Preliminary study on the partnership between students and teacher in a French LANSAD-science master context

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Introduction

University graduates across Europe face increasing professional language and intercultural demands (Taillefer, 2007). In France, foreign language courses are compulsory in the LMD system[1]. Masters' students must demonstrate ''mastery'' of at least one foreign language. Whereas programs in other European countries aiming at encouraging study abroad and teaching subject matters in a foreign language are solutions adopted by the universities, they are slowly developing in France.

This study was implemented in a science university in France (Paul Sabatier University) where English is taught to students not specialized in English LANSAD (LANgues pour Spécialistes d'Autres Disciplines). The traditional French language learning context makes it difficult for institutions to meet this challenge. In our scientific university context, very few pedagogical strategies such as CLIL (Content and Language Integrated Learning) have been designed which would help the students in their future professional lives on the one hand and motivate them with the English language in situation on the other hand. In practice, our master students take English courses which are rarely concerned with specialised language and "target community discourse". It depends on the teachers' background, their education is frequently orientated towards literature or civilization (French academic English studies) and rarely towards didactics in languages. Moreover there are numerous teachers coming from secondary schools to higher education without a sufficient teaching background and methodology. However our French scientific students will be obliged very quickly in their doctorate work or future professional lives to use English in a specific context and as an international scientific language. In practice, as it is difficult to increase the number of hours of English which amount to 48h yearly in Licence's degree and 24h yearly in master's degree and as the French daily context is purely French with no compulsory contact with the English

[1] As part of the harmonization of European higher education curriculum, the French university course is now organized around three degrees: bachelor, master and doctorate. This new organization, called the "LMD", enhances the mobility of European students between disciplines and between vocational and general educations?.

language, other ways to have efficient English courses on the professional scientific point of view had to be envisaged in order to have motivation, an authentically communicative activity (cf. Ellis, 1996), parallel development of academic, professional competences and domain-relevant communicative skills and preparation for professional activity.

This article aims at showing in a preliminary study how "various types of cooperation" (Swales, 1988: 138) in learning and how a methodology of tasks were used in a LANSAD-science master course in a French scientific university (Paul Sabatier University) in order to increase students' motivation and involvement hence their learning efficiency for their future professional lives. Two phases in the study were considered: Phase 1 and Phase 2 which was conceived due to institutional constraints. Two types of learning in partnership were considered. Firstly the focus was put on the partnership between the ESP/LANSAD[2] teacher and students from a professional master. The following year, a group of students from a different master was added to the previous one. Secondly the focus was put on the partnership between students from a professional master (the one in Phase 1) and students from a research master. The study took place in a learner-centered approach and in the context of Communicative Language Teaching (CLT) "to facilitate cooperative, collaborative learning; to take a whole language approach (with authentic, natural language used for all four skills concurrently); and to employ content and task-based lessons (using real-world subject matter and communication problem-solving activities (Brown, 2001)" (Belcher, 2009: 231).

1. French context

Several factors in the French context had to be taken into account in our study.

LANSAD

Since 2002 (LMD), English has been compulsory in French university degrees from the 1st year to the 5th year. English has become a communication language and is a *lingua franca* in all specialities. A sector called LANSAD has emerged in numerous disciplines other than English and is not as well known as ESP. It is both teaching an object and research on this object. Yet it's a reality. More than 90% of the teachers' positions in France are in LANSAD. The students are generally not motivated by learning English at university for various reasons, although they are aware of its importance. They have already studied English for more than

[2] The difference between ESP and LANSAD will be tackled in §1.

seven years in their secondary studies in a way they did not always enjoy (numerous students in a class, summative assessments). In our case, English is far less valued than science.

The French phrase 'LANSAD' can be compared to the English phrase – English for Specific Purposes –, still differences are implied. The role of the ESP teacher faced with ''specific purposes'' can be highlighted. There is an often-posed question about how much an ESP teacher needs to know about the discipline in order to be able to teach its specialised discourse. Solutions are to be envisaged.

According to Trouillon (2010: 100), the term 'scientific English' is justified: there is an international form of scientific English. This author shows that common characteristics can be found in discourses and texts despite the diversity of disciplines (2010: 97). He points out that scientific English is the language of a discourse community with the research article as one of its most representative examples (2010: 102).

Institutional constraints

The degrees aim at professional and specialized skills. Yet institutional constraints have to be taken into account because they condition the content and implementation of the course. At Paul Sabatier University, the number of hours is limited to 48 hours/year in Licence (1 to 3) and 24 hours/year in Master (1&2). The maximum number of students is 24. The level of English is heterogeneous from A1 to C1 (Common European Framework of Reference for Languages - CEFRL). The students have heavy timetables and so English is not their priority even though it is compulsory.

