'interdisciplinarité. Quels contenus lui donner ? Pour répondre à cette dernière question, notre choix s'est porté sur la didactique des deux disciplines qui constitue notre objet parce que nous pensons qu'elles peuvent se compléter en raison de la spécificité de chaque domaine- Cette structuration nécessitera de spécifier la « science » (ses origines) et ce que l'on entend par « culture scientifique » (Chaplier, 2017, p. 71).*

## **Synthesis of Chapter 1 and Chapter 2**

In this section, we summarised contextual as well as theoretical elements that have been addressed in Chapter 1 and Chapter 2. This study focused on the interaction of science and English in a plurilingual setting university trending towards the goal of internationalisation. According to Narcy-Combes et al. (2019), plurilingualism is the ability to use languages for the purposes of communication and to take part in intercultural interaction, where a person, viewed as a social agent, has the proficiency of varying degrees in several languages and experience of several cultures. This is not seen as the superposition or juxtaposition of distinct competences, but rather as the existence of a complex or even composite competence on which the user may draw. However, scientific English is always envisaged as a narrow domain focused on linguistic aspects, not considering a specific context (Chaplier, 2016a).

Our inquiry was guided by two starting points: how the English language, science, and context are interrelated, and how the particular context influences the current teaching and learning situation.

In the first chapter, we provided an overview of the socio-cultural context in which the study was set, along with a critical introduction to English teaching and learning in French higher education. We aimed to understand the current situation of multilingualism and plurilingualism in France, as well as the significant trend of internationalisation in French universities. Additionally, we explored France's educational system and language policy, with a specific focus on the LANSAD sector in the French context. This section was critical because it helped to understand the obstacles faced by teachers teaching in the LANSAD sector in a French scientific context. To provide a broad overview of English teaching and learning in France, we carefully selected historical, pedagogical, and social components that were most pertinent to our research. By doing so, we hoped to gain a comprehensive understanding of the current situation and the factors that influenced English teaching and learning in the French context.

In the second chapter, we focused on a literature review that comprises Second Language Acquisition (SLA), attitudes and motivation, and the interplay of the English language with science. We identified each component to probe into students' attitudes and motivation towards scientific English learning in scientific communities. These reviews covered the main trend of SLA, which was from cognitive to social change. Such a social trend remained at the forefront of SLA development, fostering a better understanding of the nexus between English learning and contexts in the present study. The current study adopted Gardner's Socio-educational

Model of SLA and the Attitude/ Motivation Test Battery (AMTB) as the major basis in designing the questionnaire. We introduced some central theories such as CDST and the Transdisciplinary Framework for SLA, which were the focus of the current study. We discussed the implication of CDST and the Transdisciplinary Framework for SLA in English teaching and learning and its relation with English learning in France. Our goal was to determine how the French environment affects English teaching and learning in France. Moreover, we completed literature reviews on individual learner differences, the role of family background and socio-economic factors, which were the theoretical sources of the design of the questionnaire and interview to the science students. We attempted to research the connection between an individual's former learning experience with current English learning attitudes and motivation. We also briefly discussed the role of technology in SLA in order to identify the impact of technology during the interaction between teachers and students.

The second part of this chapter discussed the theoretical framework of attitudes and motivation, representations and language teaching, including the definition, and the relation between attitudes and motivation, representations and the significant role they played in language teaching and learning of English in a scientific context. Key components such as “attitudes and motivation”, “representations” and “beliefs” are addressed, respectively. The current study adopted representations based on Serge Moscovici’s social representations theory. Claire Chaplier’s interacted model of representations was subjected to particular concern in the present study, including the network of representations indicating the relation among language teachers’ representations, representations from the professional world, representations of administrative managers, representations of Anglophone researchers and representations of science students.

The main discussion on the relationship between the English language and science was presented in the final section of this chapter. The literature reviewed in this section begins by discussing the main trends in global English, such as English as a Lingua Franca (ELF), English as an International Language (EIL), and World Englishes (WE). Our goal was to describe how English has evolved and how it is utilised for diverse purposes. The dominance of English in science, as well as English for Specific Purposes (ESP), and ESP teaching and learning globally were then explored to provide an overview of the role English plays in science. In this study, we placed particular emphasis on the introduction of Langue de Spécialité (LSP)/Languages for Specific Purposes in the French context. This includes important elements of Anglais de spécialité (ASP)/ Specialised English and the teaching sector of Langues pour Spécialistes d'Autres Disciplines (LANSAD)/ Languages for specialists of other subjects. Our goal was to

differentiate between ESP in a worldwide and French setting and demonstrate their differences, showing a general vision of ESP in France. This part ended with the constructs of scientific English. Both the general characteristics of scientific English and the historical viewpoint of the Latin origins that gave rise to it are mentioned. It was necessary to take a historical look at the concepts of scientific English. In this study, Claire Chaplier's construct of English for science was crucial since it fundamentally facilitates the interpretation of the research findings. These conceptual and historical components attracted our attention in the application. The general methodology used in the current investigation is presented in the following chapter. The setting of the university chosen for the study, the student participants and the teacher participants are described. The methods for gathering and analysing data from surveys and interviews are discussed in depth.



## **Chapter 3 The Research Design**

## Chapter 3 The Research Design

### 1.1 The Research Questions

Due to the lack of a common knowledge basis of science students and English teachers, teaching-learning scientific English does not foster the understanding in the science field. Therefore, there is no “disciplinary dialogue” or cooperation between LANSAD and science teacher-researchers within university courses (Chaplier, 2017). Meanwhile, the network of representations also indicates that language teachers’ representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of researchers in English studies; representations of science students.

Further investigations are needed to explore the current situation of specialised English taught to certain scientific audience, specifically in LANSAD-sciences context. To that aim, in this study, science students’ attitudes and motivation toward scientific English, and the influence from the particular context on current teaching and learning situation are subjected to special concern.

This chapter gives a detailed description by outlining the research questions initially, and then turns to the perspective of the research instruments and the data analysis. The research questions are recapitulated as follows:

1. What attitudes do students hold about scientific English?
2. How is students’ motivation regarding scientific English learning?
3. What attitudes do language teachers and science teachers hold about scientific English?
4. How are English pedagogical practices performed at University of Paul Sabatier?
5. How does the particular context influence the current teaching and learning situation?

To answer these questions, we settled the investigations in the University Paul Sabatier, which is a French public university in the academy of Toulouse. It provides a diverse range of programmes in the sciences, technology, health, and sports and management. There are several methods adopted in the investigations, which are respectively learner questionnaires, learner interviews, teacher interviews and classroom observations using manual record.

## 1.2 The Research Methods

This study adopted a sequential mixed-methods approach. Mixed methods research is a methodology for conducting research that involves collecting, analysing, and integrating (or mixing) quantitative and qualitative research (and data) in a single study or a longitudinal programme of inquiry (Bulsara, 2015).

Questionnaires have made headway in collecting data from hundreds of people. We chose online anonymous survey to distribute the questionnaires, which is easier to get more responses with respect to privacy preservation. While questionnaires can provide evidence of patterns amongst large populations, qualitative interview data often gather more in-depth insights on participant attitudes, thoughts, and actions (Kendal, 2008).

The research interview, one of the most important qualitative data collection methods, has been widely used in conducting field studies and ethnographic research (Qu & Dumay, 2011). Interviews are also considered as effective ways to probe into in-depth information, taking a different view from the questionnaire data and offering new connections.

Classroom observations are used nearly universally to assess teachers (Cohen & Goldhaber, 2016). However, we will not try to assess language teachers through classroom observation. Due to ethical constraints of French higher education, this research is not entitled with classroom video observation.

In this study, a) learner questionnaires; b) learner interviews; c) teacher interviews for both science teachers and English teachers; and d) classroom observations are used as research instruments. To start with, questionnaires were performed among participants who are M2 and L3 students in science domains. Subsequently, we adopted in-depth learner interviews after the collection of learner questionnaires in order to obtain details based on students' response to the questionnaire. The interviews from both perspectives of learner and teacher are quite essential since they can provide adequate enlightenment from both groups. More crucially, in this study, we decided to involve science teachers through interviews with both science teachers and English teachers, allowing the possibility of comparison and analysis combining both aspects of science teachers and English teachers.

Last but not least, classroom observation serves as complementary part in the investigation, which is a quantitative way of recording teacher behaviour and interaction between teacher and student by watching them in action. The observations in this study were recorded manually by

paper grid. Due the constraints in French higher education, the video recording was beyond the bounds of possibility.

### **1.2.1 Learner Questionnaire**

Learner questionnaires were used through a sequence process of design, pilot and adaptation. Date of learner questionnaire was collected during the academic year of 2019 to 2020. Nevertheless, there are some preliminary studies done before designing the questionnaire.

#### *Preliminary Studies*

In order to get better insight of French high education and current pedagogical English practices in scientific university, the researcher conducted preliminary studies during the academic year of 2018 to 2019 in the Language department of University Paul Sabatier.

The researcher conducted preliminary observation in degrees of Licence1 (L1), Licence2 (L2), Licence3 (L3) and Master 2 (M2). There were 22 two-hour sessions from seven language teachers. The preliminary observation in the language department lasted for two months, during the brainstorm with students five broad categories were briefly created:

- Language and cultural biography
- Status of scientific English learning
- Learning efficiency
- Attitudes towards English language, English teaching and learning and language culture
- Motivation towards learning scientific English and dealing with science

#### *Questionnaire Design*

The original questionnaire was designed basing on Attitude/Motivation Test Battery: International AMTB Research Project (English version) (Gardner, 2004) questionnaire, which is well attested to have satisfactory validity and reliability. The questionnaire was designed with regard to the particular context of University Paul Sabatier. Given the different English level of students, the questionnaire was designed in English with French annotation.

In order to examine if participants are clear about each item in the questionnaire as well as the format, and also to avoid any burst error in the formal survey, the questionnaire was piloted in

one L3 and one M2 class. After the pilot investigation (n=37), some items were revised. For example, in order to be more accurate, a four-point Likert type scale was used instead of six-point Likert type scale in the questionnaire concerning motivation. Items like “Studying English can be important for me because it will someday be useful in getting a good job” was revised into “Studying English can be \_\_\_\_\_ (Not important at all/ Not very important/Important/Very important) for me in the case of getting a good job. The modified final version of the questionnaire was administrated in November 2019. The questionnaire was set web-based in November 2019 and was available online until January 2020.

The questionnaire used for learners in this study consisted of three parts, namely a) the background, b) the Questionnaire of Attitudes and Motivation and c) the Questionnaire of Scientific English Learning. The final version of the questionnaire was in English with French annotation, which comprised 80 items. The six-point Likert scale ranging from “strongly disagree” to “strongly agree”: (1) strongly disagree, (2) disagree, (3) slightly disagree, (4) slightly agree, (5) agree, (6) strongly agree was mainly adopted in the questionnaire. Twelve items (Q68-Q79) used four-point Likert scale ranging from (1) Not important at all, (2) Not very important, (3) Important, (4) Very important. Two items (Q15, Q52) used multiple choice and one item (Q80) used sequencing question.

The questionnaire began with the instructions in French explaining the aim and focus of this survey. The first thirteen items (Q1- Q13) were open-ended questions asking about the learner’s background. The aim of these thirteen questions was to obtain data on the learner’s background, including personal information and their English acquisition experience both in class and at home. Questions 1-7 were blanks for the learners to give their personal information like age, gender, nationality, mother tongue, field of study, degree and email address if possible. Questions 8, 9, 10, 11, and 12 aimed to discover when and how long has the learner started to learn English, main languages being spoken in their families, their marks in last English exam and name of their English teachers. Question 13 asked about learners’ English competence from four components of listening, speaking, reading and writing. Students have to evaluate their English competence according to the language criteria from Common European Framework of Reference for Languages. A wealth of studies into individual differences in second language learning has shown that success in second language learning is seen as densely interwoven with a set of relevant learner characteristics (Armon-Lotem et al., 2011; Dörnyei et al., 2014; Lowie et al., 2017; Mirhadizadeh, 2016).

Questions 14, 15, 16, 19, 20, 21, 22, 23, 24 and 25 aimed to explore the content and activities students had in language courses, trying to figure out if their English courses were related to science/their field or not. Question Q15 used the multiple choice to see which period of English courses were most related to science. Representations play a crucial role in constructing identity, relationships with others and knowledge (Castellotti & Moore, 2002), thus Question Q17 investigated students' representations towards scientific English. Question Q18 investigated students' representations on teachers' effort. Q25 is set out to investigate whether or not historical scientific events are taken into account, thus determining Chaplier's construct of English for science when she refers to "common knowledge." Questions 26, 27, 28 aimed to explore students' representations of impact from English courses on future career and scientific thinking.

Bandura defines self-efficacy as a person's belief in his or her capability to successfully perform a particular task, the result of which will directly affect a person's motivation (Bandura & Wessels, 1994). Questions 29, 30 investigated students' self-assessment on his or her own English language competence. Questions 31, 32, 33 and 35 examined their comprehension ability in class. Questions 36, 37, 38, 39 and 40 investigated students' interaction with teachers and classmates when using English.

Questions 41- 48 attempted to explore students' attitudes toward English language. Questions 49- 57 investigated students' attitudes towards English teacher and learning. Question 52 used a multiple choice in order to check which period of English classes students prefer. Culture behind language is also related to one's attitudes and motivation in learning a second language. Questions 58-67 explored students' attitudes towards language culture.

Question 68-79 aimed to discover students' motivation towards learning scientific English and dealing with science. These questions adopted a four-point Likert scale ranging from (1) Not important at all, (2) Not very important, (3) Important, (4) Very important. Question 80 used sequencing question. Students were asked to choose six out of twelve reasons that motivates them to learn scientific English, then sort them in order from most motivated to least motivated. This item attempted to probe into the orientations of motivation these learners held. This question was based on intrinsic and extrinsic motivation from Self-Determination Theory (SDT) put forward by Deci and Ryan (2012). Knowing the types of motivational orientations that learners held can make teachers better equipped to motivate students.

### 1.2.2 Learner Interviews

The learner interviews were conducted after the collection of answers to the questions in the questionnaire, which aimed to probe into in-depth information from students' response to the questionnaire. Students who participated in the interviews were randomly distributed from varieties of disciplines. The learner interviews took place twice. The first session took place between March-April 2020 and the second session took place between June-November 2020.

The COVID-19 pandemic has reached France since January 2020. It soon led to the closure of all schools and all universities. Due to the pandemic, in order to maintain social distances, learner interviews were undertaken via video platform of Skype or Zoom in March 2020. Interviews were conducted in English and lasted for around 30 to 40 minutes for each participant. In November 2020, in order to enlarge the sample size, learner interviews were conducted a second time. After the second time, the sample size was increased (n=12).

The learner interviews comprised 14 questions. Before asking questions, it began by collecting some personal information. They were a) Year of study; b) Specialty; c) Country of birth; d) Native language; e) Languages used with family members; f) How long have you been learning English; and g) Other than your country of birth and France, have you lived in other countries for more than three months.

The learner interviews comprise three categories: a) students' representation; b) detailed description of classroom activities; and c) former English learning experience. Questions Q1, Q2 asked about students' representations about scientific English and their English courses. Questions Q3-Q10 aimed to discover what activities involved in English courses and if they are related to science/field of study. Questions Q11-Q13 attempted to track down students' former learning experience and family language background. Q14 was an open-ended question in order to see if they have anything to add.

The interviews were undertaken in general 30 to 40 minutes for each participant. Due to the constraints of COVID-19, all of the interviews were conducted through skype or zoom. The conversation is confidential and only for this research. The name and information of participants maintain secrecy as well. The conversation were recorded using voice recorders and then transferred manually into a full transcript applying a computer to input and edit. The transcription of interviews, which was conducted manually by the author alone, occupying approximately two weeks, was very clumsy and time-consuming.

### 1.2.3 Teacher Interviews

The teacher interviews adopted a hybrid method by using both explicitation and semi-structured interview. The explicitation interview was drawn on Piaget's theory of how experience is processed into reflection. According to Vermersch (2018), the explicitation interview makes it possible to support the subject, without induction, as he makes the transition from pre-reflective consciousness to reflective consciousness, about a specified lived experience in the past, and more specifically a lived experience of an action.

The teacher interviews also took place twice. The teacher interviews took place twice. The first session took place between June-July 2020 and the second session took place between May-July 2021.

Participants in the first round were teachers from the language department in University Paul Sabatier. In order to promote multi-dimensional perspective, making the reflection fully penetrating and accurate, science teachers in diverse scientific fields were added as subjects in the teacher interviews. Different questions were asked regarding the two groups of teachers.

#### *Interview of Language Teachers*

The interview plan for language teachers comprised 19 questions. Before asking questions, there were instructions for the teachers to prepare for the explicitation interview. Meanwhile, questions regarding their profiles were asked. They were a) Country of birth; b) English teaching experience at university: \_\_\_\_ years; c) English teaching for students in science field experience: \_\_\_\_ years; and d) Other than France, have you been teaching in other countries.

Questions Q1-Q8 used the method of the explicitation interview. Teacher were asked to recall details concerning their daily teaching practices. For example, “Can you recall one specific lesson and describe how did you arrange that English lesson?” or “In what cases did you use French during classes? Frequently or rarely?” In this way, the framework created by the interview provides the conditions for the possibility of the provoked awakening of recall, and the subject carries out a reflection (Vermersch, 2018).

Questions Q9-Q18 used the method of semi-structured interview. These questions mainly asked about their perspectives of scientific English and current English lessons, as well as the English learning context. Meanwhile, they were also asked if there were any cooperation between them



and science teachers. Question Q19 was an open-ended question to check if they have anything to add.

### *Interview of Science Teachers*

The questions are designed relying on the theoretical framework (see Chapter 2). There seems no “disciplinary dialogue” or cooperation between LANSAD and science teacher-researchers within university courses (Chaplier, 2017). The interview plan for science teachers comprised 17 questions. Similarly, science teachers were invited to give information regarding their profiles, including a) Country of birth (and native language); b) Teaching experience at universities: \_\_\_\_\_ years; c) What disciplines have been teaching; and d) What courses have been teaching.

The interview plan for science teachers mainly consisted of five categories: a) Relationship with English; b) Use of English: daily teaching/researching practices; c) Use of English: interaction with students in research; d) Collaboration with English teachers/researchers; and e) Their representations.

Questions Q1-Q2 asked about science teachers’ own feelings about English used in science. Questions Q3-Q6 attempted to explore their current use of English in daily practices, both in teaching and research. Questions Q7-Q9 enquired their daily use of English with their students. Questions Q10-Q13 asked whether there were any collaboration between them and English teachers/researchers. Questions Q14-Q16 sought their representations concerning scientific English and English courses in University Paul Sabatier. Question Q17 was an open-ended question to ensure if they have anything to add.

Afterwards, a hybrid explicitation and semi-structured interview (student and teacher) took place to probe into more in-depth the results obtained via the questionnaires.

### **1.2.4 Classroom Observation**

Aiming to familiarise with the research background of this study, we engaged classroom observation as a complementary method in this research with a view to set the scene for this study. Nevertheless, given our time restrictions, as well as the tremendous work on the analysis of learner and teacher interviews, it was no easy way to analyse the results of classroom observation thoroughly. In addition, it should be noted that this research is not entitled with

classroom video observation owing to ethical constraints of French higher education. Therefore, we mainly presented some materials adopted by teaching during the teaching process. Paper grids recorded the observations manually.

The classroom observation took place from September 2019 to February 2020. Three L3 classes and four M2 classes were observed, which were in diverse disciplines. L3 classes comprise students in the domain of physics, computer science and biology. M2 classes comprise students in the domain of in mathematics, biology, real time system engineering, and statistics and business intelligence.

## **2.1 The Research Setting**

This study took place in Paul Sabatier University. It is a French public university in the Academy of Toulouse, a southern city in France (see Chapter 1). Paul Sabatier University is considered as « Une université au cœur des sciences » in French, which means the heart of science. In this regard, Paul Sabatier University is a perfect basis for our research regarding scientific English teaching and learning.

## **2.2 The Participants**

### **2.2.1 The Participants in Questionnaires**

369 participants have filled in the questionnaire, whereas 357 questionnaires in total were considered valid. The participants were students from Licence3 (L3) and Master 2 (M2), which are both the last year in the level of bachelor's degree and Master's degree. The participants specialised in various disciplines.

At the level of **L3**, there were 188 participants, including 99 females and 89 males. The L3 participants were 20-21 years old.

At the level of **M2**, there were 169 participants, including 73 females and 96 males. The M2 participants were 23-24 years old.

As we have developed in the part of limitations, it was difficult to send questionnaires to students owing to the strict limits on student privacy. We had to seek help from secretaries, science associate professors and professors in a variety of faculties as well as language teachers and associate professors at Paul Sabatier University. Despite some misunderstandings and

ignorance, we were able to get responses from students eventually with the help of members mentioned above, but our choice was constrained by the field. The specialties of participant's in this study can be illustrated as follows:

- Applied mathematics
- Artificial intelligence / computer science
- Biology
- Business Intelligence and Statistics
- Chemical Engineering
- Civil engineering
- Mechanics
- Process engineering
- Environment engineering
- Process engineering
- Real time system engineering
- Statistics and Business Intelligence
- Chemistry
- Mathematics

### **2.2.2 The Student Participants in Interviews**

There were 12 participants who participated in the individual interview were from various fields in University Paul Sabatier. There were 4 females and 8 males. There were 6 participants in L3 level and 6 participants in M2 level.

The students specialised in mathematics, physics, chemistry, computer science, biology, real time system engineering and statistics and business intelligence. The profiles of participants can be illustrated as in the following table:

Table 6 – Student Participants

	Year	Country of birth	Specialty	lived in other countries for more than three months	Native language	Languages used with family members	English learning experience
Student 1	L3	France	Computer science	No	French	French	13 years
Student 2	M2	France	Mathematics	No	French	French	13 years
Student 3	M2	France	Statistics and Business Intelligence	No	French	French	20 years
Student 4	M2	Algeria	Real time systems engineering	No	Kabyl	Kabyl French Arabic	13 years
Student 5	L3	Luxembourg	Physics	Spain	French German	French German	21 years
Student 6	M2	Morocco	Biology	No	Arabic French	Arabic French	24 years
Student 7	M2	France	Chemistry	No	French	French	13 years
Student 8	M2	France	Chemistry	German 1year	French	French	18 years
Student 9	L3	France	Computer science	No	French	only understand Vietnamese French	14 years
Student 10	L3	France	Mathematics	Spain 1year	French	French	10 years
Student 11	L3	France	Mathematics	Thailand 7months	French	French	13 years
Student 12	L3	France	Physics	No	French	French	15 years

Student 1 was born in France. He mentions that one of his parents is native from Africa. As he puts it, he was born and raised in France and he does not speak English with family members. His parents' cultural background seems to have no impact on his language level. He declares

that he is passionate about learning foreign languages, not only English but also Chinese. He says that his interest in English has made his English level a lot higher than other classmates.

Student 2 was born in France and he never speaks English with his family members. Sometimes he speaks English with his friends, but not in his family. He believes that now it is easier to learn English because he can watch a variety of series, movies or listen to English songs. He has numerous sources to learn English. He mentioned that French culture is very important for French people. He declares that as a French, he is really proud of their culture. He also pointed out that he does not have the choice but to learn English. It depends on the situations.

Student 3 was born in France and he never speaks English in his family. His family members do not speak English at all. He mentioned that he likes to talk to people from other countries. Moreover, scientific articles are written in English. Other than that, a language is not really “fun” as he says. He disliked his English class in high school. It is only after he entered the university. When he needed to read some scientific article, he started to understand the importance of English. He started to read and watch various things in English. He mentioned that in French culture, they do not encourage English learning. In fact, in France, he sees everything in French words. During his high school studies, he did not realise why English was useful.

Student 4 is Algerian and he never speaks English in his family. He thinks English is simple and short. He especially likes the British accent. As he puts it, in Algeria, most of the people in his nation understand the importance of learning English. Almost twenty or thirty percent of students are passionate to learn English, which he thinks they are less motivated than French students. Because most students will not finish their studies, instead, they find a job, he believes that is the big problem. It is also the reason that pushes him to study in France. Kabyl is his native language. In his country, Kabyl is the language that is spoken by the minority, most of Algerians speak Arabic. His language Kabyl is disappearing slowly but surely. He believes he has to save his language and he also knows the importance of languages.

Student 5 was born in Luxembourg who has parents from different countries (German and France). Her native languages are French and German. Her parents communicate in English with each other since they came from different countries. She also has an English relative and she used to speaking English with her. She has studied in Spain for nine months. She is fond of learning foreign languages. She was studying several foreign languages including Chinese. She mentioned that she really likes English. Because she always learns English through watching series or videos stuff like that. It is more of learning about the world and hearing about other

cultures. Mostly when she spoke English, it is because she was communicating with people from another country who speaks another language that she does not know. It is very positive actually. Luxembourg is a very international place. Half of the population are foreigners. Not that many English speakers, but we use French as the language we speak to everyone usually. English is also sometimes used in that context.

Most international companies and European organisations in Luxembourg use English. She believes that if she had grown up in France, she would not have learned English as well as she did in Luxembourg apparently. Because while she is staying here, it is just French. Everything is in French. In Luxembourg, there are so many languages that you hear all the time. You can easily watch movies or TV shows in English. Her English level is the highest among all student participants.

Student 6 is Moroccan and has Arabic and French as native languages. She does not speak English with her family members. However, her English proficiency level is as high as Student 5. She mentioned that her learning experience in Morocco was very encouraging of learning other languages. When she was little, she knew learning English is important. She believes that it definitely affected the way she learnt English. As she puts it, when she grew up in Morocco, English is everywhere. She was surrounded by an international context and the environment she grew up was always encouraging her to learn other languages and specifically English. The fact that they were already speaking two languages, namely Arabic and French, they do not mind to learn another language. The first language in culture other than Arabic is English. It is in TV or in general, they saw many things written in English around you. It is not a direct message like nobody ever told her that she has to learn English, but it is just there. Therefore, she grew up with English as a third language. During her childhood, she was surrounded by English and she became more and more interested in English. Therefore, she started to watch English TV shows. It was also very easy to find ways to learn English. She believes it definitely had something to do with open-mindedness and encouraging you to learn other languages.

Student 7 was born in France and she does not speak English with family members. She thinks that French are really afraid to make mistakes in English. She thinks French students are not motivated at all. She thinks that the French background affects students' motivation in English. In France, they cannot see plenty of things in English in their daily lives. Not so much is translated into English in daily lives. For example, in cinemas, most of films were all translated

into French. It is the same case with TV programmes. She believes that French tend to conserve their history and culture.

Student 8 was born in France who does not speak English in his family. Nevertheless, he sometimes speaks English with his brother, just for fun. He has studied in German for one year. His lectures in German were all in English. This experience did not change his comprehension level that much but improved his oral expression a lot. He was less afraid to talk or to express himself.

Student 9 was born in France. His parents are from Vietnam. He was born and raised in France. His native language is French and he can only understand Vietnamese. He does not speak English with his family members.

Student 10 was born in France and he does not speak English with his family members. He has studied in Spain for one year. He learnt English only in classes. Sometimes he watches TV series on Netflix.

Student 11 was born in France and she does not speak English with her family members. She has studied in Thailand for 7 months. Student 12 is French and he never speak English in his family.

To sum up, there are 9 students who were born in France and 3 students who are from Algeria, Luxembourg and Morocco. Overall, most of these students did not have the experience of living or studying abroad (4 students out of 12 have lived in other countries for more than three months). Therefore, a majority of these cases live in France, rarely having the opportunities to interact with the outside world.

In addition, these participants' native languages are mainly French with one or two other languages, no English included. Among these participants, French students predominantly do not speak English with their family members. They sometimes use English with their peer group (e.g. friends or siblings). The investigation of their backgrounds reveals that their exposure to English in the family was very limited, offering minimal scope for applying English in exchanges beyond the classroom.

Most often, they use English for entertainment (e.g. watching English series, movies or listening to English songs). Three students mention that this recreational use of English is the main way in which they gain access to English in daily activities (S2, S6, S8). What motivates most of these students to learn English is the chance to communicate and exchange with people who speak another language and to learn about other cultures. Student1, who is passionate about

learning languages not only English but also Chinese, indicates that his interest in English has made his English level higher than his classmates. However, S2 declares his proudness of French culture and his obligation of learning English: “I do not have the choice but to learn English”, showing a lack of motivation in English learning.

Some of them raise the issue of being less exposed to English in their daily routine: “in France, I see everything in French words” (S3) “In France, I cannot see many things in English in my daily lives. Not so much is translated into English in daily lives. For example, in cinemas, most of the films were all translated into French. It is the same case with TV programmes.”(S7). S7 attributes the status to the tendency of conserving French culture in France.

On the contrary, two students who are from Luxembourg and Morocco describe the opening and encouraging cultural context of learning languages in their countries. They also highlight the plurilingualism in their countries and easy access to English in daily activities. In general, these two students who are from Luxembourg and Morocco have significantly greater English proficiency level than other participants.

### 2.2.3 The Language Teacher Participants in Interviews

There are 7 teachers from the Language department who are interviewed, including 4 females and 3 males.

There are also differences (EC, PRAG, PRCE, lecturer, part-time) regarding teachers’ statuses. We are aware of the different statuses of language teachers and associate professors, whereas we refer to them as teachers in the following part. For example, two language teachers in this study are associate professors. The profiles of the teachers being interviewed can be illustrated in the following table:

Table 7 – Teachers from the Language Department (UPS)

	Country of birth:	English teaching experience at university	English teaching experience for students in science field	Other than France, have you been teaching in other countries?
Teacher 1	Ivory Coast	5 years	5 years	Japan, Germany, Costa Rica USA
Teacher 2	France	25 years	15 years	Aikido in UK



Teacher 3	France	16 years	16 years	1 year teaching French in England
Teacher 4	France	20 years	20 years	no
Teacher 5	France	16 years	16 years	1 year teaching French in UK
Teacher 6	The United Kingdom	13 years	13 years	Few months in India
Teacher 7	France	19 years	18 years	Scientific university in Laos Teaching French in England

Teacher 1 was born in Ivory Coast and she started to teach at University Paul Sabatier in 2016. Since then she started to teach scientific English. She also did it for one year in 2015 at engineering school in Strasburg. She also had teaching experience in Japan, German, Costa Rica and the United States.

Teacher 2 was born in France and he was raised both in France and the United Kingdom. He started to teach around 2000 or 2001, it was always scientific students. He has also taught in Aikido in the United Kingdom.

Teacher 3 was born in France and he started to teach in 2004, since then it was always linked in a way with science. He has taught French in England for one year.

Teacher 4 was born in France and she started to teach in 2000, first with students in science and sport. She has no experience of teaching in countries other than France.

Teacher 5 was born in France and she started to teach since 2004. She has been teaching scientific students all along the sixteen years. She has also taught French in the United Kingdom for one year.

Teacher 6 is British and he started to teach in 2014. He taught in a scientific university in Nice before teaching in University Paul Sabatier. It was always scientific students. He has also taught in India for few months.

Teacher 7 was born in France and she has been teaching scientific students in Laos for four years. She started to teach at University Paul Sabatier in 2006. Since then she has started to teach scientific students in language department here.

In summary, two teachers out of seven are associate professors regarding language teachers' statuses. Most of these language teachers have English teaching experience at university and

the teaching experience for students in science field for more than ten years. Meanwhile, a majority of language teachers were born in France but they have been teaching in other countries other than France.

#### 2.2.4 The Science Teacher Participants in Interviews

There are 7 associate professors / professors from the science domains who have been interviewed. We are aware of the different statuses of science professors and associate professors, whereas we refer to them as teachers in the following part. There are 1 female and 6 males from scientific domains, which are mathematics, chemistry, physics, computer science and robotics.

The profiles of science teachers being interview can be illustrated in the following table:

Table 8 – Teachers from the Science Departments (UPS)

	Country of birth	native language	teaching experience	disciplines	courses
Teacher 8	France	French	20	robotics, Control theory	robotics, control theory, identification modelling of manipulator arms introduction to robotics identification using least square methods dynamic system observation and control dynamic system modelling, control and observation
Teacher 9	Italy	Italian	17	mathematics	mathematics 2 topology calculus-Differential Analysis algebra geometry and Linear Algebra
Teacher 10	France	French	10	computer graphics, programming	algorithmic and computer graphics programming rendering algorithmic geometry

Teacher 11	Armenia	Armenian	16	computer science	<p>computational imaging</p> <p>medical Imaging</p> <p>image processing</p> <p>signal processing</p> <p>under graduate : Programming, applied mathematics, electronics</p>
Teacher 12	France	French	25	electrochemistry, material science	<p>metallurgy</p> <p>electrochemistry</p> <p>corrosion</p> <p>materials for Energy storage devices</p> <p>surface treatments</p> <p>materials characterizations</p>
Teacher 13	England	English	30	physics	<p>optics</p> <p>electromagnetism,</p> <p>instrumentation</p> <p>practicals</p> <p>scientific English</p> <p>mechanics</p> <p>fluid dynamic (little)</p> <p>basic mathematics for physics</p>
Teacher 14	Greece	Greek	34	chemical engineering	<p>design and conception</p> <p>of electrochemical systems</p> <p>thermodynamics and Kinetics for chemistry</p> <p>chemical Engineering</p> <p>corrosion</p> <p>adsorption</p> <p>energy (L1 and M2)</p> <p>operation units</p>

Teacher 8 was born in France and she has been teaching in universities for 20 years. She has been teaching disciplines of robotics and control theory in universities. The courses she has been teaching were robotics, control theory, identification modelling of manipulator arms, introduction to robotics identification using least square methods, dynamic system observation and control dynamic system modelling, control and observation.

Teacher 9 was born in Italy and he has been teaching in universities for 17 years. He has always been teaching disciplines of mathematics since he started to teach in universities. The courses he has been teaching were Mathématiques, Topologie, Analyse Calcul-Différentiel, Algèbre and Géométrie et algèbre linéaire (French names).

Teacher 10 was born in France and he has been teaching in universities for 10 years. He has been teaching disciplines of computer graphics and programming in universities. The courses he has been teaching were algorithmique et programmation, informatique graphique, rendu, géométrie algorithmique (French names).

Teacher 11 is Armenian and he has been teaching in universities for 16 years. He has always been teaching the discipline of computer science since he started to teach in universities. The courses he has been teaching were Computational imaging, Medical Imaging, Image processing, Signal processing. He taught undergraduates in courses like programming, applied mathematics and electronics.

Teacher 12 was born in France and he has been teaching in universities for 25 years. He has been teaching disciplines of electrochemistry and material science. The courses he has been teaching were metallurgy, electrochemistry, corrosion, materials for Energy storage devices, Surface treatments, Materials characterisations.

Teacher 13 is British and he has been teaching in universities for 30 years. He mostly taught physics students. He has taught a few chemistry students. He also had experience of teaching scientific English. The courses he has been teaching were optics, electromagnetism, instrumentation, practicals, scientific English, mechanics, fluid dynamic (little), basic mathematics for physics

Teacher 14 is Greek and he has been teaching in universities for 34 years. He has been teaching the discipline of chemical engineering since he started to teach in universities. The courses he has been teaching were Design and conception of electrochemical systems, Thermodynamics and Kinetics for chemistry, Chemical Engineering, Corrosion, Adsorption, Energy (L1 and M2), Operation units.

In summary, regarding teachers-researchers' statuses, six out of seven are professors. They are more plurilingual than the language teacher participants, including Italian, Armenian, English and Greek associate professors / professors. Most of them had an experience of more than 20 years in higher education.

## **Chapter 4 Results**

## **Chapter4 Results**

In this part, we present and comment upon the results of the students' questionnaires carried out during the academic year of 2019 to 2020. We also present and comment upon the results of correlations analysis regarding key components in the questionnaire. Then it turns to the presentation and comment upon the results of the students and teachers' interviews conducted at the final stage of data collection. We also link the language teachers' interviews to the science teachers' interviews, exploring the intersection between these two groups.

### **4.1 Learner Questionnaire Results**

This part starts by introducing the data administration and analysis, and then follows by addressing the results. The findings are discussed by respectively presenting descriptive statistical results and correlational results with the purpose of exploring students' attitudes and motivation towards scientific English learning and teaching in a scientific university context. Some related synthesis and discussions are put forward after each part as well.

In the descriptive analysis, we offer initially a sequential illustration of learners' background, including participant information, learners' language biography, learners' background towards English learning. Afterwards, descriptive statistical results concerning status of scientific English learning and learning efficiency are displayed and interpreted in tabulations. Lastly, descriptive statistical results with regard to learner attitudes and motivation are given and interpreted.

The correlation analysis is also performed in several dimensions to determine whether there are correlations between these learners' attitudes, motivation and learning efficiency or not.

### **Data Administration and Analysis**

The learner questionnaire was designed, modified and finally displayed in a google form (see Appendix 2 for the online format), which was used to collect data with easy accessibility. The author was not fully aware of the ethicality of using it whereas it was only used for collecting data. The data obtained through learner questionnaire was downloaded and prepared as a data file of Microsoft Office Excel spreadsheets. The data of the questionnaire was imported and analysed using the statistical analysis software Statistical Product and Service Solutions (SPSS).

The descriptive analysis and the correlation analysis are two main analyses performed regarding the data in this study. The descriptive analysis can generate basic descriptive results, such as averages and frequencies, allowing us to describe the general distributional properties of the data. Subsequently, the correlation analysis can be applied to examine the relationship among groups or dimensions, thus answering specific questions or to test particular hypotheses about the data (Landau & Everitt, 2003).

The value of alpha regarding the questionnaire in this study is 0.906 (learner responses ranging from “1=strongly disagree” to “6=strongly agree”) and 0.877 (learner responses ranging from “1=not important at all” to “4=very important”), which indicates satisfactory reliability.

It is worth mentioning that the items 16, 17, 21, 36, 38, 39, 40, 48, 50, 56, 57, 67 are reverse-scored items, which need to be converted before the analysis. After the reverse coding in SPSS, a higher mean value indicates a more positive result.

#### 4.1.1 Participant Information

The participants in this study comprise the learners of License 3 and Master 2 in University Paul Sabatier in Toulouse (N=357). There are 188 participants in License 3 and 169 participants in Master 2. As shown in Table 9, the ages of the participants ranged from 18 years old to 48 years old.

Table 9 – Participant Information

Age	Valid (listwise)	N	Min	Max	Mean	SD
	352		18	48	22.1	2.778

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	172	48.2	48.2	48.2
Male	185	51.8	51.8	100.0
N	357	100.0	100.0	

Year	Frequency	Percent	Valid Percent	Cumulative
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			Percent	
L3	188	52.7	52.7	52.7
M2	169	47.3	47.3	100.0
N	357	100.0	100.0	

Nationality	Frequency	Percent	Valid Percent	Cumulative Percent
Algerian	10	2.8	2.8	2.8
Andorran	4	1.1	1.1	3.9
Belarusian	1	.3	.3	4.2
Belgian	1	.3	.3	4.5
Beninese	2	.6	.6	5.0
Bolivian	1	.3	.3	5.3
Brazilian	1	.3	.3	5.6
Colombian	1	.3	.3	5.9
Egyptian	2	.6	.6	6.4
Ethiopian	1	.3	.3	6.7
French	296	82.9	82.9	89.6
French, British	1	.3	.3	89.9
French, German, Luxembourgish	1	.3	.3	90.2
German	2	.6	.6	90.8
Guinea Bissau	1	.3	.3	91.0
Haitian	1	.3	.3	91.3
Ivorian	1	.3	.3	91.6
Lebanese	3	.8	.8	92.4
Malagasy	1	.3	.3	92.7
Malaysian	3	.8	.8	93.6
Mauritian	2	.6	.6	94.1
Moroccan	6	1.7	1.7	95.8

Nigerian	1	.3	.3	96.1
Romanian	2	.6	.6	96.6
Russian	2	.6	.6	97.2
Senegalese	2	.6	.6	97.8
Spanish	2	.6	.6	98.3
Swiss	2	.6	.6	98.9
Tunisian	4	1.1	1.1	100.0
N	357	100.0	100.0	

Note: N= the number of the subjects, Min= minimum score,

Max= maximum score, Mean= mean score, SD = standard deviation

The average age is around 22 years old. The gender distribution is relatively even, with slightly more male learners. The participants comprise 296 learners with French nationality and 61 learners from various other countries, including two learners who possess dual or multiple nationalities.

The data indicates that learners possess various backgrounds in languages and cultures. To explore the link between learners' backgrounds with their attitudes and motivation in learning scientific English, we mainly focused on learner background towards English learning. Therefore, learners' native languages, English learning experiences, when they started to learn English in their countries, and languages spoken in their families are investigated.

### Synthesis

- ✓ There is a relatively even gender of the participants: 185 males and 172 females.
- ✓ Out of 357 participants, there is a slight predominance of L3 students in number of 188 on M2 students in number of 169.
- ✓ The students are around 22 years old in average, with them ranging from 18 years old to 48 years old.

✓ The majority of students are French: 296 French and 61 from other countries, 2 of them possess dual or multiple nationality.

#### 4.1.2 Language Biography

Table 10 illustrates participants' native languages and languages spoken in their families. Owusu et al. (2015) point out that one vital external factor that has not received much attention is the family background of the second language learner. Some sub-factors of the family background are: the attitudes of parents, the educational background of parents, the culture of the family, and the language(s) spoken at home. In this section, participants' language biography was investigated.

As shown in Table 10, there are 24 types of languages serving as native language for these learners, including 6 of them who have two kinds of native languages at the same time. Knowing participants' language biographies helps to explore the impact of their own language biographies on their attitudes and motivation of English learning now.

Table 10 – Native Languages and Foreign Languages

Native language	Frequency	Percent	Valid Percent	Cumulative Percent
Amharic	1	.3	.3	.3
Arabic	18	5.0	5.0	5.3
Arabic/French	3	.8	.8	6.2
Belarusian	1	.3	.3	6.4
Catalan	2	.6	.6	7.0
Creole	3	.8	.8	7.8
Czech	1	.3	.3	8.1
English	1	.3	.3	8.4
French	299	83.8	83.8	92.2
French/English	1	.3	.3	92.4
French/German	2	.6	.6	93.0

Fulani	1	.3	.3	93.3
Haoussa	1	.3	.3	93.6
Italian	1	.3	.3	93.8
Kabyle	3	.8	.8	94.7
Malagasy	1	.3	.3	95.0
Malay	3	.8	.8	95.8
Portuguese	3	.8	.8	96.6
Pulaar	1	.3	.3	96.9
Romanian	2	.6	.6	97.5
Russian	2	.6	.6	98.0
Spanish	6	1.7	1.7	99.7
Urdu	1	.3	.3	100.0
N	357	100.0	100.0	

Languages spoken in families	Frequency	Percent	Valid Percent	Cumulative Percent
1	112	31.4	31.4	31.4
2	49	13.7	13.7	45.1
3	193	54.1	54.1	99.2
4	3	.8	.8	100.0
N	357	100.0	100.0	

Note: N= the number of the subjects, Min= minimum score,

Max= maximum score, Mean= mean score

Most of these learners speak three languages (native and foreign) in their families (N=193). Learners who speak more than one language (N=245) is around twice the number of those who have only one language spoken in families (N=112).

