

An Analysis of English Courses for Students of Science and Technology: Examining Learning Challenges and Future Prospects

Analyse des cours d'anglais pour les étudiants en sciences et technologies: Examen des défis d'apprentissage et des perspectives

Abdellah BOUGUENOUS¹ 

Ahmed Zabana University Relizane / ALGERIA
Abdellah.bouguenous@univ-relizane.dz

Abdelouahid BENADDA² 

Ahmed Zabana University Relizane / ALGERIA
abdelouahid.benadda@univ-relizane.dz

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Abstract:

English for Science and Technology (EST) is a subcategory of English for Specific Purposes (ESP). It is an approach to English language teaching specifically designed for students studying science and technology. EST focuses on educating students in English tailored to their needs in the scientific and technological fields. The present study concentrates on the Science and Technology Faculty at the University of Relizane, with the objective of investigating the effectiveness of English courses for EST students and determining the primary challenges they face in acquiring ESP skills. The study, based on a questionnaire survey, revealed that EST students recognize the crucial role of effective EST courses for their academic success and future careers. However, the courses currently offered by instructors at their faculty do not adequately address their language and learning needs. At the end, the research proposes successful strategies for instructing science and technology students in learning English.

Keywords: EST - Principles - Strategies - Teaching Methodology -Learners' needs.

Résumé :

L'anglais pour les sciences et la technologie (EST) est une sous-catégorie de l'anglais à des fins spécifiques (ESP). Il s'agit d'une approche de l'enseignement de l'anglais spécifiquement conçue pour les étudiants en sciences et en technologie. L'EST vise à enseigner l'anglais adapté aux besoins des étudiants dans les domaines scientifiques et technologiques. La présente étude se concentre sur la Faculté des sciences et de la technologie de l'Université de Relizane, avec pour objectif d'examiner l'efficacité des cours d'anglais pour les étudiants en EST et de déterminer les principaux défis qu'ils rencontrent dans l'acquisition des compétences en ESP. L'étude, basée sur une enquête par questionnaire, a révélé que les étudiants en EST reconnaissent le rôle crucial de cours d'EST efficaces pour leur réussite académique et leur avenir professionnel. Cependant, les cours actuellement proposés par les enseignants de leur faculté ne répondent pas adéquatement à leurs besoins linguistiques et d'apprentissage. En conclusion, la recherche propose des stratégies efficaces pour enseigner l'anglais aux étudiants en ingénierie, en sciences et en technologie.

Mots- clés : EST - Principes - Stratégies - Méthodologie d'enseignement - Besoins des apprenants

* Corresponding author: Abdellah BOUGUENOUS

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Introduction

The goal of teaching English for Specific Purposes (ESP) is to enable learners to function proficiently in English within their specialized areas. Scientific students feel an immediate necessity to share experiences for knowledge growth and collaboration with worldwide peers. Yet, communicating with foreigners in English presents a challenge for them. This is because of a specific inability for some ESP teachers to successfully design effective ESP courses. The success of English courses often relies on the teaching methods used by ESP practitioners during the teaching process. Hence, providing effective ESP courses for EST students is now more than just necessary.

Because English is the global language for science, technology, and research today, being able to use it smoothly and correctly is no longer a privilege, it is a requirement for scientific students who absolutely need it for conferences, writing papers, and working with others. Universities, therefore, face increasing pressure to prepare learners not only to master technical terminology but also to develop the communicative competence necessary to engage in international academic and professional contexts. Given the rigorous linguistic demands of future academic and professional careers in an increasingly Anglophone global landscape, ESP has become an indispensable preparatory tool for students. (Al-Maamari and Al-Hattami, 2021) This challenge is particularly relevant in Algerian universities, where the shift toward English as a Medium of Instruction (EMI) is gradually becoming more prominent. In this context, ESP plays the role of bridging the gap between students' linguistic abilities and the real-world demands of their scientific and technological fields.

Despite the growing importance of ESP, its implementation often encounters several challenges. One of the recurring issues is the absence of clear course design frameworks adapted to the local needs of students. While some departments still rely heavily on teaching General English, the specific requirements of engineering and technology students call for a more tailored approach. In fact, international research in ESP stresses the necessity of conducting a thorough needs analysis before designing any course, ensuring that language instruction reflects students' academic requirements and future career aspirations. Unfortunately, in many cases, ESP practitioners either lack the appropriate training in material design or rely on ready-made resources that do not necessarily align with the learners' professional and scientific needs.