Conditioning and French culture

Todd's works (1990) tried to show how family structures handed down from generation to generation influenced family life, economic life and the systems of value of cultures and how they determined the opinions and ideological attitudes of each culture. This explains partly that in France equality, stability and solidarity are rather valued, but in France people are afraid of changes and its consequences which are especially perceived as an invasion by disorder, whereas in the United Kingdom values of freedom, combined with those of individualism and autonomy, will encourage mobility and risk taking. Changes in the traditional English class can be a factor of slowing down learning efficiency for French students.

Conditioning is also part of the problem of learning English: « if each human being is led by some conditioning, it seems reasonable to take it into account » (Laborit, 1994). Scientific English courses are given in a top-down manner in which the students receive the information / knowledge transmitted by the teacher. The students are passive. They are strongly conditioned by this way of transmission. The English class envisaged in these degrees is managed in a bottom-down manner, the students participate into their own learning through different pedagogical strategies.

Conditioning as described above can be overcome but time is needed as well as a form of mediation in order to achieve some detachment (J.-P. Narcy-Combes, 2005). "The support to theories which postulate a necessary conditioning of humans does not mean that the conditioning is permanent » (Laborit, 1996: 110). Individuals can change a little and it will be big progress, according to Laborit.

According to M.-F. Narcy-Combes (2005: 80), in American universities ("high masculinity index"), there is competition between students and it is accepted as a game and challenge. In French universities ("low masculinity index"), there is competition but it is perceived as an unbearable source of stress and one of the students' claims is to diminish its impact. When French students have to speak English in front of the class, they see the performance as competition and they fear it.

2. Literature review

According to Hutchinson and Waters (1987), language learning is more of a psychological matter than a linguistic one. Consequently, learner-centred approaches have been adopted in English as a Foreign Language environments. "The natural outcome was to give more attention to language learners as individuals with different learning styles, strategies, needs, wants, lacks and interests". And as the authors conclude, the teaching methods used are also important. Yet, in the French LANSAD-science context, it is not wide-spread for diverse reasons. The questions are as Hutchinson & Waters (1987: 165) pose them in relation to our specific context (close to the ESP context). The ESP/LANSAD teacher is faced by students with certain expectations as to the nature, content and achievements of the course and also in the case of different specialisations in the same ESP/LANSAD class. The masters' year is the last year of the studies of the students who have strong requirements concerning their education. In our context, English programs do not provide specialist-area knowledge that masters' students and science teachers often demand. For Ferguson (1997), "what ESP

practitioners actually need is knowledge about an area – that is, its values and preferred genres, rather than in-depth knowledge of an area", and Dudley-Evans & St Johns (1998) say the same. Here a more narrow-angled approach is useful to our students, as when they are in a professional context or in advanced study of a specialisation. The question is: how can one increase one's own content-area knowledge when the teacher knows little about the domain? "What can be done to give all the students what they need and want? In practical terms, how can we deal with apparently specific needs without using subject-specific materials? How can you negotiate a reasonable compromise, satisfactory to both teacher and learners?" (Dudley-Evans & St Johns, 1998: 165). We have chosen the following answer: to put the stress on (1) the working mode focusing on the learner and on (2) the type of task in relation to the students' future professional lives by implementing a partnership between the teacher and the students.

2.1. Affective factor

We focused on the affective factor, "learners as emotional beings" (Hutchinson & Waters, 1987: 46) because of the relationship between the cognitive and affective aspects of the learner. "The cognitive theory tells us that learners will learn when they actively think about what they are learning. But this cognitive factor presupposes the affective factor of motivation. Before learners can actively think about something, they must want to think about it. Emotional reaction to the learning experience is the essential foundation for initiation of the cognitive process. How the learning is perceived by the learner will affect what learning, if any, will take place" (Hutchinson & Waters, 1987: 46).

The affective value also concerns cooperative activities (Crandall, 1999: 227). Cooperative learning encourages and supports most of the affective factors which correlate positively with language learning: i.e. reducing (negative) anxiety, increasing motivation, facilitating the development of positive attitudes toward learning and language learning, promotion of self-esteem.

The fear of failing or appearing foolish is a constant threat to interaction in language classrooms, especially when teachers ask questions which only a few students can answer (Crandall, 1999: 233), and especially in the French context. The French students do not want to speak because they are afraid of making mistakes even though the making of mistakes is constructive. "Lathophobic aphasia" (O'Neil, 2009: 162) is frequent. When the students have the possibility to prepare an activity in a group, their anxiety or fear is diminished.

Another important aspect related to the affective dimension is success. A success dynamics based on the pleasure of learning is generated. Students can assign responsibility for their own actions, successes and failures. This ability is correlated with motivation (Weiner, 1986; Bandura, 1997). This approach is an efficiency factor insofar as it affects the behavior of students coping with stress and perseverance in the face of difficulties.