## Synthesis

- ✓ The students possess various backgrounds in languages and cultures.
- ✓ Out of 24 languages, the majority of students have French as their native languages (N=299), 6 have two native languages at the same time.
- ✓ The majority of students speak three languages in their families (N=193). Students who speak more than one language (N=245) is around twice the number of those who have only one language spoken in families (N=112).

### 4.1.3 Learners' Background towards English Learning

Pawlak (2017) underlines that individual difference variables are likely to play a vital role, affecting both the process of language learning and the outcomes of this process. Such individual difference variables can be sociocultural (e.g., beliefs, attitudes, experience), cognitive (e.g., age, aptitude, working memory, cognitive styles, learning strategies), and affective (e.g., anxiety, personality, motivation, willingness to communicate) in nature (Dörnyei & Ryan, 2015; Gregersen et al., 2014; Pawlak, 2012). Learners' learning experience cannot be ignored.

Therefore, in this section, we examined students' background towards English learning.

Table 11 illustrates learners' English learning background, including year of English learning experience and when they started to learn English.

Findings in the table suggest that these learners have an average of 12 years' English learning experiences, with the shortest of 4 years and the longest 24 years. Most of them have been learning English since middle school or primary school. Those who started from primary school (N=199) are slightly more than those who started from middle school (N=144).

Table 11 – English Learning Background

Year of English learning experience	Valid (listwise)	N	Min	Max	Mean	SD
	353	4	24	12.05	2.902	

When they started to learn English	Frequency	Percent	Valid Percent	Cumulative Percent
I learned by myself	5	1.4	1.4	3.9
High school	9	2.5	2.5	2.5
Middle school	144	40.3	40.3	44.3
Primary school	199	55.7	55.7	100.0
N	357	100.0	100.0	

Note: N= the number of the subjects, Min= minimum score,

Max= maximum score, Mean= mean score

Students' representations regarding their level of English proficiency is shown in Table 12. The responses suggest that these students' reading proficiency (Mean=4.11, B2) is the best among the criteria of listening (Mean=3.83, B1), speaking-interaction (Mean=3.46, B1), and writing (Mean=3.53, B1). Speaking-Interaction gets the lowest mean score of 3.46. Writing is not far away, with an average score of 3.53. This implies the difficulty regarding tasks of speaking-interaction and writing for these students, which further reveals students' lower competence in production.

Table 12 – Students' Representations of English Proficiency

English proficiency	N	Min	Max	Mean	SD
Listening	357	1	6	3.83	1.233
Speaking-Interaction	357	1	6	3.46	1.064
Reading	357	1	6	4.11	1.147
Writing	357	1	6	3.53	1.056
Valid N (listwise)	357				

Note: 1=A1, 2=A2, 3=B1, 4=B2, 5=C1, 6=C2

Table 13 shows the difference in M2 and L3 students' representations of English proficiency. It is noticeable that the M2 students' English proficiency (Mean=3.9038) is higher than L3 students' English proficiency (Mean=3.5758) in all the criteria.

Table 13 also reveals a significant difference in M2 and L3 students' representations of overall English proficiency in all the criteria ( $t=3.067$ ,  $p<.05$ ). The most significant difference occurs in the criteria of reading ( $t=3.475$ ,  $p<.05$ ).

Table 13 – T-test of the Level by M2 and L3 Students

The level of English proficiency	M2		L3		T-value	Sig.(2-tailed)
	Mean	SD	Mean	SD		
Listening	4.02	1.215	3.65	1.225	2.897	.004
Speaking-Interaction	3.61	1.075	3.34	1.039	2.450	.015
Reading	4.33	1.173	3.91	1.088	3.475	.001
Writing	3.66	1.052	3.41	1.048	2.221	.027
Overall level	3.9038	1.02789	3.5758	.99190	3.067	.002

Note: 1=A1, 2=A2, 3=B1, 4=B2, 5=C1, 6=C2

## Synthesis

- ✓ The students have extensive experience in learning English: an average of 12 years' English learning experience.
- ✓ The majority of students have been learning English since primary school.
- ✓ The students rate their English level in average at B1 for listening, B1 for speaking-interaction, B2 for reading and B1 for writing, in which reading is strongest competence.
- ✓ There is a significant difference in M2 and L3 students' representations of their overall English proficiency: M2 students rate their English level in a higher level than that of L3 students in all the criteria.

#### 4.1.4 Status of Scientific English Learning

As previously discussed, representations play a vital role in learning processes (see Chapter 2). Castellotti and Moore (2002) noted that representations are closely connected with learning processes and they either strengthen or slow down learning processes. Chaplier (2019) also accentuates that every individual has a mental representation of surrounding phenomena, and knowing and being aware of representations can change ways of learning.

In this section, Table 14 presents the status of scientific English learning, including students' representations of scientific English and scientific English classes, as well as the correlation between scientific English classes with scientific thinking and their future career.

In Table 14, the representation about scientific English classes comprises “I think my English classes are related to science” (Q14) and “I think I never have scientific English classes” (Q16). As mentioned earlier, the Q16 is a reverse item, which was reverse-scored to be inconsistent with other items. As we can see from the table, the mean value of the overall representation about scientific English classes (Mean=4.2899, between the option “slightly agree” and “agree”) shows that students basically agree that they are having scientific English classes.

Table 14 – Descriptive Statistics of Scientific English Learning Status

	N	Min	Max	Mean	SD
Representation about scientific English classes	357	1.00	6.00	4.2899	1.20304
Representation about scientific English	357	1.00	6.00	5.1485	1.19354
Representation about English teachers	357	1.00	6.00	4.0224	1.39201
Activities in English classes	357	1.25	6.00	3.7234	.98549
Mainly about words and grammar	357	1.00	6.00	3.1289	1.39831
Mainly oral expression	357	1.00	6.00	4.0140	1.37077
Historical scientific events introduced	357	1.00	6.00	3.2829	1.54740
Future career	357	1.00	6.00	3.2241	1.15762
Scientific thinking	357	1.00	6.00	2.7647	1.42237
Valid N (listwise)	357				

Note: 1= strongly disagree, 2= disagree, 3= slightly disagree, 4= slightly agree, 5= agree, 6=strongly agree



The representation of scientific English, “I have no idea what scientific English is” (Q17) is also a reverse-scored item as well. After the reverse coding in SPSS, a higher mean value indicates a better representation of the subject. The data (Mean=5.1485, between the option “agree” and “strongly agree”) hints that students agree on scientific English itself than that of teaching and learning scientific English (classes). Considering the fact that the students highlighted their confusion in the interview regarding the definition of scientific English (see Appendix 6 for the learner interview), this result is somewhat puzzling. Since the results in this section show students’ relatively strong representations of scientific English, it would be interesting to see how students and teachers’ representations evolved in the interview later.

The overall representation about English teachers, “I think my English teachers prepare English classes in great effort” (Q18) shows that students basically recognise the dedication of the teacher (Mean=4.0224, between the option “slightly agree” and “agree”).

Activities in English classes, including “read articles and watch videos” (Q19), “discuss some scientific problems” (Q20), What my English teachers taught in classes “have nothing to do with my major subject” (Q21), and “are quite related to my specialty” (Q24), presents a weak relation between science or their own specialties with activities students received in English classes (Mean=3.7234, between the option “slightly disagree” and “slightly agree”).

Questions regarding “Activities in my English classes are mainly about words and grammar” (Q22) and “Activities in my English classes are mainly oral expression” (Q23) are analysed to see the activities in English classes are mainly about words and grammar or oral expression. The students’ responses to these two questions suggest that the activities in English classes are more of oral expression (Mean=4.0140, between the option “slightly agree” and “agree”) rather than words and grammar (Mean=3.1289, between the option “slightly disagree” and “slightly agree”). It makes sense since English is required to be taught centering on oral interaction in Paul Sabatier University. Chaplier (2019) presents one typical example of Master’s degree in Paul Sabatier University, whose objectives are: a) Develop the key competences students need to integrate into professional life; and b) Perfect the communication tools that make it possible to express oneself in today’s international context and acquire the linguistic autonomy necessary for this integration. The responses from these students just confirmed it.

As we developed in the research design, investigating whether or not historical scientific events are taken into account helps in determining Chaplier's construct of English for science when

she refers to "common knowledge." The question regarding historical scientific events "In my English classes I am introduced to some historical scientific events" (Q25), also implies a weak exposure (Mean=3.2829, between the option "slightly disagree" and "slightly agree") that students received to historical scientific events inside the classroom.

Students' responses regarding future career to questions "I think my English classes are really helpful for my future career in science"(Q26) and "I think what I have learned in English classes help me a lot when I am doing my research in my field of study" (Q27) suggest that most of these students did not find scientific English classes significantly helpful (Mean=3.2241, between the option "slightly disagree" and "slightly agree") to their future career.

The responses to the question "My scientific English classes help me to understand scientific thinking (French thinking VS Anglophone thinking) " (Q28) shows students' clear opposition (Mean=2.7647, between the option "disagree" and "slightly disagree") in finding scientific English classes helpful for improving their scientific thinking.

Table 15 – Descriptive Statistics of Question 15

Which period of English classes are related to science	Frequency	Percent	Valid Percent	Cumulative Percent
English classes at L1	21	5.9	7.0	7.0
English classes at L2	47	13.2	15.8	22.8
English classes at L3	129	36.1	43.3	66.1
English classes at M1	57	16.0	19.1	85.2
English classes at M2	44	12.3	14.8	100.0
Valid N (listwise)	298	83.5	100.0	
N	357			

Table 15 shows the responses of the question 15 "If you think your English classes are related to science, and then which period of English classes do you think are related to science". 298 students responded to this question. The result indicates that most of the students think that English classes at L3 are the most related to science.

## Synthesis

- ✓ The students basically agree that they are having scientific English classes, in which English classes at L3 are the most related to science.
- ✓ Most of the student think they do know what scientific English is.
- ✓ The students do recognise the dedication of the teacher.
- ✓ There is a weak relation between science or their own specialties with activities students received in English classes.
- ✓ The activities in English classes are more of oral expression.
- ✓ There is a weak exposure to historical scientific events inside the classroom.
- ✓ The majority of the students do not find scientific English classes significantly helpful to their future career.
- ✓ The majority of the students do not find scientific English classes helpful for improving their scientific thinking.

### 4.1.5 Learning Efficiency

As indicated in Table 16, the statement of “I am good at English” (Q29) aims to explore learners’ general representations about their self-learning efficiencies. The responses indicate that, these students slightly agree (Mean=4.0644, between the option “slightly agree” and “agree”) their mastery of English.

Table 16 – Descriptive Statistics of Scientific English Learning Efficiency

	N	Min	Max	Mean	SD
General representations about self-learning efficiency	357	1.00	6.00	4.0644	1.28465
Use English properly	357	1.00	6.00	3.8263	1.25110
Understand what teacher says in class	357	1.00	6.00	5.2185	1.13790
Discuss in English with classmates during class	357	1.25	6.00	4.0196	1.44454

Comprehend what I read	357	1.00	6.00	4.7787	1.06201
Comprehend what I watch	357	1.00	6.00	4.5798	1.20273
Comprehend texts at first reading	357	1.00	6.00	4.2801	1.24068
Comprehend videos at first reading	357	1.00	6.00	4.0672	1.31584
Use French or mother tongue during class	357	1.00	6.00	4.3417	1.08738
Valid N (listwise)	357				

Note: 1= strongly disagree, 2= disagree, 3= slightly disagree, 4= slightly agree, 5= agree, 6=strongly agree

Intriguingly, when exploring whether students hold the representation of using English properly by the question “I am successful in using English properly” (Q34), they do not think they are capable of using English properly (Mean=3.8263, between the option “slightly disagree” and “slightly agree”).

The items of “I can understand what the teacher says in English classes” (Q35) and “I can discuss with my classmates in English fluently during class” (Q37) are set to examine if students can understand the teacher and can use English to discuss with classmates. Apparently, most of these students can understand what teacher says in English classes (Mean=5.2185, between the option “agree” and “strongly agree”). They also believe they can basically discuss with their classmates in English (Mean=4.0196, between the option “slightly agree” and “agree”).

The details regarding the comprehension are analysed through the items of “I can comprehend most of what I read in scientific English articles” (Q30), “I can understand most of what I watch in scientific English classes” (Q31), “I comprehend the texts related to scientific English at first reading” (Q32) and “I comprehend the videos related to scientific English at first reading” (Q33). The responses of these four items suggest that, in general they can comprehend scientific English articles or what they watch in scientific English classes, whereas they find comprehending what they watch (Mean=4.5798) is difficult than that of reading scientific English articles (Mean=4.7787). Moreover, when asked if they can comprehend texts (Mean=4.2801) or video (Mean=4.0672) at first reading, the mean values are lower than that of Q30 and Q31. This indicates that comprehending scientific English articles or videos is a tough task for these students to achieve at first reading.

“I always answer questions in French even I am told to use English only in my class” (Q36), “I always discuss with my classmates in French during class” (Q38), “I sometimes talk in my own mother tongue with my classmates to understand the teacher” (Q39) and “I have to translate the words to my mother tongue to understand the meanings” (Q40) are reverse-scored items. After the reverse coding in SPSS, a higher mean value indicates that they use French or their native less than English. The responses to these four items suggest that students normally use English when they are asked by the teacher and they try to avoid using French or their native languages during class (Mean=4.3417). Considering the fact that almost all the students in the interview admitted their use of French or their native languages during English classes (see Appendix 6 for the learner interview), this result is somewhat contradicted. According to Galali and Cinkara (2017), learners’ first-language has a facilitating role in acquiring a foreign language in certain circumstances. We also investigated students’ attitudes towards using French or their native languages during English classes in the interview later.

## Synthesis

- ✓ The students slightly agree on their mastery of English, but they do not think they are capable of using English properly.
- ✓ The majority of these students can understand what the teacher says in English classes and they can also basically discuss with their classmates in English.
- ✓ In general the students can comprehend scientific English articles or videos in classes, videos are more difficult for them to comprehend than that of reading scientific English articles.
- ✓ Comprehending scientific English articles or videos is a tough task for these students to achieve at first reading.
- ✓ The students normally use English when they are asked by the teacher and they try to avoid using French or their mother tongues during class.

### 4.1.6 Attitudes

Table 17 presents the results of students’ attitudes toward English language, English teaching and learning as well as culture. It is assumed that the context will have an influence on the relative degree of success of the individual concerned (Gardner, 2001b). This is also covered in

CDST, in which learners are also seen to contribute to shaping their contexts through how they interact with input (see Chapter 2).

In Table X, the “Attitude towards English language”, suggests that these learners’ attitudes toward English language are fairly positive (Mean=5.0140, between the option “agree” and “strongly agree”), showing their favourable attitudes toward English.

The “Attitude towards foreign languages”, shows their basic interests of foreign languages (Mean=4.7731, between the option “slightly agree” and “agree”), yet not as much as that of English (Mean=5.0140).

Table 17 – Students’ Attitudes toward English Language, English Teaching and Learning and Culture

	N	Min	Max	Mean	SD
Attitude towards English language	357	1.00	6.00	5.0140	1.15014
Attitude towards foreign languages	357	1.00	6.00	4.7731	1.21625
Attitude towards learning English	357	1.25	6.00	4.6709	.99747
Attitude towards English learning in UPS	357	1.00	6.00	3.4220	1.26902
Attitude towards English teaching in UPS	357	1.00	6.00	4.0532	1.27903
Attitude towards Anglophone culture	357	3.00	6.00	5.0132	.64761
Valid N (listwise)	357				

Note: 1= strongly disagree, 2= disagree, 3= slightly disagree, 4= slightly agree, 5= agree, 6=strongly agree

These students’ attitudes toward English learning and teaching in University Paul Sabatier are in the opposite directions. The “Attitude towards English learning in University Paul Sabatier” indicates that these students possess relatively negative attitudes toward English learning in the university (Mean=3.4220, between the option “slightly disagree” and “slightly agree”). Nevertheless, the “Attitude towards English teaching in University Paul Sabatier” implies their slightly favorable opinions toward teaching from their English teachers, showing the overall degree of satisfaction (Mean=4.0532, between the option “slightly agree” and “agree”).

In general, the mean value of the “Attitude towards English learning in University Paul Sabatier” (Mean=3.4220) and “Attitude towards English teaching in University Paul Sabatier” (Mean=4.0532) are both much lower than that of English language and culture. The responses indicate that these students do not favour their English learning and teaching in the university as much as they do about English language and culture behinds English language.

The “Attitude towards Anglophone culture”, whose average score is the highest (Mean=5.0132, between the option “agree” and “strongly agree”), presents significantly positive attitudes toward the culture behinds English language.

Question 52 “Which period of English classes do you prefer” asks students to choose the period of English classes they prefer most. The responses of these students suggest that they do not enjoy English classes from L1 to M2 as much as they did in secondary school (N=93). Among all English classes in the university, they prefer English classes at L3 level (N=88) than other levels.

Table 18 – Descriptive Statistics of Question 52

Which period of English classes do you prefer	Frequency	Percent	Valid Percent	Cumulative Percent
English classes at secondary school	93	26.1	26.1	26.1
English classes at L1	16	4.5	4.5	30.5
English classes at L2	68	19.0	19.0	49.6
English classes at L3	88	24.6	24.6	74.2
English classes at M1	33	9.2	9.2	83.5
English classes at M2	59	16.5	16.5	100.0
Valid N (listwise)	357	100.0	100.0	

The concept of attitude has expanded to include stereotypes and mental images that language learners hold about the target language countries, their cultures and people (Nikitina, Furuoka, and Kamaruddin 2020). This could also be interpreted in social strategies included in the framework of strategies proposed by Oxford (1990).

Ho (1998) also found strong associations between willingness, motivation, and attitude. Students who enjoyed studying about English-speaking countries tended to have a more positive attitude, and a higher motivation to study the English language.

To probe into the details of learners' attitudes, the mean value of each item is thoroughly examined and respectively presented in the Table 19. The three statements of "I like English language" (Q41), "I like my own mother tongue" (Q42) and "I like foreign languages" (Q43), shows a general interest of learning English or foreign languages. Notably, the item "I like my own mother tongue" (Q42) (Mean=5.4930) gets an average higher score than both of "I like English language" (Q41) (Mean=5.0140) and "I like foreign languages" (Q43) (Mean=4.7731), which is a normal situation since English is a foreign language for the majority of the students.

Table 19 – Descriptive Statistics of Learners' Attitudes (Each Question)

	N	Min	Max	Mean	SD
Attitude towards English language	357	2.25	6.00	4.8130	.81714
Q41	357	1.00	6.00	5.0140	1.15015
Q42	357	1.00	6.00	5.4930	.81287
Q43	357	1.00	6.00	4.7731	1.21625
Q44	357	1.00	6.00	4.5406	1.18826
Q45	357	1.00	6.00	5.2465	1.00324
Q46	357	1.00	6.00	4.6807	1.30211
Q47	357	1.00	6.00	4.1120	1.39574
Q48	357	1.00	6.00	4.6443	1.43180
Attitude towards English teaching and learning	357	1.00	6.00	3.8165	1.16145
Q49	357	1.00	6.00	2.9160	1.55198
Q50	357	1.00	6.00	3.7787	1.65875
Q51	357	1.00	6.00	3.5714	1.43925
Q53	357	1.00	6.00	4.2409	1.46234
Q54	357	1.00	6.00	4.3137	1.49612
Q55	357	1.00	6.00	3.1569	1.54267



Q56	357	1.00	6.00	4.2689	1.60423
Q57	357	1.00	6.00	4.2857	1.39708
Attitude towards Anglophone culture	357	3.00	6.00	5.0132	.64761
Q58	357	1.00	6.00	5.2297	.87597
Q59	357	1.00	6.00	4.7787	1.06728
Q60	357	1.00	6.00	5.3165	.86315
Q61	357	1.00	6.00	5.1401	1.06396
Q62	357	1.00	6.00	4.3894	1.19794
Q63	357	1.00	6.00	5.2157	1.13473
Q64	357	1.00	6.00	5.4930	.85004
Q65	357	1.00	6.00	5.2045	1.05478
Q66	357	1.00	6.00	4.3557	1.43572
Q67	357	1.00	6.00	5.0084	1.32920
Valid N (listwise)	357				

Note: 1= strongly disagree, 2= disagree, 3= slightly disagree, 4= slightly agree, 5= agree, 6=strongly agree

Moreover, the attitudes toward native language, toward English language, toward foreign languages and toward scientific English show a gradual decreasing trend. The item “I like scientific English” (Q44) (Mean=4.5406) gets an average lower score comparing to the item “I like English language” (Q41) (Mean=5.0140), showing their different attitudes toward English itself and scientific English. The attitudes toward scientific English is slightly negative than that of English itself.

The item “I think I’m a pretty good English learner” (Q47) indicates a relatively weak sense of self-efficacy (Mean=4.1120) of these learners. As Bandura (1977) and other researchers have demonstrated, self-efficacy can have an impact on everything from psychological states to behaviour and motivation.

The item “I enjoy the activities of our English class much more than those of my other classes” (Q49), presents a significant negative attitude (Mean=2.9160) towards the activities of English classes, whose mean value is the lowest among all the items in this questionnaire. The item “I

like my scientific English class” (Q51) also shows that these learners generally do not enjoy their scientific English classes (Mean=3.5714).

Nevertheless, these learners basically recognise the dedication of the teacher. The items “I really like my English teacher” (Q53) (Mean=4.2409), “My English teacher has a dynamic and interesting teaching style” (Q54) (Mean=4.3137), “My English teacher is a great source of inspiration to me” (Q55) (Mean=3.1569), “I would prefer to have a different English teacher” (Q56) (Mean=4.2689) and “My English teacher doesn’t present materials in an interesting way” (Q57) (Mean=4.2857) (Q56 and Q57 are reverse items, high mean value indicates positive attitude), presents a general positive attitude toward the English teacher. The responses of the learners suggest that they think the English teacher has dynamic teaching style and presents materials in an interesting way for the most part, showing the overall degree of satisfaction.

Likewise, the mean values of the items “I like my own culture” (Q60), “I like France” (Q58) and “I like Anglophone culture” (Q59) are compared with each other. The results show a gradual decreasing trend as well. The responses of the learners imply that they prefer their own culture (Mean=5.3165) than that of French (Mean=5.2297) and Anglophone (Mean=4.7787). Learners’ representations of languages, the people who speak those languages and the countries in which those languages are spoken were demonstrated to play a pivotal role in learning processes (Candelier and Hermann-Brennecke 1993; Cain and De Pietro 1997; Berger 1998; Muller Mirza 1998). This could also be interpreted in the concept of cultural representations, which according to Gohard-Radenkovic et al. (2004), can either be positive or negative, indicating open and accepting attitudes, or rejection and refusal toward the other group (see Chapter 2).

## Synthesis

- ✓ The students like English and they are interested in learning English.
- ✓ Their attitudes toward scientific English is slightly more negative than that of English itself.
- ✓ The students possess relatively negative attitudes toward English learning in University Paul Sabatier.
- ✓ The students generally do not enjoy their scientific English classes.
- ✓ The students show an overall degree of satisfaction with the teacher.

- ✓ The students show significantly positive attitudes toward the culture behind English language.
- ✓ But compared to Anglophone culture, they prefer French culture or their own culture.

#### 4.1.7 Motivation

Gardner and Lambert (1972) add two orientations of attitudes and motivation in learning a foreign language, namely the instrumental orientation and integration orientation, in which integrative motivation was hypothesised to have more influence on the long-term motivation necessary for most of the tasks in second language learning (see Chapter 2). Therefore, the questionnaire concerning motivation is divided into two categories, “learning scientific English” and “dealing with science”. Moreover, as we have developed in Chapter 2, motivation theories in the process-oriented period, all these models reported in this period stimulated the awareness of relationship between learners and their learning contexts and prior experience. Meanwhile, CDST in Chapter 2 also indicates that motivation is dynamic. In this regard, the results are valid at a certain period.

The part of “learning scientific English” comprises the items “Studying English can be (“not important at all” to “very important”) in getting a good job” (Q68), “to better understand and appreciate English culture” (Q69), “to participate more freely in the activities of other cultural groups” (Q75), “to be more at ease with people who speak English” (Q76), “to meet and converse with more and varied people” (Q77), “other people will respect me more if I have knowledge of a foreign language” (Q78), “making me a more knowledgeable (bien informé) person” (Q79) (learner responses ranging from “1=not important at all” to “4=very important”).

The part of “dealing with science” comprises the items “Scientific English classes can be (“not important at all” to “very important”)to write scientific articles” (Q70), “to develop a critical mind” (Q71), “to understand science problems in the world” (Q72), “to communicate with scientists all over the world” (Q73), “to get access to international scientific articles” (Q74) (learner responses ranging from “1=not important at all” to “4=very important”).

Table 20 – Descriptive Statistics of Motivation towards Learning Scientific English and Dealing with Science

	N	Min	Max	Mean	SD
Overall motivation	357	1.42	4.00	3.0168	.53021
Learning scientific English	357	1.43	4.00	2.9780	.54852
Dealing with science	357	1.00	4.00	3.0711	.64231
Valid N (listwise)	357				

Note: 1=not important at all, 2=Not very important, 3=Important, 4=very important

In Table 20, the responses of learners suggest that their overall motivation towards scientific English is relatively low (Mean=3.0168). The mean value of the motivation regarding “Learning scientific English” is between the option “not very important” and “important”, implying a lack of motivation (Mean=2.9780). Whereas the motivation regarding “dealing with science” is slightly stronger than the motivation of learning scientific English, showing a low motivation (Mean=3.0711). This seems normal since these learners are in the domain of science. Dealing with science remains fairly centralised in their daily studies.

We also investigated the overall motivation between L3 students and M2 students. As indicated in Table 21, the mean difference is 0.06 with the significant level at  $.290 > .05$ , which indicates there is no significant difference in the overall motivation ( $t=1.059$ ,  $p>.05$ ) between M2 students and L3 students.

Table 21 – T-test of the Overall Motivation of M2 and L3 Students

The overall motivation	N	Mean	Mean difference	SD	T-value	Sig.(2-tailed)
L3	189	3.0452	0.06	.036	1.059	.290
M2	169	2.9852		.044		

To achieve further comparison, the mean value of each item in the part of motivation is presented in Table 22. The item “getting a good job” (Q68) gets an average highest score (Mean=3.5882) among all items. This case implies that these learners (students in science domains)’ motivation towards learning English is mainly employment-oriented. This finding also indicates that these students in science domains have motivation of instrumental orientation instead of integration orientation (see Chapter 2).

Table 22 – Descriptive Statistics of Learners’ Motivation (Each Question)

	N	Min	Max	Mean	SD
Learning scientific English	357	1.43	4.00	2.9780	.54852
Q68	357	1.00	4.00	3.5882	.61001
Q69	357	1.00	4.00	3.1597	.70691
Q75	357	1.00	4.00	2.8852	.84848
Q76	357	1.00	4.00	3.0280	.82059
Q77	357	1.00	4.00	2.9104	.87591
Q78	357	1.00	4.00	2.4230	.92276
Q79	357	1.00	4.00	2.8515	.79523
Dealing with science	357	1.00	4.00	3.0711	.64231
Q70	357	1.00	4.00	3.3557	.78936
Q71	357	1.00	4.00	2.6359	.81878
Q72	357	1.00	4.00	2.8011	.88508
Q73	357	1.00	4.00	3.3754	.78200
Q74	357	1.00	4.00	3.1877	.85530
Valid N (listwise)	357				

Note: 1=not important at all, 2=Not very important, 3=Important, 4=very important

Afterwards, the item “to write scientific articles” (Q70) and the item “to communicate with scientists all over the world” (Q73) are not far behind, with the latter (Mean=3.3754) slightly higher than the former (Mean=3.3557). It hints that being capable of writing scientific articles

and communicating with scientists all over the world have been targeted for particular focus by these learners, in which scientific English plays a vital role.

The item “to get access to international scientific articles” (Q74) also presents learners’ basic motivation (Mean=3.1877) towards learning scientific English when they have to get access to international scientific articles. As English takes the forefront in science, learners are aware that they need English when reading scientific articles.

Rather than the motivation of dealing with science, learners also possess the motivation of understanding culture and valuing diversity. For instance, the item “to better understand and appreciate English culture” (Q69) (Mean=3.1597) shows their motivation of understanding cultural connotations; the item “to be more at ease with people who speak English” (Q76) (Mean=3.0280) shows these learners’ motivation of using English with people who speak it and also indicates that there have been stresses and strains when dealing with people who speak English.

Table 23 – Motivation Ranked by Participants (Question 80)

Motivation	Rank
Getting a good job	1
To get access to international scientific articles	2
To communicate with scientists all over the world	3
To be more at ease with people who speak English	4
To write scientific articles	5
It will make me a more knowledgeable person	6

Question 80 “In which of the following cases motivates you to learn scientific English? (veuillez sélectionner 6 réponses et les classer par niveau d'importance)” (Q80) is a rank order scale question, inviting respondents to rearrange and rank multiple-choice motivation in an order of importance. They are invited to choose 6 out of 12 types of motivation and rank them from the most important to the least important. This item offers detailed insights with accuracy.

Table 23 also demonstrates that motivation of these students is mostly employment oriented. Getting a good job is the reason that motivates them most to learn scientific English.

These students are also motivated to learn scientific English in order to get access to international scientific articles and to communicate with scientists all over the world. It is not surprising since the scientific article is the main way to spread and share what they have achieved in science domains with the entire world, with English being the dominant language among scientists.

Afterwards, to be more at ease with people who speak English is also the driving force for them to learn scientific English. Exchanging ideas in conferences by giving lectures can be a mainstream way to share scientific achievements. These students will have to meet colleagues or collaborators from all over the world. Their responses imply that they feel the pressure when meeting with people who speak English and they are willing to learn scientific English in order to ease the pressure.

“To write scientific articles” is ranked fifth, which is behind “To get access to international scientific articles” and “To communicate with scientists all over the world”. This situation makes sense since writing scientific articles are not basic and compulsory tasks for L3 and M2 students.

“It will make me a more knowledgeable person” comes last, revealing that these students have an intrinsic motivation. However, this finding concerning the rank of motivation implies students’ low intrinsic motivation (rank 6 for ‘It will make me a more knowledgeable person’), comparing with extrinsic motivation previously discussed. Rather than external pressures or rewards, when students are motivated intrinsically, learning scientific English can be more effective (see Chapter 2).

## Synthesis

- ✓ The motivation of learning scientific English for these students is extrinsic (employment-oriented).
- ✓ The scientific students recognise the importance of English in the domain of science, thus they are more motivated when dealing with science.
- ✓ They are motivated to learn scientific English in order to get access to international scientific articles and to communicate with scientists all over the world.
- ✓ To be more at ease with people who speak English is also the driving force for them to learn scientific English.

- ✓ The students are also motivated to learn scientific English in order to write scientific articles.
- ✓ They also have the motivation of being a more knowledgeable person.

#### 4.1.8 Correlations Analysis

To further investigated whether there is any correlation among students' attitudes, motivation, learning efficiency and the level of English proficiency, we conducted correlation analysis.

Table 24 shows the relation between languages spoken in learners' families (monolingual or plurilingual) and other scales including attitudes, motivation, learning efficiency and the level of English proficiency. The results reveal that languages spoken in the students' families have a positive and significant correlation with their attitudes ( $r=.180$ ,  $p<.01$ ). It also has a significantly positive correlation with their learning efficiency ( $r=.110$ ,  $p<.05$ ) and the level of English proficiency ( $r=.133$ ,  $p<.05$ ). Nevertheless, the languages spoken in their families are not significantly correlated to learners' overall motivation.

Table 24 – Correlation between Students' Languages Spoken in Families and Students' Attitudes, Motivation, Learning Efficiency and Level of English Proficiency

		Overall attitudes	Overall motivation	Learning efficiency	Level of English proficiency
Languages spoken in families	Pearson Correlation	.180**	.067	.110*	.133*
	Sig. (2-tailed))	.001	.210	.038	.012
	N	357	357	357	357

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Table 25 shows that the representation of the students about scientific English is not significantly correlated to their overall motivation. In contrast, their representation about



scientific English has a significantly positive correlation with their overall attitudes ( $r=.166$ ,  $p<.01$ ), learning efficiency ( $r=.314$ ,  $p<.01$ ) and levels of English proficiency ( $r=.233$ ,  $p<.01$ ).

Table 25 – Correlation between Representation about Scientific English, and Attitudes, Motivation, Learning Efficiency and Level of English Proficiency

	Overall attitudes	Overall motivation	Learning efficiency	Level of English proficiency
Pearson Correlation	.166**	.067	.314**	.233**
Sig. (2-tailed)	.002	.209	.000	.000
N	357	357	357	357

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Table 26 presents that the representation about scientific English classes is significantly and positively correlated to the students' attitudes ( $r=.123$ ,  $p<.05$ ) and motivation ( $r=.120$ ,  $p<.05$ ). It means that students' representations about scientific English classes can significantly affect student's attitudes and motivation of English learning. While there are no significant correlations between the representation about scientific English classes and learning efficiency and the level of English proficiency.

Table 26 – Correlation between Representation about Scientific English Classes, and Attitudes, Motivation, Learning Efficiency and Level of English Proficiency

	Overall Attitudes	Overall motivation	Learning efficiency	Level of English proficiency
Pearson Correlation	.123*	.120*	.050	-.036
Sig. (2-tailed)	.020	.023	.348	.493

Representation about scientific English classes	357	357	357	357
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\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Table 27 shows that the learning efficiency is significantly and positively correlated to students' attitudes towards English language ( $r=.552$ ,  $p<.01$ ) and attitudes towards language culture ( $r=.453$ ,  $p<.01$ ) While there are no significant correlations between learning efficiency and attitudes towards English teaching and learning.

Table 27 – Correlation between Attitudes and Learning Efficiency

		Attitudes Learning towards efficiency English language	Attitudes towards English teaching and learning	Attitudes towards language and culture
Learning efficiency	Pearson Correlation	1		
	Sig.(2-tailed)			
	N	357		
Attitudes towards English language	Pearson Correlation	.552**	1	
	Sig.(2-tailed)	.000		
	N	357	357	
Attitudes towards English teaching and learning	Pearson Correlation	.014	.195**	1
	Sig.(2-tailed)	.792	.000	
	N	357	357	357
Attitudes towards language culture	Pearson Correlation	.453**	.738**	.096
	Sig.(2-tailed)	.000	.000	.071

N	357	357	357	357
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Table 28 presents an illustration of the relations between overall attitudes and motivation, as well as the relations among the various dimensions in attitudes and motivation.

From the table we can see that attitudes and motivation are in significant positive correlation ( $r=.322$ ,  $p<.01$ ).

Table 28 – Correlation between Attitudes and Motivation

		Overall Attitudes	Overall motivation	Attitudes (English language)	Attitudes (teaching and learning)	Attitudes and (language culture)	Motivation (dealing with science)	Motivation (learning scientific English)
Overall motivation	Pearson Correlation	.322**	1					
	Sig.(2-tailed)	.000						
	N	357	357					
Attitudes (English language)	Pearson Correlation	.801**	.201**	1				
	Sig.(2-tailed)	.000	.000					
	N	357	357	357				
Attitudes (teaching and learning)	Pearson Correlation	.682**	.272**	.195**	1			
	Sig.(2-tailed)	.000	.000	.000				
	N	357	357	357	357			
Attitudes (language culture)	Pearson Correlation	.744**	.220**	.738**	.096	1		
	Sig.(2-tailed)	.000	.000	.000	.071			
	N	357	357	357	357	357		
Motivation (dealing with science)	Pearson Correlation	.248**	.882**	.166**	.197**	.179**	1	
	Sig.(2-tailed)	.000	.000	.002	.000	.001		
	N	357	357	357	357	357	357	
Motivation (learning scientific English)	Pearson Correlation	.325**	.919**	.194**	.287**	.216**	.625**	1
	Sig.(2-tailed)	.000	.000	.000	.000	.000	.000	
	N	357	357	357	357	357	357	357

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\*. Correlation is significant at the 0.01 level (2-tailed).

Moreover, each dimension in attitudes is positively correlated with each dimension in motivation. The attitudes towards English language has a positive correlation with the motivation of dealing with science ( $r=.166$ ,  $p<.01$ ) and the motivation of learning scientific English ( $r=.194$ ,  $p<.01$ ). The attitudes towards English teaching and learning also has a positive correlation with the motivation of dealing with science ( $r=.197$ ,  $p<.01$ ) and the motivation of learning scientific English ( $r=.287$ ,  $p<.01$ ). The attitudes towards language culture has a positive correlation with the motivation of dealing with science ( $r=.179$ ,  $p<.01$ ) and the motivation of learning scientific English as well ( $r=.216$ ,  $p<.01$ ).

## **Synthesis**

While conducting the survey, the students themselves evaluated their learning efficiency and English proficiency levels, which ideally should have been obtained through a unified examination. With regard to the limitation in this study, there was no national assessment in France. As the participants were widely diverse across the university, it was not possible to obtain results via a standardized examination for all participants.

Findings in the correlations analysis suggest that the students' language biographies do have a significantly positive impact on their attitudes toward English learning. Compared to students who speak only one language in their families, those with multiple languages in their families are more likely to have a favorable attitude towards English learning. This finding is very much in line with the social context proposed by Gardner (2007), in which social context impacts individuals in language learning (see Chapter 2).

The language biographies of students have a significantly positive impact on their learning efficiency and level of English proficiency. This means that students who grow up in families with multiple languages tend to achieve better outcomes in English learning and have higher levels of proficiency. These findings are consistent with research conducted by Nikolov (2009), who observed a strong link between parents' education level and their children's language learning achievement in Hungary. Additionally, these findings align with the results of PISA Report in 2015 and PISA Report in 2018, which indicated that students who predominantly spoke English at home performed significantly better in scientific literacy and reading literacy than those who primarily spoke a language other than English (Sizmur et al., 2019).

Afterward, we investigated the correlation between the students' representation of scientific English and their representations of their learning efficiency and English proficiency. The results indicated that having a clear understanding of scientific English significantly improves both their learning efficiency and proficiency in English. This finding is consistent with representations proposed by Castellotti and Moore (2002), which suggests that representations are closely linked to the learning process and can either facilitate or impede learning.

Another notable discovery is that the representation of scientific English classes is significantly and positively correlated to the students' motivation. This indicates that having a clear understanding of the goals and objectives of such classes can greatly contribute to their motivation to learn scientific English.

Additionally, the students' representations of learning efficiency are significantly and positively correlated to their attitudes towards English language and attitudes towards culture. This suggests that their interest in English can effectively impact their learning outcomes. Furthermore, their attitudes towards culture also have a positive effect on their learning outcomes, which is consistent with the notion of cultural representations, encompassing mental and public representations of a particular group or subgroup within a community (Sperber, 1996). The interaction between attitudes towards culture and learning outcomes could also be interpreted in CDST (see Chapter 2)

Finally, we have confirmed that overall attitudes and motivation are positively correlated, indicating a dense interweaving between the two. A positive attitude towards English, English teaching and learning, as well as culture in language, appears to have a positive impact on students' motivation to learn scientific English or deal with science. This finding is integrated in Socio-educational Model of SLA proposed by Gardner (1988) (see Chapter 2). Consequently, the level of motivation exhibited by students when learning English can have significant implications for the development of an efficient learning process.

## 4.2 Learner Interview Results

There were six L3 student participants and six M2 student participants in the interviews. After coding, several themes emerged and were presented inductively as follows. Some data was presented in tables.

Learner interviews started with the inquiry of students' general background and language biography. Afterwards, learner interviews constituted 14 questions, whose aim was:

- a) to cross-check the data from the questionnaire and to offer details on learners' representation of scientific English and their English classes;
- b) to identify the teaching practice in the University Paul Sabatier (contents, activities, tools and evaluations);
- c) to explore nexus among learners' representation, motivation and learning context.

### 4.2.1 Learners' Representations of Scientific English

The interview question 1 investigated students' representations of scientific English. Four participants stated unequivocally that they were not clear about what scientific English is. One participant even mentioned that the teacher did not know what scientific English means.

*[What does scientific English mean to you?]*

*S1: I don't see how it could be scientific English. I think it is not enough.*

*S2: I don't know exactly what it is, because we don't have scientific English learning experience.*

*S4: It's not clear for me. In fact, I have asked my teacher this question and my teacher asked me the same question(laugh). The teacher doesn't know what that means.*

*S5: It doesn't mean anything to me, I think.*

Table 29 – Students’ Representation of Scientific English (N=12)

S1 : English for specific purposes.	S2 : using English to talk about scientific stuff.	S3 : exists in reports or articles that we read, such as complicated vocabularies in our field.	S4 : how to spell mathematical formulas, how to communicate with professionals maybe.
S5: It doesn’t mean anything to me.	S6: English used between scientists in the world, who are working on the same subject.	S7: it’s language, like English language, but specifically scientific.	S8: the type of English that will be used only in scientific papers, with specific vocabularies.
S9: to learn something about what you are studying.	S10: specific words or phrases that we mostly use in scientific publications and scientific discussions.	S11: the language used specifically on the field of science.	S12: the vocabulary to explain scientific subjects in English.

Note: \*\*S= Student. Question 1: “What does scientific English mean to you?”

We illustrate students’ representations of scientific English in the above table. All the participants agreed on the essential role that scientific English played in the scientific community. However, each participant perceived scientific English differently:

*S1: English for specific purposes. That is all I know about this.*

*S2: I think it refers to using English to talk about scientific stuff.*

*S3: For me, I think scientific English exists in reports or articles that we read, such as complicated vocabularies in our field.*

*S4 : I think technical English or scientific English means how to spell mathematical formulas, how to communicate with professionals maybe.*

*S5 : I learned scientific words as just English, not as scientific English specifically.*

*S6: For me, it means English used between scientists in the world, who are working on the same subject.*

*S7: For me, it’s language, like English language, but specifically scientific.*

*S8: I guess it's the type of English that will be used only in scientific papers, with specific vocabularies.*

*S9: For me, scientific English means to learn something about what you are studying.*

Some students perceived it as specific vocabularies:

*S10: I think for me it means specific words or phrases that we mostly use in scientific publications and scientific discussions.*

*S11: I think it means all the vocabulary that you can need to work in the scientific field. So I think I would say that the language used specifically on the field of science.*

*S12: For me, in particular, the vocabulary to explain scientific subjects in English.*

The interview discourse indicated that their common point about scientific English is that it was used for various purposes in science domains. The interview data was also compared with the results derived from the questionnaire data. The results derived from the questionnaire data (n=357) showed that these students agreed on knowing what scientific English is. Nevertheless, the data of interviews showed that they did not have clear representations on scientific English. Thus the data of questionnaires and interviews illustrated that these students might know the term scientific English, but they did not really know what it means or refers to. Their representation of scientific English was presented as Table 29. Afterwards; we continued to explore their representations of scientific English classes.