2.2. Tasks - TBL and PBL

The course is based on tasks that have a realistic set of actions leading to 'non school' language production - real world activities and real-world processes of language use (Ellis, 2003). They are tackled using two approaches in a socio-constructivist perspective. Task-based learning (TBL) is based entirely on meaningful tasks and follows procedural syllabi: sets of tasks based on real-life situations (Nunan, 1989). The first one, called task-based learning (TBL) (Prabhu, 1987; Ellis, 2003) uses problem situations, but the problems are not 'real' because the answers are already known to the teacher. It incorporates aspects of language in the task in order to put them in position. In the second one, called problem-based learning (PBL) (Barrows, 1996), the problems are 'real' - the teacher does not know the answers - and belong to a different type of knowledge. Problem-solving and discovery approaches have long been assumed to be effective with learners. Both Piaget (1970) and Vygotsky (1978) advocated such practices. The former saw it more as an individual pursuit and the latter as a collaborative endeavor mediated by the teacher and scaffolded by peers, eventually leading to processing. "The discovery tasks and problem-solving activities will prove to be challenging and should be encouraged" (Bertin *et al.*, 2010: 113).

TBL is similar to PBL, but there are essential differences in strategy. In PBL, learning issues are to be raised by students, based on the theory this promotes an active, independent learning attitude in the students. Small groups serve as the basic unit in which students discuss a problem with group mates, coming up with a hypothesis and trying to solve the problem in English. There is activation of prior knowledge, which arises from learners reconsidering what they know in order to address the problem, and as a result, restructuring their prior knowledge. PBL also facilitates elaboration of knowledge, as learners working together formulate and criticize hypotheses, discuss evidence, and present work done, all of which results in redundancy in memory structure, thus strengthening memory use.

The purpose of PBL is to train students to look for answers themselves, and through this process to develop the ability to transform abstract concepts and knowledge into practical and

workable solutions, and be able to formulate strategies that will solve the problems. All of these goals are done in English and can be achieved with the support of a tutor.

Simply put, the generation of knowledge and situational contexts have a complementary relationship, and knowledge gained through situational contexts is truly mastered knowledge.

2.3. Cooperative work

In numerous higher education programmes, group work and group discussion tasks are commonly practised. The hypothesis is the following one: in group interaction and talk the students contribute to the process of constructing knowledge and learning. This hypothesis is also supported by the Vygotskian view of interaction and learning.

According to Vygotsky (1978), group work or group interaction can create opportunities for learning. "Cognitive processes are the result of social and cultural interactions" (Vygotsky, 1978, cited in Lunt, 1993: 156) and "interaction is good only when it proceeds ahead of development" (Vygotsky, 1956, cited in Wertsch and Stone, 1985: 165).

Vygotsky defines the zone of proximal development -ZPD - as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978: 86). According to this definition, guidance is needed from 'more capable peers' or 'expert guidance' and learning will take place in the ZPD. Yet just interacting or talking is not sufficient.

Following this Vygotskian view of interaction for learning, two categories according to the type of interactions have been studied:

1/ There are studies (e.g. Bliss, Askew, & Macrae, 1996; Jarvis & Robinson, 1997; Wood, Bruner, & Ross 1976) which investigate the nature of interaction between the teacher and students, or between the expert and the novice. Interactants have unequal relationships in terms of the knowledge they possess. In such interactions, the teacher or the expert possesses the expertise required for the successful achievement of the task and helps the novice to achieve the task. It is the case of Phase 1: the expert is the student who is a specialist in his field whereas the teacher, though a specialist in linguistics and language, is a novice in the science domain. The student will try with his expertise to explain the different phenomena to the teacher. The focus will be on the activities designed by the students according to the teacher's general instructions and aiming at explaining in English different aspects of their domain to the novice teacher.

2/ The other type of interaction commonly practised in pedagogy is interaction between peers or between students. In such interactions, the role relationship in terms of expertise is not fixed as in the previous type of interaction. In general, students differ in the knowledge they possess and in the different sources of knowledge they bring to the task, and can thus act as experts at different points in the problem solving task. It is the case of Phase 2. The students from the two different masters will help one another with the knowledge in their own domain of expertise. The focus will be on the way the M2P students and M2R students tackle the activities conceived by the M2P students (Phase 1). As their expertise domains are different, the students will view the activities according their specializations. The teacher will be an intermediate and not the main transmitter of the knowledge or information.

2.4. Phase 1 – Students-teacher cooperation

Since Swales, there has been a lot of literature about interdisciplinary cooperation that is to say collaboration between language teachers and specialist teachers in an academic context. Dudley-Evans (2001), in reference to Barron (1992), developed a framework for understanding these "various types of cooperation" with subject specialists, and classified them under three areas–cooperation, collaboration and team-teaching–depending on the extent of the cooperative relationship and ranging from a low level of (1) cooperation where the ESP teacher consults the 'subject-specialist informant' about aspects of the discipline, (2) collaboration with the language teacher and subject teacher working outside the classroom to conceive materials together and (3) team-teaching which involves both teachers working together in the same classroom. Collaboration appears to offer action based on negotiation between disciplinary cultures. For instance, in legal ESP in France, the students are not specialists of Anglosaxon law and the English teacher is not an expert in the field (Liebenberg, 2010); collaboration with a law specialist is thus indispensable because law is a specialized subject (Liebenberg, 2008: 126).

In our scientific context, there are two reasons for not choosing collaboration between science specialists and linguistics experts:

1/ As Swales (1990: 129) said "doubts have been raised as to the relative efficiency of using subject specialists". We would add that they don't always know the issue of language in their speciality and the way to communicate it, as it is different from the modes used in science courses in France (see §1 Conditioning).

2/ “ESP teachers might, for example, find themselves having to work in close cooperation with sponsors or subject specialists who are responsible for the learners’ work or study experience outside the ESP classroom. This is not always an easy relationship” (Hutchinson & Waters, 1987: 164). The reason is pragmatic. Establishing cooperation with experts of the discipline is not always easy to achieve due to organizational and relational reasons (Barron, 2002). There may be differences in personality and sharp differences in the pedagogic methods of the teachers. Even if a partnership would provide a more specialized content and possibly bring more credibility to the English teacher, this is not what is wanted. English modules at the UPS language department are not science courses in English.

Consequently, another type of partnership was implemented between the teacher and the students: “how the teacher becomes an interested student” (Hutchinson & Waters, 1987: 163). Indeed, the communicative approach, based on the differences in knowledge of the world of each individual, promotes the "real" exchange between the teacher and learners and among learners. Ishikawa (2008) became interested in verbal interactions conducted in collaboration between Japanese students and the teacher. He showed that the students can participate in the course, not only as recipients of knowledge and language skills, but also as owners and transmitters of certain knowledge. Students are probably the most readily available sources of specialist knowledge in any ESP classroom. In this case, Dudley-Evans (1997) observed that the ESP teacher has willingness to learn from and with one’s own students. Each one can bring something to the other: language for the language specialist, specialisation for the science master student.

When the teaching becomes more specific, the methodology is not the same as in General English courses (Dudley-Evans & St John, 1998: 13): “ […] the teacher is not in the position of being the ‘primary knower’ of the carrier content of the material. The students may in many cases, certainly where the course is specifically oriented towards the subject content or work that the students are engaged in, know more about the content than the teacher. It is often stated that this provides the ESP teacher with the opportunity to draw on students’ knowledge of the content in order to generate genuine communication in the classroom (not disagree but much more complicated)”. Consequently and following Dudley-Evans & St John, the activities “in addition to language–learning activities will reflect the learners’ specialist world” (1998: 187) and these activities will be conceived with a methodology specific to an ESP/LANSAD context.

2.5. Phase 2 - Student-student cooperation or cooperative learning

Before explaining Phase 2, we will define "cooperative learning" according to Sharan (2010: 301): "It is a pedagogy that generates a diversified body of methods of instruction which organise students 'to work in groups toward a common goal or outcome, or share a common problem or task in such a way that they can only succeed in completing the work through behaviour that demonstrates interdependence, while holding individual contributions and efforts accountable' (Brody & Davidson, 1998: 8). Cooperative learning by definition relates to the amount of group support; the degree to which individual members of a group need to learn from each other's strengths and weaknesses to develop an achievable goal and to exhibit their skills (McCafferty, Jacobs, & Iddings, 2006: 4–5).

In the past few decades, cooperative learning has been promoted in language classrooms as a way of increasing learning and teaching efficiency, learner motivation, and communication and collaboration between learners. Learning with peers provides learners with numerous opportunities to practise the target language through the exchange of ideas. In our French context, cooperative learning alleviates students' anxiety and concern about 'face' when working with peers.

3. Methodology

We have chosen the case study because it is suited to our type of action-oriented research project where "the purpose is, in the first instance, to help practitioners enhance the understanding of, and solve problems related to, their own professional workplace, and where the problem of external validity is less significant than in other types of research" (Nunan, 1992: 89). This action research approach allowed the researcher to start from real field problems and to achieve a validation of hypotheses by a permanent return between theory and practice as highlighted by Nunan (1992: 56): "Research is initiated by the practitioner and is derived from a real problem in the classroom which needs to be confronted. It is supported by data and interpretation. It usually takes the form of an ongoing cycle".