#### **4.2.2 Learners' Representations of Scientific English Classes**

The interview Question 2 and Question 5 investigated students' representations of scientific English classes. Question 2 explored whether these participants perceived their English classes as science-related or not. This question was compared with Question 5, in which students were asked if they think their English class is related to their scientific courses.

Among 12 participants, S1, S5, S9, S10, S11, S12 were students in the third year of the License's degree (L3), while S2, S3, S4, S6, S7, S8 were students in the second year of the Master's degree (M2). Only one student in the Master's degree perceived English classes as not related to science (S2), while one student in the License's degree replied indirectly (S11).



Regarding question 2, except for S2, who expressed a clear objection, and S11, who gave indirect answers,

*S2: No, I don't think so. You don't have to talk specifically science just because you are studying science.*

*S11 So for me it's more like mathematics culture. it could be more about the news of mathematics world, or history of mathematics.*

All other participants showed a definite affirmation to this question (9 students out of 12). Many of these students stated that they perceived their English classes as science-related due to scientific topics involved in the class (e.g. S6, S7, S8, S10, S11, S12).

*S3: Yes, we have learned words in artificial network and also ways to present our skills and educational background. I think it's related to our field.*

*S4: I would say seventy percent related to science and forty percent related to my field.*

*S6: Yes, we were always talking about different subjects that maybe weren't directly linked to our main field, but it was just mainly how to analyse and navigate between different topics.*

*S7: Yes, I think so. We talked about things which are related to science.*

*S9: Yes, but we can do something better I think.*

*S10: Yes, it's related to science. I don't think it's really related to my field because we mostly do discussion about other fields.*

*S12: Yes. Because our English teacher make us watch video about physics subjects.*

Notably, S5 implied that English classes are related to common knowledge about science. S11 also stated that English classes were more like mathematics culture.

*S5: Yes, it is related to common knowledge about science. It is more about scientific news.*

*S11: So for me it's more like mathematics culture. it could be more about the news of mathematics world, or history of mathematics.*

Specifically, S1, who was a student in the third year of License 3, stated that only in License 3 did he think English classes are related to science. While S8, who was a master student, stated

that English classes in Master's degree got more specific in science rather than in license's degree that was a bit more general.

*S1: Yes, but only this year(L3). Yeah, I do think it is targeted for science.*

*S8: It depends. Like when we were in the License it was not that related. It was a bit more general. And when we got into master, it got more specific in science, and teachers try to interest us by picking scientific topics.*

Question 5 asked about the relation between English classes and scientific courses. Differently from the question before, there were more oppositions.

Only 3 out of 12 gave a solid and positive answer when asked "Does your English class relate to your scientific training/course?". A few students stated that sometimes they were connected (e.g.S1, S6). One student (S9) expressed dual attitudes toward this question: "Yes and no. [...] Some subjects are related to this (computer science) but others are not related like net neutrality."

S1 stated that they had a course named artificial intelligence (AI), which is related to the English class centred on AI. S3 and S4 stated that there was a connection when they were doing presentations regarding their internship projects and when they did the bibliographic research. S6 asserted that the connection was in a general way: "The way that we worked in English classes were somehow related to the scientific courses."

6 students out of 12 expressed a clear objection to this question. Almost all of these six students stated that they perceived their English classes and scientific courses as being entirely different: for instance, " what we have learned are general knowledge, like something you would read in newspaper. Actual science is completely different."(S5); "the science we saw in English class was quite easy to understand, like, there was no scientific challenge for us to understand it."(S8); "The scientific courses are completely differently from the English classes. It is not just scientific articles or debates. I think in English classes, it's just scientific topics for normal people."(S12)

Thus, the results obtained in this section indicated that these students perceived their English classes as being related to science, but not related to their scientific courses. Most of them attributed such a connection to the scientific topics engaged in English classes. Meanwhile, these learners perceived English learnt in classes as "general knowledge" (S5) and "scientific topics for normal people" (S12), which was "quite easy to understand" (S8), "completely different with actual science" (S5), and "more related to general science" (S7). This finding is

very much in line with Chaplier's construct of English for science when she refers to "common knowledge", in which she proposes to building "common knowledge" to teach scientific English (see Chapter 2).

### 4.2.3 Learners' Representations of the Teaching Content

This section explored learners' representations of the content in English classes, in which the interview discourse of question 3 and question 4 was analysed.

Question 3 asked about the teaching content, including activities being involved, tools being used and the evaluation.

Regarding the activities engaged in English classes, almost all of the students stated that their English classes were mainly based on oral comprehension and oral expression: "I think my teacher just wants us to practice oral English as much as possible. That's the overall goal in my class."(S2); "We mainly talked about small subjects in the science field."(S6); "we were assigned to watch videos or reading articles and explain to the teacher what we had understood."(S3); "It was mainly about discussion and presenting a scientific topic to other classmates," (S6); "the teacher tried to make as much interaction and actually speaking English as much as possible. (S8)"

According to most students, the activities can be listening to audios, watching videos, role playing, reading articles, writing an abstract, discussions, and debates.

*[Normally what activities are involved in your English class?]*

*S1: Most of time, we just listened to audios or we watched videos as well as oral comprehension sometimes we did write short passages about a subject.*

*S2: Normally we have lots of activities during class, role plays for example. I remember once we acted as American and French, and we debated with each other about which side is a better country.*

*S3: Most of time, we were assigned to watching videos or reading articles and explain to the teacher what we had understood. Sometimes it can be scientific articles in our relevant field.*

*S11: We do some debates. It's quite interesting. [...] The exercises of vocabulary are about the videos that we watch, which are related to our fields.*

Both L3 students and M2 students stated that the subjects engaged in English classes were mostly in science fields, for example history of science, scientific inventions. The response

from these participants confirmed that most teachers already adapted to students' various disciplines by adopting scientific content in L3 and M2 degrees.

*S3: Sometimes it can be scientific articles in our relevant field.*

*S5: It was usually about the history of science. Not just in physics, but scientific inventions, something like that.*

*S6: We mainly talked about small subjects in the science field. For example, topics like sustainable agriculture, microbiota in guts and mental health in students.*

*S11: The exercises of vocabulary are about the videos that we watch, which are related to our fields, but it can be also, for example, ethics algorithm.*

The teacher also involved subjects like job search, making a CV or job interviews.

*S3: Sometimes it can be scientific articles in our relevant field. Sometimes it is about our job hunting in the future, making a CV or job interview for example.*

The interview question 3 also asked about tools used during English classes. Almost all of the participants stated that videos and handouts were mostly used during the class.

*[What kind of tools are used during class?]*

*S4: Mostly videos, and handouts of exercises.*

*S5: Videos or some handouts with questions.*

*S7: I think most of the time there are articles and videos.*

*S8: So in Master, it was mostly videos and sometimes some newspaper articles.*

*S9: I think our teacher only use videos for us to talk about the subject.*

*S10: The teacher uses texts. If happened sometimes that she used videos or audios.*

*S11: Short videos like from the BBC. It's more for the homework.*

*S12: I would say videos and some texts.*

Four students stated that they use computers very often and the teacher uploaded various sources on the platform Moodle.

*S1: We used computers all the time.*

*S3: We use computers and the platform named Moodle. We have different files uploaded by the teacher, such as texts, videos or audios.*

*S10: The teacher puts all the videos and articles that she made us watch on the Moodle. It is mainly for the homework.*

*S12: The teacher also put links of the videos at the Moodle platform.*

S1 also stated that they sometimes work in groups through google doc, which he perceived as being a quite efficient tool. S6 also mentioned that the teacher made the contact very regularly with students.

*S1: The teacher upload audio and video sources on Moodle and we sometimes work in groups through google doc, which are quite efficient tools.*

*S6: We used computers and email very often. We mainly communicated with the teacher by email. The teacher made the contact very regularly.*

Question 3 also asked about the evaluation after English classes. S1, S3 and S5 stated that the evaluation was conducted remotely due to the COVID-19.

*[How did your teacher evaluate your English competence?]*

*S1: Our lessons were suspended due to the COVID-19, we will take the exam remotely.*

*S3: Due to the Coronavirus COVID-19, we have to conduct our presentation remotely.*

*S5: We should also have the evaluation of an oral presentation, but due to the Coronavirus COVID-19, it seems that we can only have an online presentation for the current situation.*

Almost all of the participants stated that they had an oral comprehension or an oral expression on a scientific topic that was either their own choices or from what had been learning during class. Some videos, scientific articles and documents of answer sheets were adopted during the evaluation.

*S4: Specifically, there were two evaluations. We had listening comprehension and written expression; we also had an oral presentation. We had to present a scientific topic related to our field or about our internships.*

*S6: The oral evaluation was that we were in groups of two or three, each of us had to watch a scientific article and take notes, then we talk about these specific topics to share our attitudes.*

*S8: Most of the time, there is at least one oral presentation where we have to pick a topic for presentation or something.*

S2, S3, and S6, who were second-year master students, stated that their evaluations were also based on topics concerning the job interview or internship projects. Likewise, two of them indicated that the English teacher collaborated with science teachers during the evaluation, where the English teacher only evaluated their English competence.

*S2: The evaluation is divided into two parts, the job interview and the individual conversation with the teacher.*

*S3: They are comprehension and written expression, as well as a job interview and a group presentation about our internship. [...] A scientific teacher in our department will evaluate us together with the English teacher, while the English teacher only evaluates our English competence.*

*S6: The writing part was talking about our internship subject. We also did an oral presentation in the end of the semester about our internship subject in front of teachers in our field and my English teacher at the same time. The English teacher only evaluated our English competence.*

The interview question 4 aimed to discover whether there were historical scientific events introduced during class.

The majority of the students gave a positive answer (7 students out of 12). These seven students stated that they were introduced to the history of the field, some scientists and some scientific discoveries (S1, S5, S7, S9, S10, S11, S12).

*[During English class, have you been introduced to some historical scientific events?]*

*S1: Yes, for example, the history of AI, the most famous person in this field and some date. It is quite interesting for me.*

*S5: Yeah, definitely. [...] I remember it was once about Galileo Galilei and his scientific discoveries. Also, there was once about Marie Curie and women scientists.*

*S7: Yes. As I mentioned before, some scientists in the scientific world.*

*S9: Yes. Normally the teacher displays videos to let us learn something about the subject.*

*S11: Yes, as I said, the culture or history in mathematics. She uses a lot of real articles from English newspaper, or American newspaper.*

S1 and S12 verbalised the enjoyment concerning these historical scientific events: “it is quite interesting for me.”; “It’s a bit more interesting than in high school.” S4 and S8 stated that they were introduced to some hot subjects that came up on the news very recently.

*S4: I think the video we watched mainly introduces what happened in recently years, not ancient.*

*S8: Most of the time, it was just about hot subjects and something that came up on the news two days ago.*

Notably, S10 stated that, though he was in the field of math, he was introduced to important events in the history of biology, and the implication of the discovery on science and ethics. S12 even indicated that they discussed “general science”.

*S10: Yes. But it was not in math. It was in biology. We used it to talk about ethics in biology. We talked about the important events in the history of biology, and then we discussed the implication of the discovery on science and ethics.*

*S12: Yes, we talked a bit about general science. For example, we studied a video about the Mars climate orbiter (MCO). [...] We studied the climate of Mars. We also studied about The Curiosity Rover’s landing on Mars.*

The results obtained in this section indicated that English classes were mainly based on oral practice, as indicated in the programmes established by the pedagogical team of the Département des Langues. Activities in English classes comprise discussion, role playing, debate, watching videos, reading articles and so on. Tools like computers, audio, videos, texts and scientific articles were engaged in the teaching practice, in which the Moodle platform played a vital role in efficiently delivering sources to students. The responses of students are consistent with what we refers to in Chapter 2, the applications of Web 2.0 technology exhibit numerous merits. The first advantage of using these online tools is that they help develop a greater sense of community(Faizi, 2018) . The evaluation was conducted in different ways according to the teaching programme, which toward specific scientific topics.

During English classes, most of these learners were introduced to historical scientific events, including famous scientists and scientific discoveries either far back into their history or significantly updated. As mentioned by Chaplier (2017), it allows the students to know how science emerged and have a complete vision of science as a product and process. A few students

perceived it as being interesting concerning these historical scientific events. According to Chaplier (2017), acquiring *common knowledge* allows the teacher to remain in his or her field of competence and to approach several types of content in science through a different way than that envisaged by science teachers.

#### 4.2.4 Significance of English Classes

This section aimed to explore the significance of English classes on learners' daily interaction in the scientific community (Q5), future professional career paths (Q6), and scientific thinking (Q7).

The interview question 5 asked if English classes were beneficial when interacting with professors in science or the lab. Only three students expressed a positive attitude toward this question.

*[Is it beneficial when interacting with professors in science or in your lab?]*

*S2: Sometimes our professors distribute scientific articles in English to us. I would say it is beneficial.*

*S6: Yes, it is always beneficial.*

*S9: Yes, because we talked about many subjects in classroom. I practiced for my oral expression.*

Nine students out of 12 expressed their disapprobation towards the significance of English classes on daily interaction in the scientific community. S5 and S10, who were both L3 students, attributed the disapprobation to the situation that French was the only language adopted during the interaction with their teachers.

*S5: Not really. I can practice my English in English classes. But we mainly use French with our teachers.*

*S10: My interaction with my teachers is only in French so...I don't know.*

S4, S7 and S8 revealed the limited significance of English classes. It seemed that these students were not aware of the objective of scientific English classes.

*S4: I don't think so. What we have learnt during class is very limited.*



*S7: I think we really learn a lot when you have to practice by yourself and you have to talk with someone who can talk in another language than English.[...] I think I learnt more in three internships than in English classes.*

*S8: The thing is I think it's really hard to learn the language in class setting.[...] I mainly learnt English by myself like watching videos, movies and reading articles.*

S11, despite negative opinions showed to this question, perceived intense enjoyment in English classes.

*S11: Not really. But it can be very interesting because in English classes, we present some mathematics in a way that the normal math teachers don't present. So it's very, very interesting.*

S3 expressed the overt dissatisfaction that the teaching is not adapted to the needs of communication. S12 also expressed a clear objection concerning the significance of English classes on daily interaction.

*S3: I think what we learned during class is useful when reading scientific articles, but when it comes to communication with others in a conference, it is not enough. I mean the teaching is not adapted to the needs in communication.*

*S12: : I don't think in particular this course is totally useful. English is useful, but this course maybe not.*

The interview discourse indicated that many of these students did not perceive scientific English classes as beneficial for their daily interaction with their science teachers. The interview discourse implied that these learners were not clear about the objective of the scientific English class either.

The interview question 6 asked if English classes positively or negatively influenced students' future professional career paths. Eight students out of 12 expressed a positive attitude regarding the impact of English classes on their future professional career paths.

Most students attributed the favourable impact to their opportunities for practicing oral English during the class.

*[Does your English class positively/negatively influencing your future professional career paths?]*

*S1: Yes, definitely positive. It's better than no English. I still get to practice my English.*

*S2: My English class greatly improved my oral English, for my case.*

*S6: It's definitely positive. Things we did in English classes were beneficial in terms of learning how to speak, how to engage in conversations and focus on communication in English.*

*S10: Yes, it's positive. it's globally improving my English level.*

A few students attributed the favourable impact to the possibility of working with people from other fields.

*S10: : So that's obviously a good thing for my future career. I wouldn't be only talking with math people. It's very closely related to physics. So I'm sure in my personal career, we will be talking with people doing physics.*

*S12: Yes, I think it is positive. because English is one of the universal languages, especially in physics. In Physics, we need to speak three maybe four languages, English, French, German and Russian.*

The interview discourse of S4 indicated that he perceived the favourable impact relevant to his interest: "I learned many new things in my English class. It also pushes me to work more to know things that we didn't know in the past."

On the contrary, S3, S5 and S7 indirectly disagreed with this question. S3 stated that watching series, movies or talking to others benefited him more than English classes.

*S3: Actually, I'm not sure that English class is important for improving my English. I have the feeling that I can speak better English when I watch series, movies or talking to others. I think it's better to learn English through talking with other people.*

S5 expressed her interest in English classes, but she also accentuated that the profit is very minimal.

*S5: : For me specifically, it might be sometimes interesting, because knowing about scientists in this field and scientific discoveries is kind of inspiration sometimes. That is nice, yes. But I would say very very minimally.*

S7 acknowledged some teachers' effort in improving their capacity for job search. He also expressed the positive attitude of teachers' managing to catch students' attention via interesting subjects.

*S7: Some teachers could be very helpful concerning writing Curriculum Vitae (CV), cover letter or resume in English, So I think it's a good point, but well that's it. [...] And there are some interesting subjects. I think when a teacher can catch the attention of the students it could be a really good time to practice English.*

The interview discourse indicated that most of these students hold a positive attitude towards the impact of English classes on their professional career paths.

The interview question 7 examined if English classes had significance on learners' scientific thinking. Only three students responded directly with positive answers to this question.

Most students expressed a negative attitude regarding the impact of English classes on their scientific thinking (9 students out of 12). Some of them gave the objection directly: for instance "I don't think my English class helped me with that."(S4); "I don't think it helps to understand science. It's complicated."(S12); "No, I don't think so."(S5); "I would say no. Maybe a little bit" (S11).

S2 and S10 attributed the lack of relevance between English classes and scientific thinking to an absence of classroom experience with this topic.

*[Do you think English class helps you understand scientific thinking (French thinking versus Anglophone thinking), can you specify?]*

*S2: No, since I don't have this kind of learning experience. I would say no.*

*S10: No, no, we never really really looked into the difference between the French thinking and others. So I don't think so.*

S7 mainly attributed her English thinking to the American English shows on Netflix. S9 and S12 both indicated that English classes were merely a relaxation.

*S7: I think my English thinking are most of the time thanks to the American English shows on Netflix.*

*S9: Not really. Because English classes are just a way of relax for me.*

*S12: Not really, I think. We talked about interesting things, it is good. I feel relaxed and I think my English classes are very cool.”*

Some students (S3, S4, S6, S8) did recognise the difference of scientific thinking via activities prepared by English teachers in English classes, for instance scientific articles, videos or specific subjects.

*S3: Maybe. In our field, we need to read a lot of English articles. Reading scientific English articles can help me a lot and we also read scientific articles during English class.*

*S4: I do feel the differences in the scientific thinking. I think simple English can be used to understand reports and journals quickly, whereas French journals and books are very long with very complicated expressions. We struggled to understand in French but English is simple.*

*S6: Sometimes when we watched videos in classes, people have English background talking about their experience in science.[...] it is helpful for us to realize that there are differences between English and French way of doing things in scientific field.*

*S8: Yeah. Because we had some classes about how to study English like the difference between French and English perspective.*

The interview discourse indicated that most of these students opposed that English classes had benefited their scientific thinking. Meanwhile, they were indeed aware of the difference between French thinking and Anglophone thinking through varieties of activities during English classes, for instance scientific articles, videos or specific subjects.

#### **4.2.5 Language Use during Class**

Question 8 asked if French or students' native languages were used in English classes. Meanwhile, their representation concerning French or their native languages used in English classes was also examined.

The results obtained from this question indicated that except for S10, almost all of these students used French or their native languages during English classes (11 students out of 12).

A few students mentioned that they were not supposed to use French or their native languages, suggesting that their teachers had requested English to be used only (S8, S10, S11). Some of them highlighted their efforts of trying not to use French or their native languages (S7, S9). S1

expressed his firm willingness of English used only during class: “But for me, I would really like to have an English class only in English. I prefer our English class without using French.”

Attributions regarding the use of French or their native languages in English classes could be various. S1 attributed it to their limited capacities of English and the time constraints. S4 stated that they use French since that they cannot stay focused on using English all the time.

*[Do you use your native language (French) in English class? why?]*

*S1: All the time. [...] Actually, I understand why does the teacher use French, it is because our English is not so good. To verify or save some class time, I think it is feasible to explain in French when we don't understand so well.*

*S4: Yes, I will speak to my classmates in French, because we can't stay focused all the time.*

A majority of the students ascribed it to a better understanding and an easier exchange in French (S2, S3, S5, S8, S9, S12).

*S2: If you don't speak English very well, it is reasonable to use French for better understanding.*

*S3: Yes, because it's easier to understand.*

*S5: Yeah, I use French with my classmates. On one hand, we can easily understand. On the other hand, it's just because that's my language I used to communicate with them. I can't just suddenly change*

*S8: Most of the time the teacher speaks English mainly, but sometimes students didn't understand. So we have to speak French a bit.*

*S9: Sometimes some students don't understand what the teacher says in English, it's a good point to explain in French sometimes.*

*S12: It's when we are debating with my friends. You need some French to continue.*

Nevertheless, S6 attributed the situation to the attachment to French in French culture:

*“I think in the French culture, people are really attached to their native language. They are a lot less interested in learning other languages.[...] Often you will hear people say that they don't need to learn English or other languages, because French is perfect. [...] They don't want to put effort in learning English because they are so attached to French.”*

S7 ascribed it to the fear of making mistakes: “it is a really good opportunity to participate, to have the right to make mistakes. Because I think most of French are really afraid to make mistakes.” S5 and S11 expressed the difficulty and weirdness of speaking English with French people:

*“it’s just because that’s my language I used to communicate with them (French). I can’t just suddenly change. it would be very unnatural to speak English with them.”; “At the beginning, it’s not easy to speak another language with others who speak French. It’s a bit weird at the beginning.”*

These students’ representation of French being used in English classes indicated that most of them are optimistic about this issue, for instance:

*“Actually, I understand why does the teacher use French, it is because our English is not so good.” (S1); “If you don’t speak English very well, it is reasonable to use French for better understanding.” (S2); “we have to speak French a bit.” (S8); “I think it’s normal. Because we are in France so we use French.” (S9); “It’s when we are debating with my friends. You need some French to continue. Just for some words, we ask the teacher for help in French, and then we continue to speak English” (S12).*

On the contrary, a few students believed that students should be forced to use English only:

*“I would really like to have an English class only in English.” (S1); “it is a really good opportunity to participate, to have the right to make mistakes.” (S7); “I think speaking and thinking in English is obviously beneficial.” (S10); “if you’re not forced to speak English, maybe we wouldn’t do it and it would be too bad” (S11).*

The interview discourse indicated that both teachers and students would use French during English classes, and English could not be used during class all the time. Most students expressed a preference for French being used occasionally during English classes to enhance understanding and efficient communication. This finding is consistent with the finding from Galali and Cinkara (2017), which revealed that participants had a slightly positive attitude towards the use of their first-language in the facilitation of their target-language learning. Students preferred their native languages not being banished from their English classes.

#### 4.2.6 Affective Attitude of English and English Classes

This section explored the affective attitude of English itself and their English classes. Attitude is traditionally divided into three various components: affective, cognitive and behavioural components (Fishbein & Ajzen, 1977). The affective component of attitude refers to emotions and drives engendered by the prospect of performing a behaviour (French et al., 2005). Question 9 investigated the affective component of attitude towards both English and English classes. Alternatively stated, whether these students like English and like English classes or not.

Almost all of these students expressed positive opinions towards English. S1 attributed his perceived liking or interest in English to its dominance in the world. He perceived English as the best tool for learning.

*[Do you like English? Why?]*

*S1: in order to get to know as many as subjects I can, English is the only measure to do so, because everything is written in English.*

S2, S8 and S9 ascribed their perceived liking or interests in English to the need for wider communication

*S2: Yes, I think English is very useful. If I travel to other countries, English is the only way to communicate with others who don't speak French.*

*S8: I think it's a huge connection between the word. Like we can talk to a lot of different people. We can connect with them. We can travel and work, especially in science nowadays.*

Despite a positive response to this question, which he attributed his perceived liking for English to both the dominance of English in science and the need for wider communication, S3 still expressed his low interest in language learning

*S3: Yes, I like to talk to people from other countries. Also, scientific articles are written in English. Other than that, a language is not really fun for me.*

Differently from the aforementioned students, S4 and S6 attributed their perceived interest in English to its simpleness in structure and its type of accent.

*S4: Yes. English is simple and short. I especially like the British accent.*

*S6: It's very easy language to learn. It's a good communication tool, I think.*

S5 and S7's cases indicated that their interests in English were derived directly from TV series or videos in English with the aim of learning different cultures.

*S5: I really like English. I think it's because I always learn English through watching series or videos stuff like that. It's more of learning about the world and hearing about other cultures.*

*S7: I like watching shows in English.*

S10 expressed a dual attitude towards English as well as his obligation of using English

*S10: I would say yes. I don't dislike it. [...] Anyway, we use it. I feel obligated to use it.*

S11 and S12's cases implied that their interests in English generally derived from the interest in learning foreign languages. S12's interview discourse also indicated his high self-efficacy and the intrinsic motivation of learning English

*S11: Yes, I did. I like languages in general. I also learned a German.*

*S12: I think I have good English and I'm kind of proud.[...] It's good to talk to people from other countries. It's cool.*

Question 9 also investigated learners' affective attitudes toward their English classes. Except for S5, S8, S9, S10 and S12, who expressed a dual attitude towards English classes, the rest of the students expressed favourable opinions about their English classes (7 students out of 12).

S5, S8, S9, S10 and S12 expressed a dual attitude and did not respond directly to this question.

*S5: I would say it's interesting, but boring at the same time(laugh).*

*S8: I don't know. It was always a fun class because it wasn't really that difficult for me. It was more like two hours where we were just talking English about interesting topics. So it's always a good lecture.*

*S9: This is a hard question.*

*S10: I don't know. There are many people in English classes. The English level of students is very different.*

*S12: I don't know. I like because there is a good atmosphere in English classes. It's cool for me, but not particular for the course, but for the atmosphere.*



S5 stated that he regarded English classes as both interesting and boring at the same time. He admitted that exercises followed after interesting topics during class are boring for him. S8 stated that English classes are fun and not difficult for him. He also revealed insufficient duration of English classes: “It's not enough to really learn the language by two hours per week.” He expressed the expectation of having some lectures in English given by science teachers. S9 admitted that English classes were both enjoyable and painful for him at the same time. He enjoyed it owing to the teacher, while he felt pain because he lost two hours not to learn anything. S10 and S12 expressed their indirect dislike and did not give the answer straightforwardly.

Seven students out of 12 responded positively concerning their English classes. A few students (S1, S4, S11, S12) attributed their enthusiasms for English classes to the relaxed atmosphere they perceived during class: for instance, “Compared to my other courses, English class can make me relax. I don't feel much pressure during class” (S1); “I find myself with no fear during class.”(S4); “I like because there is a good atmosphere in English classes” (S12).

S2 stated that English classes benefitted him with the opportunity to communicate in English. S3 expressed his satisfaction with accessing interesting videos and being able to work in teams during English classes.

*S2: I prefer this kind of class that we can really use English to communicate, instead of writing or watching videos.*

*S3: Yes, but for me, I like it because I can be with my friends and during the presentation we can work in a team. I also like watching interesting videos in my English class.*

S7 indicated that she enjoyed English classes very much for perceiving more joy than in other courses. She also implied the lack of motivation among students and the insufficient duration of English classes.

*S7: Yes, I do enjoy our English classes. [...] I think most of the students not really interested in English classes and they are not really presented, like physically and mentally. And I think there's not enough hours to take it really seriously and to make progress.*

S6 and S11 ascribed their perceived satisfaction to their English teachers who built and created appealing English classes.

*S6: I think it was the way the teacher built and organized, which is interesting and different from English classes I had in the past. [...] I think my teacher is the most enthusiastic and efficient teacher I have ever had.*

*S11: The teachers are always a bit fun and a bit relax teachers are always a bit fun and a bit relax than other teachers. And they creates very nice English classes. It's a class, for me, a little bit different from the others.*

The interview discourse implied that most of these students perceived English classes as positive, cool and interesting. Meanwhile, they felt relaxed and less anxious than in other courses. The analysis of the interview data also indicated an insufficient duration of English classes (two hours per week).

#### **4.2.7 Expectations for Scientific English Teaching**

Question 11 asked how these participants think teachers can improve scientific English teaching.

Most students (S2, S6, S8, S10, S12) expressed general satisfaction with the teacher and the teaching style. S8 stated that English teachers had done as best as they could.

*[How do you think teachers can improve scientific English teaching?]*

*S2: For this year, I'm quite satisfied with it.*

*S6: I think I'm fine with the way it is.*

*S8: That's a tough question. Because I think they're doing as better as they can.*

*S10: I don't know. Now I think the scientific English teaching is ok.*

*S12: I really don't know. Because it is good and interesting. The problem is to keep us motivated and it is not great.*

S1 and S9 expressed dissatisfaction with the outdated sources their teachers had been using. S1 also revealed that he perceived English classes as being not adapted to their needs and interests.

*S1: The kind of teaching we get is very outdated, which was from ten years ago.*

*Maybe teachers can try to understand what we do like, what we do need and what ways we prefer.[...] Teaching is supposed to adapt to students, but I feel like teachers don't bother with it. They just do what they have to do, that's it.*

S4 and S6 expressed a preference for English classes related to their fields rather than general science.

*S4: I would prefer the English class to be more related to our field, not only general science.*

*S6: I think it would be even more beneficial to talk about things that more related to our scientific field rather than general science.*

S5 implied the expectation of rearranging students by English level instead of random distribution. S7 stressed on the insufficient duration of English classes.

*S5: I think it would be better to make two classes based on English levels, not just in random distribution.*

*S7: I think two hours a week it's really really not enough.*

S8 and S12 revealed that he perceived the discontent teaching effect as relevant to students' lack of motivation and expected teachers to keep students motivated.

*S8: I think teachers are doing as better as they can. Because most of the time, it's just that people should find the motivation themselves to learn English, like outside of the class. Because they only speak English like two hours a week. It could be the best teacher in the world and they will still not learn English. So on the teacher part and I'm not sure they can do much more.*

*That's a genuine feeling in France. Most people don't realize that you will never really learn the language in school. It has to come from within you and something you want to do.*

*S12: The problem is to keep us motivated and it is not great.*

The interview discourse indicated that students are satisfied with teachers and ways of teaching. The data also demonstrated that learners expected English classes to be updated and adapted to their needs and interests. Most of them expected the duration of English classes to be extended instead of two hours per week. This finding is very much in line with typical institutional constraints concerning the lack of teaching hours (e.g. 24 hours per year), according to Sarré (2017).

#### 4.2.8 Language Use in Family

Question 11 asked whether these students spoke English with their family members or not. Respondents replied with surprising unanimity on whether they used English in the family.

*[Do you speak English in your family?]*

*S1: No. We don't speak English with family members.*

*S2: No, never. Sometimes with my friends, not in my family.*

*S3: No, never. They don't speak English at all.*

*S4: No, in my family, never.*

*S5: Not with my parents.*

*S9: No, never. They doesn't know how to speak English*

*S12: No, never.*

A few students stated that English was mostly involved when they watched TV series or contacted foreign friends.

*S7: I think my really big English time is when I'm watching series because I always put in in the original version even if it's not an English language.*

*S8: I still have contact with friends from European countries, so I speak English with them.*

*S11: I tried to subscribe on pen pal on websites. So I met a few English friends. I think it helped me improve my English.*

S10 underscored on English classes' being his only experience of using English: "No, I only do oral practices in English classes."

The interview data suggested that not all of the students used English with family members. It also indicated that these learners had limited use of English outside the classroom and oral communication in English mainly took place during their English classes.

#### 4.2.9 Learners' Former English Learning Experience

This section investigated whether learners' former English learning experience affected their English learning motivation/ effectiveness now. Half of the students answered this question in the affirmative (6 students out of 12). Almost the same number of students offered a negative reply to this question (5 students out of 12).

Six students stated that their former English learning experience influenced their learning motivation/effectiveness (S3, S4, S5, S6, S9, S11). S3 stated that he disliked his English classes in high school and he was only motivated to learn English after entering university. S4 also revealed his enhanced motivation after entering university.

*[Do you think your former English learning experience impacts your English learning motivation/effectiveness now?]*

*S3: It's only after I entered the university. when I need to read some scientific article, I start to understand the importance of English. I started to read and watch lots of things in English.*

*S4: Yes, each year I saw teachers, researchers come with a presentation to share their work in English, that pushes me to improve my English level.*

S5 and S9 stated that English learning in high school was basic and positive, which only played a limited part in their studies.

*S5: Yeah, I would say a little bit. [...] Mostly I learned English through other ways. In general, my high school English learning was positive and the teaching was good. We had good memories of English learning classes.*

*S9: I think just a little bit. Because when I was in primary school I learnt basic words.*

S6, who was from Morocco, revealed that she found her motivation in learning English highly relevant to the learning context in Morocco.

*S6: Yes, because my learning experience in Morocco is very encouraging of learning other languages. When I was little, I know learning English is important. It definitely impacted the way I learn English.*

S11 implied the substantial impact the teacher had on students' motivation.

*S11: I think it can have impact. I know a lot of people who are not motivated to learn English, or the teachers who didn't really motivate them.[...] But sometimes, for some students, who were absolutely not motivated, they need a very, very good and energetic teacher and then they become very motivated.*

Five students out of 12 perceived their motivation in learning English as irrelevant to their former English learning experience (S1, S2, S8, S10, S12). Their interview discourses indicated that they already possessed high motivation in learning English: “I think English lessons I had when I was little actually helped me and opened the gateway to enlightenment.”(S1); “I’m always motivated to learn English. It would be always useful for my career later on.” (S8); “I think I’m motivated to learn English but it has no relation with English classes. I want to watch English videos because the subtitles. I want to understand everything.” (S10); “It’s only after my experience of internship and travelling that I start to think I have to learn English well” (S2). S7 did not respond straightforwardly to this question. However, her interview discourse indicated that she felt obliged to learn and use English in her former learning experience. She also acknowledged the importance of English, but she stated that she was surprised about the fact that even PhD students in French higher education were not trained to be international.

*S7: It wasn't like really interesting for me because I don't learn a lot of things in English classes.[...] French and Chinese are really difficult language and English is quite, quite simple. I don't speak perfect English. But we have to speak in English and it's really important.*

*An interesting thing is that in France when you do a PhD, you didn't have to write it in English. You have to write it in French and I found it's really surprising because you always read things in the English. But your and I found it's really surprising because you always read things in the English. But your PhD is not like international. If there's like an American who wants to know what you do. And he sees your PhD paper. He gets interested but it's in French and I think it's really not good.*

The interview discourse suggested that students’ former English learning experience affected their learning motivation/effectiveness now. Either very encouraging English learning context or very energetic teachers engaged in students’ former learning experience would affect learners’ motivation later on. For those who had already possessed high motivation in English, the former learning experience could hardly be an impact.

#### 4.2.10 Learners' Learning Context and the Cultural Impact

The section investigated the English learning context in learners' own countries and whether their culture affected their English learning motivation. Before presenting the results, it is vital to recall these participants' profiles presented in the former chapter. Except for S4, S5, S6, who were from Algeria, Luxembourg, and Morocco, the rest of the students were all from France.

Regarding the learning context in France, except for S2 and S12, the rest of them all expressed a negative attitude towards this question (S1, S3, S7, S8, S9, S10, S11). S2 and S12 responded positively by comparing the past and present learning contexts, indicating easier accessibility to language sources and more diversified language courses.

S1, S10 and S11 indicated their overtly unfavourable attitudes toward the English learning context in France and direct discontent with the education system.

*[What is the English learning context in your own country?]*

*S1: I think the English learning context here is terrible. [...] I do think public school system is to blame here.*

*S10: It is seen as pretty bad. Yeah, the English level of the French population is pretty bad. So (the context is) not good.*

*S11: I feel that it's not always good teaching in France.*

Most students indicated an extremely low motivation and a lack of interest in English classes among students.

*S7: I think there's a lot of students who doesn't care. [...] They're not motivated at all. [...] And I think they (teachers) make these rules to push the students to go to their English classes.*

*S8: I think students believe they are motivated to learn English, but they are not really. They complain about the fact that the teacher is bad or they can not speak English. But they know the solution to forward and they just don't do it.*

*S9: On average, I think they are not interested because for us it's losing time.*

*S10: Because people aren't paying attention in classes like you're mainly in high school. People are not interested with English classes so it's hard to be improved.*

A few students (S7, S10, S11) stated that they perceived teachers relevant to the present learning context. S11 even claimed that not all teachers can speak proper English.

*S7: There are two kinds of teachers. Most of the time the person really wants students to learn something and the person always want to share interesting subjects, to share interesting information, to keep the attention of the students. There is also one kind of teacher like he doesn't care if you go to school or if you pass all the hours on your cell phone.*

*S10: I think it's a bit of a combination of both bad teachers and and no motivation to learn English.*

*S11: In France, not all teachers speak English very well.*

S4, S5 and S6 were from Algeria, Luxembourg, and Morocco. S4 made a comparison of the English learning context between Algeria and France. He illustrated that he perceived Algerian students as being less motivated than French students. He also indicated a lower knowledge level in Algeria than that of France due to high dropout rates.

*S4: In Algeria, most of the people in my nation understand the importance of learning English. I would say twenty or thirty percent of students are passionate to learn English, which I think they are less motivated than French students. Frankly, the knowledge level there is lower than that of France. Because most students will not finish their studies, instead they find a job, that's the big problem. It is also the reason that pushes me to study in France (laugh).*

S5 expressed favourable opinion about English learning in Luxembourg, indicating a very encouraging English learning context in Luxembourg.

*S5: I think Luxembourger are quite passionate to learn English, because other than Luxembourgish, they know they have to learn French and German and eventually English. It's just natural and normal for them to learn another language.*

She attributed the favourable English learning context to the high presence of English in daily life and the high mobility of Luxembourger.

*S5: Lots of international companies and European organizations in Luxembourg use English. Normally you will hear lots of English speakers on buses and public transportations. Since it's so international, people view English as a vital communication tool that we should learn. [...] people in Luxembourg will usually study not in Luxembourg, but in other neighbouring countries. They know they will have to go to a country where they will have to speak another language.*



Likewise, S6's interview discourse also suggested a high presence of English and multilingualism in Morocco.

*S6: When you grow up in Morocco, English is very presented. You are surrounded by an international context and the environment you grown up is always encouraging you to learn other languages and specifically English.[...] It's in TV or in general you see a lot of things written in English around you. It's not a direct message like nobody ever told me that you have to learn English, but it's just there. So, you grown up with English as a third language.*

She overtly attributed her English learning motivation to the encouraging learning context in Morocco.

*S6: During my childhood, I was surrounded by English and I became more and more interested in English. So, I start to watch English TV shows. It's also very easy to find ways to learn English. Yeah, I think it definitely has something to do with open-mindedness and encouraging you to learn other languages.*

Notably, S5 and S6, who were from Luxembourg, and Morocco, had a general superior English proficiency in oral communication than other students.

The analysis of the interview data indicated that many students perceived negative attitudes toward English learning context in France. Students were not motivated and generally less interested in English classes. The data also clearly demonstrated that some students perceived the learning context as being highly relevant to their motivation in English.

Question 13 also investigated the cultural impact on English learning motivation. Most students perceived the culture as being relevant to the learning context and their motivation in learning English (9 students out of 12).

Most students (S2, S3, S6, S7, S8 S11, S12) revealed that they found the discouraging English learning context as being relevant to the proudness over culture in France and the strong willingness of conserving French culture.

*[Do you think your own culture impacts your English learning motivation/effectiveness now?]*

*S2: French culture is very important for us. French are really proud of our culture. We love our language and we don't want to speak in other languages.*

*S3: In French culture, we don't encourage English learning.*

*S6: I like the education here in France. But I think the French educational system doesn't encourage people enough to learn other languages.*

*S7: I think the French wants to conserve his history and don't want to speak a lot of English because he scared about his history and his culture go away.*

*S8: I will tell you like it's maybe not noticeable, like they don't realize it, but it impacts us.[...] In France, we are so worried about the preservation of the language. So we have to translate everything.*

*S12: Because French people are kind of proud to be French. Maybe not(influenced) in universities but in high schools.*

Some students (S1, S3, S5, S7, S8, S11) also attributed the situation to the very limited exposure to English in France.

*S1: Honestly, I think what we have learned related to English are mostly translated from English.*

*S3: In fact, in France, we see everything in French words.*

*S5: Yeah, I think if I had grown up in France, I wouldn't have learned English as well as I did in Luxembourg apparently. Because while I am staying here, it's just French. Everything is in French. In Luxembourg, there are so many languages that you hear all the time. You can easily watch movies or TV shows in English.*

*S7: Yeah, I think so. Because in France we couldn't see a lot of films in English in the cinemas. There's a lot of things were translated in French. In the TVs, the same. And there's other things which are translated in daily life.*

*S8: For example, in countries like Sweden and stuff like that, they have cartoons for children in English. They don't translate it.*

*S11: Countries like India for example, where there is a big part of the population who speaks English, so it's good that you have more hours in English teaching.*

Only S9 and S10 perceived motivation in learning scientific English as irrelevant to French culture or the learning context. In contrast, they believe motivation is somewhat related to personal goals and students' attitudes towards scientific English classes.

According to Ushioda (2015), contexts have traditionally been referred to fairly generic terms, such as cultural or linguistic setting, type of learning environment (e.g. formal versus informal, home versus study abroad), or input and instructional conditions (e.g. focus-on-form, task-based learning). Learners are placed "in" some certain kind of context, which has positive or negative impact on learners. In this conventional view, learners and contexts are viewed in isolation, with the latter impacting the former one normally (Ushioda, 2015).

The analysis of the interview data demonstrated that the pride over French culture and the solid willingness to conserve French culture are part of the reason regarding the discouraging English learning context in France. The data also indicated a minimal exposure to English in France. This finding could be interpreted within the framework of CDST proposed by Ushioda (2015) (see Chapter 2), which is a scientific paradigm that has developed in the natural and social sciences during the past several decades and that views diverse phenomena—including, for example, the weather, the brain, ecosystems, the economy, locomotion, language, programmes, families, education, culture, personality, emotion, cognition, motivation, development—as complex dynamic systems: networks of interdependent elements whose continuous, iterative, interaction give rise to the system's behaviour (Bar-Yam, 2019).

### **Global Synthesis of Interviews**

The interview with students revealed the status of their English learning and teaching, as well as their attitudes and motivation in learning English.