According to Yin (1984: 23), "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and which multiple sources of evidence are used". We will analyse phenomena in context: students' motivation and involvement. Our study is concerned with the cultural context (French students and scientific culture) and

cultural interpretation of the phenomena under investigation (Wolcott, 1988). Our case study is more limited in scope than ethnography. While the case study, like ethnography, can utilise qualitative field methods (observation, questionnaires), it can also employ quantitative data (assessment questionnaires). Our study is a bounded system (2 types of masters and one group), a hypothesis is proposed and an instance drawn from that class is selected and studied. Mixed-methods research enquiry is based on the assumption that collecting diverse types of data provides a better understanding of the research problem in question. A mixed-methods approach was used in order to capture the best of both quantitative (questionnaire) and qualitative (observations) data. Such an approach enables the researcher to test consistency of findings obtained through different instruments and provides triangulation (Greene *et al*. 1989). In this study, a two-phase exploratory research design was used. That is, the research methodology consisted of two phases; qualitative (questionnaire data and observation) and quantitative (satisfaction questionnaire) procedures.

The present study was conducted in a French scientific university. The participants were French master (fifth year of university studies) science students and a non-native English teacher. The students had a scientific background and a level of English between A2 and C1 (CEFRL). They had a 24 hour-English course with 12 sessions in the first semester based mainly on oral competences.

For this study, the researcher's biases and assumptions resided in her own experience as a teacher at UPS. She was also a teacher in this institution. Thus, the participant students were the researcher's own students. The researcher was aware of these biases; therefore she: a) maintained the commitment to conform to a researcher's neutrality code and the ethics of research; b) tried to sustain a clear focus on the purpose of the study; and c) explained the purpose to the students, and her role as a researcher.

There were two phases in the study: Phase 1 (2010) and Phase 2 (2011). In Phase 1, the 20 students were majoring in a professional master (M2P) in mechanics and energetics whose professional goal is to produce graduates who have an engineering profile in industrial sectors such as transportation (aerospace, automobile), energy and the environment.

In Phase 2, a part of the students were majoring in a research master (M2R) in materials science – nanomaterials and multimaterials - whose professional goal is to follow doctorate studies in varied sectors such as aeronautics and space, electronics, catalysis, ceramics, metallurgy, plastics, biomaterials, composites, nuclear, mineralogy. The other part was the students from a professional master in mechanics and energetics. There were 22 of them.

In Phase 1, the group of M2P students participated in a course based on extracts from the *Apollo 13* movie. They had to watch the movie and work in groups of two. Firstly they were required to deal with TBL tasks. Secondly, after understanding the main points in the movie, they had to work in groups on PBL tasks. Phase 1 allowed the teacher to implement the system and the students to conceive the activities. A questionnaire assessing the student's satisfaction about the system was distributed. Then a questionnaire asking about the type of tasks following the teacher's instructions was handed to the students in order to get to know the type of tasks they did and then the teacher classified them. There were open questions dealing with the elaboration on information (for example, with the takeoff and the physical phenomenon of reaction principle or chemical principle with combustion), thought-provoking questions (for example, when comparing their opinions), and activation and use of their relevant prior knowledge. The teacher's observations completed the questionnaire. The focus was on student-teacher collaboration.

Phase 2 was conceived because of institutional constraints and dealt with another type of partnership: student-student cooperation (*cooperative learning*). The students from the two different masters helped one another in groups of three or four. Phase 2 allowed the teacher to implement the system on the basis of Phase 1's system. In Phase 2, a questionnaire was given to assess the students' satisfaction then another questionnaire was handed out to the students in order to collect their perceptions of the task in this working mode (about the team-mate, the student's responsibility, the task, the interaction with the teacher, use of L1). The teacher's observations completed the perception.

4. Experimental study

4.1. Implementation

For Phase 1 & 2, thanks to the film (*Apollo 13*) chosen for the groups of students specialized both in energetics and mechanics and in materials, a dialogue was generated among the students due to the attractiveness of the medium and the familiarity of the content to the students: because familiarity with content increases, in general, the fluidity of the performance, but neither its correction, nor its complexity (Bygate *et al*., 2001). As these students had difficulty in expressing themselves both linguistically and psychologically, this approach – task and working mode – helped them develop their knowledge and skills in English. According to Narcy-Combes (2005: 59), any approach to the learning of L2 gains to take into account the influence of content that is conveyed by language in the exchange.

Working on a true, disciplinary, scientific, literary, artistic or otherwise, content, may increase the investment of the learners who have not strongly developed intelligence of language, according to the conception of Gardner (1996), and who will see their interests maintained by the content. The introduction of content will be needed in an approach with tasks, and will justify it.

4.2. *Social validation*

The satisfaction questionnaires given in Phases 1 & 2 allowed the teacher to validate the system - the film and the choice of the task - socially:

1/ The filmic medium is supposed to be attractive. The film which was chosen is a popular one *Apollo 13* with the well-known Tom Hanks. In Phase 1, two (out of 20) students watched it and 18 knew the story. In Phase 2, two (out of 24) students saw it and 10 of them knew the story.

2/ All the students were satisfied. In Phase 2, one student was very satisfied because he could explain the different aspects of his speciality. Another student said it was interesting because she could work with students from another master.

4.3. *Role of the teacher*

The teacher has a new role: a role of mediator. She left students time to focus on the task. Silent presence at the beginning, she circulated, listened, watched and waited for the opportune moment to intervene. She asked questions, gave tips for using the visual and sound effects. She offered students an update with their (s) team-mate (s), to report difficulties. She encouraged them to use their expertise, but also their knowledge of the world, to give possible solutions to problems. Thus, she coordinated the efforts and helped develop learning strategies that contributed to master the language better and to organize the students' thoughts.

The teacher asked the students to link the movie with their scientific knowledge then to explain to her what they found without forgetting she is not an expert. The teacher is not a 'font of wisdom' but she plays the role of 'consultant'; negotiation took place (Dudley-Evans & St John, 1998:189).

4.4. Phase 1 (focus on the teacher-student relationship)

In LANSAD-science, 'real' exchanges between the teacher and the students are not always possible. Another working way with M2P students was considered: the teacher became a student in the specialization. The English module in M2P being specifically directed towards their specialty, students may know more than the English teacher on the specialized content. The course took place not only in a relationship of mediation but also of negotiation of meaning given the advanced level of the students in the specialty (Hutchinson & Waters 1987: 157). Thanks to their knowledge in physical modeling, scientific computing, modeling and industrial applications (aerospace, transportation), the students were responsible for explaining to the teacher the various physical phenomena (mechanical, ballistic, thermal, electrical, chemical), from the film and according to their language level. When the teacher did not understand what the student said, she asked questions and gave them the opportunity to speak as specialists. So that the teacher understood and discovered the specialized field, a sense of satisfaction was created and students were given personal satisfaction (Weiner, 1986; Bandura, 1997).

4.4.1. Organization of the sessions

All the students had previously worked in groups of two on oral activities. The activity on the movie with the working mode described started in session n° 6 for four sessions as follows:

- introduce the work through *cooperative learning* : vocabulary and cultural background about *Apollo 13*,
- watch the three selected sequences, do the TBL tasks in groups with the worksheet and correct collectively. Then the students revise/bring their science courses on the subject,
- work in groups on PBL tasks with the teacher as a mediator, discussion and feedback (cultural, linguistic), hand out questionnaire. They were allowed to finish their preparation after the class at some other moment with their team-mate.

4.4.2. Tasks

Firstly, the students had to work in groups on TBL tasks so that they may be introduced to some linguistic and cultural elements before entering the specialized part of the work and before engaging a discussion with the novice teacher.

Secondly, in order to exploit the film in class, guidelines to conceive PBL tasks were given by the teacher who would play the role of "naive". Students had to pay particular attention to vocabulary, structures and pronunciation to make the message understandable because the teacher could not anticipate due to her poor knowledge in the domain. Among the various models of problem solving (Barron, 2002: 306), the choice fell on one where the real problems tended to engage students more (Barron, 2002: 308), because they wanted to know the solution. They could explore and reveal different dimensions to the problem. According to our observations and questionnaire, the activities which were suggested by the students according to our instructions (explaining the scenes with their specialized knowledge positioning oneself as an expert facing a novice) and which seemed suited to their needs were the following ones. Firstly they had to link the scenes to their specialized knowledge: it was descriptive. The intent was to bring to the surface the knowledge of the specialized area that the students already have and to create opportunities for them to actualize this knowledge in English. Then they were asked to develop a more critical and argumentative work based on skilled knowledge. The students worked in small groups of two to four and then they had to express themselves in front of the class and the teacher.

The teacher gave them some instructions concerning the way to deal with the activities, then they had to conceive them. Students only rarely engage in high-level discourse that are known to promote thinking and learning (King, 2002) or explanatory behaviour unless they are explicitly taught to do so (Meloth and Deering, 1999). The characteristics of high-level discourse are: exchange ideas, provide explanations and justifications, engage in speculations, make inferences, develop hypotheses, and draw conclusions. In so doing, the teacher would provide some external guidance such as telling them to use this knowledge or consider the special effects. Cognitive and metacognitive levels of group discussions are positively correlated with students' cognitive and metacognitive outcomes. In effect, task-related talk about information, concepts, strategies, and thinking is very important to students' learning yet it will not emerge unless students are told to do so. They would turn into active rather than passive recipients of learning.

The second questionnaire given to the students and the teacher's observations allowed the latter to classify the different activities implemented by the students as follows in 4.2.3.

4.4.3. Classification of activities

Activity 1. Explaining different phenomena thanks to the students' theoretical knowledge

It is directly related to students' competence in their discipline. Using and calling upon/mobilizing their knowledge in general and specific aerospace, they were able to explain certain physical phenomena from a scene depicting a technical point. They reflected together, collected information and confronted them. They used the selected scenes to explain the operating principle of a rocket, its architecture and propulsion, then the progress of the launch and the guidance and control.

a. Explaining implicit events

The students specified various events which were not explained at the beginning:

- Engine / path : due to the quadruple failure, the trajectory is changed;
- Power / simulation: recovering some amps was necessary and to do that, a counselor on earth, has proposed to solve the problem by doing a simulation;
- CO2/DIY: CO2 appeared and was likely to poison the passengers of the lunar module. The filters were not working and the engineers tinkered filters using everything aboard the capsule.