As we have developed in Chapter 2 concerning CDST, diverse phenomena shaped complex dynamic systems, in which the continuous, iterative, interaction interdependent elements can give rise to the system's behaviour. Moreover, as indicated in the Douglas Fir Group's transdisciplinary framework for SLA in a multilingual world (see Chapter 2), L2 learning is regarded as an ongoing process that begins at the micro level of social activity (the smallest concentric circle), together with meso contexts of sociocultural institutions and communities and the macro level of ideological structures. Therefore, students' attitudes, motivation, and

behaviours can be influenced by their past English learning experiences, language use within their families, and by the learning context at the macro level, as identified by the Douglas Fir Group in France. Overall, the results of our interviews indicate a complex interaction between students, families, culture, emotion, and motivation, which highlights the intricate nature of language learning and teaching.

Firstly, both students and teachers had an unclear representation of scientific English. In general, students perceived their English classes as being related to science, but not related to their scientific course. Specifically, students perceived what they received from English classes as “general science” or “general knowledge”.

Secondly, regarding the representation of the content, English classes focused mostly on oral practice, which included discussions, role-playing, debates, viewing films, reading articles, and other activities. This was in line with the goal of the instructional programme, which called for a foundation in oral expression. Throughout the teaching process, tools like computers, audio, video, texts, and scientific papers were used. The Moodle platform was crucial in effectively providing information to students. Several methods of evaluation were used depending on the educational programme, which leaned more towards scientific subjects. Regarding the language use in English classes, however, English was not used consistently in class, and students preferred occasional use of French to enhance their understanding and communication.

Thirdly, with regards to the affective attitude towards English classes, students perceive them positively, finding them "cool" and appealing. Additionally, they feel more relaxed and less anxious in English classes compared to their other courses. Students express satisfaction with their teachers and teaching methods. They expect English classes to be updated and tailored to their individual needs and interests. Furthermore, the majority of students wish for English classes to be extended beyond the current two-hour weekly sessions.

Fourthly, regarding the learning context and motivation in learning English, many students have expressed negative attitudes towards English learning context in France. As a result, students often lack motivation and interest in their English classes. Additionally, the study demonstrated that the learning context is closely linked to students' motivation in English. This is partly due to the pride that students have in French culture and their strong desire to preserve it, which contributes to a discouraging English learning context in France. The data also showed that there is minimal exposure to English in France.

Students' former English learning experience also affected their learning motivation/effectiveness now. Either very encouraging English learning context or very energetic teachers engaged in learners' former learning experience would affect learners' motivation later on. For those who had already possessed high motivation in English, the former learning experience could hardly be an impact.

Finally, regarding the impact of English classes on their professional career paths and scientific thinking, most students hold a positive attitude. Although they recognize the difference between French and Anglophone thinking, they do not perceive English classes as being relevant to this difference in scientific thinking.

### 4.3 Language Teacher Interview Results

There were 7 language teacher participants in the interviews. Language teacher interviews comprised 19 questions. The aim of language teacher interviews was:

- a) to explore the teaching practice(content, activity, tool) in the University Paul Sabatier and the teacher training;
- b) to identify difficulties in teaching practices and the collaboration with science teachers;
- c) to determine what representations language teachers hold about scientific English.

Before reporting the results, it seems necessary to recall the teachers' profiles presented in Chapter 3.

Table 7 – Teachers from the Language Department (UPS)

	Country of birth:	English teaching experience at university	English teaching experience for students in science field	Other than France, have you been teaching in other countries?
Teacher 1	Ivory Coast	5 years	5 years	Japan, German, Costa Rica USA
Teacher 2	France	25 years	15 years	Aikido in UK
Teacher 3	France	16 years	16 years	1year teaching French in England
Teacher 4	France	20 years	20 years	no
Teacher 5	France	16 years	16 years	1year teaching French in UK
Teacher 6	The United Kingdom	13 years	13 years	Few months in India
Teacher 7	France	19 years	18 years	Scientific university in Laos Teaching French in England

### 4.3.1 Teaching Practice and the Relation to Science

The first aspect being examined was the English teaching practice in University Paul Sabatier. Teachers were asked to recall one specific class and describe how they had arranged that class. The results obtained from this question indicated that English teaching at University Paul Sabatier was based on oral communication, which was very much in line with the results obtained from the learner interviews. The whole session lasted for twelve weeks, two hours per week, in which three weeks were dedicated to the evaluation.

*T1: So, the idea was that they speak with as many people as possible within 30 minutes time frame.*

*T5: Each time, they were working on their summary and on their presentations, and on reading article. [...] At the stage, the major issues were oral expression more than technical vocabulary or the structure we studied together.*

*T7: I try to always start with a video document, so in that case it would have been a news bulletin on the discovery of the detection of gravitational waves which scientists had been after for quite some time. The idea was to try through either an article or a more specific documents made by physicists not journalists to understand what gravitational waves are, etc.*

All of teacher participants stated that the aim was to engage students in oral communication as much as possible.

*T2: My purpose is always to get my students speaking as much as they can like 50 percent of the time. [...] I always start my classes with my students speaking, they have to give a presentation using computer or not. It is on voluntary basis, five minutes or ten minutes. They lead a comparison or a debate among students for half of the class. I follow up on their mistakes. Then maybe fifteen minutes written exercises. Then I play a video which we comment on. Basically, this is the basic pattern of my classes.*

Moreover, Teacher 1, Teacher 2 and Teacher 6 revealed that they found students were very shy about their accents and mistakes that they can make, which was consistent with the results obtained from learners' interviews. Hence, it was of paramount importance to minimise the fear of making mistakes and relieve tension and stress during English classes, to establish an emotionally secure environment.

*T1: I told them it's very important that they feel comfortable speaking in class, because for people in general and for French in particular, they're very shy about their accents or mistakes that they can make. So, I try to really minimize*

*the impact that their language mistakes can have so that they feel comfortable practicing.*

*T2: I found that in this country students write too much. They are very shy. I organize my class around this idea.*

*T6: Once I made it perfectly clear that I'm not here to break them down but rather to help them, suddenly the tense goes, they smiling and interacting, life is a lot easier.*

Teacher 1 and Teacher 6 stated that they paid attention to such an emotionally secure environment at the first class by making it clear that teachers were there to help and English classes were mainly for practicing and interaction.

*T1: I told them it's only for practicing so that they can learn. Then I presented the syllabus.*

*T6: Basically, in the first class, I will break in the eyes, put them at ease. They would have two hours of class that they would speak in English for forty minutes, pretty much. So, they would understand the nature of the class, which is interaction, interaction, interaction.*

It appeared that teachers adopted varieties of tools for English classes, including emails, mobile phone applications, the Moodle platform, google drive, scientific articles, audios and videos. Using these online tools helps develop a greater sense of community (Faizi, 2018) Thus collaborative learning is greatly impelled rather than individual learning. The frequent recourse to group work enhances students' motivation, self-confidence, self-esteem and success (Hillyard et al., 2010).

*T1: Since the COVID-19, I have been using Moodle more because I have to teach online. [...] We have this contact at least once a week. I like them to have these documents that we use. [...] I think it's important to do it frequently.*

*T3: I think I was the first one in the language department to use Moodle. In 2005, very early I started to use Moodle and I started having my students registered and subscribed to my courses. I used the forum a lot to give them information. [...] That's why the lockdown and distance teaching really was not a problem for me at all during the last two months.*

*T4: For L1 and L3 students I do use Moodle, but for master students I don't use it(Moodle). I use the email if I have to but very rarely. Sometimes students ask me questions and I reply them.*

*T7: I give them a lot of documents on the Moodle platform. So, they regularly have to log on to Moodle to sometimes watch documents in advance before the class, sometimes they have to refer to documents such as chapters from some*



*books that they have to study for an exam. I also use Moodle forum to give them information about the course or assessment etc.*

Teacher 3 indicated his experience of using a mobile phone application that provided videos in English. Teacher 6 described his follow-up instructions via the Moodle platform, google drive and emails, indicating his strong correlation with students.

*T3: the last two years, they have been using gymglish (<https://www.gymglish.com/en>), a company which provides videos about English. When they complete the session for the day, they receive the correction about what they have done. It tends to be more effective. So, I combined all these elements and I give them marks of course. [...] Quite a lot of them enjoy gymglish system.*

*T6: What I do in preparation is that I will keep everything online, all the content on the Moodle. I tend to use google drive. I can work on it in a train. I can be a lot more efficient using it. [...] I contact students weekly and I give them stuff to do, mostly reminding, mostly asking questions, mostly set up work to do.*

Results from students' interviews indicated an insufficient duration of English classes, which confirmed the interview with Teacher 2 that students only had "nine opportunities (for them) to enrich their English". Two hours per week seemed to be no longer adequate for students' needs, and teachers seemed to have strived to complement the insufficient hours of English learning.

*T1: In France, we have two consecutive hours per week. For me, that is a little too decremental to learning a language. For my teaching in the US, teaching French as a foreign language in US, I found that it was a lot more effective in terms of requiring language skills to have fifty-minute class four times a week, or fifty-minute class three times a week would be great. I don't think it is good for learning a language in one chunk.*

*T2: We have twelve classes and three classes for exams. So, it means there were nine opportunities for them to enrich their English. [...] there are too few hours(in the University of Paul Sabatier). English should be more important. There are so many constraints and too many lessons a day.*

*T3: They only have 24 hours per semester, so, that's far from enough.*

*T7: There are two main problems in English learning at French universities. One is not enough time, 24 hours per term is not nearly enough.*

Regarding the content, Teacher 2 and Teacher 4 accentuated that they did not have the choice of what to be taught and what field of science they had to teach. Despite the given guidelines, teachers endeavoured to interest students with numerous topics. Teacher 4 stressed on the challenge to interest students that were all mingled together. This finding also echoed the results from students' interviews, where students expressed their expectations of rearranging groups instead of random distribution. These results also confirmed the institutional constraints of the large number of students per group (20–28) in English classes proposed by Chaplier (2019).

*T2: For example, for third year biology students, what I taught were mostly what the head department gave me.*

*T4: First of all, we don't really have the choice of what field of science we want to teach, we get what we get.[...] The challenge was to find topics or subjects that would interest all the students, because they were all mingled together to start with. I wanted math students to be interested in chemistry topics. That was the challenge.*

Apparently, teachers had their own teaching patterns with similar activities for students, including displaying videos, debating, cooperative group work, pair work, listening, general understanding, writing and so on. Teachers tried to adapt their teaching to students' needs and interests, for example, preparing for a job interview and mastering IMRAD structure for presenting scientific achievements, as indicated from teachers' interviews.

*T5: During the whole session, the first thing we do, for the technical part, is that we study some methodology basically the IMRAD structure, how is the article made, how is it written. [...] So, I made groups and I asked each group to pick one article. Then they had to check in their article if they managed to find the different parts, the methodology, the IMRAD structure that we worked on in the article. Then they had to try and get the main ideas basically, and they started to work on their slides so they prepare their presentation.*

*T6: I do as many interaction activities as possible. I try to balance the content with the skills. [...]* We have to think about what motivates the kids, we want them to be motivated, we don't want them to be in class half in coma, which is often the case.

Afterwards, when asked whether there were scientific contents integrated into the lesson or not, Teacher 2 acknowledged fifty percent of his lessons as being scientific content. Students were asked to give science related presentation about a topic in their fields. Teacher 3 stated that he involved vocabularies and he tried to use documents, videos and texts related to topics students

were dealing with. Also according to answers to the question before, all of teacher participants regarded their lessons as being science related.

*T2: Yes, fifty percent is scientific mainly. I told them that they have to give science related presentations. They have to speak about their field, about a topic in their field.*

*T3: Vocabulary, I'm not sure it's scientific. But I try to use documents, videos and texts related to topics they are dealing with. I also involve an amount of technical vocabularies.*

For Teacher 1, scientific content could not necessarily be related to doing experiments or being in the laboratory, but could be about the “bigger problem”. Here Teacher 1 refers to the topic like earth carry capacity for students majoring in biology organisms, species and populations. She also focused on the role of soft skills. This is very much in line with the interview with Teacher 6, who indicated that soft skill module could be the content that meets with science students’ needs. As indicated from Teacher 5 earlier, who is an associate professor, mastering IMRAD structure was also an important skill for science students, which was essential for them to present scientific achievements.

*T1: In the second semester of the third year, the whole theme is around the earth carrying capacity. [...] As for scientific content, it doesn't have anything to do with being in the laboratory or doing experiments or anything like that, but it's taking a step back about the bigger problem.*

*[...] I think what's most important is not necessarily scientific skills but skills that are outside it, soft skills. I think it's important that they learn how to present themselves and that they get the sense of how to go about in the working world. I think that's more important than the scientific content because they get the scientific content from their other fields of study.*

*T6: How basically English teachers can give is by producing the soft skills, the soft skills module. It's wonderful and students did learn things. It's more kind of business management style teaching than specific language-based teaching. That's what those students need more than anything else. The question is needs based.*

According to Teacher 6, the role of English teachers is so limited that sometimes a certain level of students took on the scientific content for the teacher. This was well covered in the interviews of learners, in which students stated that sometimes they taught their teachers about the scientific topics.

*T6: Basically, once you get to a level of certain students, they take on the scientific content for you. [...] Obviously, these kids need experts in their fields. So, our role is limited in many many ways. [...] Yes, specifically, certain kids going to certain research projects needs specialized language teaching, once they are here in certain level, they would learn these things by themselves.*

In this regard, teachers were asked how they accessed to scientific content while they were not specialists in science. All teacher participants replied with surprising unanimity on accessing to scientific content: they explored the scientific content on their own terms.

It appeared that most teachers either read or browsed on the internet, searching for scientific articles or videos by themselves (Teacher 1, Teacher 2, Teacher 4, Teacher 6 and Teacher 7). Another way of accessing to scientific content, as indicated by Teacher 5, was from the science coordinator, who usually provided them with some research articles or scientific articles in their fields and attended disciplinary board. Teachers 4 indicated that they worked in teams and shared resources.

*[How did you get access to scientific content while you are not a specialist in science?]*

*T1: For written content, I just look at the publications that I know students are using. I go and look at Nature, pick articles both like general science and more specific to their fields. Another thing that I found is useful is the YouTube channel for pronunciations. [...] I've also subscribed to their general page on Moodle, sometimes there are announcements from other teachers about things they have to read and conferences that they have to attend. I click and see what's happening. That's how I found a video that has been used by scientific teachers.*

*T2: Well, I read a lot and I browse a lot. I ask my colleagues and I always try to keep up to date with latest scientific breakthroughs in the fields I am teaching.*

*T4: I read articles. [...] I subscribed personally to a few resources and I share it with other teachers as well, especially for the year L1. I also share with another teacher; [...] I try to find as much as I can.*

*T5: I asked the science coordinator. Usually the science coordinator provides me with some research articles or scientific articles in their field and attends disciplinary board. Yeah, that's mostly what they do. They also invite me for the inception meeting in September and some fully integrated in their team.*

*T6: I found a couple of wonderful websites. I spent a lot of time on it. I cannot say I understand everything, but I'm sorting out.*

*T7: This is what I'm always looking for. Probably the longest time I spent preparing those classes is researching documents. It was a lot more difficult to find documents when there was no internet. [...] There is a lot to learn.*

Three teachers out of seven (Teacher 2, Teacher 3 and Teacher 6) highlighted English classes' being "general". Teacher 2 also expressed his expectation of learning from students about the scientific domains. The teachers in general felt that they did not have to be experts in students' fields. This finding echoes with the constraint of not having "disciplinary dialogue" between LANSAD and science associate professors /professors within university courses (Chaplier (2017). Instead, English teachers could teach science students from "the humanity perspective", meaning the history of the specific discipline and its impact on society. Teacher interview discourse further confirmed the framework of "common knowledge" proposed by Chaplier (2017), which is to elaborate an English teaching-learning device in the spirit of linguistic, cultural and social mediation with students and also science teachers, by integrating scientific culture through the so-called "human" disciplines. For instance, philosophy history and sociology of science in a teaching perspective (see Chapter 2).

*T2: I told students I'm not going to teach their fields in English. That's not my job. My job is just to get them speaking basically in their field. I want them to teach me something.*

*T3: I've been keen on computer science for quite a while now. [...] I can't tell them anything about real mathematics, but I can talk about the impact of math on society, [...] I feel that I don't need to be good at math to do that and that's something they usually don't have in other classes. [...] I try to give them another perspective, the humanity perspective.*

*T6: To begin with, I kept it in general at first.*

The teachers in general felt that exploring scientific content was time-consuming. They had spent abundance of time searching for interesting documents that were scientific enough to be challenging for students but not too difficult either. It seemed that the teachers had been struggling by themselves at the beginning and did not get much help.

### 4.3.2 Teacher Training

It is noted that Teacher 4 and Teacher 5 are associate professors, while other teachers are lecturers (PRAG, PRCE). However, all teacher participants said that they had not been trained regarding teaching English for students in science field. Teachers in general stated that they had expected opportunities of specific training before. However, this kind of specific support and training seemed to be absent from the teachers' interviews.

*[Have you received any training in teaching English for students in science field?]*

*T1: No, not for training. [...] I remember there were a couple of conferences that were organized here on campus at Paul Sabatier, so I went to one of those.*

*T2: No, I could have if I had time opportunity.*

*T3: I wish I had an opportunity before, but now I feel like I'm too old. I'm stuck with the way I do things using Moodle or things like that.*

*T4: No, not at all. I'm not really expecting training. [...] I read a lot and try to be updated with my knowledge.*

*T5: No, there is no specific training. I used to expect training, but not now.*

*T6: No. never. I would like some specific training definitely.*

*T7: Not specifically, no. It seems natural for me to be doing my own research in teaching.*

Teacher 1 mentioned that there were conferences for teachers and she had attended one of those conferences. Teacher 3 also confirmed that there were numerous exchanges in seminars or some national associations for language teachers, instead of formal training.

*T1: No, not for training. We definitely have conferences that we can attend on optional basis if you want. As a teacher you can go to these conferences and sometimes the department will have the money in the budget to be able to help with the fees that are involved. Conferences were organized by different organizations. Some of my colleagues have gone to. I remember there were a couple of conferences that were organized here on campus at Paul Sabatier, so I went to one of those.*

Some teachers attributed the absence of training to the time constraints and a high workload in the language department. Teacher 6 stated that they need training but they simply did not have time to do it.

*T3: I wish I had an opportunity before, but now I feel like I'm too old. I'm stuck with the way I do things using Moodle or things like that. That's acceptable because there is a national association for language teachers. I represent the department there and I'm in contact with them for ten or twelve years with a lot of teachers from a lot of universities in France. I read some articles, I even committed to one for myself. There's a lot of exchanges, even they are informal. We talk when we need to. I don't know if I would attend a formal training. There is a seminar for exchanging how to use new technologies, I have been attending this seminar for twelve years.*

*T4: I'm not really expecting training because in my research lab, I read a bit about teaching students with specific needs, not only science but also people with disabilities, that kind of things. I read a lot and try to be updated with my knowledge.*

*T6: I would like some specific training definitely. But above all, I would like to have time to do specific training. It would be nice to have time to do it. The university terms are so condensed, my work is so intensive for thirteen-week period. [...] So, it's a tricky situation, we need training. But there simply are not hours in the week to do it.*

Teacher 5 described the dilemma of facing students with specific needs while they were only teachers who were good at general English instead of scientific English or any specific English at the very beginning. Cargill et al. (2018) reported the difficulty of marking science students' drafts of discipline-specific article introduction sections, due to their own lack of content knowledge.

*T5: I used to expect training, but not now. Basically, it's a type of audience you are not used to. [...] What I was good at was general English not scientific English or any specific English. Obviously after nine years in a computing department, I became pretty good at computing English.*

Teachers in general felt that after years of teaching in some specific domains, they were eventually comfortable teaching students in various science fields and capable of meeting students' needs: "I can say I'm pretty comfortable with electronics, mechanics, computing, that kind of area." They tried to be updated with their knowledge through massive reading. It seemed natural for them to conduct their own researches in teaching. This way of teaching English for scientific students just confirms what Chaplier (2017) claims, there is a lack of "disciplinary dialogue" or cooperation between LANSAD and science associate professors / professors within university courses, due to the lack of a common knowledge basis.

*T5: Also I taught in the electrical engineering department, I can say I'm pretty comfortable with electronics, mechanics, computing, that kind of area. That's why I naturally decide to teach computing and electronic classes after I got the position in the language department.*

*T7: It seems natural for me to be doing my own research in teaching. At the beginning, L3 physics was only part of my teaching, I was also teaching levels of first year and second year students, also some master students. There were a lot of different courses that have already been built and devised. I must say the fact that I had been part of a team of English teachers back in Laos working on the curriculum of English for science was a great help. I wasn't feeling lost at all because I already had that experience and clear idea of what my students should be able to do.*

However, when asked directly whether they expect specific training right now, most teachers responded with a negative answer. Teacher 1 directly denied the possibility of having this kind of specific training and expressed a preference for cooperating more with science teachers.

*T1: I don't expect it, because I know it hasn't been happening. I do think if I really want more guidelines, I could attend the conferences by different institutions and organizations that I told you about earlier. I think what I am keener on would be exchanges with scientific teachers about what they do and how we can cooperate together. That's happening in some cases. Like the Master's degree for instance, I am sure I could do more of interactions with them.*

In summary, despite the fact that there were opportunities for teachers to exchange in conferences, seminars or some national associations, the specific training for teaching students in science fields seemed to be absent. Teachers admitted that they needed training and they had expected training at the beginning of their careers. Nevertheless, due to the lack of opportunity, time constraints and a high workload, it seemed natural for teachers in the language department to seek the growth path of specialization on their own terms.



### 4.3.3 Cooperation with Science Teachers

Two teachers out of seven (Teacher 3 and Teacher 4) stated that there was no cooperation with science teachers. Teacher 4 stated that she tried to get some knowledge by her own and adapt the English teaching to the field students were working on.

*T3: At university, no.*

*T4: No, we are quite independent for the evaluation. I try to get some knowledge about students' scientific programmes in other courses. [...] English is kind of integrated, I can't cover the whole scientific programme. If I've got the programme I'm interested in, it's very easy to find out what they teach, so I try to adapt to the field they are working on.*

According to most language teachers, there were mainly two types of collaboration with science teachers. For Teacher 1 and Teacher 7, the collaboration mainly took place at the evaluation stage. Teacher 1 stated that she had worked with the coordinators to determine the documents used in the evaluation and she had prepared students for the oral presentation during English classes. She was also invited to the meetings with the panel before the evaluation.

*T1: The Master's degree yes. So, this is a second-year Master's degree, first semester. I have to give them a written exam and that written exam could be on various topics throughout the year at the different options. One of them is writing an abstract. To pick the article that I'm going to give the students, I usually contact the coordinators of the Master's degree and I give them two or three articles that I found, and I asked them if it does correspond to what they're doing in class and to make sure that it's something that students can understand and cumulate to. That's the most specific I can say.*

*I also prepare students for the oral presentation that they have to give in front of the whole panel. To prepare students for that, I give them the chance to give a short version in class. So, I coordinate in that we have the meeting together when the exam takes place with the panel. I can hear their perspectives, but I don't have the scientific content to understand everything that's going on.*

This was also covered in the interview with Teacher 7, who stated that she had been invited to assess the language in students' oral presentations while science teachers assessed what progress students had made in science.

However, both of them admitted that their understanding during the collaboration could be very limited due to the lack of scientific knowledge.

*T7: There are different types of collaboration with scientists. When students give an oral presentation, and I was presented for the assessment of the language and they assess what progresses students have made in science. Students would report on their internship, sometimes on projects. We do that in L3 but we also do that in master's level a lot. That was another way of collaboration which is quite interesting as well. But I must admit that most of the time, the understanding of the projects students have been working on or the internship they did especially in a research lab and they did some research on a very specific point, it was something that I cannot grasp, I do not have the scientific knowledge.*

Teacher 7 also shared the experience of an efficient collaboration, in which she worked with the science teacher together in practical projects and they both interacted with students. As indicated by Teacher 7, it was an opportunity for students to use English in a scientific context. She considered this kind of collaboration a very successful one.

*T7: A few years back, I had a very nice experience with one teacher in L3 physics who worked in thermodynamics. He decided to make it possible for volunteer students to do practical projects. So, he asked me to come and make sure the English teacher to correct grammar, etc. That was fantastic experience because not only did I learn a lot about thermodynamics, but also because he chose the practical projects in which there was a lot of communication between the lecturer and the students. [...] That was fantastic because I learnt a lot and for the students, it was an opportunity to use English in a scientific context, which there is a real objective for them to find out how it works, etc. That was great. I would have loved to continue this collaboration, but unfortunately the reduction of finance made it impossible to continue that experiment. That was really one of my best times I had back.*

Another collaboration mainly took place in the meeting with the science coordinator at the beginning of the academic year in September. For Teacher 2, Teacher 5 and Teacher 6, they discussed the objectives of the class as well as the expectations from both language and science teachers. The science coordinator also shared documents and scientific articles with language teachers. Cadman (2017) proposes to create “a dialogic classroom environment”. As she states, the aim is not to imprint or demand adherence to its assumptions and its logic, but rather to learn more about how mutually acceptable social research may be conceptualised and practically carried out in their learner-researchers’ own contexts.

*T2: Oh yes, we share ideas. They give me documents, they come to my classes to listen to presentations. We republish articles together; we share to students what my scientific colleagues do We work on the same articles sometimes. Each year at the beginning of the academic year, in September, we often have a crash course together for half of the day or two hours in biology.*

*T5: Yes, now I've been working with the same people for several years, I don't need them every single year. But at the beginning, that's what I did. Every time I take a new class, I go and meet the science coordinator and we have a chat for one hour or two. We talk about the objectives of the class, his or her expectations, my expectations and we see what we can co-build basically together. So, we co-design the curriculum based on what I think or he or she thinks is important for students so that basically we both agree on the content.*

*T6: I think it's good to have a nice relationship with coordinator in math. I'll ask them do you need anything, do you expect anything specifically? But generally, the students go back and are happy about the English class. That's when we lost contact and they know students are happy.*

In summary, as pointed out by language teachers, the collaboration usually took place with the science coordinator, whom they discussed and determined the teaching content and objectives with at the beginning of the academic year in September. The science coordinator also shared teaching materials like scientific articles with language teachers. At the evaluation stage, language teachers were invited to assess students' language competence. However, the collaboration seemed to have taken place often with the new teacher. It seemed to be noncontinuous.

#### 4.3.4 Difficulties

When asked about the difficulties in teaching English for scientific students, only two teachers (Teacher 4 and Teacher 6) out of seven said they did not encounter many challenges. According to Teacher 4, having had decades of teaching experience seemed to get problems solved.

*[Did you encounter any difficulties during teaching English for scientific students?]*

*T4: Not really, because I had been a teacher for 20 years, I had some teaching practice. When teaching students with specific needs, so I have to adapt myself to any kind of students.*

*T6: No, never any problem with students (laugh).*

##### 4.3.4.1. Difficulties in Attitudes

Teacher 2 expressed his strong discontent with students' laziness or "couldn't care less" attitude, indicating that students were not very motivated.

*T2: There is something I hate. Maybe you notice that people are late on this campus. My class usually starts at a quarter to eight, they came at eight or half past eight. I hate that. The laziness or "couldn't care less" attitude, that's the difficulty. The university education is very very cheap, their "couldn't care less" attitude is not a good point to me. I see that they are not very motivated. But It's not high school any more. They choose to be here.*

Teacher1 and Teacher 3 found that dealing with students with different personalities and various personal situations was challenging.

*T1: Well, sometimes it's just individuals in a group that whose behaviour is a bit different and you have to adapt to that. [...] I think the content part, it's usually alright. Yeah, I think the difficulties for me are more in terms of personalities and dynamics within a group.*

*T3: There were also difficulties with specific students under specific situations. I remember a student who was deaf and he wants me to wear a microphone. I wasn't used to do that. I tried my best to adapt my teaching and comply to their demands. It took some time to get used to it, remember and take that situation into consideration.*

Another difficulty mentioned by some teachers was the way languages were seen and perceived in a scientific university, namely the lack of legitimacy.

*T3: Difficulties are also about the administration. Difficulties with the way languages are seen and perceived in a scientific university, the lack of policy. In fact. We've been asking for eight years for a reshuffling and organization outside the department, to be the same level with other faculties. but they keep refusing. There are some difficulties with my colleagues. There are people in the department with whom I don't want to work simply. I suppose it's the same with me, they don't feel comfortable working with me, and I don't mind. That's the way it is, we can't please anyone and we can't be friends with anyone.*

#### 4.3.4.2. Difficulties in the Scientific Content

The main difficulty, according to most teachers (Teacher 2, Teacher 3, Teacher 5, Teacher 7), was the limited scientific knowledge and the fact of not being specialised at the very beginning.

*T2: Yes, my scientific knowledge is very limited. But I want my students to teach me to contribute. When there is something I don't know, I focus on English. I know many scientific professors on our campus. When I had a problem, I let them know.*

*T5: Well, Yes, obviously in the beginning when I was not specialized. It requested a lot of efforts from me. I had to do a lot of reading of articles that I didn't understand that much, to be honest and to be familiar with the field basically. The major difficulty for a new teacher would probably be familiarize some specific fields.*

Teacher 4, despite her response of saying no challenge earlier, she still admitted that challenges in scientific content existed at the beginning of her career.

*T4: It was difficult to get the specific vocabulary to start with, because it's not obviously my cup of tea(laugh). But by reading articles, it was really easy to get at least the right vocabulary. After I start to teach master students, that was a little difficult for me to read on all the subjects I had to cover and to be sure I was going to adapt to the right level. [...] So, I decided not to be a teacher, but to be someone that would help them with their English and they would help me in my knowledge of the subjects.*

Teacher 4 solved the problem by getting the scientific knowledge from students. This was also covered in the interview with Teacher 1. Various cases indicate an effective measure of content specialists engaged in the instructional process, or achieving a collaborate partnerships between language and content specialists (Cargill et al., 2018; Cargill & O'Connor, 2006; Corcoran,

2017). Complementary feedback from both language and content teachers can be rather beneficial for participants. It should also be noted that participants may be experts who are more familiar with content knowledge in course participants' disciplines than ERPP instructors, making it advantageous for instructors to learn from participants.

*T1: In terms of the content, I think that because I told them from the very beginning that I know I'm not an expert in their field, and neither am I a walking dictionary. They know I don't have to pretend to know all powerful knowledge. When this content that they bring in and I don't know about, it works out. All this content that I bring in, if they question me, usually works out too, because it's actually more of a discussion. So, I think the content part, it's usually alright.*

Another difficulty mentioned by Teacher 3 was becoming acquainted with new specific fields after being accustomed to one field. This was well covered in the interview with Teacher 7.

*T3: Yes, a lot. In L1 L2 at the beginning, to use resources that has been designed by my colleagues. Because when you don't create something yourself, it's more difficult for you to use it. Also, at the beginning, the specific knowledge about the content. I was quite at ease with computer science, but not with mathematics or biology. Even during the last five years with M2 chemistry it's difficult, I start to feel at ease now with the subject. That's not something I'm passionate about, so I find it quite difficult. So yeah, difficulty in feeling comfortable with the topic and with what I'm talking about.*

*T7: The difficulties would be, for example now I'm quite familiar with L3 physics, but a few years ago I started to teach L3 biology, I had no idea. [...] I would not call them difficulties I would say challenges to learn. It's more of a challenge for me to deal with documents in math which I'm more familiar with now, chemistry as well. Having one field you work on year after year because you go deeper into that and you can link every subject with each other which is fascinating, but it's not enough for me. It's also good to be able to go and see what others are doing in different fields.*

In summary, the language teachers generally felt it was very challenging to be specialised with very limited scientific knowledge. Because students were not grouped by English proficiency, teachers thought it was challenging to be acquainted with new fields after being accustomed to a particular one.

On the other hand, students' attitudes and lack of motivation were plaguing language teachers. Other than students' attitudes, teachers also found that there was a lack of policy for them in the university. How languages are perceived from the governance in this scientific university has been a long-lived issue for language teachers.

#### 4.3.5 Representation of Scientific English

As previously covered in Chapter 2, teacher and student have their own representations in teaching-learning activities. They take different perspectives in viewing and evaluating the outcomes of learning. Therefore, it is very difficult to communicate between students and teachers who do not have the same representations and the same knowledge bases. This could be interpreted in the framework of representations proposed by Chaplier (2017), which the network of representations also indicated that language teachers' representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of Anglophone researchers; representations of science students. In this regard, it is pivotal to take the part of the science teachers and administrators into account, which are not included in the current situation.

In order to explore language teachers' representation of scientific English, they were asked about what scientific English means to them. Surprisingly, each teacher perceived scientific English differently.

Teacher 3 considered scientific English as being nothing to them other than the vocabulary. This was much in line with the interview discourse of Teacher 4. The interview discourse indicated that teachers did not have a clear representation of scientific English. The finding was also very much in line with the interview discourse of students: "The teacher doesn't know what that (scientific English) means" (S4).

*[What does scientific English mean to you?]*

*T3: Hmm... I don't know. To me, it means nothing(*laugh*). I think that without understanding when you talk about something, scientific English is useless. I mean we have the online dictionary that they can look up the words and that's all. It's just vocabulary basically. That's not scientific English. The main mistakes I find in papers that students gave me, they are grammar mistakes and structures for sentences. It's not about the vocabulary. I mean scientific English for me, it's just vocabulary.*

According to Teacher 4, scientific English is just a way of expressing.

*T4: To be honest, I don't know. It doesn't mean anything, apart from being the set of words. I think I can write in a literary way and in scientific way. I'm capable of telling from the very first line of any article if it is literary or scientific, even if I don't focus on the content itself, just the style. It's just a way of expressing. That's what I call scientific English. I don't really think it's two different languages, it's just a way of dealing with the subject using the right words. Actually I tend to teach a bit of this to students, I ask students to write in a scientific way as they were scientists.*

For Teacher 1 and Teacher 2, scientific English was considered as being able to communicate scientifically, including speaking or writing about a scientific topic, reading articles in science and giving presentations at a conference.

*T1: Hmm, scientific English means specific vocabulary. For me it also brings on the idea of communicating scientifically, for instance, them being able to communicate at a conference, them being able to give a presentation or them being able to read articles in science. Yeah, just anything in their field given in English.*

*I also notice the language aspect. I have to say that the passive is not used as often as I think it was before. In articles I've noticed that they tend to use "we" more. I would say it mostly the vocabulary that's different, that's it.*

*T2: Speaking or writing about a scientific topic. Nothing special. Because language can be science too. But to me, it means Paul Sabatier campus, hard science. I understand it can be some psychology, language as well.*

For Teacher 5, the main purpose of teaching scientific English was to help students adapt their English skills to their professional needs.

*T5: It's helping students with their English skills, adapting their English skills to their professional needs as well. That is why I believe it has to be adapted to their professional or scientific fields.*

For Teacher 6 and Teacher 7, scientific English was considered to be a specific genre of English, which was punctual and direct using passive construction. Teacher 7 underlined her using "English for science" instead of scientific English.

*T6: Punctual English. Have you read time magazine? That kind of punctual, frugal, didactic language. It's frugal with your language as possible. It's direct*



*communication. It's a preponderance of a passive construction as well. It's credibly important. That's the fundamental thing students should seize when they reach maybe B2 level.*

*T7: I do not use the phrase "scientific English", I use English for science(laugh). There is no such language as scientific English. For me, English for science involves vocabulary of course, which is specific to each field. There is also grammar, and in science report or experiments, you use a lot more passive than in everyday language. Language used in English for science is comparative and all those are expressed in quantity. All of these will have to be particularly studied by students in science.*

Teachers generally perceived scientific English differently. There seemed to be no clear representation of scientific English among language teachers. According to language teachers, scientific English was considered as English in a specific genre, which was punctual and direct for communication in scientific communities. There was also controversy on the term itself, indicating the absence of instructions and the urgent need for the correlation theory support.

#### **4.3.6 The Learning Context (from the Teacher's Perspective)**

The learning context was investigated in learners' interviews, which was also an important theme in the interview with language teachers. Teachers were asked to describe the learning context at universities in France.

##### **4.3.6.1. Institutional Constraint (University)**

The first problem that emerged was the "hours"; this was well covered in the interviews with Teacher 4 and Teacher 7. This finding was consistent with the results from learners' interviews, in which both teachers and students stated that two hours per week was far too short for learning a language.

*[How would you describe the English learning context at university in France?]*

*T4: In this university, we are having less and less time and obviously the classrooms we have, I mean everything, is not fitted for language teaching and language learning. The background is not optimal to teaching and to learn languages in this particular university. It was easier ten years ago, because we have less students in the classes, we were more independent and we had more money. Now it is being controlled a lot. We were more free in the past including*

people doing what they wanted which has nothing to do with scientific content. Because we have less hours, we have to get to the core of the courses.

T7: *There are two main problems in English learning at French universities. One is not enough time, 24 hours per term is not nearly enough.*

Teacher 1, who had teaching experience in other countries, proposed that having a fifty-minute class four times a week or a fifty-minute class three times a week would be a better alternative.

T1: In France, we have two consecutive hours per week. For me, that is a little too decremental to learning a language. For my teaching in the US, teaching French as a foreign language in US, I found that it was a lot more effective in terms of requiring language skills to have fifty-minute class four times a week, or fifty-minute class three times a week would be great. I don't think it is good for learning a language in one chunk.

#### 4.3.6.2. Institutional Constraint (National)

Teacher 5 described the fact that there was a shortage of teachers, not only in University Paul Sabatier, but on a national level, indicating the national constraint in education.

T5: Well, I think there is a shortage of teachers on a national level, which is not specific to Paul Sabatier. For students' learning, I think it depends on their group dynamics, the room we are in, teachers they had before, it depends on so many different things.

This was confirmed in the interviews with Teacher 2 and Teacher 7, who indicated fewer teachers for more students, making the classroom too small for language teaching and learning. They felt more anxiety and stress than before.

T2: Classes are too big too large. They do too much writing. Behind the content, the teaching life here is very good, very serious teaching here.

T5: It's generally being a lot of anxiety and stress, a lot of supply teachers, a lot of administrative extra work to have them payed, to prepare Moodle pages for them, to have all these resources they need, to coordinate and organize extra meeting, etc. Should we have more positions opening, it would be easier to manage. But that's not in our hands, I guess.

T7: When they start at university, we have groups of 24 students maximum in our university. But it's not going to last very long, because there are fewer teachers for more students, there will have to be more students per group which means their speaking skills is not going to improve enough.

Teacher 3 also mentioned the fact of diverse learning context among different universities in France.

*T3: The learning context is extremely diverse. Last summer, I was in a seminar organized by another scientific university in France. The president of the university declaimed to create a new language department. At the same time, in our university we are denying it. So, the context in France is extremely different. [...] There lots of differences among different universities, which might be the way things are organized, the number of teachers, the finance they get and in all aspects. These differences have impacts on actual work that is being done. But also, there might be less students in other universities than we do, you cannot do the same thing.*

In this section, the problems of insufficient hours of English teaching, a national shortage of teachers, the growing proportion of students, and the financial and administrative issues were constantly proposed by language teachers. It appeared that these teachers suffered from a great deal of anxiety and stress.

#### **4.3.7 Students' Motivation (from the Language Teacher's Perspective)**

When asked about whether students were motivated to learn English or not, teachers in general felt that students were interested in the lessons.

*[Do you think students are motivated about learning English?]*

*T1: Generally speaking, yes. Some of them are very motivated, some of them are not motivated. But overall, I think they are interested in what we are offering.*

Teacher 2 said that it was challenging to keep students motivated. He also mentioned the conflict between English people and French people could also be an issue during teaching, which was in line with the results from learners' interviews.

*T2: The problem is that it's difficult to keep a whole class motivated, they are teenagers you know. It always seems to be an offence between English and French, English people and French people. There's always a fight between England and France. It's almost genetic. Things are changing, hopefully.*

Three teachers (Teacher 1, Teacher 3 and Teacher 5) stated that students' motivation was closely related to their goals and their domains, which was individually based.

*T1: There is a huge variety of their wants and desires. It depends on what their goal is. If they have a personal goal behind learning a language, they are much more motivated. I really think it's individually based.*

*T3: In terms of motivation, I think it depends on what subjects they are studying. For computer science, yes. Because they know they will have to use English almost every day. Mathematics, not sure. They are going to either be math teachers or dealing with mathematics, I don't know if they need English in their future careers. The situation is different. I have also got students in astrophysics, they know one hundred percent they will have to use English, so they are very interested in lessons and they are very motivated.*

*T5: It's hard to say, I mean some of them are motivated and some aren't.*

Regarding the change of attitudes or motivation after English classes, teachers generally felt that there were some changes in a positive way. They had the feeling that students were a lot more motivated.

*[Did you notice any changes in the students' attitude/motivation to English learning after they received scientific English lessons?]*

*T4: This has changed in a positive way over the years. Before, we sort of had five students of master in a class. But now they know English is important and they want to improve, they regularly showed up. The oral skills are getting better over the years. I find it more lively and active. I used to spend hours speaking to myself with half students sleeping in classes, it was terrible.*

*T5: Some of them came in saw me at the end of the session telling me that they were really enjoy my class that they wanted to thank me basically, so, I guess they were more motivated after then before. I also gave them an anonymous questionnaire that I put on the Moodle page, I asked them what do you think about it, do you want me to change something, is there anything you would like to tell me, I regularly get some feedback about the content of the class, that's how I know they usually liked my classes.*

*T6: Yes, a lot more motivated. I always get students' feedbacks. They fill in an online questionnaire from me. They are all lovely lovely comments. I've never got a negative comment. Yeah, I think I've got a positive feedback from students.*

*T7: I find there were quite motivated students, they understand they have to deal with and master the language. One of the reasons I'm still teaching these L3 physics students is that I can keep the same group of students all year long*

*so I get to know them individually. I can see their progress year by year. I can see their improvements, which is great. Hopefully they are getting more motivated, that's what I hope.*

For Teacher 1, the change of students' attitudes or motivation was not related to scientific English, but mainly regarding communication or confidence building.

*T1: The only point I had is that students coming at the end of the semester and giving me the feedback. I have had students who came in and said thank you so much for this term, it changed my perspective on English or my perspective on my capacities to speak. But it was not related to scientific English. Mainly regarding communication or confidence building, I think.*

However, for Teacher 2 and Teacher 3, there was no great change in terms of motivation. Only a small portion of the students started to perceive English as a means to communicate in their fields instead of a subject only. Teachers had the perception that students who had been interested before were still interested. This finding echoed with the findings from the learners' interviews.

*T2: I have been teaching at Paul Sabatier for fifteen years, no great change in terms of motivation, unfortunately. Maybe I'm wrong (laugh).*

*T3: No, students who were interested before are still interested. Maybe for few minorities they sort of discovered that English is not a subject but a means to communicate what they are working on, that would be an incentive. But that's the minority. I'm not really sure that there is a big impact.*

In summary, language teachers felt that students were interested in English classes and motivated to learn English. The learning context from teachers' perspectives seemed to contradict the results of the students' interviews, where there was a lack of motivation among students. However, the insufficient hours, indicated from teachers' interviews, were in line with the results of the students' interviews. Meanwhile, teachers pointed out that there was a national shortage of teachers and a growing proportion of students, and they felt more anxiety and stress than before.

## Synthesis

The interviews with language teachers revealed the teaching practices in University Paul Sabatier, as well as the dilemma language teachers faced.

Firstly, regarding the teaching practices, language teachers generally built their classes around the target of engaging students more in oral communication. The teachers placed great emphasis on reducing students' fear of making mistakes and alleviating tension and stress during English classes. Various tools were utilised for teaching English, including emails, mobile phone applications, the Moodle platform, Google Drive, scientific articles, audios, and videos. In addition, despite having a set syllabus, teachers aimed to captivate students with a wide range of interesting topics. They also made an effort to tailor their teaching methods to meet the needs and interests of their students. However, the interviews also exposed a dilemma faced by language teachers. While they aimed to create an engaging and interactive environment for their students, they were limited by time constraints and a lack of resources.

Secondly, regarding the representation of scientific English, there seemed to be no clear representation of scientific English among language teachers, which is surprising. According to language teachers, scientific English was considered as English in a specific genre, which was punctual and direct for communication in scientific communities. There was also controversy on the term itself, indicating the absence of instructions and the urgent need for the correlation theory support.

Regarding the relation to science, teacher regarded their lessons as being science related. For language teachers, scientific content could not necessarily be related to doing experiments or being in the laboratory, but could be about the “common knowledge”, which is in line with the construct of “common knowledge” proposed by Chaplier (2017). As she explained, common knowledge is a foundation of knowledge, which is accessible to linguists and can be understood by scientists. It is surprising to note that teachers have been exploring scientific content on their own, which they find to be a time-consuming process. It appears that at the beginning of their careers, they did not receive much support and had to struggle on their own. The teachers generally feel that it is challenging to specialise in a subject area with limited scientific knowledge. Additionally, due to having students from diverse backgrounds, it can be challenging to familiarise oneself with new fields after becoming accustomed to a particular subject area.

Thirdly, regarding the teacher training, In France, there is no such training for language teachers (see Chapter 1). Although there are opportunities for teachers to participate in conferences, seminars, and national associations, there appears to be a lack of specific training for teaching students in science fields. Teachers themselves have acknowledged the need for such training and had hoped to receive it at the beginning of their careers. However, due to a lack of opportunity, time constraints, and heavy workloads, it seems natural for teachers to seek their own path of specialisation.

Fourthly, it is worth noting that there appears to be no disciplinary dialogue between language teachers and science teachers in terms of cooperation. Although some collaboration may occur with new teachers, it is often non-continuous.

Lastly, in terms of the English learning context in France, teachers expressed that students were generally interested in English classes and motivated to learn. However, this seems to contradict the results of learner interviews, which indicated a lack of motivation among students. The insufficient hours of English instruction, as mentioned in the teacher interviews, are consistent with the results of the learner interviews. Additionally, teachers have pointed out that there is a national shortage of teachers, leading to increased levels of anxiety and stress.

#### 4.4 Science Teacher Interview Results

There were 7 science associate professors / professors who participated in the interview. Other than Teacher 8 and Teacher 10, who are a lecturer and an associate professor, Teacher 9, Teacher 11, Teacher 12, Teacher 13, Teacher 14 are all full professors. We are aware of the different statuses of science professors and associate professors, whereas we refer to them as teachers in the following part. Science teacher interviews comprised 17 questions. The aim of science teacher interviews was:

- a) to identify science teachers' representation of scientific English and English being used in science;
- b) to explore the role of English in their daily practice (research, teaching and interaction with students);
- c) to identify the collaboration with language teachers.

Before reporting the results, it better to recall the associate professors / professors' profiles presented in Chapter 3.

Table 8 – Teachers from the Science Departments (UPS)

	Country of birth	Native language	Teaching experience	Disciplines	Courses
Teacher 8	France	French	20	robotics, Control theory	robotics, control theory, identification modelling of manipulator arms introduction to robotics identification using least square methods dynamic system observation and control dynamic system modelling, control and observation
Teacher 9	Italy	Italian	17	mathematics	mathematics 2 topology calculus-Differential Analysis algebra geometry and Linear Algebra



Teacher 10	France	French	10	computer graphics, programming	algorithmic and computer graphics programming rendering algorithmic geometry
Teacher 11	Armenia	Armenian	16	computer science	computational imaging medical Imaging image processing signal processing under graduate : Programming, applied mathematics, electronics
Teacher 12	France	French	25	electrochemistry, material science	metallurgy electrochemistry corrosion materials for Energy storage devices surface treatments materials characterizations
Teacher 13	England	English	30	physics	optics electromagnetism, instrumentation practicals scientific English mechanics fluid dynamic (little) basic mathematics for physics
Teacher 14	Greece	Greek	34	chemical engineering	design and conception of electrochemical systems thermodynamics and Kinetics for chemistry chemical Engineering corrosion

					adsorption energy (L1 and M2) operation units
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#### 4.4.1. The Researcher and Relation to English

##### 4.4.1.1. The Role of English

The first question on this theme was what science teachers thought of English's current role in science. Most science teacher participants perceived English as playing an essential role in science.

*T8: I think it plays an important role especially in research. When you're a researcher, you have to communicate.[...] I think that for research, English is fundamental.*

*T12: English is the language for science. I mean, at least in our discipline. [...] In our discipline, the official language is obviously English, because there is no good journals in our field that publish papers in French.*

*T14: Depending on what do you do. If you work in a factory, then English is not necessary. But if you work in the university as a researcher or professor, then yes, it's mandatory. It's not possible to do research without English.*

Specifically, Teacher 8 said he used English on a daily basis for research when he had to publish an article or attend a conference. There are numerous international Master's degrees or bachelor's degrees that they have to teach in English. To sum up, English is the language for communication between people who do not speak the same language in science. In this case, the way science teachers regarded English indicates that English is used as a Lingua Franca (ELF), which considers English as a vehicular language between speakers who do not share a first language (see Chapter 2).

*T8: When you communicate, you have to publish. When you publish you're writing English. Sometimes you attend the conference and you present your article in English. You ask questions and you're asked questions. Your answer questions and you're interacting and talking with other researchers which are always in English.*

*For teaching, [...] there are plenty of international masters or bachelors which are created. And in this case you get your lecture in English, and then it becomes very important.*

As indicated by Teacher 13, the importance of English is not taken enough into account in France.

*T13: I think it's completely essential at the moment, because I think it's the language for communication between people who don't speak the same speak the same language. And I don't think its importance is taken enough into account in France.*

For Teacher 9, Teacher 10 and Teacher 11, English is the official international language in science. They felt it is mandatory and natural to use English to write and read scientific documents or articles.

*T9: Well it's common languages. It is the natural way of communicating among scientists. It is a very simplified version of English we use in science. It is completely sufficient to exchange among scientists.*

*T10: For me, it's the mandatory language to write and read scientific stuff, like scientific documentation, reading papers etc., and also when you are on the international side you need to speak English to colleagues or communicate during conferences.*

*T11: I don't know, I mean it is the official international language in science. I think that we cannot even ask ourselves if it is true or not it's just like this. I mean everybody, all the conferences we speaks English, I mean, of course if you meet a French guy you speak French, but yeah for me the language of science is English and so we cannot say we can agree or not, I'm not sure that this is the place to talk about this, but it is like this.*

Teacher 13, who is British, considered English as the chosen language for communication between people who do not speak the same language. Using English has nothing to do with the countries.

*T13: In fact, often there is confusion between countries and language. So of course, I mean there's the problem of Brexit. People sometimes are confused about the language and the countries. Yeah, because, for me at the moment. The reason for using English, is not because I'm English. But originally, the reason for using English is not to be able to talk to people in England, and in America, and in Canada and in Australia and so on, is to be able to talk to other people in other other countries when you don't have the same language. And it just happens to be the language that's been chosen for the time being. It*

*can be changed, but at the moment it's the language you have to use as a scientist, if you want to discuss together.*

When asked about the reason why English was chosen in science communities, teachers seemed to have no clear perception. Teachers, in general, felt that it is the historical reason that led to the situation being completely irreversible. They also indicated that French was once the language in science, yet English has become the official language of science at some stage. The interview discourse is in accordance with the Latin origin of scientific English and the possibility of Latin influence proposed by David Banks on the early development of scientific English (see Chapter 2).

*T8: Never thought really about it. It's just like French was used in diplomat. I don't know.*

*T9: I guess it's just the historical reason. Historically, it turned out to be the very spoken language among scientists and then it became a standard.*

*T10: Oh, it's a good question. I don't really know. I think it was French a long time ago, and then English, maybe from the US. [...] I don't really have clear idea about that.*

*T11: I have no idea when it starts. [...] if you go take 100 years back, most of the publication's people were doing were in French, most of the great scientists we know, they were writing their papers in French. I don't know exactly when it switches to English completely. It is clear that at some point, English became the official language of science.*

*T12: This is a good point. I'm French, so we may remember that the 18th century, the official language for science was French, but everything has changed since the First World War. And then it was even more stuff after the Second World War. So, this is, we cannot fight against that, so it's started 100 years ago. Anyway, we have to deal with that. Now this is English and I think it's completely irreversible.*

*T13: Probably because the predominance of America. Okay I'm not an expert on that.[...] Well, first of all, it's a language that's very very widely spoken because there are a lot of countries that speaking English already, as their first language. That is a little bit linked to Empire, of course(laugh). I think the reason everybody uses it because at some stage it's the language that are the most current in the world, [...] I mean you make the choice and once the choice is made and that's what everybody does. And the thing is kind of self sustaining until you get some big events or some big momentum that changes it.*

#### 4.4.1.2. The Relation to Science

This section investigated science teachers' affective attitudes about using English in the scientific community. Three teachers (Teacher 9, Teacher 10 and Teacher 12) expressed a neutralising attitude (“Well, I don’t have feelings about this”; “Any language is okay”; “this is what it is. So I need to deal with it”) towards using English in the scientific community and they did not have many feelings about that.

*[Do you like English? Could you describe your own feelings about English used in the scientific community?]*

*T9: Well, I don’t have feelings about this(laugh). I mean, the kind of English we use in math is quite poor. So aesthetically speaking, I not especially like it, but it's practical. And speaking it. I find it funny to discover the different accents in different countries.*

*T10: For me it's fine. Any language is okay. If it were German, I would have learnt German instead of English. For me it’s more of a tool. If it were Chinese, or maybe it will be Chinese at some point. So we need to learn Chinese some day. Okay. What is important is to have this kind of main language, everyone can use at least a little bit, because we need to exchange and discuss some stuff. For me most of the important thing is mathematics and programming. So this is also an important language to communicate.*

*T12: What do you mean like what is my feeling? Am I happy with that? I don’t have to like it or not, I mean, this is what it is. So I need to deal with it. Now I don't have any problem to be taught in English. Sometimes it could be frustrated for discussions, obviously, when you have to prove a point, you could have more interaction if it is your native language. I don't really pay any more attention to that. But obviously I would prefer to read those in French, to switch to French and so on. But I will say that it is what it is, and English is fine.*

Teacher 8 accentuated on her fear about English at the beginning. She found that dealing with English at the beginning was very scaring. She seemed to have suffered a great deal of stress in using English properly.

*T8: At the beginning, I was quite scared. [...] When I started, I was very good at writing. If I have to understand or summarize any kind of text, whether scientific or not, it was not a problem. But if I had to have a conversation just like now, it was much more scaring. Now it's better after 20 years experience(laugh). Speaking English was like a nightmare. I remember at the beginning I made a very good presentation but the question part, it was awful, awful, awful. Now after 20 years, I think I’ve improved.*

Teacher 11 also shared his experience of dealing with English at the beginning of his career, indicating that English was an issue or a challenge for him back then.

*T11: I would say that, you know, at the beginning of the career I think that the fact that everything is in English can be an issue, because you know when you are submit papers for example, then you can have some remarks from the reviewers that maybe your English level is not sufficiently good and also I think that when we start in our career we have to give talks in foreign universities or in conferences. Of course I think that doing them in English, will provide an additional challenge. But I would say that after some years it is less true. Because we become more and more used to write scientific papers in English, more and more used to present our work in English.*

Intriguingly, Teacher 11, who is Armenian, shared his experience of being more comfortable using English in science rather than French or his native language after years of experience. This was also covered in the interview with Teacher 14.

*T11: It becomes even more even easier to present our work in English than in French. [...] I experienced these not with French but with Armenian, I mean I stopped after high school in Armenia. So the scientific words I know in Armenia they stopped in high school. And I was invited once to give a talk in Armenia and of course it was natural to do it in Armenian, and I had a very hard time to present it in Armenian even if it is my native language.*

*T14: I can communicate in English or French about scientific subjects, but I can't discuss in Greek(his native language). Maybe there's been a long time not using it.*

Teacher 14 stated directly that he did not like English used in the scientific community and he expressed his preference for French.

*T14: Not really. I prefer French. Because there is a problem of style. You can express things very nice in French. Now I write directly in English. But if I write a text in French and then translate into English. The overall words will be decreased about 40%. And my English will simplified and all the style will disappear. Of course I like my community, so it's impossible for me to communicate without English. But if the possibility exists, I prefer to communicate in French. Because it's better.*

Only one teacher (Teacher 13) expressed positive opinions about using one common language in science and he also admitted using English was a particular advantage for him since he is British.

*T13: I think it's good that there is one common language. I think it's good to keep the same common language. Because if you keep changing, then everybody has to learn from the beginning. Of course I'm happy that it's English because that gives me a certain advantage. It's much easier(laugh).*

*But I think there's also a danger of using English that means that people from countries which are not speaking English, that have never been exposed maybe to the problem. They may be less sympathetic. They don't understand, there's other people who are trying to speak English, who don't have the same mastery of English. This a disadvantage, so it can also be not a good thing. It puts people at disadvantage because of the language.*

In summary, science teachers considered English to play a vital role in science. They perceived English as the official language for communication in the international scientific community. Teachers expressed their neutral attitudes regarding the common acceptance of using English in the scientific community. Still, they did bear with some challenges of scientific English at the beginning of their career due to the insufficient English level, for instance, they felt uncomfortable and they ever fear of presenting their works and exchanging ideas publicly. However, after years of experience, they became more sophisticated in using English in the scientific domain, sometimes even better than their native languages. Even so, native language allowed to better convey messages. This makes sense since the problems emerge mostly at the beginning of these teachers' careers.

## 4.4.2 Use of English: Daily Practices

### 4.4.2.1. Daily Practices

There was a consensus regarding the teaching practice that a minimal part of teaching for science teachers was in English. According to teachers, only dozens of hours' teaching regarding specific international master programmes were conducted in English. This finding was very much in line with the students' interviews, where students said that their science teachers barely used English in teaching.

*[Could you describe your use of English in your daily practice : research, teaching, other?]*

*T8: I have to say, (teaching) nearly never. Because all my lectures are all given in French, except during three years when an international master was existing in robotics in Paul Sabatier University. And then I have to do 20 hours speaking in English on robotics, you know. But except from that. I don't use it for teaching, except when looking at technical documents for teaching.*

*T9: Teaching otherwise, I teach in English in the level of master. A part of our master in mathematics is in English and accordingly I teach them in English.*

*T11: For the teaching part, let's say that the English is not used so often, you know because in France we are mostly teaching in French. However, there was a few years back there was an international Master's programme in engineering course in Toulouse.*

*I also had an experience in undergraduate in python programming in University Paul Sabatier. [...] This is also, most of the time done in English. [...] I would say that in teaching, English is a small part. But in research, English is a big part.*

*T12: Regarding teaching, I have one Master's degree which is fully taught in English. [...] So it's one semester in Toulouse, for me around 60 hours' lectures(in English), and the rest is in French.*

*T13: Sure, basically there are two ways that I use English. The one is classes which are specifically meant to be teaching in English. So I have classes where I'm specifically teaching scientific English[...] I don't do much teaching at master's level apart from the scientific English. And when I do that, I propose to them to have just one examples class in English. [...]It was the same thing, for example when I went for examples classes in instrumentation. [...] I'm not that involved in giving these disciplinary courses in English.*

*T14: I give a 30 hour of teaching in M1 on medical chemistry. [...] Other than the 30 hours in master I mentioned, almost all the time, my lecture is in French.*



The fact that English was a minimal part in science teachers' teaching practice was also confirmed in some comments when asked whether they integrated English into their science courses. It seemed compulsory for science teachers to use French only in courses for undergraduate students.

*[Do you integrate English into your science courses?]*

*T8: I have to say that, up to now, I have mainly mainly mainly use the English to communicate for research purposes.*

*T9: Not in general. In general is not required by the university, so I don't. I mean, like in License, we are supposed to speak French, so I never speak English to them.*

*T11: In the undergraduate I would say no English or very very few, but in the graduate courses of course we do use English.*

*T12: Yeah. Sometimes I have some slides in English and so we are getting used with English vocabulary in everything. But you cannot teach in English if it is not planned in the application, because you may have some students which may raise a protest official, because the language has to be French.*

Meanwhile, adopting English sources was very different at undergraduate and graduate levels. Given students' comprehension and time constraints, teachers admitted that they barely used English at the undergraduate level. Nevertheless, they mainly employed scientific English articles that they referred to in the teaching at the graduate level.

*[Do you use English sources in teaching?]*

*T8: Oh, no, no, because my work is quite technical, and I have to give the students the basics. You know the basics about robotics, about control theory, about identification.*

*T10: Okay, so there is scientific paper mostly at the master level. And before that, is the documentation.*

*T12: Yeah, English papers that we refer to, obviously.*

*T13: Not so much, again you have to understand I'm talking about teaching the bachelor's level. Teaching a bachelor's level in French is often mostly based on giving the very, very detailed courses and notes to the students which are prepared in advance and not so much to ask them to go and read books and things like that, although maybe we should.*

*T14: I use scientific articles for analyzation, for presentation, for dissertation only in M2, never before M2. I send them papers with exercises for them to*

*familiarize. But if you send scientific articles to students, I have to explain and analyse which they will need a long time to understand. I don't have enough time. So for M1, I use only chalks(laugh).*

On the contrary, English played a dominant part in the daily research practices of science teachers. They employed English with their colleagues, their PhD students, and their collaborators in the daily routine. English was fully involved when science teachers published scientific papers and attended international conferences.

*T9: Yeah, basically I'm using English everyday. My colleagues can speak English and my collaborators are not in France. So, every day I'm speaking English for research and write my papers in English, and all the conferences.*

*T10: So, for instance, when we write code and we always use English for commands, etc. [...] this is one thing I teach to students, saying you know when you write code, everything is in English because you don't want to read German code with German name of Bibles and Spanish or whatever. So, English is the thing for that. And also, when you write papers maybe, sometimes with my PhD students for instance, you made some stuff in French. But every scientific paper is in English. Yeah, so this is the daily practice, not writing in English everyday, but participate in something in English.*

*T11: Then for the research part, most of the time we use English because most of our PhD students do not speak French, or do not speak sufficiently well French to be able to communicate in French.*

*Of course, 99% of the publications that we are doing are also in English, all the conferences we are attending are in English, we have a lot of collaborators outside France and we also speaking English.*

*T12: But for research, English is the language for any kind of result discussion that we have in the lab, so it's about 80% of the time. the main language is English.*

However, the question can be raised: what type of English is used in these cases? Is it English as a lingua franca? ELF is usually chosen to mean “any lingual medium of communication between people of different mother tongues, for whom it is a second language” (Ammon, Dittmar et al. 1984). The interview discourses indicated that English used in the scientific communities was not the same as the English that is being taught in LANSAD sector. In this regard, it is difficult to achieve disciplinary dialogue between language teachers and science teachers because they have different representations of English in science.

#### 4.4.2.2. Difficulties

Regarding the difficulties encountered with students in science, all associate professors/professors found that there was not too much issue in communicating with students in science. Instead, the problem could be not knowing the terminology. The difficulties also lay in writing scientific papers due to insufficiently good English at the very beginning.

Teacher 8 was realist about the difficulties because she admitted that sometimes the teacher also did not use English properly. However, Teacher 9 declared that the mission is a matter of just words, which is not true in pedagogical practices in LANSAD sector.

*[Did you encounter any difficulties or misunderstandings when using English with scientific students? or with other researchers?]*

*T8: Yeah, because students do not understand English quite well and sometimes the teacher also don't use English quite well(laugh). So, you have to try to understand before other things are possible. I think I don't have huge issues about that.*

*T9: Seldom, sometimes students don't know the technical terminology. And they have to learn it for the first time but it's a matter of just learning some words. Once you learn the words, the rest is ok.*

*T10: Not really on the meaning but sometimes when we have interns in the team, then it can be problematic because they don't speak a lot of English.*

*T11: For PhD students, of course it is true that all the PhD students will not have the same English level. [...] Most of them, they speak very well so everyday we communicate without any problem. The problems come mostly when they start to write papers. Writing a paper is a difficult task. Reading the paper in the language that you do not have very high level, it becomes even more difficult. So I would say that for communicating it is not really an issue but for writing papers, most of the students have issues. And by the way, the French students, they also have problems about this. But most of the PhD students, they have a hard time you know in writing the first paper because the accumulated difficulties.*

Teacher 11 stressed on the difficulties in writing for PhD students. However, what about students' writing before PhD studies? Can something be done before? As previously indicated in the interview discourse, the problem was not only in writing but also in oral expression.

For Teacher 12, Teacher 13 and Teacher 14, misunderstandings occasionally occurred due to the strong accent researchers and diverse students have. The way that people mixed French with

English words was also a hassle for some teachers (form of *translanguaging*). These issues tended to happen to new teachers. However, eventually, they got more sophisticated in dealing with such problems after they got more experienced.

*T12: I would say, naturally, the tricky point is, when you do conferences, when you ask them questions in English to researcher who may come from Mississippi or Texas who is speaking super fast and with a strong super strong accent, and you ask “okay, can you repeat the question?”, because you don't get your point. Then he repeats, with the same speed and you still cannot understand the question.*

*Except that, I would say not really. Because I'm doing a lot of conferences. I'm also speaking daily English, a little by little you'll get used to it. Also I have 25 years experiences so I'm not somebody who is starting his career. So I think that might be a problem for maybe a younger researcher, when they are at an earlier stage. But so far there is no big misunderstanding, stuff like that.*

*T13: Sure, yeah, sometimes I don't understand them. And that's not so often, but occasionally, I don't understand quite often when they they're speaking in French and then they suddenly come out with an English word. [...] Sometimes you can understand something a little bit differently, or you can understand something not in the way it means.[...] Just a small change sometimes can make a big meaning that the person wants to say and then there can be some kind of misunderstanding.*

*T14: Not often. It depends. For example, there are more than 30 nationalities in a diploma. People from German, they are mostly easy to understand, because German people are very keen. While some people from the United Kingdom are not easy to follow. Because I have a guy who talks like BBC news. People from India are very complicated to understand. One of my students is from Pakistan, she only speaks English. At first, it was not easy to understand her. But after some time, she learnt how to express things correctly and to define everything very well. In this case, I understand around 90% when discussing with her. So there is no standard, depending on the situation.*

In summary, it appeared that science associate professors/professors barely used English in the teaching for undergraduate students; rarely did they adopt English sources in science courses. This could be caused by the administrative policy in the university, the student's comprehension level as well as time constraints. This finding echoed with the results from learners' interviews. On the contrary, English was highly engaged in the daily research for science teachers, with either their colleagues, their PhD students, or their collaborators in the daily routine.

Science associate professors/professors stated that it was challenging to interact with students and researchers that had strong accents and different ways of expression. They generally found that the main challenge during the interaction with students was writing scientific papers rather than communicating orally, in which the latter could be obviously improved after some time.

### 4.4.3 Use of English for Students

#### 4.4.3.1. English Competence of Students

Only two teachers (Teacher 8 and Teacher 11) out of seven expressed their discontent of students' English competence (e.g. "awful", "very far away"). They generally felt that it was difficult to motivate student in learning English and students' English level was far from satisfaction.

*T8: For most of them, English is difficult. The level of the students' English is rather awful, generally speaking. [...] It's quite difficult to show them that it's important to study English, to try to write it, to try to speak it. They don't see the point.*

*T11: Unfortunately, most of them, once again, I don't really have the proof for what I'm going to say, but my feeling however is that most of them they are not speaking very well. [...] To be honest I think that in France, students, they have a better and better level each year. But we are still very far away from the level that the students may have in other countries.*

There was an absolute consensus among most science associate professors / professors that students' English level was improved gradually (e.g. "quite good", "decent", "getting better and better"), according to science associate professors / professors. They generally had the impression that students' level of English was surprisingly good.

*T9: Well, I am surprised, because when I arrived in France, there was a mix of French people not speaking English, and possibly was kind of true. French is a very substantial country. But it turns out that right now I find that the level of English fluency of the student is quite good. So they surprised me positively. [...] As for my PhD students, It's quite good. I mean they can speak and understand clearly, they can speak and give talks. Writing is little bit more bumpy because I can always spot plenty of mistakes, but that's it. There's still improvement. But I think it's okay.*

*T10: It depends. Sometimes they are good but in general PhD students are definitely better.*

*T12: So now it's much better. And the level of English, even French students, is decent. Although they are really shy to speak English, definitely.*

*T13: But it's interesting that I get the impression that students' English is getting better and better. That means, for me at least qualitatively, I get the impression that the English is improving.*

*T14: Better than me(laugh). Generally, probably 80% have correct English.*

#### 4.4.3.2. Motivation of Learning English

Out of seven, four teachers (Teacher 8, Teacher 9, Teacher 10 and Teacher 14) said that they found students were not motivated in learning English. Only at the master level did they attach importance to English in science (e.g. “start to feel the pressure”, “they know they will have to work with English”).

*[How do you feel about their motivation of learning English?]*

*T8: I think they don't have the motivation to work, not even to mention the motivation of learning English(laugh). I find that sometimes it's difficult to motivate them.*

*T9: Well, I don't know. Maybe they're. [...] I guess, at the master level they definitely do get the importance of English in science. They definitely start to feel the pressure for being able to speak English or understand it, because we do teach in English or because they know that in two years they will have to work with English.*

Teacher 10 stated that some students had expressed their dislike of English courses. Teacher 14 ascribed their only motivation of learning English being derived from the pressure of job.

*T10: Maybe not, I don't know. What I think is that the English course, some of them don't like it, not all the time but sometimes I get the feedback on English courses they say “okay, we don't know why we have the courses.” But I think, most of them will appreciate to do more English or to have more courses in English.*

*T14: Practically zero (laugh). Because I asked a lot of times my students, to give the lectures in English. I asked and I tried to meet their needs. And they said, “stop, I understand nothing, we need to do the lectures in French”.*

*So the motivation mostly comes from the job. When they find a job, they write to me and say that one thing important is the language, English. Everything in work is English. Some students are very interested in English and have a good level of English. They ask questions and read a lots of papers.*

*It depends.*

For Teacher 11, Teacher 12 and Teacher 13, students were more exposed in a world with English than before, thus they were motivated to learn English and tried to speak decent English. However, this motivation was not likely to transfer to the effort on learning English, as indicated by Teacher 11.

*T11: I think that they are motivated. I think that if we ask them, would you like to speak better English I think that most of them will say yes. [...] But this motivation is not always transfer into hard-working of the English courses.*

*T12: I think that we are living in a world which is more and more connected. So they all watch movies in Netflix and so on. Most of them watch movies in the English language with subtitles. So we are more and more sensitized to English, and I think they are motivated by learning English and trying to speak a decent English. This is my feeling. Again 20 years ago it was “we don’t need English, who cares”. Now it is “okay, English is everywhere”.*

*T13: Their motivation is very very good globally. I think occasionally there may be one or two students who really just don't want to. That happens. But overall, most of the students are very very motivated to learn and work in English.*

#### 4.4.3.3. Involvement of Students in English

As mentioned earlier, teachers said that only at the master level did students attach importance to English in science. This was confirmed and illustrated in the following comments from Teacher 8, Teacher 9, Teacher 10 and Teacher 13. It appeared English was barely used and taken account of for students in bachelor’s level.

*[In what students’ activities are they normally required to use English?]*

*T8: It depends. Most of the lectures are done in French so it's not really at this level that they need English. But when they end and they are looking for an internship or anything like that, English becomes very, very, very important. you know. [...] So I think that it's mainly at the end of their master studies that they really need English. And this is the moment when they think “oh I need English”. This is my opinion.*

*T9: Not in license but in Master's degree, depending on the diploma, they could be English.*

*T10: For courses of master that I am in charge, they have one English course actually for two years of master, one in the first year, one in the second year. And I think it's almost that when they have to use English, but they can use English for presentation, and also for one course.*

*T13: I would say in bachelor's level, they will be required to use English only when they have English teaching.[...] At master's level, if the master is in English or partially in English, then they have to understand English very well. Even if the course is given in French at masters level, then they very likely have to understand English because they have a lot of sources textbooks, papers and so on which are in English, so they have to understand it.*

Teacher 12 and Teacher 14 accentuated again on English's dominant part for students engaged in research.

*T12: For research, you need to read papers, all the literatures are in English, all the bibliographies are in English. So we need to be able to read English and to understand English, then they will need to write one or two papers minimum. So they need to know how to write papers. This is super important. For master and bachelor students, they don't need to write. That's true.*

*T14: Mainly research, of course. Others, it depends.*

When asked whether English was actively involved in their fields or in students' future professional careers, all teacher participants answered in the affirmative. Teachers said that students needed to be English-speaking candidates if they were to be hired in international industries.

*[In your field/specialization will English be actively involved in the students' future professional careers?]*

*T8: Yes, I think it's mandatory, because it's a highly technical field. And you have to be able to read technical documentation, you have to be able to discuss some methods with someone who may be abroad. It's mandatory. Their future careers, it depends on the students.*

*T9: English is necessary for them if they want to go on as researchers. Also necessary if they don't do research.*

*T10: Okay, so my field is computer graphics and in computer science in general, the documentation is in English. And also there is a lot of international companies, even in France, and they use English for the basic language, for*



*instance, Nvidia, unreal engine, unity. They use English to communicate because there are international companies.*

*T11: I think so. I honestly I think that students that we are teaching will become engineers. I think that maybe not all of them, but most of them will have to speak English almost every day.*

*T12: Yeah, again, as long as you plan to have a job in a big company. I mean these groups are normally big groups. When you have meetings, there is one guy who does not speaking French, everyone switches to English.*

*T13: I mean it depends basically on what the student does his job afterwards. If the student is going to be working, basically, at a fairly high level, let's say responsibility, or working in a company where there's a lot of international contacts. They needed it.*

Teacher 10 also pointed out that if students work in French companies, they might not need English. It depends on the choice of students.

*T10: It really depends. Because there is also a lot of French companies, specifically linked to Airbus. They, they have a lot of French speaking people there, so most of the time they don't have to speak English all the time or use English.*

Regarding students' pursuing a career as researchers, an overall consensus emerged. There seemed to be no doubt about English's role in research.

*T8: Some of them are keen on research and they want to pursue with with a PhD at the end of their studies.*

*T9: English is necessary for them if they want to go on as researchers.*

*T11: I think so. Of course if they are continuing academia for sure they need to speak English.*

*T13: If the student wants to go into research career he definitely needs English. If he wants to have a high level position he probably needs English as well.*

*T14: Yes, definitely. For example I have a PhD student. We have collaboration with other researchers who speaks English. Then everything between us is in English.*

#### 4.4.4 Collaboration with Language Teachers/Researchers

Four teachers (Teacher 8, Teacher 9, Teacher 10 and Teacher 11) stated that there was rarely or no collaboration with language teachers in University Paul Sabatier.

Most teachers emphatically said “no”, emphasising that they “never” collaborate with language teachers, which seemed natural for them to have no connection with language teachers.

Teacher 8 and Teacher 10 attributed the non-cooperation to not having time and gradual negligence, indicating science teachers' low willingness to cooperate with language teachers. It also implied the lack of language policy for the collaboration between science teachers and language teachers.

*[Is there any collaboration between you and language/English teachers?]*

*T8: Not really. I have discussed with one of the language teachers at the beginning when we first met. And I think we should have discussed more, to see what we could. I think it was very interesting for them, but I have no time and I haven't thought, in fact, really about it. I don't know why.*

*T9: English researchers, yes. English teachers, no.*

*T10: Not really, we have some exchange at some point you just plan etc. And I don't remember when maybe five, six years ago, I, myself, took an English course for the scientific writing, something like that, I don't remember very well. So I have done this one time. I think we've mentioned a couple of times, but we don't have to have a lot of interaction.*

*T11: No, in Paul Sabatier, I never collaborate with language teachers. Only when I was a PhD student back then, each time before submitting a paper, we sent it to a English teacher who corrected our English. So this was the only collaboration that we had.*

*T14: But with language teachers, never.*

Only two teachers (Teacher 12 and Teacher 13) said there had been collaboration with English researchers or teachers who gave lectures in Master's degree or had classes together with science teachers.

*[What kind of collaboration?]*

*T12: Yes, we have collaboration with a English researcher in the language department. By collaboration I mean that she's doing lectures in our Master's degree.*

*T13: Yes, and I hope it continues, Well, when I'm teaching scientific English, I work very much in collaboration with them. So, for example, at the moment I teach scientific English of the IUT, and I work in parallel with a teacher who's primary knowledge is English. So we teach scientific English together. So at the moment I haven't done very much. I think it's probably a budgetary issue of having to pay two people at the same time.*

We also examined science teachers' representations of the collaboration between them and language teachers. Teacher 14 considered it as impossible to conduct collaboration.

*T14: In fact, it's impossible to do collaboration. Because if I work with people from the language department, I don't have time to spend on courses on my disciplines.*

Except Teacher 14, almost all teachers attached great value to such a collaboration.

Despite the significance the science teachers attached to, the interview discourse indicated that they seemed to have low willingness or no motivation of collaborating with language teachers: for instance, "I regret not to have done it", "maybe we could try..." (T8); "I guess' it 'can be' done and 'should' be useful for the students. (T9)"; "I don't know. Of course I think that it is a good thing but I have no idea of how" (T11).

*[What do you think of the collaboration between language teachers and content specialists?]*

*T8: As I said, I regret not to have done it, with the language teacher. I think it's a good thing because maybe it could be help English teachers to understand what are our needs, and maybe we could understand better what are the different difficulties. And maybe we could try to design a programme, which could match the interest of the students.*

*T9: I guess it can be done and should be useful for the students. For instance, I was recently speaking with one of my colleagues in the language department about what should the contents of our English courses be in the Masters depending on the direction. And indeed there are some differences for adapting the content but I think the abundance of those differences is very good thing.*

*T10: Yeah, it can be variable for the student to improve or to focus the learning on a specific field, but also what usually happens is that the mix different field for courses.*

*T11: I don't know. Of course I think that it is a good thing but I have no idea of how, how we could really interact and how what we are doing could help them in their activities and how they could help us in our activities.*

*T13: I think it's very very important. There are English teachers who are very very good and have a lot of experience, very keen and working with disciplinary teachers. There are disciplinary teachers who have experienced and used to working with language teachers, but maybe that is a minority, overall.*

Teacher 8 attributed the very limited collaboration to teachers' lack of motivation. While Teacher 13 and Teacher 14 ascribed the status to the financial investment and time constraints.

*T8: Because I think the problem is often a problem of motivation.*

*T13: I mean, there are a lot of things that the university that we should do and would be nice to do, but we don't simply because financially we can't do it. I mean if we could work that way it would be ideal. [...] but we don't do them because we don't have the money to do that, we don't have the resources.*

*And everybody in university is very very busy. We're all fairly very very busy, you know, and often we have to work evenings and weekends and so on and so on. And even with a lot of wanting to do things. It's very difficult to do things properly if the resources aren't available to do it.*

*T14: if I work with people from the language department, I don't have time to spend on courses on my disciplines.*

Meanwhile, as indicated by Teacher 12 and Teacher 13, science teachers were quite aware of the dilemma language teachers faced: "They don't have the professional knowledge." "The idea is to work together but there needs to be resources for that." as accentuated by Teacher 13. This finding was consistent with results obtained from language teachers' interviews.

*T12: The example of my second colleague is a good example. Because she got a PhD degree in material science from chemistry. Also she's Australian, a native English speaker and she understands and she knows what we are expecting. But the example of the first colleague is completely different. They don't have the professional knowledges. So the example of my second colleague was a perfect choice for this kind of teaching. This is the main problem for language teachers.*

*T13: About the specific content, it's always going to be struggling if you ask an English teacher who doesn't have specialized knowledge in the subject to teach him that subject even if you provide them with the content and the ideas and*

*so on. [...]The idea is to work together but there needs to be resources for that.[...]*

Lastly, we further investigated science teachers' viewpoints towards an English class for scientific students. Teacher 8 expressed her expectation of students being distributed according to the English level, which was very much in line with results from learners' interviews.

*[What would be your view of an English class for scientific students ?]*

*T8: I think that the students should be split in different levels, to try to add the weak students to improve by maybe, maybe orientating the lecturers towards grammar or vocabularies or things like that. And for those who are more advanced, maybe proposed something around technical articles or things like that.*

Teacher 10 stated that students needed to enhance their oral communication skills, thus being capable of exchanging ideas publicly. Meanwhile, students faced with a major challenge of scientific writing, which should be subjected to a special concern.

*T10: Two main points. The first one is speaking a lot. Because they need to practice how to speak and feel comfortable when they want to say something. And also, writing, because scientific writing is something bit different than day to day practice of writing. [...]To learn how to write can be very valuable for the student.*

Teacher 12 and Teacher 14 both considered being able to conduct serious scientific discussions and negotiate about facts were the skills to be trained.

*T12: So I think that, you must integrate in the English lectures some scientific discussions, scientific vocabularies, basic stuff like that. So I think that this is super important that they have this kind of training, curriculum. To find some very basics scientific articles and try to give them to the English professor, so that this guy can take it, read it, understand the scientific concept, find the English vocabulary associated with the science, and then discuss with the students. This is more that students need.*

*T14: The objective could be to have teacher here who speaks very well English to give lectures. In this way we can save hours. Because the English in science is different from what taught by language teachers. It could be to have, people who teach science, in English, which is my point of view.*

Students need to be able to understand, to be able to negotiate. The problem is not to learn Shakespeare in English, my goal is to negotiate about the facts.

In summary, the interview discourse of science teachers further confirmed that the collaboration between science teachers and language teachers was minimal, and there seemed almost no connection among them.

Even though science teachers attached great value to such a collaboration, there seemed to be impractical to conduct any collaboration, according to teachers. A lack of motivation, few financial investments and time constraints appeared to be demotivating factors for science teachers.

From the perspective of science teachers, mastering scientific writing, conducting serious scientific discussions and exchanging ideas publicly should be tackled as a particular focus for scientific students. Teachers also suggested that students be distributed based on their English levels.

#### **4.4.5 Science Teachers' Representations**

##### 4.4.5.1. The Influence of Language Courses on Scientific Thinking

All science teacher participants perceived language courses as irrelevant to scientific thinking, but most of them did acknowledge the existence of the differences in scientific thinking among students.

Teacher 11, Teacher 12, Teacher 13 and Teacher 14 attributed such a difference in scientific thinking to students' diverse cultural backgrounds.

*T11: There are differences, but I'm not sure that it is really related to the language they are speaking, but mostly the background that they have.*

*T12: Yeah, we have a lot of differences between, for instance, American and French people.*

*T13: Afterwards, is there a difference in the way you think in English and French. I don't think it's so fundamentally different, it's just a difference in the words you might choose to say it or to do it.*

*T14: Yes, of course, enormous. For example, among my students, there are people from Poland, they have good knowledge of physics. There are people*

*from Morocco, they have a good level in mathematics. There are people from Egypt, they are good at mathematics. People from German, they are very good at practicing. All the students are different.*

For instance, as indicated by Teacher 11, Chinese students appeared to be biased by their native languages in writing English papers. They tended to make errors differently from that of French students.

*T11: So, I noticed that, I don't want this to be sound as racist. But for example, we had a lot of Chinese students, a lot of very good Chinese PhD students. It is true that when you discuss with them, you do not see any difference. But when they start writing for example, I think they do have a way of writing the sentences, and even making the paragraphs or writing the whole text, which I think the French student would make as many errors as a Chinese students, but not the same kind of errors. So I think that they will. Yeah, I do see differences between students at this level, maybe because their culture, and they seem to be also biased somehow by their native language.*

Meanwhile, as indicated by Teacher 12 and Teacher 13, people with Anglophone culture tended to be more open, while the French way of thinking was more likely to be formal and precise.

*T12: American people they like to sell things, that they make a paper in universal journal, then they make a big announcement. like "wow, we are world champion" But I would say in a positive way, they are really used with the social network and advertising their job and work and so on and so on. So, this is a Anglophone culture. In France, if you say that you start to be happy with what you have done. It's really really not good. Because you're going to make your colleague jealous. The success of somebody's personal success is not well seen here.*

*So US and UK is different. Even though you deserve the success, there is obviously some people might be jealous but it's more culture. In France, everyone is equal, everyone is good. Yes sometimes you're obliged to give marks but you would say no no, everyone is good. So this is the main difference.*

*T13: When I got here, a French way of thinking is much more formal, is much more precise. Whereas an English way of thinking is is more open, that's what I found when I got here and I think it may have changed now. So a student who is French would be much better at choosing the exact mathematical language to discuss something.*

Moreover, Teacher 13 also attributed the difference in scientific thinking to the tendency of translating to the native language due to insufficiently good English. Teacher 13 stated that students seemed to be capable of actually thinking in another language after reaching a certain language threshold.

*T13: I think the problem is that the students probably don't think in English. My guess is, as the bachelors level anyway, both the students they're taking what they say to them in English, translating it in their head into French word, finding the answer and then translating it into English. [...] It means up until a certain level, at a certain stage, you pass a threshold and then you start actually thinking in the other language. But it takes quite a lot before you arrive at that stage. [...] But most of the students I teach in bachelor's degree are not working like that, they're translating.*

#### 4.4.5.2. Representations of Scientific English (from Science Teachers' Perspective)

As previously discussed in Chapter 2, the network of representations indicated that language teachers' representations are bearing direct or indirect impact from the professional world. In this regard, it is pivotal to take science teachers and administrators into account concerning scientific English teaching, which are not included in the current situation.

Not surprisingly, science teachers do have clearer representations on scientific English than language teachers. There seemed to be a consensus in the perception of scientific English. According to Teacher 9, Teacher 10 and Teacher 12, scientific English was considered as in streamlined version, simplified with short sentences, presenting one idea per sentence directly and precisely.