After the explanation of the students, the teacher better understood the technical difficulties and the challenge: without electricity, the control module had broken down; without electricity and without oxygen, the crew was dead.

b. Explaining the procedures involved

Different questions were asked without the answers being provided and proceedings started. Missing information had to be found. Students could speculate then possibly check them through the explicit or implicit scenes, for example:

- What shortcut to reboot?
- How can the releases change the path?
- What does "We just put Sir Isaac Newton in charge"?
- How does the cold affect battery efficiency?
- What is the role of lithium hydroxide?

The two following tasks imply more time to reflect, to think, to associate former and new ideas into the activity and to discuss all these steps with the others in the group.

Activity 2. Comparing opinions – as in a professional situation

Discussions between the various professions (engineers, designers) took place about the previous points. The student-viewer witnessed scenes where professionals compared their different points of view. Thus students could give their opinion on the proposed options and compare them with those of their mates. They explained and defended their position.

The conflict that arises over differences of opinion, for example, can be constructive if it is used as a stimulus to search for more information or to rethink one's conclusions. But it can destroy group cohesion and productivity if it results in students stubbornly clinging to a position or referring to each other as "stubborn".

Here more than in the previous activity skills in negotiating (clarifying, seeking clarification, checking for comprehension, probing for more information) are needed as well as group interaction skills in turn-taking, listening, encouraging, helping, disagreeing appropriately and accepting others' opinions and disagreements (Bennett, Rolheiser-Bennett and Stevahn, 1991).

Activity 3. Evaluating the accuracy of the information – as experts

The authenticity of the recounted scientific facts could be, however, questioned /challenged to critically evaluate the real information value of these representations, by crossing them with other sources.

The visual and sound effects which served to increase the realism of the physical phenomena and processes and to create the suspense were reviewed. The students used their knowledge in the specialty to demonstrate the reliability of the physical phenomena. They questioned the credibility of certain effects, such as the sound illustration of the mechanical effects of dropping out of the rocket engines that actually do not make noise.

The activities linked to the students' expertise domain provided them an opportunity to give and receive information (to the teacher and receive from the team-mate), to develop new understandings and perspectives (through discussion and confrontation of opinions), and to communicate in socially appropriate ways. By interacting with others in reciprocal dialogues, they learnt to use language to explain new experiences and realities and, in so doing, constructed new ways of thinking and feeling (Barnes, 1969; Mercer, 1996) in their future professional lives.

The exchange of roles encouraged the students to work cooperatively together, to show increased participation in group discussions, to be responsible for their own success, to demonstrate a more sophisticated level of discourse as seen with activities 2 & 3. They helped and supported each other's learning which, in turn, motivated them to provide information.

4.5. Phase 2 (focus on the M2R student-M2P student relationship)

Phase 2 was conceived on the same activities as in Phase 1. Yet the addition of M2R students to the M2P student group would change the answers to the questions which were not fixed and depended on the students' expertise. In order to know what this type of collaboration would bring to the students concerning language learning in a specialized context, a questionnaire was distributed to the 22 students in both M2P and M2R. The questions were asked in relation to the difference in the origin of the student in the group. There were questions about the film, the relationship with the team-mate, the student's responsibility in the cooperative work, the competences worked on, the interaction with the teacher, the satisfaction about the task and what the students have learnt.

The aim was to allow the students to exchange their knowledge and to put their knowledge in real life with students from another expertise domain, a situation which could occur in a real professional workplace, the teacher not being directly implied.

4.5.1. Description of items

We are going to discuss the different items of the questionnaire :

- About the team-mate

There were three groups of four students and four groups of three. In each group, there was at least one student in M2R and one in M2P. 13 chose their team-mate against 11 who said they did not have the choice. In general, they knew their team mate a little and it did not prevent them from talking, they were even more confident because they only saw them in the English class and no competition would arise because they did not belong to the same department.

- About the student's responsibility

They all accepted internally to participate in the cooperative work (unlike Phase 1 they did not have to explain or discuss with the teacher, it depended on their good will and willingness to learn and participate). They all worked and helped one another. 22 of them got along well. Each member of the groups made a significant contribution to achieving the group's goal

(individual accountability). They also showed how to help one another/each other overcome problems and complete the assigned activity. It involved episodes of peer tutoring, exchange of information, challenging each other's reasoning, feedback and encouragement to keep one another motivated.

- About the task

In general, they spoke French (see *Tables 1&2*) because of a lack of vocabulary and because they wanted to be understood. One student underlined the fact that the dialogues in the movie were too fast and prevented him from understanding.