*[What does scientific English mean to you?]*

*T9: Well, it's a very simplified, streamlined version of English. Basically, it has a much more vocabulary than English, which is a language with much more vocabulary than French or Italian, which is very useful for standard communication in science.*

*T10: Compared to the sentences on the book, in science we want it to be short sentences, one idea per sentence, which is really direct.*



*T12: So scientific English is that you don't need to make big sentences or obliged to have subject and verb in sentences. You can only put words. It's like, you know what we go in French, the "style télégraphique" which means that you have a slide you summarize a sentence, you put the keywords, This is more of this, scientific English is something like sentence removing all the extra words. So, it's often that you can discuss science like that with simplified sentences, which are short and precise and you can go directly into the point.*

According to Teacher 11 and Teacher 13, scientific English allowed students and researchers to communicate in a scientific context, in the way of spoken or written.

*T11: For me, scientific English means being able to read and correctly understand papers without having google translation, being able to communicate and to collaborate with students and colleagues, and being able to present your work fluently to others in English.*

*T13: So basically, scientific English means speaking English in a scientific context, in a concentrated context. So of course, doing that means having the vocabulary but it also means knowing how to say things correctly. [...] So yeah, for me, scientific English is everything specifically that allows you to communicate in a scientific environment, like spoken or written or whatever.*

*T14: It means nothing(laugh). It means I need English in science to communicate and to have explanation with people who speak English. For me, scientific English is just a tool. It's just a way to publish. Because you have science in English, or in French. But science is before them.*

Teacher 11 also underlined that scientific English played a crucial role in disseminating the science, in which the most difficult part is being able to write correctly or at least decently regarding the scientific papers in English.

*T11: And then the most difficult part is being able to write correctly or at least decently the papers in English. Because this is very important you know, people, they pay attention to how you write. I saw people that have been rejected of papers, not necessarily because of the scientific content but because of the English language. So I think that both of them are important. Of course, what we are doing science is more important because the most important is to do good science, but I think that the English plays a crucial role in disseminating the science that we are doing. So for me, I think that they are strongly related. By the way, we can see best researchers who speak very well English, so it is very rare but we can see a very famous researcher whose English is not good.*

#### 4.4.5.3. The Significance of Scientific English

All science teacher participants attached great importance of English used for communication in the scientific community.

According to Teacher 8, students needed to reach a certain English level, not necessarily perfect but good enough to be independent speakers.

*[Do you think English is important for scientific students? in what aspects?]*

*T8: Yes. They must be able to read English, at least the technical documentation. It's mandatory. They must be able to understand and to express themselves.[...] They have to master English, at least, with a B2 level. They must be an independent speaker.*

Teacher 13 pointed out that students should be capable of accessing the references or information in English.

*T13: There is also getting access to information, because there's a lot more scientific information in English than there is in any other language. Really, I mean, it's been chosen that most publications and reviews and so on, at least in physics are in English.*

In general, all teachers indicated that students should be capable of communicating in scientific context, including writing and publishing scientific papers in decent and correct English, and presenting their results in science publicly.

*T9: Well, it is important. Yes. First of all, for accessing the references. Most of the scientific references are in English. Second, on a longer term, it's about writing in English. For those students if they aim at becoming researchers they must be able to write in English. And third, after writing in English they are supposed to give talks in English in conferences. All of these are necessary steps for them. Nothing happens in French.*

*T10: I mean, there are three points, one is reading, we can read everything. Writing to communicate to other people. And also day-to-day speaking. Not necessarily perfect speaking mandatory, but at least they can go in some base, just discuss a little bit about what are you doing in life, whatever, and also explain what they do.*

*T11: For me, once again it is crucial. It goes from, from the very low level, which is being able to understand the small document the documentation, to the level that in their careers, in academia or in companies, they will have to collaborate with people they do not speak their language. They will be, at some point,*

*obliged to present themselves, to write documents or reports in English. Honestly, I think that in this kind of engineering or research job, it is almost impossible nowadays, to be able to think that we can do a career without speaking English in Europe.*

*T12: English is very important for scientific students because again, whatever we do, I mean, for bachelor students, I would say that what you expect as the English level for bachelor students should be different from Master.[...] So, this is super important that students at the Master's degree have a very decent level in English, from obviously speaking but also they should try to present the results they should try to discuss science or technique with technical rules and so on. So this is super important.*

*T13: Yes, specifically communication. There's nothing worse than being brilliant at something and not being able to communicate with other people who don't speak your language.*

*T14: I think it is necessary for communication. [...] If scientific students start to pursue a career in research, they will need English, of course. If they stop at other careers, then they will not need it.*

## **Synthesis**

The interviews with science teachers revealed another perspective of English in the scientific community, which was complementary to the perspective of language teachers.

The network of representations presented by Chaplier (2017) (see Chapter 2) shows that language teachers' representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of researchers in English studies; representations of science students. However, the results of this study indicate that the representations from the professional world differ significantly from those of language teachers and science students.

Meanwhile, as explained in CDST (see Chapter 2), English learning is a system that constantly interacts and develops with internal subsystems. Language ability, environment, and learners all develop dynamically, interact, and influence each other, thus forming a larger system. Different people, different cultural backgrounds, and different learning experiences are different, and learners have different goals in different periods (Dou et al., 2021). CDST led us to the conclusion that language teachers, science

teachers and students were mutually influenced. However, each group of them has different representations.

Specifically, science teachers perceived English as playing an essential role in science. They viewed it as the official language for communication in the international scientific community and felt that it was mandatory and natural to use English to write and read scientific documents or articles. Teachers expressed neutral attitudes towards the common acceptance of using English in the scientific community. However, they did encounter some challenges with scientific English at the beginning of their careers due to insufficient English proficiency. For instance, they felt uncomfortable presenting their work and exchanging ideas publicly. However, after gaining years of experience, they became more proficient in using English in the scientific domain, sometimes even better than their native languages.

Secondly, in terms of the use of English in daily practices, science teachers rarely used English in teaching undergraduate students and seldom adopted English sources in science courses. This was largely due to administrative policies in the university, student comprehension levels, and time constraints. These findings were consistent with the results of learner interviews. In contrast, science teachers extensively used English in their daily research, whether it be with colleagues, PhD students, or collaborators. Science teachers expressed that it was challenging to interact with students and researchers who had strong accents and different ways of expressing themselves. They found that the main challenge during interactions with students was writing scientific papers rather than communication, as the latter could be improved with time.

Thirdly, in terms of the use of English by students, science teachers generally had the impression that students had a surprisingly good level of English. However, they also observed that students lacked motivation to learn English, which was consistent with the results of learner interviews. Science teachers noted that students only seemed to attach importance to English in science at the master's level.

Fourthly, in terms of collaboration with language teachers or researchers, science teachers were quite aware of the dilemma faced by language teachers, which was the lack of professional knowledge in the field of science. Although science teachers attached great value to collaboration with language teachers, there appeared to be minimal connection between them. According to teachers, it was practically impossible

to conduct any collaboration due to a lack of motivation, limited financial investments, and time constraints. These factors seemed to be demotivating for science teachers.

From the perspective of science teachers, it is important to focus on developing scientific writing skills, conducting rigorous scientific discussions, and being able to exchange ideas publicly for science students. The teachers also suggested that students be grouped according to their English proficiency levels.

Lastly, in terms of their representations of scientific English, there seemed to be a consensus among science teachers. They considered scientific English as a streamlined version that is simplified with short sentences, presenting one idea per sentence directly and precisely. Scientific English allowed for communication in a scientific context, both spoken and written. Science teachers believed that scientific English played a crucial role in disseminating science, and the most challenging part was being able to write correctly or at least decently in scientific papers in English.

Science teachers attached great importance of English used for communication in the scientific community. According to teachers, students needed to reach a certain English level, not necessarily perfect but good enough to be independent speakers. In general, students should be capable of accessing the references or information, writing scientific papers in decent and correct English, and presenting their research publicly.

In terms of the influence of language courses on scientific thinking, the findings were consistent with the learners' interviews. While most science teachers believed that language courses were not directly relevant to scientific thinking, they did acknowledge that differences in scientific thinking among students could be attributed to their cultural backgrounds and the tendency to translate ideas into their native language due to insufficient English proficiency.

## **Chapter 5 Discussion**

## Chapter 5 Discussion

To better illustrate and present the results visually, four mind maps are constructed as shown in following figures. Figure 24 is a whole mind map that shows the connection and interaction among learners, language teachers and science teachers. It is a good illustration of CDST (see Chapter 2) in the case of English for science as well. Afterwards, Figure 18 to Figure 22 show respectively the details of the results.

Figure 18 – Mind Map of Students’ Attitudes and Motivation

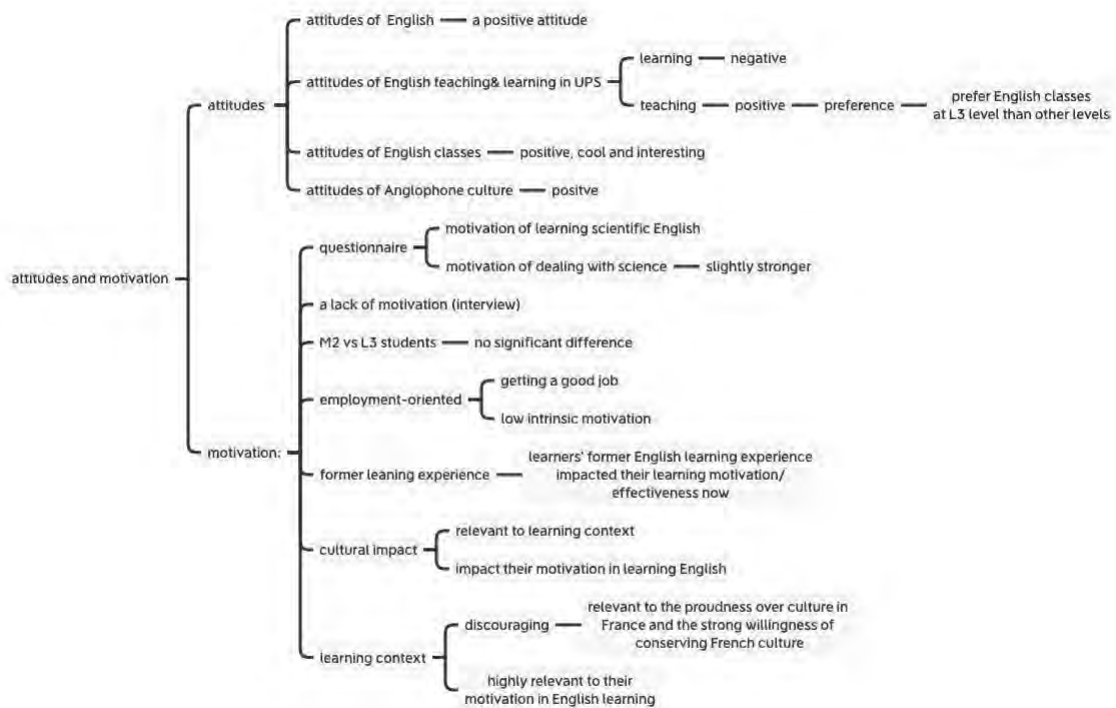


Figure 19- Mind Map of Students' Representations

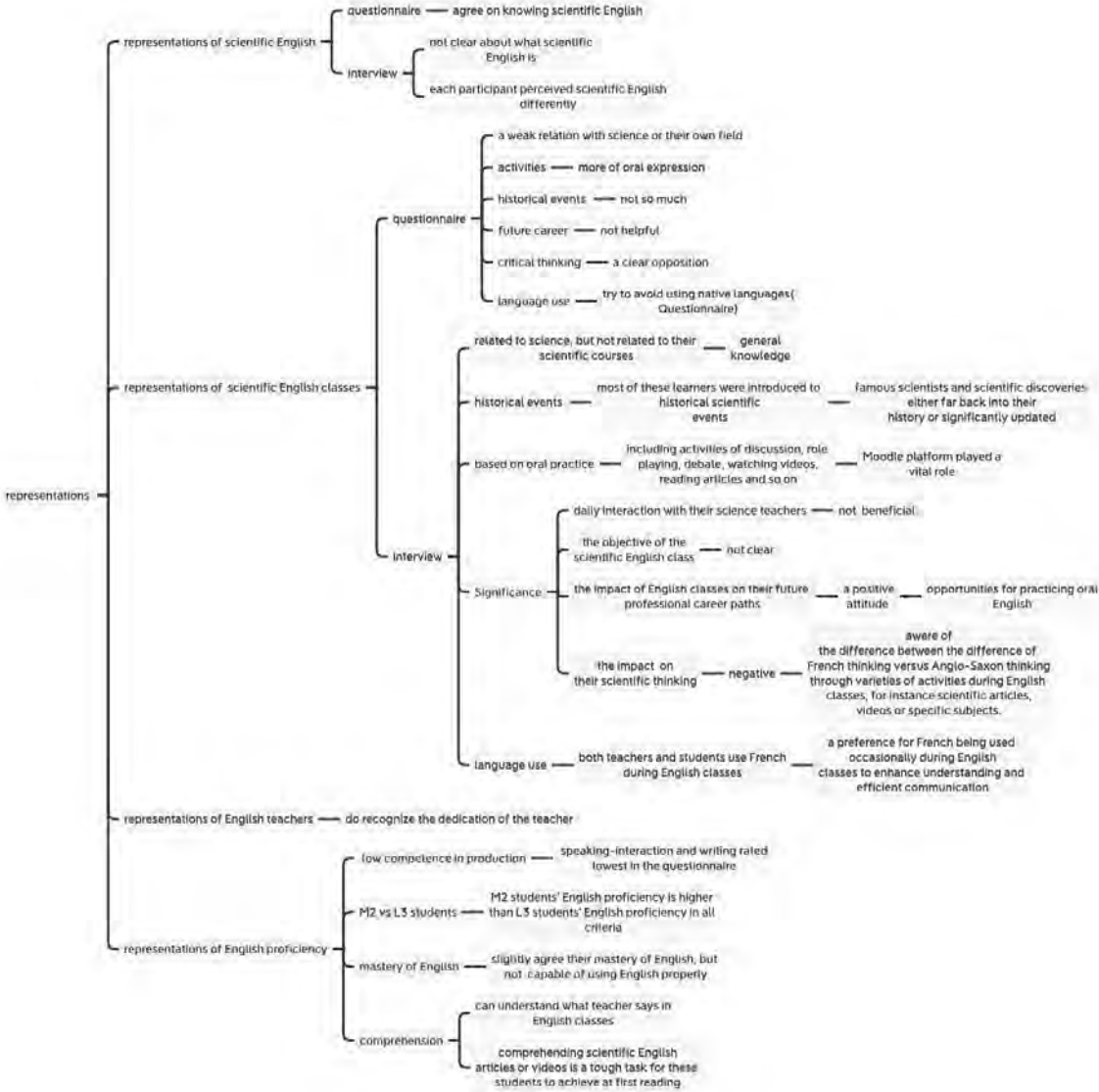




Figure 20 - Mind Map of Correlation Analysis

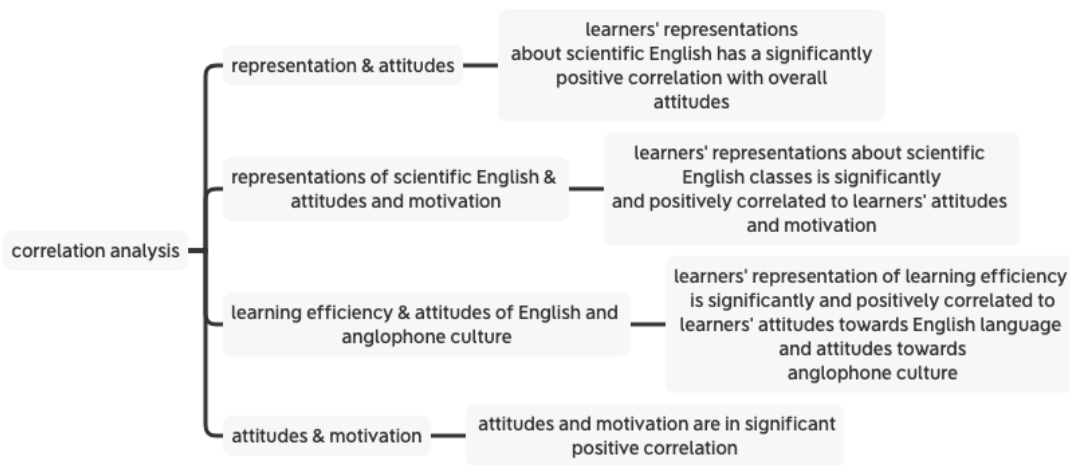


Figure 21 - Mind Map of the Results of English Teachers

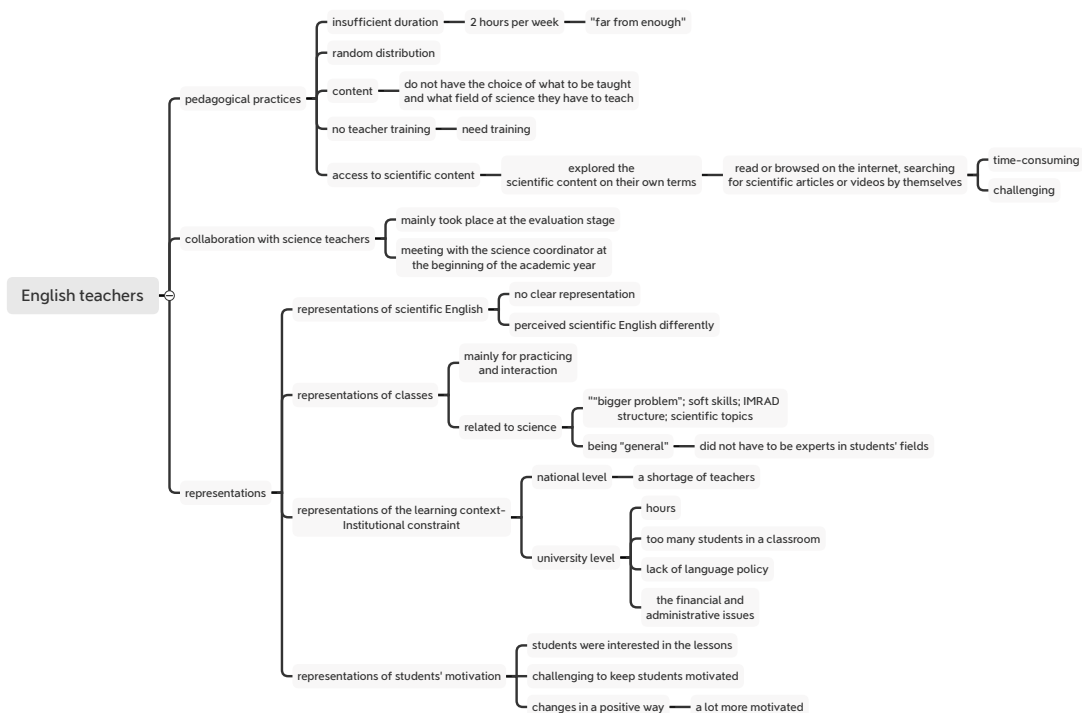
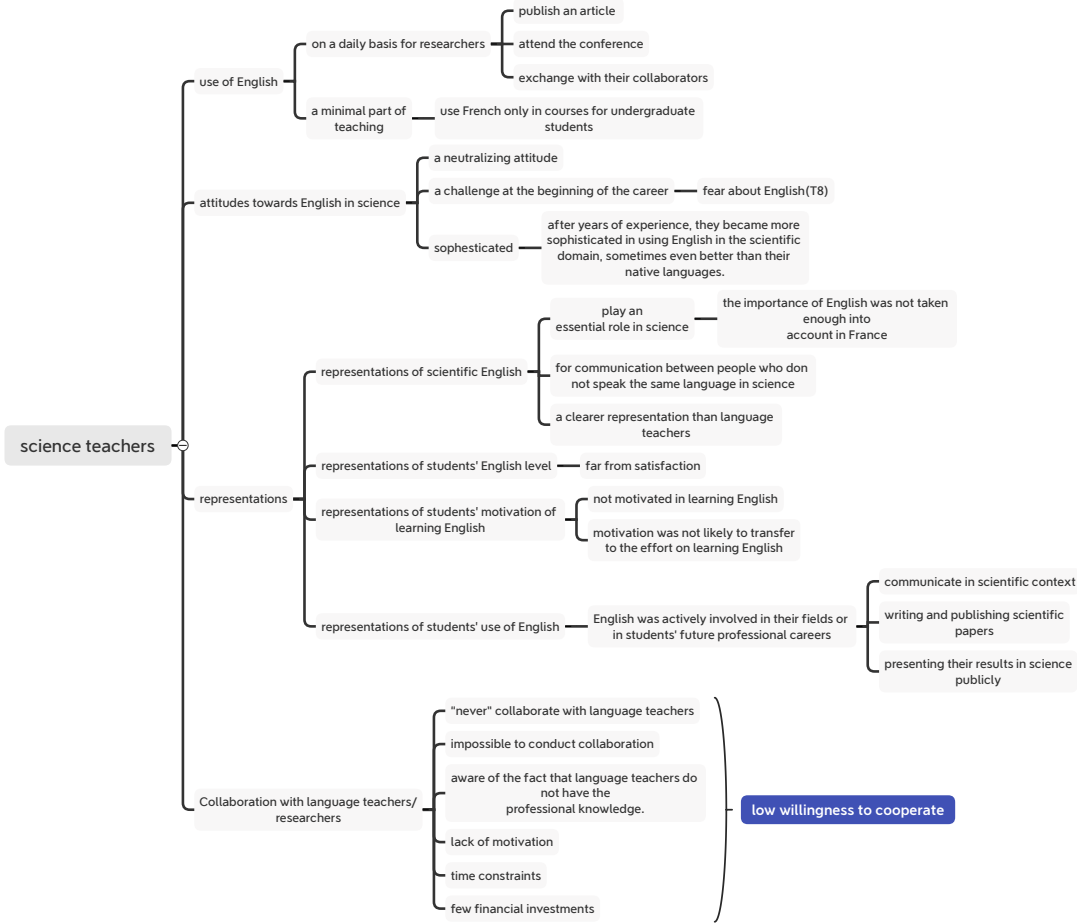
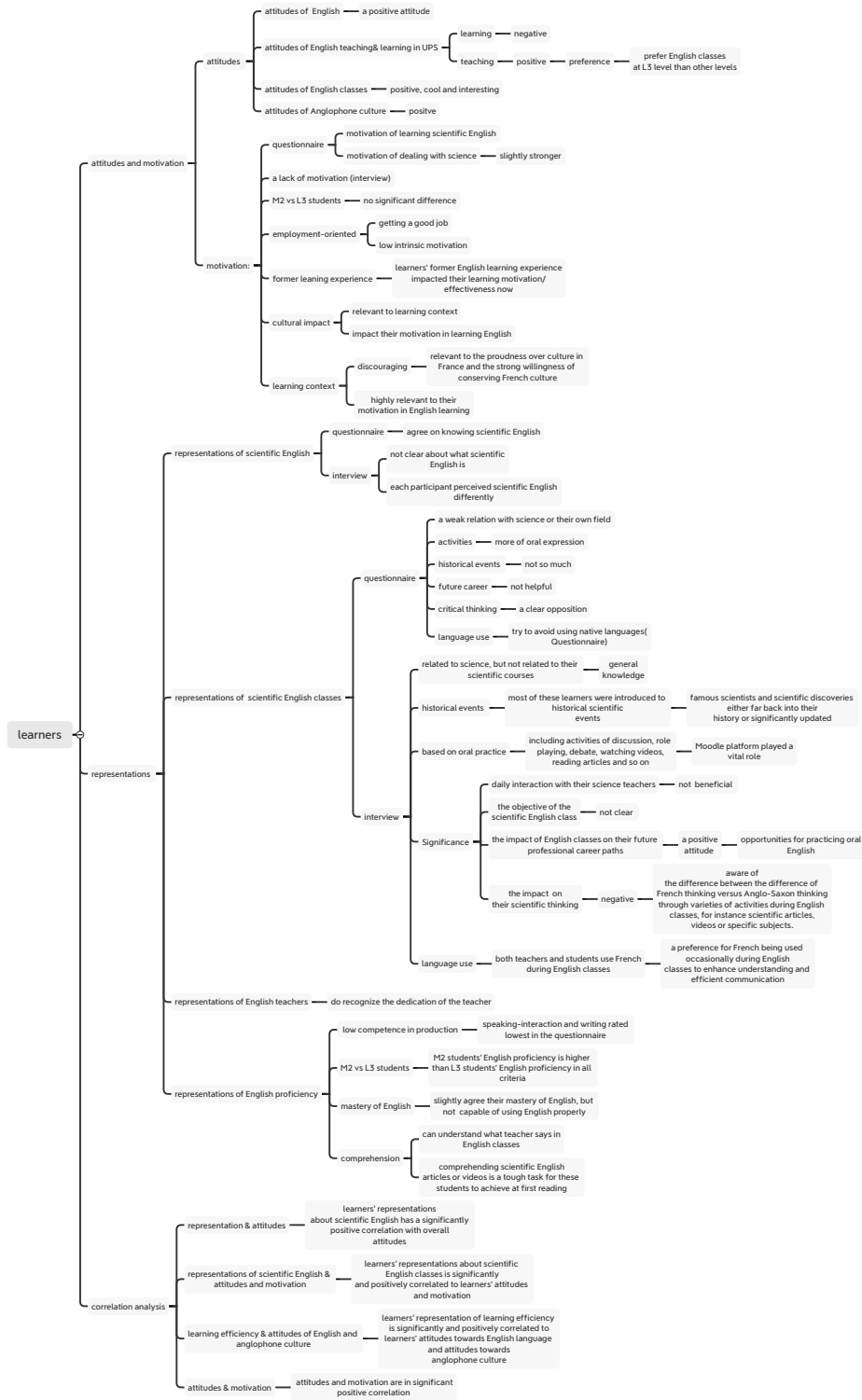


Figure 22 - Mind Map of the Results of Science Teachers



The following two figures (Figure 23 and Figure 24) depict the interrelationship of the elements mentioned above.

Figure 23 - Mind Map of the Results of Students





As proposed by the Douglas Fir Group's transdisciplinary framework for Second Language Acquisition (SLA) in a multilingual world (Group, 2016) (see Chapter 2), there are different levels in the system of scientific English teaching and learning.

Regarding the supra-international level, there is a strong trend of internationalisation of training in French higher education (see Chapter 1), with more and more Master's degrees being taught in a foreign language (Derivry-Plard et al., 2013). English is everywhere. However, what type of English are teachers using and teaching? When English is chosen as the means of communication among people from different first language backgrounds, across linguacultural boundaries, the preferred term is 'English as a lingua franca' (Seidlhofer 2005) (see Chapter 2). Therefore, it could be English as a lingua franca (ELF) with the aim of communication among people with various first language backgrounds. It could also be English for academic purposes (EAP) for researchers. Nevertheless, the findings from the interview of language teachers reveal that pedagogical practices by language teachers are performed based on their own research on LANSAD courses. In this regard, we have to ask the question, what type of English are students learning?

Regarding the macro- national level, there is no programme or "rules" for English teaching in France. In addition, there is no training in French higher education, let alone training for teachers in LANSAD sector (see Chapter 1). In this regard, language teachers perpetually have to explore the objectives, content, and teaching methods of the course on their own (Van der Yeught, 2014).

Subsequently, regarding the meso-institutional level, there is no language policy for teachers in LANSAD sector. Science teacher-researchers seem invisible in the whole course system and language teachers are getting very little support. Apparently, the significance of language is not highlighted and everyone in the system persists in his/her own beliefs. This situation is also in accordance with learners' interview discourses, in which most of the learners claim a discouraging English learning context in France.

Lastly, regarding the micro-class level, both language teachers and science teachers have different representations, nor do they have the same "rules". Students also remain unclear about what they are learning. Therefore, there is no dialogue among individuals, nor is there any dialogue among the disciplines invited in English for science. All of these contribute to the difficulties and the low effectiveness of English training in the LANSAD sector.

In this part, we discuss from three perspectives, learners, language teachers and science teacher-researchers, regarding five issues: a) representations of scientific English; b) attitudes; c) motivation; d) collaborations; e) cultural context. As stressed up in CDST by Ushioda (2015), learners are placed “in” some certain kind of context, which has positive or negative impact on learners. She also explains, if language input is regarded as a feature of context in L2 learning, we recognise that learners act upon their contexts. Learners are also seen to contribute to shaping their contexts through how they interact with input. Therefore, the teaching-learning process involves not only learners and language teachers, but also science teacher-researchers. All of them contribute to shaping their contexts through interactions, as well as being impacted by the contexts.

Rather than criticising or giving recommendations, the ultimate goal of our research was to understand the phenomena that emerge in teaching-learning situations of English in a scientific context in the case of Paul Sabatier University that is a university dedicated to science mainly.

## **5.1. Representations**

### **5.1.1 Representations of Scientific English**

The issue we paid first attention to was the representation of scientific English. In this study, learners’ representations, language teachers’ representations, and science teacher-researchers representations regarding scientific English were examined, respectively. In terms of students’ representations of scientific English, the results from both questionnaires and interviews indicate that these learners have basic representations of the expression “scientific English.” In contrast, they genuinely do not clearly understand what scientific English means or refers to. Alternatively, students are not aware of what they are learning during pedagogical practice. For instance, S4 states: “It’s not clear for me. I have asked my teacher this question, and my teacher asked me the same question. The teacher doesn’t know what that means.”. S5 also states: “It doesn’t mean anything to me, I think” (see Appendix 6).

Meanwhile, it seems to be the same case with language teachers. According to the interview discourses, there is no consensus among language teachers about scientific English, and they have various representations regarding scientific English. Two language teachers out of seven expressed their confusion towards scientific English, stating that scientific English meant nothing to them. When referring to scientific English, it seems overbroad even though it is limited in the range without human sciences taken into account, since the sciences encompass

enormous domains and various disciplines, including physics, mathematics, chemistry, geology, biology, computer science, etc. (Trouillon, 2014). Hence, it is obviously impossible to deal with scientific terminology extensively. Trouillon (2014) also proposes that the approach regarding scientific English should be done in a comprehensive manner in order to understand at what level common traits can be identified, despite the diversity observed even beyond the disciplines. He also highlights that there is a necessity to start from a proper and clear definition. In this regard, the absence of a consensus on scientific English make it fundamentally conducive to a clear scientific and educational path in scientific English pedagogical practices.

As Chaplier (2016a) states, the phrase ‘scientific English’ contains two terms: language and science. However, the latter has received little attention in research and teaching, and merits further investigation. Owing to the nature of ‘science’ itself, science has always been seen as hermetic and limited to specialists who are the only ones who can understand it. Currently, the problem of English for science primarily lies in the fact that there is no clear reflection on how science and English should be combined/integrated. Now it seems that science is juxtaposed to English.

Non-specialist teachers are excluded by the use of standardised symbols, equations and concepts. They skim the surface, or use science as the background or pretext for the study of language as a tool. However, science is also a domain that can be apprehended through other disciplines, and this analysis argues that its many aspects should be understood. It is generally perceived through various clichés that are analysed here (Chaplier, 2016a).

This makes sense since there is no language policy at French higher educational level. According to language teachers, they developed the curriculum and explored the scientific content on their own terms. As we have covered in Chapter 1, in France, language education policy is determined at the national level, being generated and published in official bulletins by the Ministry of Education. At university level, the texts depend on the Ministry of Enseignement supérieur et de la Recherche. There does not exist a language policy that specifically instructs the pedagogical practices of the English language in France. On the contrary, the policies are only formulated and presented in relation to the French language (Hofstee & Cultuur, 2014).

For science associate professors and professors, the interview discourses show that they have stronger representations than language teachers in terms of scientific English. They generally consider scientific English as in streamlined version, simplified with short sentences, presenting one idea per sentence directly and precisely, which is used for communication among people

who do not speak the same language in science. This was not surprising considering the fact that science researchers employ English daily. According to science teachers, English serves as a lingua franca (ELF) in the scientific community concerning their daily use of English.

However, it is one view of English in the scientific context that is not the same as that of teaching English in a scientific context by English teachers and researchers in English.

As previously covered in the part of representations (see Figure 4), teachers and students have their own representations in teaching-learning activities. They take different perspectives in viewing and evaluating the outcomes of learning. As Chaplier (2017) stresses up, it is very difficult to communicate between students and teachers who do not have the same representations and the same knowledge bases. Meanwhile, the network of representations also indicated that language teachers' representations are bearing direct or indirect impact from both four components: representations from the professional world; representations of administrative managers; representations of Anglophone researchers; representations of science students. In this regard, it is pivotal to take the part of the science teachers and administrators into account, which are not included in the current situation. In this case, since language teachers, science teachers, and learners hold widely differing representations of scientific English and these representations do not converge, the questions emerge: what kind of English are teachers teaching and using? How can we build this knowledge together, considering the fact that there is a lack of coherence between language teachers and science teachers?

### **5.1.2 Cultural Representations**

Comprising mental and public representations, cultural representations portrays a specific group or subgroup within a community (see Chapter 2). Being either positive or negative, cultural representations implies open and accepting attitudes, or rejection and refusal toward the other group. Rubinfeld et al. (2006) make the hypothesis that positive interrelations between the contact with the L2 community, confidence when speaking the L2, and identification with the L2 community would lead to more positive cultural representations instead. This process then guides individuals to more positive representations of the L2 culture. In daily life, this research proposes that learning an L2 might positively influence intergroup relations. According to Rubinfeld et al. (2006, p. 627), "in the context of learning an L2, we see greater identification with that community, which, in turn, leads us to feel more positively about the



community”. Therefore, cultural representations are of prominence in English learning in this study, as they are further developed in 5.5 Cultural context.

## **5.2 Attitudes and Motivation**

### **5.2.1 Learners’ Attitudes**

Regarding students’ attitudes towards English teaching and learning at Paul Sabatier University, there seems to be a contradiction in the results from questionnaires and interviews. Despite that student participants in the interviews mostly perceived their English classes as being “cool” and “appealing”, the results obtained from questionnaires reveal that these students hold a fairly negative attitude towards English learning at Paul Sabatier University, and they generally do not enjoy their scientific English classes. As Gardner (1985) explains, motivation is the combination of effort and desire to achieve the goal of learning the language and favourable attitudes towards learning the language as well. The data obtained from this study indicated these students have fairly lower motivation towards scientific English lessons.

However, it is noted that this motivation is process-oriented, because motivation is dynamic. Dörnyei and Ottó (1998) divide the L2 motivation in two major dimensions: action sequence and motivational influences. Action sequence refers to the behavioural process in which initial desires sequenced into goals, intentions, action, accomplishment of goals and evaluation. Motivational influences can be regarded as fuel to the behavioural process. Dörnyei and Ottó further develop the motivated behavioural process into three main phases: 1) preactional stage, 2) actional phase, and 3) post-actional phase. According to language teachers, they generally felt that students were progressively more motivated to learn English than several years ago.

According to students’ feedback, it seems that students in science hold a positive attitude towards English teaching in the language department. Students, in general, recognise the dedication of language teachers. Gardner and MacIntyre (1993) also further enhances integrative motive by involving attitudes towards the learning situation, which comprises attitudes towards the language teacher and the L2 course.

The data obtained from this study indicated students’ integrative motives would be strengthened by these students’ favourable attitudes towards language teachers in a specific period.

Moreover, students perceive scientific English classes as being not helpful for their future careers and being of no avail for critical thinking. However, internationalising (see Chapter 1)

is not only as a result of language but also of culture and the issues of internationalisation of training are shared across borders (Barrault-Méthy, 2019). A major challenge of internationalisation is to develop students' intercultural competence, preparing them for a globalized professional world. Rather than the mastery of basic grammar and vocabulary, there are rising needs for enhanced soft skills in the workplace, which are also indispensable in comparison with hard skills. As a consequence, fostering learners' intercultural competence, critical thinking, problem-solving abilities, and capacity to communicate and fully participate in current networked world has targeted for particular focus (ACTFL, 2011). It is well acknowledged that French universities should 'professionalise' students (Labetoulle, 2020). Higher education in institutions today is starting to be challenged by the issues of how to foster students' professional development and equip them with skills for a successful launch of new careers.

As previously discussed in Chapter 4, students' representations of scientific English classes impacted their attitudes and motivation for English learning. Therefore, a conclusion could be drawn that their representations of scientific English classes negatively affected their attitudes towards English learning, eventually lowering their motivation.

Regarding students' attitudes towards English and Anglophone culture, they tend to hold a positive attitude towards English and Anglophone culture. Apparently, students appreciate Anglophone culture, but will this kind of appreciation of Anglophone culture transfer into the effort of learning English?

### **5.2.2 Teachers' Attitudes**

The results of language teachers' and science teachers' attitudes towards scientific English are different, although they are facing the same group of students.

For language teachers, English is mainly adopted in pedagogical practices. The most noticeable obstacle for language teachers was getting access to scientific content. The interview discourse indicates that due to the absence of language policy, teacher training and collaboration, these language teachers tend to be struggling to explore the scientific content on their own terms, which is challenging and time-consuming for them at the beginning of their careers.

For science teachers, scientific English plays a minimal part in teaching since they are obliged to use French in courses for undergraduate students. English was highly involved in their

publishing articles, attending conferences and exchanging with their collaborators in science for researchers.

However, there are differences between teaching English in scientific context and using English in scientific contexts. According to Chaplier (2016b) the problem is not the excessive use of English but “bad English”, which might damage real scientific communication and thinking. When one uses a language, it means that they use a system of standards that shape thought and its relationship to the universe. Each language has a systemic set of forms and categories which not only allow someone to communicate but also shape her/his analysis of reality, influence her/his reasoning (Leduc, 1996). Using a lingua franca for science in professional usage can raise the question of limited language proficiency such as impoverished forms of language and an absence of cultural references. There is also the risk of developing uncertain norms which will lead to less comprehensible input both in oral and written communication (Chaplier, 2016b).

Science teachers hold a neutralising attitude towards scientific English. They feel obliged to use English in daily research. Nevertheless, despite their intensive use of English, there is still a challenge in using English properly at the beginning of their career. One of the teachers even expressed her fear of English back then, saying that speaking English was a nightmare.

To sum up, language teachers and science teachers are facing distinctly different obstacles in the university, in which the former mostly occurs in the pedagogical practice, and the latter occurs in a professional context.

### **5.3 Motivation**

Learners’ motivation for learning scientific English was investigated from three perspectives. In terms of learners’ own perspectives, there is a lack of motivation among learners. Moreover, there is no significant difference between M2 students and L3 students regarding their motivation to learn scientific English. Specifically, their motivation for learning scientific English is employment-oriented, in which the main motivation of learning scientific English was to get a good job. Their motivation for dealing with science is slightly stronger than learning scientific English, which makes sense since they are students in science domains. All of these results indicate that these learners have mainly extrinsic motivational orientations and they have low intrinsic motivation towards learning scientific English.

On the one hand, most science teachers believe that students are not motivated to learn scientific English. In addition, their motivation was not likely to transfer into the effort of learning

scientific English. Therefore, science teachers in general consider students' English levels far from satisfaction.

On the contrary, the responses of language teachers regarding students' motivation to learn scientific English are far more positive. Language teachers perceive students as being relatively motivated and highly interested in the lessons. Moreover, they hold the perception that students' motivation changes in a positive way, in which they in general feel students are more motivated than before. However, language teachers consider it is challenging to keep students motivated in learning scientific English.

## **5.4 Collaborations**

### **5.4.1 Collaborations between Language Teachers and Science Teachers**

It is worth noting that the collaborations between language teachers and science teachers are interactions among humans, which are issues concerning a human relationship. Therefore, it is crucial to create a dialogue. Meanwhile, pedagogical practices mainly depend on the teacher, not only their status (associate professor/professor, higher education professor, reader, temporary staff) but also their professional experience (Chaplier, 2019). Thus pedagogical practices in the LANSAD sector differ depending on language teachers' status and experience.

Today, the interdisciplinary approach is a key concept to the advancement of school curriculum at all levels. English for science or English in scientific contexts is a hybrid / interdisciplinary notion. The interdisciplinary approach refers to inquiries which critically draw upon two or more disciplines and which lead to an integration of disciplinary insights (Haynes, 2002). Interdisciplinary techniques go beyond these two techniques by allowing students to see different perspectives, work in groups, and make the synthesizing of disciplines the ultimate goal (Jones, 2010). However, the interview discourses of students indicate that there is only a weak relation between English classes with science or their own fields. Students generally perceived scientific English classes as being related to "general knowledge" instead of being related to their science courses. This situation makes sense since there is no national programme and no training for language teachers.

As previously mentioned, language teachers explored the scientific content on their own terms. There was no teacher training for language teachers, whereas language teachers felt that they needed training and they did not get much help at the beginning of their career.

According to science teachers, some of them “never” collaborate with language teachers and they feel it impossible to conduct collaborations. Science teachers attribute the lack of collaboration to time constraints and few financial investments. However, they are indeed aware of the fact that language teachers do not have professional knowledge.

In this regard, there seems to be almost no connection between language teachers and science teachers. The reason could be attributed to a lack of “common knowledge” between science teachers and language teachers within the university, which means language teachers' lack of content knowledge in course participants' disciplines. Chaplier (2017) highlights that the structure of the university also contributes to the situation, which does not favour the decompartmentalisation of disciplines and it is not very common for linguists and scientists to collaborate on teaching and research programmes.

#### **5.4.2 Collaborations between Language Teachers and Students (in the Classroom)**

The collaborations between language teachers and students in the classroom play a critical role in language teachers' pedagogical practice. Language teachers in general felt that they did not have to be experts in students' fields and they sometimes acquired scientific content from students. It seems that the collaborations between language teachers and students in the classroom are a lot more beneficial for language teachers.

For instance, T4 states: “I told students I’ m not going to teach their fields in English. That’s not my job. My job is just to get them speaking basically in their field. **I want them to teach me something.**”; and T6 states: “Basically, once you get to a level of certain students, **they take on the scientific content for you.** [...] Obviously, these kids need experts in their fields. So, our role is limited in many, many ways.” (see Appendix 7). Instead, language teachers could teach science students from “the humanity perspective”, meaning the history of the specific discipline and its impact on society.

The cooperation between language teachers and students in the classroom is also consistent with what Dudley-Evans, St John et al. (1998) put forward: when team teaching is not a possibility, the ESP Practitioner must collaborate more closely with the learners, who will generally be more familiar with the specialised content of materials than the teacher him or herself (see Chapter 2).

## 5.5 Cultural Context

The strong trend of internationalisation of training and the need of attracting international talents lead to a growing number of international students in French higher education (see Chapter 1). Internationalisation should be seen as plurilingualism and not English only. As previously discussed, each language has a systemic set of forms and categories which not only allow someone to communicate but also shape her/his analysis of reality, influence her/his reasoning (Leduc, 1996).

In this regard, culture is important for language learning and education because these phenomena take place within a culture (or different cultures), which influences their form and because culture is inextricable from language, and so constitutes part of the content of language learning and education (Roberts et al., 2000). CDST (Cameron and Larsen-Freeman 2007; De Bot, Lowie, and Verspoor 2007) also emphasises the need to take into account of the interconnectedness of social, cognitive and psychological factors and thus offers an all-embracing framework for investigating both the use and acquisition of an L2 and individual learner differences. The cultural context included in our research falls into two aspects: a) the learning context; b) learners and teachers' diversity/own cultural impact.

Meanwhile, as we have discussed in Chapter 2, intercultural communicative competence (ICC) development is important for all parties: students, sojourners and hosts in field contexts, and staff and faculty. ICC development is not only link to be academic and cognitive activities, but also experiential and affective activities. Specifically, ICC development is for all: ourselves and others; English-speakers and other language-speakers; and important for diversity, at home and abroad; and for internationalisation and internationalism (Fantini, 2020, p. 4). Therefore, ICC development is fundamentally conducive to achieve intercultural communication for all parties, particularly in the trending process of internationalisation in worldwide higher education. However, in this study, the findings indicate a poor development of learners' intercultural communicative competence (ICC).

Regarding the English learning context in France, the data obtained from this study indicated students in general perceive the learning context as being discouraging to learning English, which is relevant to the proudness of culture in France and the strong willingness to conserve French culture. Eventually, the discouraging learning context is highly correlated to their motivation to learn English.

For instance, S5 and S6, who were from Luxembourg, and Morocco, attributed their high motivation in learning English to their favourable English learning context in their countries. S5 states: “I think Luxembourgers are quite passionate to learn English, because other than Luxembourgish, they know they have to learn French and German and eventually English. It’s just natural and normal for them to learn another language.” S6 states: “When you grow up in Morocco, English is very presented. You are surrounded by an international context and the environment you grew up in is always encouraging you to learn other languages and specifically English. [...] It’s in TV or in general you see a lot of things written in English around you. It’s not a direct message like nobody ever told me that you have to learn English, but it’s just there.”

The results confirm what Pawlak (2017) emphasises that individual difference (ID) (see Chapter 2) variables are likely to play a vital role, impacting both the process of language learning and the outcomes of this process. Dörnyei (2017) also states that ID factors in SLA research have been well established as constituting a relatively straightforward concept involving background learner variables that modify the general language acquisitional processes. Undoubtedly, ID variables contribute much to the interaction in which learners engage, causing diversified learning process and learning outcome.

This result is also very much in line with the Plurilingual and Pluricultural Competence (PPC- see Chapter 2) proposed by Coste et al. (2009, p. 11). The more languages one learns the easier and more efficient it becomes to learn other languages. The PPC is defined as following: it refers to the ability to use languages for the purposes of communication and to take part in intercultural interaction, where a person, viewed as a social actor has proficiency, of varying degrees, in several languages and experience of several cultures. This is not seen as the superposition or juxtaposition of distinct competences, but rather as the existence of a complex or even composite competence on which the social actor may draw.

Regarding learners and teachers’ diversity/own cultural impact, as previously discussed on the setting of the university (see Chapter 1), Paul Sabatier University was built as an international scientific university, where English serves as a lingua franca (ELF) in the scientific community. As pointed out by Piccardo (2017), from a didactic perspective, embracing plurilingualism can empower students in perception, awareness and active exploration of linguistic and cultural diversity, hybridity and interconnection. Therefore, we should not neglect the diverse profiles of students and teachers, as well as their own cultural impacts. Moreover, we should take into account their various ways of teaching/constructing English for science.

The student participants and teacher participants in our research are not all French, in contrast, they have diverse profiles. This shed light on their own cultural impact on teaching/constructing English for science.

One language teacher mentioned the difficulty of dealing with students who have different personalities. T1 states: “Sometimes it’s just individuals in a group whose behaviour is a bit different, and you have to adapt to that. I think the difficulties for me are more in terms of personalities and dynamics within a group.”

Science teachers also mentioned the obstacle during the interaction with students and researchers with different cultural backgrounds, indicating a discrepancy in scientific thinking. For instance, T11 states: “We had a lot of very good Chinese PhD students. It is true that when you discuss with them, you do not see any difference. But when they start writing for example, I think they do have a way of writing the sentences, and even making the paragraphs or writing the whole text, which I think the French student would make as many errors as a Chinese students, but not the same kind of errors.”; T11 makes the comparison between Chinese students and French students in scientific writing, implying a difference between these two groups.

Meanwhile, the interview discourses of T12, T13 and T14 are resembling closely with that of T11. T12 and T13 draw comparisons between French and Anglophone researchers, suggesting different ways of behaving and thinking. T12 states: “American people they like to sell things, that they make a paper in the universal journal, then they make a big announcement. like “wow, we are world champion””; T13 states: “When I got here, a French way of thinking is much more formal, is much more precise. Whereas an English way of thinking is more open,”; T14 compares his students in diverse nationalities and reveals that cultural background is inextricably linked to individual’s way of behaving and thinking. T14 states: “For example, there are more than 30 nationalities in a diploma. People from German, are mostly easy to understand because German people are very keen. While some people from the United Kingdom are not easy to follow.”

The framework proposed by the Douglas Fir Group (Group, 2016) (see Chapter 2) regards L2 learning as an ongoing process that begins at the micro level of social activity (the smallest concentric circle), with individuals recruiting their neurological mechanisms and cognitive and emotional capacities and engaging with others in specific multilingual contexts of action and interaction, resulting in recurring contexts of use that contribute to the development of multilingual repertoires.



As the Douglas Fir Group (2016) emphasises, the institutions and communities at the meso level are powerfully characterised by pervasive social conditions (e.g., economic, cultural, religious, political), which affect the possibility and nature of persons creating social identities in terms of investment agency, and power. As a consequence, the fact that the significance of language is not highlighted by institutions and communities at the meso level could be attributed to the large-scale, society-wide ideological structures with particular orientations toward language use and language learning (including belief systems and cultural, political, religious, and economic values) at the macro level (the largest concentric circle).

To sum up, there are some issues that emerge from this research: on the one hand, the supra level has an impact on the following macro, meso and micro levels. On the other hand, the micro level also has an impact on the other macro levels etc. Thus, the knowledge in science created from English is not very well defined. It is a question of knowledge dissemination.

Specifically, what kind of English to teach in a scientific context? However, there is not only the problem of English but of the native language. In this case, any individual or student must be able to express himself well in his native language before expressing himself in a foreign language (know how to organise his ideas correctly with the right words). This view is coherent with CDST, which is not just English as a foreign language but also the native language. Therefore, the obstacles cannot be researched and envisaged as a narrow domain focused on linguistic aspects. It needs to be both broadened and enriched, through the collaboration with science associate professors and professors.

## **Conclusion**

## Conclusion

This study set out to investigate students' attitudes and motivation towards scientific English learning and teaching in a scientific university context. It focuses on how scientific English is currently taught and learned at Paul Sabatier University, a French higher education institution in science and technology. The study involved a group of students in scientific fields, language instructors, associate professors and professors in science. We have also looked into language teachers and associate professors and science associate professors and professors' representations of scientific English, as well as the relations mentioned above. The aim was to better understand learners' attitudes and motivation in the context of plurilingual English classes. If we consider the research questions proposed in the research design of this study, it is now possible to state that scientific English teaching at Paul Sabatier University is appealing to students in scientific fields and students generally acknowledge the effort of language teachers.

On the one hand, this study has provided in-depth insights into comprehending how students' attitudes and motivation in the context of plurilingual English class are, and how language teachers and associate professors and science associate professors and professors' representations of scientific English are. The initial step in this exploratory inquiry was to survey students about their attitudes and motivations toward scientific English as well as on the state of scientific English teaching and learning at Paul Sabatier University. Interviews were conducted with associate professors and professors of science, language teachers and associate professors, and students. The cross-checking of students', teachers', and researchers' representations of scientific English was made possible via data processing. The results highlight students' relatively negative attitudes and low motivation in scientific English learning, as well as the vague representation of scientific English among both students and teachers, pointing out the lack of "disciplinary dialogue" between language teachers and associate professors as well as science associate professors and professors at Paul Sabatier University. Consequently, it is very difficult to communicate between students and teachers who do not have the same representations and the same knowledge bases, thus leading to unsatisfactory outcomes of learning.

On the other hand, this study has made an effort to identify the factors that contribute to students' unfavourable attitudes and lack of motivation when learning scientific English as well as the effects of the specific context on the current teaching and learning environment. Institutional constraints may exist at both the national and university levels. Since there is a shortage of training for language teachers in France, it seemed natural for teachers to pursue specialisation

as a career path on their own terms. Teachers noted that they felt more tension and anxiety than usual due to the nationwide teacher shortage and the insufficient hours (two hours per week) of classroom time. Moreover, there is no consensus among language teachers about scientific English, and they have various representations regarding scientific English. According to science teachers, English serves mostly as a lingua franca (ELF) in the scientific community concerning their daily use of English. This study also indicated that students in general perceive the learning context as being discouraging to learning English, which is relevant to the proudness of culture in France and the strong willingness to conserve French culture. Eventually, the discouraging learning context is highly correlated to their motivation to learn English. Some recommendations were proposed to improve the current situation of learning and teaching scientific English in French universities.

Yet, the main objective of our research was to comprehend the phenomena that appear in teaching-learning situations of English in a French scientific context in the case of Paul Sabatier University, which is a university devoted primarily to science. It is necessary to have a clearer picture of the differences in representations of scientific English and didactic practices in France. There is still a need for more investigation into the underlying causes of the ineffectiveness of English teaching in scientific communities and how these factors play their roles in shaping students' negative attitudes and low motivation, as well as students and teachers' hazy perceptions of scientific English.

The current study merely acts as an exploratory investigation, future research is required to understand the interactions between language teachers, associate professors, and associate professors and professors in science, in the context of the teaching and learning of scientific English. Specifically, how to start a successful cooperative teaching programme and change the current state of instructors' lack of mutual motivation. Additionally, it appeared that a specific training is absent for teaching students in science fields, which is crucially needed for language teachers at the beginning of their careers. It is imperative to consider how future teachers can be efficiently prepared to teach scientific English.

## **Some recommendations**

Rather than attempt to criticise or give recommendations, the ultimate goal of our research was to understand the phenomena that emerge in teaching-learning situations of English in a scientific context in the case of Paul Sabatier University. Given my cultural background, it is hard to fully grasp and picture English teaching and learning in French higher education. Despite immense differences in cultures, here are a few recommendations that might be of interest to the LANSAD teaching sector in the scientific domains. To start with, there are recommendations at the macro level (national):

### **Institutional propositions at the macro level (national)**

- Establish a national web network of LANSAD teachers aiming to share their experiences and propositions.
- Provide training at university for teachers in LANSAD sector.
- Hire sufficient teachers in order to make up for the national shortage of teachers and the rapidly increasing population of students in universities.
- Provide financial support for teachers who are willing to participate and are actively involved in the collaboration between language and science teachers.

According to Narcy-Combes et al. (2019, p. 65), “[...]we are convinced that some changes at the micro level may be often more successful than top-down reforms and that some very limited changes may be very effective”. We continue to propose didactical propositions that could be implemented at the meso level (university) and micro level (classes).

### **Didactical propositions**

#### **-University (meso level)**

- Establish a language policy for teachers who are teaching in LANSAD sector (through discussions in conferences, seminars or some national associations).
- Establish a wide range of “common knowledge” regarding a variety of science domains (historical scientific events, famous scientists, latest scientific innovations and breakthroughs, etc.)

- Provide language teachers with training on accessing to scientific content.

**-Classes (micro level)**

- Create teams of language teachers and offer opportunities of classroom observation for teachers at the beginning of the career.

- Create collaborative projects of teachers engaging both language and science teachers in order to collaboratively build up didactic content and strategies.

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## **Résumé long**

**Anglais scientifique dans une université françaises : des attitudes et motivations des étudiants aux pratiques pédagogiques dans les contextes culturels**

Mots clés : anglais scientifique, attitudes et motivation, représentation, université française, contextes culturels

## **Introduction**

### ***Multilinguisme et plurilinguisme en France***

Le plurilinguisme a été étudié avec insistance dans le domaine de l'apprentissage des langues en Europe et dans d'autres régions où de nombreuses langues sont inextricablement liées les unes aux autres (Coste, 2001). Depuis les années 1990, des concepts fondamentaux tels que le bilinguisme, le plurilinguisme, la langue, l'utilisation de la langue et le discours ont été reconsidérés à la lumière de la recherche sur l'acquisition d'une langue seconde (ALS), la psychologie du développement, la sociolinguistique et la psycholinguistique (Castellotti & Moore, 2011 ; Gabillon, 2022 ; Moore, 2020 ; Narcy-Combes & Narcy-Combes, 2014).

Il existe de nombreuses définitions du multilinguisme et du plurilinguisme. Par conséquent, nous utiliserons la définition du Conseil de l'Europe (2001, p. 168). Le multilinguisme fait référence à la présence dans une zone géographique, petite ou grande, de plus d'une "variété de langue", c'est-à-dire le mode d'expression d'un groupe social, qu'il soit formellement reconnu comme une langue ou non. Dans une telle zone, les monolingues ne peuvent parler que leur propre variété. Le plurilinguisme est la capacité d'utiliser des langues pour communiquer et participer à des interactions interculturelles, lorsqu'une personne, considérée comme un agent social, maîtrise à des degrés divers plusieurs langues et a une expérience de plusieurs cultures. Il ne s'agit pas d'une superposition ou d'une juxtaposition de compétences distinctes, mais plutôt de l'existence d'une compétence complexe, voire composite, sur laquelle l'utilisateur peut s'appuyer (Narcy-Combes et al., 2019).

### ***Aperçu de l'étude actuelle***

La recherche sur " l'anglais scientifique ", un concept créé par Chaplier (2017), dans un tel contexte universitaire plurilingue a été motivée par les études de l'auteur dans le domaine de l'anglais à des fins spécifiques et de l'enseignement normal dans un institut normal en Chine. Actuellement, l'"anglais scientifique", c'est-à-dire l'anglais pour les étudiants spécialisés en sciences (chimie, mathématiques, etc.) à l'Université Paul Sabatier (UPS), est enseigné par des professeurs qui n'ont pas d'expertise ou d'expérience réelle dans le domaine des sciences et/ou de la didactique des langues étrangères. Leur approche pédagogique s'appuie principalement sur la tradition anglophone de l'anglais à des fins spécifiques (ESP), qui est axée sur les objectifs plutôt que sur les domaines spécialisés : l'accent est mis sur les objectifs linguistiques, tandis que les objectifs professionnels et disciplinaires sont soit ignorés, soit simplement apposés sans véritable articulation avec la langue.

La présente recherche exploratoire est conçue pour étudier les attitudes et la motivation des étudiants à l'égard de l'apprentissage et de l'enseignement de l'anglais scientifique dans le contexte d'une université scientifique. La présente étude explore également la relation entre les attitudes et la motivation des apprenants, les représentations de l'anglais scientifique des professeurs de langues, des professeurs associés et des professeurs associés en sciences, et l'enseignement et l'apprentissage de l'anglais scientifique. Des théories telles que la théorie des représentations sociales de Serge Moscovici (Castellotti & Moore, 2002), la théorie des systèmes dynamiques complexes (CDST) (Ushioda, 2015), le cadre transdisciplinaire du groupe Douglas Fir pour l'acquisition d'une seconde langue (SLA) dans un monde multilingue (Groupe, 2016), le modèle interactif de représentations de Claire Chaplier (Chaplier, 2017) et sa proposition de " connaissances communes " (Chaplier, 2017, p. 72) sont employées pour interpréter les résultats de la recherche.

Plutôt que d'essayer de critiquer ou de donner des recommandations, le but ultime de notre recherche était de comprendre les phénomènes (approche globale) qui émergent dans les situations d'enseignement-apprentissage de l'anglais dans un contexte scientifique dans le cas de l'Université Paul Sabatier, qui est une université dédiée principalement à la science.

Dans la présente thèse, une approche mixte combinant des méthodes quantitatives et des méthodes qualitatives a été utilisée. Cette enquête exploratoire a d'abord été entreprise par le biais d'un questionnaire adressé aux étudiants sur leurs attitudes et leur motivation à l'égard de l'anglais scientifique et d'un questionnaire adressé aux étudiants sur la situation actuelle de l'enseignement et de l'apprentissage de l'anglais scientifique à l'Université Paul Sabatier. Dans le même temps, des étudiants, des professeurs de langues et des professeurs associés, des professeurs associés en sciences et des professeurs ont été interrogés, respectivement. Le traitement des données a permis de croiser les représentations des étudiants, des enseignants et des chercheurs sur l'anglais scientifique. Les résultats mettent en évidence les attitudes relativement négatives et la faible motivation dans l'apprentissage de l'anglais scientifique, ainsi que la représentation vague de l'anglais scientifique tant chez les étudiants que chez les enseignants, soulignant le manque de "dialogue disciplinaire" entre les enseignants de langues et les professeurs associés ainsi que les professeurs associés et les professeurs de sciences à l'Université Paul Sabatier. Enfin, quelques recommandations ont été proposées pour améliorer la situation actuelle de l'apprentissage et de l'enseignement de l'anglais scientifique dans les universités françaises.

## **Le contexte**

### *Présentation de la France*

Le contexte, qui est un élément non négligeable dans le domaine de recherche des langues à des fins spécifiques (LSP), constitue la condition préalable à l'enseignement et à l'apprentissage des langues. "La sensibilité à la langue en contexte a toujours été une force sous-jacente des langues à des fins spécifiques, mais ce que l'on entend par contexte a également évolué (Upton, 2012, p. 18). Comme le soulignent Narcy-Combes et al. (2019, p. 14), la complexité des contextes multilingues, diglossiques ou monolingues et leur effet sur le développement du langage sont tels qu'ils doivent être analysés avec des outils bien adaptés afin de dépasser les analyses traditionnelles basées sur une ou deux langues clairement définies. En d'autres termes, la mise en œuvre de l'enseignement des langues signifie que le contexte doit être compris et traité dans le processus d'enseignement et d'apprentissage.

Le groupe Douglas Fir (2016) propose un cadre qui considère l'apprentissage des L2 comme un processus continu qui commence au niveau micro de l'activité sociale (le plus petit cercle concentrique), avec les contextes méso des institutions socioculturelles et des communautés et le niveau macro des structures idéologiques (voir chapitre 2). Le contexte peut comprendre le sujet, l'institution dans laquelle il est mis en œuvre, la formation des enseignants, l'exposition à la langue cible, la durée de l'exposition, etc. (Chaplier & O'Connell, 2015). En ce qui concerne la perspective du CDST (voir chapitre 2), la première question à aborder est celle de la définition du contexte. La relation entre l'apprenant et le contexte ne va pas dans une seule direction, et l'apprenant et le contexte ne peuvent donc pas être considérés individuellement. Comme l'explique Ushioda (2015), si l'apport linguistique est considéré comme une caractéristique du contexte dans l'apprentissage des L2, nous reconnaissons que les apprenants agissent sur leurs contextes. Les apprenants sont également considérés comme contribuant à façonner leurs contextes par la manière dont ils interagissent avec l'input.

Comprendre et analyser le contexte peut être une tâche complexe. Le contexte renvoie à une pluralité de choses. Il est constitué de tous les facteurs situationnels pertinents pour comprendre les comportements langagiers (et d'apprentissage), mais il peut aussi être plus pratique et se référer à l'environnement quotidien des apprenants et de l'institution d'enseignement (Narcy-Combes et al., 2019, p. 56).

Dans cette étude, le contexte se réfère au niveau supra qui est le niveau d'internationalisation, au niveau macro qui signifie les contextes institutionnels français sur la langue et au niveau méso qui concerne l'Université Paul Sabatier ainsi que la formation des professeurs d'anglais.

Cette partie présente le contexte de recherche fondamental de l'étude actuelle en France, y compris l'internationalisation de l'enseignement supérieur en France, la politique linguistique en France, le statut actuel de l'enseignement de l'anglais dans les universités françaises et la formation des enseignants d'anglais en France. Cette partie présente le contexte général de cette étude.

### ***L'Université Paul Sabatier : Une université scientifique***

L'Université Paul Sabatier est une université publique française, située dans une ville du sud de la France, Toulouse. Le nom de l'université rend hommage à Paul Sabatier, scientifique né à Carcassonne en 1854. Prix Nobel de chimie en 1912, Paul Sabatier a été doyen de la faculté des sciences de Toulouse et membre de l'Académie des sciences. C'est sous l'égide de ce scientifique que l'Université Paul Sabatier est fière d'accueillir plus de 35 000 étudiants et d'héberger 64 structures de recherche.

L'Université Paul Sabatier trouve ses origines au XIII<sup>e</sup> siècle et naît officiellement en 1969 de la fusion des facultés de médecine, de pharmacie et des sciences. La diversité de ses laboratoires et la qualité de ses formations en sciences, santé, sport, technologie et ingénierie assurent son rayonnement scientifique depuis plus de 50 ans et la placent parmi les meilleures universités mondiales. Elle est reconnue parmi les 300 meilleures institutions pour ses performances scientifiques par le classement international de l'Université nationale de Taïwan (NTU ranking).

Considérée comme une université au cœur de la science, l'Université Paul Sabatier est un établissement public à caractère scientifique, culturel et professionnel (EPSCP), doté de la personnalité morale et de l'autonomie pédagogique, scientifique, administrative et financière. L'université est placée sous le contrôle a posteriori du recteur de l'académie de Toulouse, représentant le ministre chargé de l'enseignement supérieur, de la recherche et de l'innovation. L'université est composée d'organes de direction, de composantes, de directions et de services.

## Revue de la littérature

### *La grande tendance de l'acquisition d'une seconde langue : Du changement cognitif au changement social*

Zhang (2020) a mené une étude systématique pour examiner les principales tendances du domaine de l'ALS entre 1997 et 2018 en utilisant la méthode bibliométrique. Les résultats présentent un schéma clair montrant que l'approche cognitive de l'ALS a dominé le domaine au cours de la période 1997-2007 et est restée l'approche principale de l'ALS au cours de la période 2007-2018. Ils révèlent également qu'un débat cognitif-social animé a eu lieu il y a environ 20 ans, conduisant à un changement positif du domaine et ouvrant de nouvelles opportunités pour des approches alternatives. Aujourd'hui, le champ s'est considérablement élargi.

Défini comme un domaine interdisciplinaire aux élucidations très variées, l'ALS a été développé et enrichi en permanence par des personnes issues de divers horizons disciplinaires et ayant des exigences variées (Long, 2017). Diversifié, large et en expansion, tels sont les mots exacts qui peuvent être utilisés pour décrire le domaine de l'ALS.

Les trois dernières décennies ont été marquées par une augmentation drastique des théories et de la production dans le domaine de l'ALS. L'hétérogénéité de l'interdisciplinarité peut être perçue par les chercheurs de diverses disciplines, par exemple la linguistique appliquée, la psychologie, l'éducation, l'anthropologie, etc. Comme l'explique Long (2017), les résultats prolifiques sont également utilisés dans des domaines interdisciplinaires, notamment la psychologie, la neurolinguistique, l'enseignement des langues, l'éducation, etc.

Compte tenu de cette énorme hétérogénéité, il n'est pas facile de couvrir toutes les théories et perspectives de l'ALS. Néanmoins, la connaissance de ses tendances et de sa nouvelle navigation la rend fondamentalement propice à notre recherche, dans laquelle le CDST fait l'objet d'une attention particulière.

Larsen-Freeman (2018) résume trois étapes dans l'histoire du développement du domaine de l'ALS : un début cognitif, un défi social et un processus sociocognitif.

### *Théorie des systèmes dynamiques complexes (CDST)*

La CDST est un paradigme scientifique qui s'est développé dans les sciences naturelles et sociales au cours des dernières décennies et qui considère divers phénomènes - y compris, par exemple, la météo, le cerveau, les écosystèmes, l'économie, la locomotion, le langage, les programmes, les familles, l'éducation, la culture, la personnalité, l'émotion, la cognition, la

motivation, le développement - comme des systèmes dynamiques complexes : des réseaux d'éléments interdépendants dont l'interaction continue et itérative donne lieu au comportement du système (Bar-Yam, 2019).

Comme le dit Ushioda (2015), la CDST est une discipline transdisciplinaire centrée sur le changement et l'émergence, c'est-à-dire le changement qui résulte de l'interaction des composants du système, tout comme une volée d'oiseaux émerge de l'interaction d'oiseaux individuels.

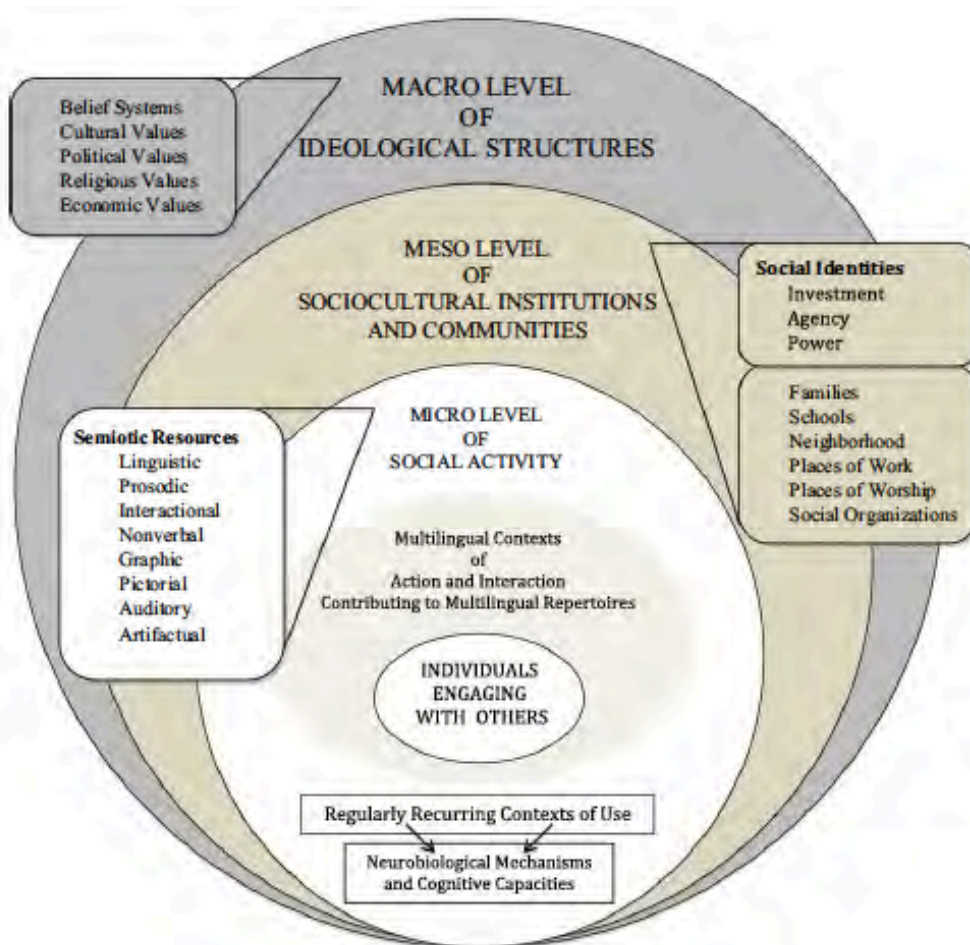
"Essentiellement, rien dans son environnement [un système dynamique complexe] n'est fixe" (Waldrop, 1993). Cet accent montre clairement que la CDST est une théorie du processus plutôt que de l'état. Comme l'explique Ushioda :

la motivation est dynamique. Des périodes de stabilité peuvent être atteintes, mais la motivation change indéniablement, parfois souvent et certainement au fil du temps. Si nous voulons vraiment comprendre la motivation, et d'ailleurs d'autres aspects du développement d'une langue seconde (SLD), nous devons les concevoir davantage comme des processus que comme des états (Ushioda, 2015, p. 12).

### ***Un cadre transdisciplinaire pour l'enseignement de la langue seconde dans un monde multilingue***

Le groupe Douglas Fir (2016) propose un cadre qui considère l'apprentissage des L2 comme un processus continu qui commence au niveau micro de l'activité sociale (le plus petit cercle concentrique), avec les contextes méso des institutions et communautés socioculturelles et le niveau macro des structures idéologiques.

Comme le montre la figure 2, le cadre proposé par le Douglas Fir Group (2016) considère l'apprentissage des L2 comme un processus continu qui commence au micro-niveau de l'activité sociale (le plus petit cercle concentrique), les individus recrutent leurs mécanismes neurologiques et leurs capacités cognitives et émotionnelles et s'engageant avec d'autres dans des contextes multilingues spécifiques d'action et d'interaction, ce qui donne lieu à des contextes d'utilisation récurrents qui contribuent à l'élaboration de répertoires multilingues.



Comme le souligne le Douglas Fir Group (2016), les institutions et les communautés au niveau méso sont fortement caractérisées par des conditions sociales omniprésentes (par exemple, économiques, culturelles, religieuses, politiques), qui affectent la possibilité et la nature des personnes créant des identités sociales en termes d'investissement, d'agence et de pouvoir.

### *Attitudes et motivation*

L'effort de recherche sur l'importance de facteurs tels que les attitudes et la motivation au cours du processus d'apprentissage d'une seconde langue remonte aux années 1940 (Gardner, 2001b). Une question intéressante soulevée par Gardner en premier lieu est de savoir comment une personne peut véritablement apprendre une seconde langue si elle n'aime pas le groupe qui parle cette langue.



Il existe de nombreuses situations différentes dans lesquelles l'acquisition d'une seconde langue peut avoir lieu, et il est raisonnable de supposer que le contexte aura une influence sur le degré relatif de réussite de l'individu concerné (Gardner, 2001b). Comme nous l'avons vu dans la première partie, ce point est également abordé dans le CDST, dans lequel les apprenants sont également considérés comme contribuant à façonner leurs contextes par la manière dont ils interagissent avec l'input.

Les facteurs sociaux, attitudinaux et émotionnels présents dans le processus d'apprentissage d'une langue étrangère sont connus sous le nom d'"attitudes langagières". Ces attitudes étaient à l'origine limitées aux perceptions qu'ont les apprenants de la communauté de la langue cible et de la langue cible elle-même (Gardner, 1985). Le concept d'attitude s'est élargi pour inclure les stéréotypes et les images mentales que les apprenants ont des pays de la langue cible, de leurs cultures et de leurs habitants (Nikitina et al., 2020).

Gardner (1960) réalise un test empirique mesurant les résultats en français, les attitudes envers les parents, les caractéristiques du milieu familial et d'autres variables dont l'hypothèse est de mesurer un motif d'intégration dans l'étude d'une seconde langue, comme il l'avance :

Tout comme l'ensemble des variables qui composent l'"aptitude" ont été déterminées par des analyses des variables intellectuelles importantes associées à la réussite en langue seconde, l'ensemble des variables relatives à la motivation doit faire l'objet d'une étude similaire. Il ne suffit pas de considérer la motivation comme une vague envie de travailler assidûment dans un cours de langue étrangère Gardner (1960, p. 2).

Le concept de motivation de Gardner comporte trois composantes : l'intensité de la motivation, le désir d'apprendre la langue et l'attitude à l'égard de l'acte d'apprentissage de la langue (Gardner, 1985). Le facteur de motivation s'est avéré corrélé à la réussite avec d'autres composantes engagées dans l'activité (compétences, attitudes, anxiété, désir d'apprendre une langue étrangère, parentalité, ethnocentrisme, etc.) . Dans son étude, Gardner a également considéré ces attitudes et le motif d'intégration des étudiants comme densément imbriqués pendant qu'ils étudient une langue étrangère s. (Softa, 2019).

### ***Représentation sociale***

Le terme "représentation sociale" provient de la théorie de la représentation sociale, qui a été formulée pour la première fois par Serge Moscovici et qui a eu un impact sur des chercheurs de différentes disciplines (Höijer, 2011). Le concept de représentation sociale est adapté du concept de "représentations collectives" de Durkheim (Durkheim, 1894, 1898; Durkheim,

1893). Serge Moscovici a introduit pour la première fois la représentation sociale de la psychanalyse dans sa thèse en 1961 (Moscovici, 1961). Héritière d'une forte tradition sociologique française, la théorie de la représentation sociale s'impose comme l'une des théories les plus significatives de la psychologie sociale (Rateau, 2011). Elle a d'abord été répandue en Europe, puis a balayé le globe principalement dans le domaine de la psychologie sociale, mais aussi sur toutes les autres sciences sociales. Des chercheurs en sciences sociales de divers domaines s'inspirent de Moscovici et mènent des études approfondies sur la représentation sociale de la maladie, du corps humain, de la biotechnologie et de l'environnement, etc. (Figari & Skogen, 2011).

Une représentation sociale peut être brièvement expliquée comme un processus d'élaboration collective de sens aboutissant à des cognitions communes qui produisent des liens sociaux unissant les sociétés, les groupes et les organisations (Höijer, 2011) Selon Rateau (2011) Au cours du processus de reconstruction constamment répété depuis notre jeune âge, notre perception du monde est façonnée par les échanges et les communications. Au fil de nos multiples implications et contacts avec divers groupes sociaux, nous acquérons et transmettons nous-mêmes des connaissances, des croyances et des valeurs qui nous permettent de partager une conception commune des choses et des autres. Les caractéristiques reconnues de la représentation sociale sont le partage, la production collective, l'organisation et l'utilité sociale (Duveen et al., 1990; Moscovici, 1991; Rateau, 2011). En tant que Jodelet (1989) une représentation sociale est " une forme de connaissance socialement élaborée et partagée, ayant des implications pratiques, qui contribue à la construction d'une réalité commune à un groupe social ". (Castellotti & Moore, 2002, p. 8).

### ***Représentations dans les contextes d'apprentissage des langues***

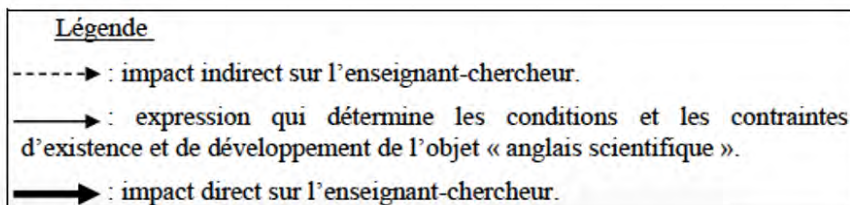
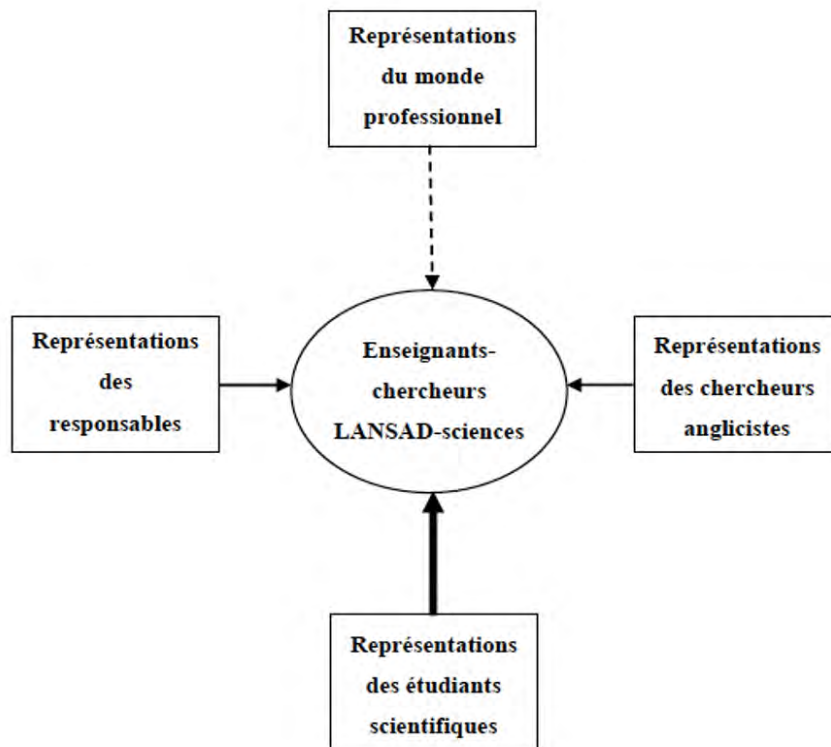
Dans un contexte éducatif, les représentations sociales servent à établir une relation de consentement entre les participants engagés dans un processus d'apprentissage. Orientant le processus de communication dans le contexte de l'apprentissage, les représentations sociales jouent également un rôle prépondérant dans l'encadrement des conduites et des comportements des participants. Castellotti and Moore (2002) présumant que le terme de représentation fait référence à des connaissances communes ou à des croyances culturelles telles que les stéréotypes, les attitudes, les préjugés et les images.

Les représentations sont également utilisées dans le domaine de l'enseignement des langues pour la science. L'enquête menée par Chaplier (2017) auprès des étudiants de master de

l'Université Paul Sabatier de 2013 à 2015 implique que l'enseignant et l'étudiant ont leur propre représentation des connaissances en anglais scientifique. Ils adoptent des perspectives différentes pour voir et évaluer les résultats de l'apprentissage. Comme elle l'explique plus loin, les enseignants vérifient en termes d'objectifs prédéfinis pour l'évaluation normative. En revanche, les étudiants, qui ont une plus grande expertise dans le domaine scientifique, évaluent la pertinence de ces "connaissances enseignées" en fonction de critères tels que l'adéquation de l'enseignement aux exigences professionnelles, l'adéquation du cours de langue au contexte scientifique et l'assurance que l'enseignant peut servir de référence.

Les étudiants en sciences peuvent apprécier l'anglais, mais ce n'est pas forcément le cas du cours d'anglais, qui dépend de l'enseignant (aspects cognitifs et affectifs) et qui ne correspond pas toujours aux attentes des étudiants. C'est pourquoi il est difficile de communiquer entre étudiants et enseignants qui n'ont pas les mêmes représentations et les mêmes bases de connaissances.

Réseau de représentations (Chaplier, 2017, p. 53)



Un réseau de représentation est présenté par Chaplier (2017) montrant que les représentations des enseignants de langues sont impactées directement ou indirectement par quatre composantes : les représentations du monde professionnel ; les représentations des responsables administratifs ; les représentations des chercheurs en études anglaises ; les représentations des étudiants en sciences.

### ***Motivation dans le contexte de l'apprentissage d'une deuxième langue ou d'une langue étrangère***

Il est assez intéressant de constater que des élèves assis dans les mêmes classes finissent par avoir des compétences d'apprentissage totalement différentes. Malgré l'importance reconnue de facteurs tels que l'intelligence, la mémoire auditive, la capacité d'analyse et l'aptitude au mimétisme, il est admis que la motivation est l'un des éléments les plus essentiels à prendre en compte lorsqu'il s'agit de l'apprentissage d'une deuxième langue ou d'une langue étrangère.

Comme le souligne Dörnyei (2003) l'apprentissage d'une seconde langue diffère de l'apprentissage d'autres matières scolaires en raison de sa nature sociale. Par conséquent, de nombreuses théories concernant la motivation d'apprentissage sont socio-psychologiques. La théorie de la motivation pour l'apprentissage d'une seconde langue est reconnue comme ayant été élaborée par Gardner et Lambert dans les années 1960. Dörnyei (2005b) énumère trois phases distinctes de la recherche sur l'apprentissage d'une seconde langue, à savoir

1. La période sociopsychologique (1959-1990)
2. La période cognitive-située (au cours des années 1990)
3. La période axée sur les processus (le tournant du siècle) qui s'est transformée en une nouvelle phase appelée période socio-dynamique .

## **Langue anglaise et sciences**

### *La prédominance de l'anglais dans les sciences*

Au cours des derniers millénaires, une seule langue a été utilisée la plupart du temps pour articuler les sciences en Occident, du sumérien au grec, à l'arabe et au latin. La modernité constitue l'exception, lorsque plusieurs langues, essentiellement le français, l'anglais et plus tard l'allemand, se sont progressivement substituées au latin (Walter, 1996). En tant que Hamel (2007) explique qu'au début du 20<sup>e</sup> siècle, trois langues, l'anglais, le français et l'allemand, occupaient une position centrale et relativement équilibrée dans la science, avec des disciplines différenciées. En raison de facteurs socio-économiques et politiques, ce type d'équilibre a progressivement disparu. La communication internationale est passée d'une utilisation plurielle de plusieurs langues à une nette prééminence de l'anglais, en particulier dans le domaine de la science tout au long du 20<sup>e</sup> siècle. (Hamel, 2007).

### *Constructions de l'anglais scientifique*

L'anglais scientifique a longtemps été considéré comme un domaine axé sur les aspects linguistiques. En fait, l'anglais scientifique doit être élargi et enrichi, de même que son champ d'application limité (Chaplier, 2016a). Une autre notion est nécessaire et un tel besoin motive le développement de l'anglais scientifique. En franchissant les frontières qui limitent une approche épistémologique, le métaconcept d'anglais scientifique a été forgé pour combler ces lacunes. La méthode consistant à fixer les limites du nouveau territoire de l'enseignement et de l'apprentissage des langues, qui chevauche deux domaines - l'anglais et la science - pour développer un nouveau domaine - l'anglais pour la science - doit ensuite être retracée (ibid). La

construction de l'anglais scientifique est centrée parce qu'elle implique un objet à multiples facettes, y compris un contenu scientifique que les étudiants-apprenants doivent s'approprier et exprimer dans une langue étrangère, ce qui rend chaque aspect significatif et non négligeable. Cette section commence par l'anglais de spécialité, puis passe à la définition de la science, à la perspective historique dans le but de comprendre comment la langue a été utilisée dans la science.

### *Langues de Spécialité et Anglais de Spécialité*

La recherche sur les langues de spécialité a donné lieu à de riches récoltes depuis que Michel Perrin a souligné la "réalité bien vivante et polymorphe" et le "terrain puissamment labouré" de "La langue de spécialité (LSP)" lors d'une conférence (Perrin, 1994) au congrès de l'Association des Professeurs de Langues des Instituts Universitaires de Technologie (APLIUT). L'APLIUT a été fondée en 1977 à l'Institut Universitaire de Technologie (IUT) de Paris V, et s'est constituée en association en mai 1978. C'était dix ans après la conférence présentée sous le titre "ESP comes of Age ? 21 years after 'some Measurable Characteristics of Modern Scientific Prose'" par John M. Swales au 4e Symposium européen sur les langues spécialisées en 1983, dans laquelle il présentait une rétrospective de l'anglais spécialisé. (Perrin, 1985).

Pour comprendre ce qu'est l'anglais scientifique, il faut d'abord définir ce qu'est une langue spécialisée.