9 students did not talk about the different physical phenomena because of a lack of vocabulary, among them 2 evoked the takeoff, terrestrial attraction, "small things" according to some students. 6 said they did "not really" talk about physical phenomena without saying why. 9 talked about different aspects of physics: thermics, mechanics, electricity, about chemistry (materials) and aeronautics. Among them were students whose level was not so good but they tried.

This activity allowed 11 of them to learn vocabulary, 5 of them to express themselves with simple words. It is easier to understand when there are several students to work with, easier to talk from images and familiar content.

Table 1 : Rate of speaking English

Rate of speaking English	10%	20%	30%	40%	50%	80%
Number of students	7	7	4	2	2	2

Table 2 : Rate of speaking French

Rate of speaking French	20%	50%	60%	70%	80%	90%
Number of students	2	2	2	4	7	7

- Interaction with the teacher

15 students asked the teacher mainly about vocabulary or a word to translate. Others told her what they did or found. The teacher still had this role of knowing and control for the students whereas she defined herself as not knowing the domain. Yet it is a matter of conditioning and of needing to be reassured because the teacher remained the one who will grade them and assess them.

4.5.2. Discussion

The results of Phase 2 lead to the following remarks:

- The relationship with the other expert student: not knowing the other student helped the one who talked to be more spontaneous and more cautious with what he/she said. It contributed to the development of the skills in oral comprehension and also of the use of linguistic forms. It developed the student's listening ability and attention, the student paid even more attention to linguistic use as he/she did not know this specialised field, he/she was not familiar with the content. There was more emphasis on the cognitive elaboration effect (explaining something to someone else), unlike the teacher the other student who tried to understand was not able to anticipate the linguistic forms and not even the content because it was not his/her domain. The student from a different master tried to negotiate for more comprehensible input (Krashen 1982) and to modify his/her output to make it more comprehensible to the student from the other master (Swain 1985 ; Swain and Lapkin, 1989).
- The relationship to the teacher: there was an increase in the demand in vocabulary and grammar because the student needed to be understood as the other one did not know the specialised domain. An average level in English was required to have satisfying results unlike Phase 1.
- The use of interlanguage: the students tried not to talk in French but it was more difficult to avoid than in Phase 1. It may be unrealistic to expect students to restrict themselves to English when they can express themselves more fully in a language that all can understand, French.
- This experience had a heuristic function ; it was new and even newer than in Phase 1 because at least the students could think that the teacher, even if he/she did know the domain, could help them to express themselves whereas in Phase 2 they were facing another student proficient in his/her domain. Not many solutions were possible: either the other student adhered/understood, or he/she did not and both failed. It was even more destabilizing but one could see it as aiming at discovery. In general, all the students made the effort.

- The problem of evaluation/assessment : how could the teacher grade the students as he/she did not hear them all and how could he/she include this part in the final exam – if a group failed how would they be able to do the written assessment ? In Phase 1, all the students expressed themselves in front of the whole class and the teacher and they could be assessed. Yet it was not the case in Phase 2.

Conclusion

The goal to achieve in both phases was first to have an effect on motivation and involvement and it seems that the goal was achieved. Different difficulties arose such as the novelty aspect which is to be considered in the French context from both parts: teacher and students. As it is new French students do not easily accept this working mode. These situations accept low tolerance of uncertainty, the courses are not structured the same way as traditional courses. The teacher is in a risky situation and gets exposed to difficulties he/she may not have anticipated. Structured learning situations with precise objectives, detailed assignments and structured time frames are preferred. In Phase 1, the students may not know what to say about the content and the teacher may not be able to help the students or the students may say nonsense and the teacher won't be able to correct. The question remains what should a teacher know in order to be efficient enough? In Phase 2, learning in small cooperative groups can be perceived as too loose a structure and the teacher's guidance may not always be clear enough in the eyes of the students. French students have generally grown up with traditional, teacher-centered classes. This type of interaction can appear to be chaos (Crandall, 1999: 240), unless learners have been prepared for it. Other difficulties concern language. As the requirements in content are high, there is a lower quality in form (fluency rather than accuracy, treatment of mistakes) (cf. Eisele-Henderson 2000). The limits should be examined. Moreover, the cognitive competences of an individual influence his/her discourse more than his/her grammatical skills, in particular orally. There will be more coherence than cohesion in what he/she says.

This experiment was a preliminary study under the form of a study case with one master group each year, the researcher aimed at assessing the students' motivation and involvement with a small number of students. A further study should envisage and analyze the language features and also the teacher and students' behaviours through video in order to go more in an in-depth analysis of language learning and teaching in a specialized master context (LANSAD-science) and also in order to ameliorate the teaching and learning conditions in

this context by developing partnership between students with a possible upstream consultation of science teachers.

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