Selon Mémet (2007) la toute première définition largement diffusée en France se trouve dans le Dictionnaire de didactique des langues de Robert Galisson et Daniel Coste intitulé "spécialité, langues de spécialité" :

Langues de spécialité (ou langues spécialisées) : expression générique pour désigner les langues utilisées dans des situations de communication (orales ou écrites) qui impliquent la transmission d'une information relevant d'un champ d'expérience particulier (Galisson & Coste, 1976, p. 511).

Par la suite, en 1982, la question des langues a fait l'objet d'une discussion intensive dans la revue *Langues modernes*, dans laquelle le terme a été utilisé par Bernd Spillner : Par "langue de spécialité" nous entendons l'ensemble des éléments linguistiques qui peuvent se manifester, dans une situation donnée, lors de la communication entre des spécialistes d'une discipline scientifique ou technique sur un sujet de leur discipline (Spillner, 1982, pp. 19-27).

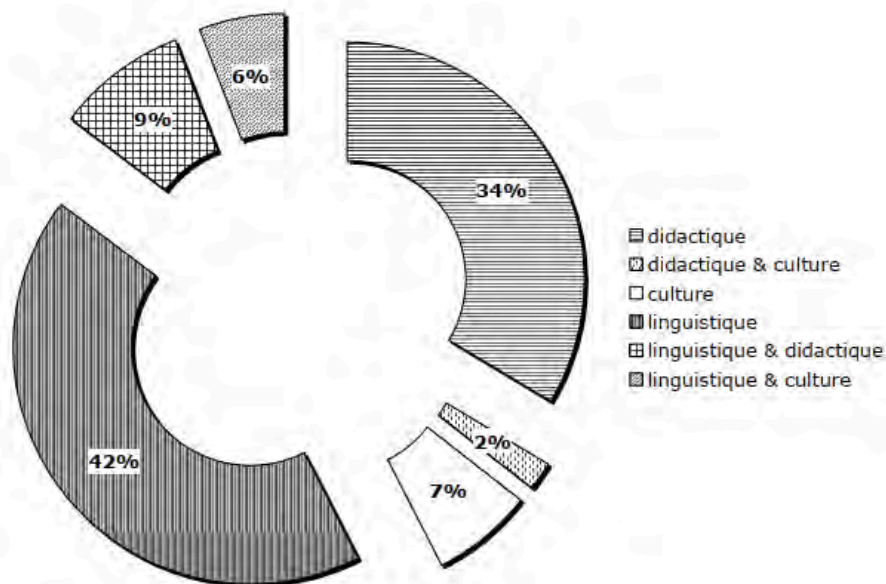
Comme Van der Yeught (2016) ce qui différencie le langage spécialisé du langage général, c'est "l'univers intentionnel véhiculé par le discours". Tant que l'intentionnalité et son objectif sont spécialisés, la langue exprime le domaine concerné et sert son objectif.

Finally, a clear definition of "specialized English" was proposed by Michel Petit in 2002, which is well known and integrated :

specialized English is the branch of anglistics that deals with the language, discourse and culture of professional communities and specialized Anglophone social groups and the teaching of this subject (Petit, 2002, p. 2).

The study of anglistics in France is historically divided into three currents, Tardieu (2008) identifies "three traditional domains in English studies : linguistics, literature, culture", today four with the more recent inclusion of specialized English.

Axes D'étude Des Thèses (Mémet, 2007, p. 19)



Mémet (2007) groups theses between 1986 and 2007 into several categories : didactics, didactics and culture, culture, linguistics, linguistics and culture, as well as linguistics and didactics. The figure indicates a proportion of 42% of theses in linguistics compared to a proportion of 34% of theses in didactics.

Perrin (1994) addressed the creation and growth of specialized languages in France during the conference. He emphasized that specialized languages are increasingly at the intersection of three main currents, which indicates that the linguistic characteristics of languages, the implementation of pedagogy, other cultures as well as the main domains of learners should all be included :

Ces trois fleuves, et leurs multiples affluents, sont :

- La langue, ou plutôt, les langues : l'étude de la langue, tout ce qui se rattache à la linguistique ;
- Le didactique, la mise en œuvre d'une pédagogie-andragogie ; y compris le fleuve annexe du technologique ;
- Le spécifique, qui est aussi la culture des autres : champ d'application pour nous, champ principal d'étude pour les apprenants (Perrin, 1994, p. 14).

## **Méthodologie**

Cette étude a adopté une approche séquentielle de méthodes mixtes . La recherche par méthodes mixtes est une méthodologie de recherche qui implique la collecte, l'analyse et l'intégration (ou le mélange) de recherches (et de données) quantitatives et qualitatives dans le cadre d'une étude unique ou d'un programme d'enquête longitudinal (Bulsara, 2015).

Les questionnaires ont fait des progrès dans la collecte de données auprès de centaines de personnes. Nous avons choisi une enquête anonyme en ligne pour distribuer les questionnaires, ce qui permet d'obtenir plus facilement un plus grand nombre de réponses tout en préservant la vie privée. Si les questionnaires permettent de mettre en évidence des tendances au sein de vastes populations, les données issues d'entretiens qualitatifs permettent souvent d'obtenir des informations plus approfondies sur les attitudes, les pensées et les actions des participants (Kendal, 2008) (Kendal, 2008).

L'entretien de recherche, l'une des principales méthodes de collecte de données qualitatives, a été largement utilisé pour mener des études de terrain et des recherches ethnographiques (Qu & Dumay, 2011). Les entretiens sont également considérés comme des moyens efficaces d'approfondir les informations, d'adopter un point de vue différent des données du questionnaire et d'offrir de nouvelles connexions.

Les observations en classe sont presque universellement utilisées pour évaluer les enseignants (Cohen & Goldhaber, 2016). Cependant, nous n'essaierons pas d'évaluer les enseignants de langues par le biais de l'observation en classe. En raison des contraintes éthiques de l'enseignement supérieur français, cette recherche n'a pas droit à l'observation vidéo en classe.

Dans cette étude, les instruments de recherche utilisés sont les suivants : a) questionnaires pour les apprenants ; b) entretiens avec les apprenants ; c) entretiens avec les enseignants pour les professeurs de sciences et les professeurs d'anglais ; et d) observations en classe. Pour commencer, des questionnaires ont été distribués aux participants qui sont des étudiants M2 et



L3 dans les domaines scientifiques. Par la suite, nous avons adopté des entretiens approfondis avec les apprenants après la collecte des questionnaires destinés aux apprenants afin d'obtenir des détails basés sur les réponses des étudiants au questionnaire. Les entretiens menés du point de vue de l'apprenant et de l'enseignant sont tout à fait essentiels, car ils permettent d'obtenir des informations adéquates de la part des deux groupes. Plus important encore, dans cette étude, nous avons décidé d'impliquer les professeurs de sciences en interrogeant à la fois les professeurs de sciences et les professeurs d'anglais, permettant la possibilité de comparaison et d'analyse combinant les deux aspects des professeurs de sciences et des professeurs d'anglais.

Enfin, l'observation en classe est un élément complémentaire de l'enquête. Il s'agit d'un moyen quantitatif d'enregistrer le comportement de l'enseignant et l'interaction entre l'enseignant et l'élève en les observant en action. Les observations de cette étude ont été enregistrées manuellement à l'aide d'une grille papier. En raison des contraintes de l'enseignement supérieur français, l'enregistrement vidéo n'était pas possible.

## **Résultats et discussion**

Comme le propose le cadre transdisciplinaire du groupe Douglas Fir pour l'acquisition d'une langue seconde (ALS) dans un monde multilingue (Group, 2016) (voir chapitre 2), il existe différents niveaux dans le système d'enseignement et d'apprentissage de l'anglais scientifique.

Au niveau supra-international, on observe une forte tendance à l'internationalisation des formations dans l'enseignement supérieur français (voir chapitre 1), avec de plus en plus de masters enseignés en langue étrangère (Derivry-Plard et al., 2013). L'anglais est partout. Cependant, quel type d'anglais les enseignants utilisent-ils et enseignent-ils ? Lorsque l'anglais est choisi comme moyen de communication entre des personnes dont la première langue est différente, au-delà des frontières linguistiques et culturelles, le terme préféré est "anglais en tant que lingua franca" ( Seidlhofer 2005) (voir chapitre 2). Il peut donc s'agir de l'anglais en tant que lingua franca (ELF) dans le but de favoriser la communication entre des personnes dont la première langue est différente. Il pourrait également s'agir de l'anglais à des fins académiques (EAP) pour les chercheurs. Néanmoins, les résultats des entretiens avec les professeurs de langues révèlent que les pratiques pédagogiques des professeurs de langues sont basées sur leurs propres recherches sur les cours LANSAD. À cet égard, nous devons nous demander quel type d'anglais les étudiants apprennent.

Au niveau macro-national, il n'existe pas de programme ou de "règles" pour l'enseignement de l'anglais en France. De plus, il n'y a pas de formation dans l'enseignement supérieur français, et

encore moins de formation pour les enseignants du secteur LANSAD (voir chapitre 1). De ce fait, les enseignants de langues doivent perpétuellement explorer par eux-mêmes les objectifs, le contenu et les méthodes d'enseignement du cours (Van der Yeught, 2014).

Ensuite, au niveau méso-institutionnel, il n'y a pas de politique linguistique pour les enseignants dans le secteur LANSAD. Les enseignants-chercheurs en sciences semblent invisibles dans l'ensemble du système de cours et les professeurs de langues reçoivent très peu de soutien. Apparemment, l'importance de la langue n'est pas soulignée et chacun dans le système persiste dans ses propres croyances. Cette situation est également conforme aux discours des apprenants lors des entretiens, dans lesquels la plupart des apprenants affirment que le contexte d'apprentissage de l'anglais en France est décourageant.

Enfin, au niveau de la micro-classe, les professeurs de langues et les professeurs de sciences ont des représentations différentes et n'ont pas les mêmes "règles". Les élèves ne savent pas non plus très bien ce qu'ils apprennent. Il n'y a donc pas de dialogue entre les individus, ni entre les disciplines invitées à l'anglais scientifique. Tous ces éléments contribuent aux difficultés et à la faible efficacité de la formation à l'anglais dans le secteur LANSAD.

Dans cette partie, nous discutons de trois points de vue, celui des apprenants, des professeurs de langues et des enseignants-chercheurs en sciences, concernant cinq questions : a) les représentations de l'anglais scientifique ; b) les attitudes ; c) la motivation ; d) les collaborations ; e) le contexte culturel. Comme souligné dans le CDST par Ushioda (2015) les apprenants sont placés "dans" un certain type de contexte, qui a un impact positif ou négatif sur les apprenants. Elle explique également que si l'apport linguistique est considéré comme une caractéristique du contexte dans l'apprentissage des L2, nous reconnaissons que les apprenants agissent sur leurs contextes. On considère également que les apprenants contribuent à façonner leurs contextes par la manière dont ils interagissent avec l'input. Par conséquent, le processus d'enseignement et d'apprentissage implique non seulement les apprenants et les professeurs de langues, mais aussi les enseignants-chercheurs en sciences. Tous contribuent à façonner leurs contextes par le biais d'interactions, tout en subissant l'impact des contextes.

Plutôt que de critiquer ou de donner des recommandations, le but ultime de notre recherche était de comprendre les phénomènes qui émergent dans les situations d'enseignement-apprentissage de l'anglais dans un contexte scientifique dans le cas de l'Université Paul Sabatier qui est une université dédiée principalement à la science.

## ***Représentations***

### Représentations de l'anglais scientifique

La question à laquelle nous avons accordé la première attention était la représentation de l'anglais scientifique. Dans cette étude, nous avons examiné respectivement les représentations des apprenants, les représentations des enseignants de langues et les représentations des enseignants-chercheurs en sciences concernant l'anglais scientifique. En ce qui concerne les représentations de l'anglais scientifique par les étudiants, les résultats des questionnaires et des entretiens indiquent que ces apprenants ont des représentations de base de l'expression "anglais scientifique". En revanche, ils ne comprennent pas vraiment ce que l'anglais scientifique signifie ou ce à quoi il se réfère. Par ailleurs, les étudiants ne sont pas conscients de ce qu'ils apprennent au cours de la pratique pédagogique. Par exemple, S4 déclare : " Ce n'est pas clair pour moi. J'ai posé cette question à mon professeur, et mon professeur m'a posé la même question. L'enseignant ne sait pas ce que cela signifie ". S5 déclare également : " Cela ne veut rien dire pour moi, je pense " (voir annexe 6).

Il semble qu'il en aille de même pour les professeurs de langues. D'après les entretiens, il n'y a pas de consensus parmi les professeurs de langues sur l'anglais scientifique, et ils ont des représentations diverses de l'anglais scientifique. Deux professeurs de langues sur sept ont exprimé leur confusion à l'égard de l'anglais scientifique, déclarant que l'anglais scientifique ne signifiait rien pour eux. Lorsque l'on évoque l'anglais scientifique, il semble trop large même s'il est limité dans l'éventail sans que les sciences humaines soient prises en compte, car les sciences englobent d'énormes domaines et diverses disciplines, notamment la physique, les mathématiques, la chimie, la géologie, la biologie, l'informatique, etc. (Trouillon, 2014). (Trouillon, 2014). Il est donc évidemment impossible de traiter la terminologie scientifique de manière exhaustive. Trouillon (2014) propose également que l'approche de l'anglais scientifique soit faite de manière globale afin de comprendre à quel niveau des traits communs peuvent être identifiés, malgré la diversité observée même au-delà des disciplines. Il souligne également qu'il est nécessaire de partir d'une définition claire et appropriée. À cet égard, l'absence de consensus sur l'anglais scientifique rend fondamentalement propice à un cheminement scientifique et éducatif clair dans les pratiques pédagogiques de l'anglais scientifique.

Comme Chaplier (2016a) l'expression "anglais scientifique" contient deux termes : la langue et la science. Cependant, ce dernier a reçu peu d'attention dans la recherche et l'enseignement, et

mérite d'être approfondi. En raison de la nature même de la "science", celle-ci a toujours été considérée comme hermétique et limitée aux spécialistes, qui sont les seuls à pouvoir la comprendre. Actuellement, le problème de l'anglais scientifique réside principalement dans le fait qu'il n'y a pas de réflexion claire sur la manière dont la science et l'anglais devraient être combinés/intégrés. Aujourd'hui, il semble que la science soit juxtaposée à l'anglais.

Les enseignants non spécialisés sont exclus par l'utilisation de symboles, d'équations et de concepts standardisés. Ils ne font qu'effleurer la surface, ou utilisent la science comme toile de fond ou prétexte à l'étude de la langue en tant qu'outil. Cependant, la science est aussi un domaine qui peut être appréhendé à travers d'autres disciplines, et cette analyse soutient que ses nombreux aspects doivent être compris. Elle est généralement perçue à travers différents clichés qui sont analysés ici (Chaplier, 2016a).

C'est logique puisqu'il n'y a pas de politique linguistique au niveau de l'enseignement supérieur français. Selon les enseignants de langues, ils ont élaboré le programme d'études et exploré le contenu scientifique selon leurs propres termes. Comme nous l'avons vu au chapitre 1, en France, la politique linguistique éducative est déterminée au niveau national et est élaborée et publiée dans des bulletins officiels par le ministère de l'Éducation nationale. Au niveau universitaire, les textes dépendent du ministère de l'Enseignement supérieur et de la Recherche. Il n'existe pas de politique linguistique qui oriente spécifiquement les pratiques pédagogiques de la langue anglaise en France. Au contraire, les politiques ne sont formulées et présentées qu'en relation avec la langue française (Hofstee & Cultuur, 2014).

Pour les professeurs associés en sciences et les professeurs, les discours d'entretien montrent qu'ils ont des représentations plus fortes que les professeurs de langues en termes d'anglais scientifique. Ils considèrent généralement l'anglais scientifique comme une version rationalisée, simplifiée avec des phrases courtes, présentant une idée par phrase de manière directe et précise, qui est utilisée pour la communication entre des personnes qui ne parlent pas la même langue dans le domaine scientifique. Cela n'est pas surprenant étant donné que les chercheurs scientifiques utilisent l'anglais quotidiennement. Selon les professeurs de sciences, l'anglais sert de lingua franca (ELF) dans la communauté scientifique en ce qui concerne leur utilisation quotidienne de l'anglais.

Cependant, il s'agit d'une vision de l'anglais dans le contexte scientifique qui n'est pas la même que celle de l'enseignement de l'anglais dans un contexte scientifique par les professeurs d'anglais et les chercheurs en anglais.

Comme nous l'avons vu précédemment dans la partie consacrée aux représentations (voir figure 4), les enseignants et les étudiants ont leurs propres représentations dans les activités d'enseignement et d'apprentissage. Ils adoptent des perspectives différentes pour voir et évaluer les résultats de l'apprentissage. Comme le souligne Chaplier (2017) il est très difficile de communiquer entre les étudiants et les enseignants qui n'ont pas les mêmes représentations et les mêmes bases de connaissances. Par ailleurs, le réseau de représentations indique également que les représentations des enseignants de langues sont directement ou indirectement influencées par les quatre composantes : représentations du monde professionnel ; représentations des gestionnaires administratifs ; représentations des chercheurs anglophones ; représentations des étudiants en sciences. A cet égard, il est essentiel de prendre en compte la part des enseignants de sciences et des administrateurs, qui ne sont pas pris en compte dans la situation actuelle. Dans ce cas, étant donné que les professeurs de langues, les professeurs de sciences et les apprenants ont des représentations très différentes de l'anglais scientifique et que ces représentations ne convergent pas, les questions suivantes se posent : quel type d'anglais les enseignants enseignent-ils et utilisent-ils ? Comment construire ensemble cette connaissance, compte tenu du fait qu'il y a un manque de cohérence entre les enseignants de langues et les enseignants de sciences ?

### Représentations culturelles

Comprenant des représentations mentales et publiques, les représentations culturelles désignent un groupe ou un sous-groupe spécifique au sein d'une communauté (voir chapitre 2). Qu'elles soient positives ou négatives, les représentations culturelles impliquent des attitudes d'ouverture et d'acceptation, ou de rejet et de refus à l'égard de l'autre groupe. Rubenfeld et al. (2006) font l'hypothèse que des interrelations positives entre le contact avec la communauté L2, la confiance en soi lorsqu'on parle la L2 et l'identification à la communauté L2 conduiraient plutôt à des représentations culturelles plus positives. Ce processus guide alors les individus vers des représentations plus positives de la culture de la L2. Dans la vie quotidienne, cette recherche propose que l'apprentissage d'une L2 puisse influencer positivement les relations intergroupes. Selon Rubenfeld et al. (2006, p. 627) dans le contexte de l'apprentissage d'une L2, nous constatons une plus grande identification avec cette communauté, ce qui, à son tour, nous amène à avoir des sentiments plus positifs à l'égard de la communauté". Par conséquent, les représentations culturelles jouent un rôle prépondérant dans l'apprentissage de l'anglais dans cette étude, comme nous le verrons plus en détail au point 5.5 Contexte culturel.

## *Attitudes et motivation*

### Attitudes des apprenants

En ce qui concerne les attitudes des étudiants à l'égard de l'enseignement et de l'apprentissage de l'anglais à l'Université Paul Sabatier, il semble y avoir une contradiction entre les résultats des questionnaires et ceux des entretiens. Bien que les étudiants ayant participé aux entretiens perçoivent pour la plupart leurs cours d'anglais comme étant "cool" et "attrayants", les résultats obtenus à partir des questionnaires révèlent que ces étudiants ont une attitude assez négative à l'égard de l'apprentissage de l'anglais à l'Université Paul Sabatier et qu'ils n'apprécient généralement pas leurs cours d'anglais scientifique. Comme le souligne Gardner (1985) la motivation est la combinaison de l'effort et du désir d'atteindre l'objectif d'apprentissage de la langue et d'attitudes favorables à l'apprentissage de la langue. Les données obtenues dans le cadre de cette étude indiquent que ces étudiants sont relativement peu motivés par les cours d'anglais scientifique.

Toutefois, il convient de noter que cette motivation est axée sur le processus, car la motivation est dynamique. Dörnyei and Ottó (1998) divisent la motivation en L2 en deux dimensions principales : la séquence d'action et les influences motivationnelles . La séquence d'action fait référence au processus comportemental dans lequel les désirs initiaux se traduisent par des objectifs, des intentions, des actions, la réalisation des objectifs et l'évaluation. Les influences motivationnelles peuvent être considérées comme le carburant du processus comportemental. Dörnyei et Ottó développent le processus comportemental motivé en trois phases principales : 1) la phase pré-actionnelle, 2) la phase actionnelle et 3) la phase post-actionnelle. Selon les professeurs de langues, ils ont généralement l'impression que les élèves sont progressivement plus motivés pour apprendre l'anglais qu'il y a plusieurs années.

D'après les commentaires des étudiants, il semble que les étudiants en sciences aient une attitude positive à l'égard de l'enseignement de l'anglais dans le département des langues. En général, les étudiants reconnaissent le dévouement des professeurs de langues. Gardner and MacIntyre (1993) renforcent également le motif d'intégration en impliquant les attitudes envers la situation d'apprentissage, qui comprend les attitudes envers le professeur de langue et le cours de L2.

Les données obtenues dans le cadre de cette étude indiquent que les motivations intégratives des étudiants de seraient renforcées par les attitudes favorables de ces étudiants à l'égard des professeurs de langues au cours d'une période spécifique.

En outre, les étudiants considèrent que les cours d'anglais scientifique ne sont pas utiles pour leur future carrière et qu'ils ne favorisent pas l'esprit critique. Cependant, l'internationalisation (voir chapitre 1) n'est pas seulement le résultat de la langue mais aussi de la culture et les enjeux de l'internationalisation des formations sont partagés au-delà des frontières (Barrault-Méthy, 2019). Un défi majeur de l'internationalisation est de développer la compétence interculturelle des étudiants, en les préparant à un monde professionnel globalisé. Plutôt que la maîtrise de la grammaire et du vocabulaire de base, il existe des besoins croissants en matière de compétences non techniques (soft skills) sur le lieu de travail, qui sont également indispensables par rapport aux compétences techniques (hard skills). Par conséquent, la promotion de la compétence interculturelle des apprenants, de la pensée critique, des capacités de résolution de problèmes et de la capacité à communiquer et à participer pleinement au monde en réseau actuel a fait l'objet d'une attention particulière (ACTFL, 2011). Il est reconnu que les universités françaises doivent "professionnaliser" les étudiants (Labetoulle, 2020). Aujourd'hui, l'enseignement supérieur dans les établissements commence à être confronté à la question de savoir comment favoriser le développement professionnel des étudiants et les doter des compétences nécessaires au lancement réussi de nouvelles carrières.

Comme nous l'avons vu au chapitre 4, les représentations qu'ont les élèves des cours d'anglais scientifique ont eu un impact sur leurs attitudes et leur motivation à l'égard de l'apprentissage de l'anglais. Par conséquent, on peut conclure que leurs représentations des cours d'anglais scientifique ont affecté négativement leurs attitudes à l'égard de l'apprentissage de l'anglais, ce qui a fini par diminuer leur motivation.

En ce qui concerne les attitudes des étudiants à l'égard de l'anglais et de la culture anglophone, ils ont tendance à avoir une attitude positive à l'égard de l'anglais et de la culture anglophone. Apparemment, les élèves apprécient la culture anglophone, mais cette appréciation de la culture anglophone se traduira-t-elle par un effort d'apprentissage de l'anglais ?

#### Attitudes des enseignants

Les résultats des attitudes des professeurs de langues et des professeurs de sciences à l'égard de l'anglais scientifique sont différents, bien qu'ils soient confrontés au même groupe d'étudiants.

Pour les professeurs de langues, l'anglais est principalement adopté dans les pratiques pédagogiques. L'obstacle le plus notable pour les professeurs de langues est l'accès au contenu scientifique. Le discours des entretiens indique qu'en raison de l'absence de politique linguistique, de formation des enseignants et de collaboration, ces professeurs de langues ont

tendance à s'efforcer d'explorer le contenu scientifique selon leurs propres termes, ce qui est difficile et prend du temps pour eux au début de leur carrière.

Pour les professeurs de sciences, l'anglais scientifique joue un rôle minime dans l'enseignement puisqu'ils sont obligés d'utiliser le français dans les cours destinés aux étudiants de premier cycle. Pour les chercheurs, l'anglais est très présent dans la publication d'articles, la participation à des conférences et les échanges avec leurs collaborateurs scientifiques.

Cependant, il existe des différences entre l'enseignement de l'anglais dans un contexte scientifique et l'utilisation de l'anglais dans des contextes scientifiques. Selon Chaplier (2016b) le problème n'est pas l'utilisation excessive de l'anglais, mais le "mauvais anglais", qui pourrait nuire à la communication et à la pensée scientifiques réelles. Lorsqu'une personne utilise une langue, cela signifie qu'elle utilise un système de normes qui façonne la pensée et sa relation à l'univers. Chaque langue possède un ensemble systémique de formes et de catégories qui non seulement permettent à quelqu'un de communiquer, mais aussi de façonner son analyse de la réalité, d'influencer son raisonnement (Leduc, 1996). L'utilisation d'une lingua franca pour la science dans le cadre professionnel peut soulever la question de la maîtrise limitée de la langue, comme l'appauvrissement des formes de langage et l'absence de références culturelles. Il y a également le risque de développer des normes incertaines qui conduiront à des contributions moins compréhensibles à la fois dans la communication orale et écrite (Chaplier, 2016b).

Les professeurs de sciences ont une attitude neutralisante à l'égard de l'anglais scientifique. Ils se sentent obligés d'utiliser l'anglais dans leurs recherches quotidiennes. Néanmoins, malgré leur utilisation intensive de l'anglais, ils ont encore du mal à l'utiliser correctement au début de leur carrière. L'une des enseignantes a même exprimé sa peur de l'anglais à l'époque, déclarant que parler l'anglais était un cauchemar.

En résumé, les professeurs de langues et les professeurs de sciences sont confrontés à des obstacles très différents à l'université, les premiers se produisant principalement dans la pratique pédagogique et les seconds dans un contexte professionnel.

### ***Motivation***

La motivation des apprenants pour l'apprentissage de l'anglais scientifique a été étudiée sous trois angles. Du point de vue des apprenants eux-mêmes, il y a un manque de motivation parmi les apprenants. En outre, il n'y a pas de différence significative entre les étudiants de M2 et les étudiants de L3 en ce qui concerne leur motivation à apprendre l'anglais scientifique. Plus précisément, leur motivation pour l'apprentissage de l'anglais scientifique est axée sur l'emploi,



c'est-à-dire que la principale motivation pour l'apprentissage de l'anglais scientifique est d'obtenir un bon emploi. Leur motivation à traiter de la science est légèrement plus forte que l'apprentissage de l'anglais scientifique, ce qui est logique puisqu'il s'agit d'étudiants dans des domaines scientifiques. Tous ces résultats indiquent que ces apprenants ont principalement des orientations motivationnelles extrinsèques et qu'ils ont une faible motivation intrinsèque à l'égard de l'apprentissage de l'anglais scientifique.

D'une part, la plupart des professeurs de sciences pensent que les élèves ne sont pas motivés pour apprendre l'anglais scientifique. D'autre part, leur motivation n'est pas susceptible de se traduire par un effort d'apprentissage de l'anglais scientifique. Par conséquent, les professeurs de sciences en général considèrent que les niveaux d'anglais des étudiants sont loin d'être satisfaisants.

Au contraire, les réponses des professeurs de langues concernant la motivation des étudiants à apprendre l'anglais scientifique sont beaucoup plus positives. Les professeurs de langues perçoivent les étudiants comme étant relativement motivés et très intéressés par les cours. En outre, ils ont l'impression que la motivation des étudiants évolue de manière positive, c'est-à-dire qu'ils estiment en général que les étudiants sont plus motivés qu'auparavant. Toutefois, les professeurs de langues considèrent qu'il est difficile de maintenir la motivation des étudiants dans l'apprentissage de l'anglais scientifique.

### ***Collaborations***

Collaborations entre les professeurs de langues et les professeurs de sciences

Il convient de noter que les collaborations entre les professeurs de langues et les professeurs de sciences sont des interactions entre humains, qui concernent une relation humaine. Il est donc crucial de créer un dialogue. Parallèlement, les pratiques pédagogiques dépendent principalement de l'enseignant, non seulement de son statut (professeur associé/professeur, professeur de l'enseignement supérieur, lecteur, personnel temporaire), mais aussi de son expérience professionnelle (Chaplier, 2019). Ainsi, les pratiques pédagogiques dans le secteur LANSAD diffèrent selon le statut et l'expérience des enseignants de langues.

Aujourd'hui, l'approche interdisciplinaire est un concept clé pour l'avancement des programmes scolaires à tous les niveaux. L'anglais pour la science ou l'anglais dans des contextes scientifiques est une notion hybride / interdisciplinaire. L'approche interdisciplinaire se réfère à des enquêtes qui s'appuient de manière critique sur deux ou plusieurs disciplines et qui conduisent à une intégration des connaissances disciplinaires (Haynes, 2002). Les techniques

interdisciplinaires vont au-delà de ces deux techniques en permettant aux élèves de voir des perspectives différentes, de travailler en groupe et de faire de la synthèse des disciplines l'objectif ultime (Jones, 2010). Cependant, les discours des étudiants lors des entretiens indiquent qu'il n'y a qu'une faible relation entre les cours d'anglais et les sciences ou leurs propres domaines. Les étudiants perçoivent généralement les cours d'anglais scientifique comme étant liés à la "culture générale" plutôt qu'à leurs cours de sciences. Cette situation est logique puisqu'il n'existe pas de programme national ni de formation pour les professeurs de langues.

Comme indiqué précédemment, les professeurs de langues ont exploré le contenu scientifique de leur propre chef. Il n'existait pas de formation pour les professeurs de langues, alors que ces derniers estimaient avoir besoin d'une formation et n'ont pas reçu beaucoup d'aide au début de leur carrière.

Selon les professeurs de sciences, certains d'entre eux ne collaborent "jamais" avec les professeurs de langues et estiment qu'il est impossible de collaborer. Les professeurs de sciences attribuent le manque de collaboration aux contraintes de temps et au peu d'investissements financiers. Cependant, ils sont conscients du fait que les professeurs de langues n'ont pas de connaissances professionnelles.

À cet égard, il semble qu'il n'y ait pratiquement aucun lien entre les professeurs de langues et les professeurs de sciences. La raison pourrait être attribuée à un manque de "connaissances communes" entre les professeurs de sciences et les professeurs de langues au sein de l'université, ce qui signifie que les professeurs de langues n'ont pas de connaissances de contenu dans les disciplines des participants aux cours. Chaplier (2017) souligne que la structure de l'université contribue également à cette situation, car elle ne favorise pas le décroisement des disciplines et il n'est pas très courant que les linguistes et les scientifiques collaborent à des programmes d'enseignement et de recherche.

#### Collaborations entre les professeurs de langues et les étudiants (en classe)

Les collaborations entre les professeurs de langues et les étudiants en classe jouent un rôle essentiel dans la pratique pédagogique des professeurs de langues. En général, les professeurs de langues estiment qu'ils n'ont pas besoin d'être des experts dans les domaines des étudiants et qu'ils acquièrent parfois un contenu scientifique auprès des étudiants. Il semble que les collaborations entre les professeurs de langues et les étudiants en classe soient beaucoup plus bénéfiques pour les professeurs de langues.

Par exemple, T4 déclare : "J'ai dit aux étudiants que je n'allais pas enseigner leurs domaines en anglais. Ce n'est pas mon travail. Mon travail consiste simplement à les faire parler dans leur domaine. Je veux qu'ils m'apprennent quelque chose" ; et T6 déclare : "En fait, une fois que vous avez atteint le niveau de certains étudiants, ils se chargent du contenu scientifique à votre place. [...] Il est évident que ces enfants ont besoin d'experts dans leur domaine. Notre rôle est donc limité à bien des égards". (voir annexe 7). Au lieu de cela, les professeurs de langues pourraient enseigner aux étudiants en sciences "du point de vue de l'humanité", c'est-à-dire de l'histoire de la discipline spécifique et de son impact sur la société.

La coopération entre les enseignants de langues et les étudiants en classe est également conforme à ce que Dudley-Evans, St John et al. (1998) avancent : lorsque l'enseignement en équipe n'est pas possible, le praticien ESP doit collaborer plus étroitement avec les apprenants, qui seront généralement plus familiers avec le contenu spécialisé des supports que l'enseignant lui-même (voir chapitre 2).

#### Contexte culturel

La forte tendance à l'internationalisation de la formation et la nécessité d'attirer des talents internationaux conduisent à un nombre croissant d'étudiants étrangers dans l'enseignement supérieur français (voir chapitre 1). L'internationalisation doit être considérée comme un plurilinguisme et non comme une simple pratique de l'anglais. Comme nous l'avons vu précédemment, chaque langue possède un ensemble systémique de formes et de catégories qui permettent non seulement à une personne de communiquer, mais qui façonnent également son analyse de la réalité et influencent son raisonnement (Leduc, 1996). (Leduc, 1996).

À cet égard, la culture est importante pour l'apprentissage des langues et l'éducation parce que ces phénomènes se déroulent au sein d'une culture (ou de différentes cultures), qui influence leur forme, et parce que la culture est indissociable de la langue et constitue donc une partie du contenu de l'apprentissage des langues et de l'éducation (Roberts et al., 2000). Le CDST (Cameron et Larsen-Freeman 2007 ; De Bot, Lowie et Verspoor 2007) souligne également la nécessité de tenir compte de l'interconnexion des facteurs sociaux, cognitifs et psychologiques et offre donc un cadre global pour étudier à la fois l'utilisation et l'acquisition d'une L2 et les différences individuelles des apprenants. Le contexte culturel pris en compte dans notre recherche comporte deux aspects : a) le contexte d'apprentissage ; b) la diversité et l'impact culturel propre des apprenants et des enseignants.

Par ailleurs, comme nous l'avons vu au chapitre 2, le développement de la compétence en communication interculturelle (CCI) est important pour toutes les parties : les étudiants, les personnes en séjour et les hôtes sur le terrain, le personnel et le corps enseignant. Le développement de la CCI n'est pas seulement lié à des activités académiques et cognitives, mais aussi à des activités expérientielles et affectives. Plus précisément, le développement de la CCI concerne tout le monde : nous-mêmes et les autres ; les anglophones et les locuteurs d'autres langues ; il est important pour la diversité, dans le pays et à l'étranger, et pour l'internationalisation et l'internationalisme (Fantini, 2020, p. 4). Par conséquent, le développement de la CCI est fondamentalement propice à la réalisation de la communication interculturelle pour toutes les parties, en particulier dans le cadre du processus d'internationalisation de l'enseignement supérieur dans le monde. Cependant, dans cette étude, les résultats indiquent un faible développement de la compétence en communication interculturelle (CCI) des apprenants.

En ce qui concerne le contexte d'apprentissage de l'anglais en France, les données obtenues dans le cadre de cette étude indiquent que les étudiants perçoivent généralement le contexte d'apprentissage comme étant décourageant pour l'apprentissage de l'anglais, ce qui est lié à la fierté de la culture en France et à la forte volonté de conserver la culture française. Enfin, le contexte d'apprentissage décourageant est fortement corrélé à leur motivation à apprendre l'anglais.

Par exemple, S5 et S6, originaires du Luxembourg et du Maroc, ont attribué leur grande motivation pour l'apprentissage de l'anglais au contexte favorable de l'apprentissage de l'anglais dans leur pays. S5 déclare : "Je pense que les Luxembourgeois sont très passionnés par l'apprentissage de l'anglais, parce qu'en plus du luxembourgeois, ils savent qu'ils doivent apprendre le français et l'allemand et finalement l'anglais. C'est tout simplement naturel et normal pour eux d'apprendre une autre langue". S6 déclare : "Quand on grandit au Maroc, l'anglais est très présent. Vous êtes entouré d'un contexte international et l'environnement dans lequel vous avez grandi vous encourage toujours à apprendre d'autres langues et en particulier l'anglais. [...] À la télévision ou en général, on voit beaucoup de choses écrites en anglais autour de soi. Ce n'est pas un message direct, personne ne m'a jamais dit qu'il fallait apprendre l'anglais, mais c'est là.

Les résultats confirment ce que Pawlak (2017) souligne, à savoir que les variables relatives aux différences individuelles (voir chapitre 2) sont susceptibles de jouer un rôle essentiel, en influant à la fois sur le processus d'apprentissage des

langues et sur les résultats de ce processus. Dörnyei (2017) déclare également que les facteurs ID dans la recherche sur l'ALS ont été bien établis comme constituant un concept relativement simple impliquant des variables d'arrière-plan de l'apprenant qui modifient les processus généraux d'acquisition de la langue. Il ne fait aucun doute que les variables ID contribuent grandement à l'interaction dans laquelle les apprenants s'engagent, entraînant un processus d'apprentissage et des résultats d'apprentissage diversifiés.

Ce résultat est également très conforme à la compétence plurilingue et pluriculturelle (CPP - voir chapitre 2) proposée par Coste et al. (2009, p. 11). Plus on apprend de langues, plus il devient facile et efficace d'en apprendre d'autres. Le CPP est défini comme suit : il s'agit de la capacité à utiliser les langues à des fins de communication et à prendre part à une interaction interculturelle, lorsqu'une personne, considérée comme un acteur social, maîtrise, à des degrés divers, plusieurs langues et a une expérience de plusieurs cultures. Il ne s'agit pas d'une superposition ou d'une juxtaposition de compétences distinctes, mais plutôt de l'existence d'une compétence complexe, voire composite, sur laquelle l'acteur social peut s'appuyer.

En ce qui concerne la diversité et l'impact culturel des apprenants et des enseignants, comme nous l'avons vu précédemment dans le cadre de l'université (voir chapitre 1), l'Université Paul Sabatier a été créée en tant qu'université scientifique internationale, où l'anglais sert de lingua franca (ELF) au sein de la communauté scientifique. Comme le souligne Piccardo (2017) d'un point de vue didactique, l'adoption du plurilinguisme peut permettre aux étudiants de percevoir, de prendre conscience et d'explorer activement la diversité linguistique et culturelle, l'hybridité et l'interconnexion. Par conséquent, nous ne devrions pas négliger les divers profils des étudiants et des enseignants, ainsi que leurs propres impacts culturels. En outre, nous devrions prendre en compte leurs différentes façons de enseigner/construire l'anglais pour la science .

Les étudiants et les enseignants participant à notre recherche ne sont pas tous français, au contraire, ils ont des profils divers. Cela a permis de mettre en lumière leur propre impact culturel sur l'enseignement/la construction de l'anglais scientifique.

Un professeur de langues a mentionné la difficulté de traiter avec des étudiants ayant des personnalités différentes. T1 déclare : "Parfois, il s'agit simplement d'individus dans un groupe dont le comportement est un peu différent, et il faut s'y adapter. Je pense que les difficultés pour moi se situent davantage au niveau des personnalités et de la dynamique au sein d'un groupe.

Les professeurs de sciences ont également mentionné l'obstacle lors de l'interaction avec des étudiants et des chercheurs d'origines culturelles différentes, ce qui indique une divergence dans

la pensée scientifique. Par exemple, T11 déclare : "Nous avons eu beaucoup de très bons doctorants chinois. Il est vrai que lorsqu'on discute avec eux, on ne voit pas de différence. Mais quand ils commencent à écrire par exemple, je pense qu'ils ont une façon d'écrire les phrases, et même de faire les paragraphes ou d'écrire le texte entier, et je pense que l'étudiant français ferait autant d'erreurs que l'étudiant chinois, mais pas le même type d'erreurs " ; T11 fait la comparaison entre les étudiants chinois et les étudiants français dans l'écriture scientifique, ce qui implique une différence entre ces deux groupes.

Par ailleurs, les discours d'entretien de T12, T13 et T14 sont très proches de ceux de T11. T12 et T13 établissent des comparaisons entre les chercheurs français et anglophones, suggérant des manières différentes de se comporter et de penser. T12 déclare : "Les Américains aiment vendre des choses, ils publient un article dans la revue universelle, puis ils font une grande annonce, comme "wow, nous sommes champions du monde" ; T13 déclare : "Quand je suis arrivé ici, le mode de pensée français est beaucoup plus formel, beaucoup plus précis. T14 compare ses étudiants de diverses nationalités et révèle que l'origine culturelle est inextricablement liée à la manière de se comporter et de penser de l'individu. T14 déclare : "Par exemple, il y a plus de 30 nationalités dans un diplôme. Les Allemands sont pour la plupart faciles à comprendre parce qu'ils sont très enthousiastes. Par contre, certaines personnes du Royaume-Uni ne sont pas faciles à suivre.

Le cadre proposé par le groupe Douglas (Group, 2016) (voir chapitre 2) considère l'apprentissage des L2 comme un processus continu qui commence au micro-niveau de l'activité sociale (le plus petit cercle concentrique), où les individus recrutent leurs mécanismes neurologiques et leurs capacités cognitives et émotionnelles et s'engagent avec d'autres dans des contextes multilingues spécifiques d'action et d'interaction, ce qui donne lieu à des contextes d'utilisation récurrents qui contribuent à l'élaboration de répertoires multilingues.

Comme le Douglas Group (2016) souligne, les institutions et les communautés au niveau méso sont fortement caractérisées par des conditions sociales omniprésentes (par exemple, économiques, culturelles, religieuses, politiques), qui affectent la possibilité et la nature des personnes créant des identités sociales en termes d'investissement, d'agence et de pouvoir. Par conséquent, le fait que l'importance de la langue ne soit pas soulignée par les institutions et les communautés au niveau méso pourrait être attribué aux structures idéologiques à grande échelle, à l'échelle de la société, avec des orientations particulières concernant l'utilisation et l'apprentissage des langues (y compris les systèmes de croyance et les valeurs culturelles, politiques, religieuses et économiques) au niveau macro (le cercle concentrique le plus large).

En résumé, certaines questions ressortent de cette recherche : d'une part, le niveau supérieur a un impact sur les niveaux macro, méso et micro suivants. D'autre part, le niveau micro a également un impact sur les autres niveaux macro, etc. Ainsi, les connaissances scientifiques créées à partir de l'anglais ne sont pas très bien définies. Il s'agit d'une question de diffusion des connaissances.

Plus précisément, quel type d'anglais enseigner dans un contexte scientifique ? Cependant, il n'y a pas que le problème de l'anglais, mais aussi celui de la langue maternelle. Dans ce cas, tout individu ou étudiant doit être capable de bien s'exprimer dans sa langue maternelle avant de s'exprimer dans une langue étrangère (savoir organiser ses idées correctement avec les mots justes). Ce point de vue est cohérent avec le CDST, qui n'est pas seulement l'anglais en tant que langue étrangère, mais aussi la langue maternelle. Par conséquent, les obstacles ne peuvent être étudiés et envisagés comme un domaine étroit axé sur les aspects linguistiques. Il doit être à la fois élargi et enrichi, grâce à la collaboration avec les professeurs associés et les professeurs de sciences.