Accordingly, the current research seeks to achieve the following objectives:

- 1- Assessing the teaching approach of ESP in the science and technology department at Relizane University.
- 2- Explaining the primary motives for instructing scientific learners on the importance of effective ESP.
- 3- Exposing the major principles of designing ESP courses and recommending effective methods for instructing authentic ESP for EST learners specifically.

This study aims to address a number of questions such as: How do English teachers instruct scientific students in the English language? Is it important to teach ESP to scientific students? If so, what steps should be followed to assist Relizane University students in enhancing their English skills?

In order to address the research questions mentioned earlier, we have developed the following hypotheses:

- 1-The Science and Technology department prioritizes teaching General English, emphasizing terminology and technical terms.
- 2- It is imperative for engineering students to learn English in order to succeed in their academic and professional endeavours.
- 3-Needs analysis is crucial for identifying students' language and learning needs in English. Therefore, pinpointing the actual needs of students is the first step in creating an efficient ESP course for students in the field of Science and technology.

1. Literature Review

The integration of English language instruction into the curricula of science and technology (S&T) students has become increasingly critical. This literature review delves into the complex landscape of English for Specific Purposes , focusing on the unique challenges S&T students face in acquiring language skills essential for their academic and professional success. It will examine existing pedagogical approaches, and explore the specific difficulties related to vocabulary acquisition, technical writing, and oral communication within scientific and technological contexts.

2.1- English for Specific Purposes

ESP is about the teaching or studying of English as a second or foreign language so as to reach specific objectives within a certain area of expertise, focusing on understanding the needs of learners in fields such as: medicine, science, and law. The purpose and focus of ESP differ significantly from General English, particularly in terms of subject matter and abilities. Although General English deals with them broadly, ESP focuses on them in a more specific or limited manner. ESP generally refers to the instruction of English designed to serve a distinct utilitarian objective. (Mackay and Mountford, 1978). This explains the fact that English is typically taught in order to develop specific language abilities needed to understand English communication relevant to the field of expertise. ESP is fundamentally a learner-centered approach to language instruction, structured around the specific requirements of the learners. (Hutchinson and Waters, (1987a)). Generally, ESP learners take English courses not because they are interested in the English Language or English culture, but because they need English for study or work purposes (Robinson, 1991). In ESP, Language acquisition, within this framework, is not pursued as an end in itself or for broad educational enrichment. Instead, it serves an instrumental purpose, facilitating integration and enhancing linguistic efficacy within specialized academic, professional, or vocational contexts. (Basturkmen, 2006). This confirms that ESP aims to help students develop their language skills for use in a particular area of study, job, or professional setting.

2.2- Types of ESP

A large number of ESP scholars categorized ESP into English for Specific Purposes (EOP) and English for Academic Purposes (EAP). However, over time, the evolution of ESP was met with different perspectives on its categorization. Various categories are suggested by a number of language experts. With regard to the current research, it is based on Hutchinson and Waters' classification. In 1987, one of the most famous and practical theories about teaching English language branches was established with the Tree of ELT, categorizing ESP into three different types such as: English for Science and Technology, English for Business and Economics, English

for Social Studies. In fact, each category mentioned above is split into two distinct types: English for academic Purposes (EAP) and English for professional Purposes (EOP). The figure below illustrates Hutchinson and Waters' classification to ESP.

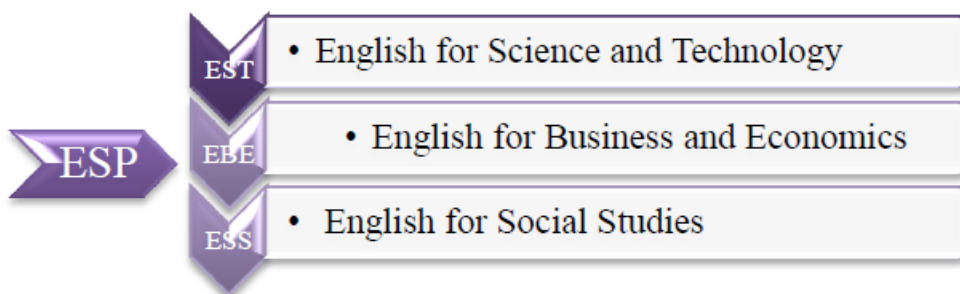


Figure 1: Types of ESP (adapted from Hutchinson and Waters ELT Tree, 17: 1987)

2.3-English for Science and Technology

One of the branches of ESP is English for Science and Technology (Hutchinson and Waters, 1987). It is a language learning method that may concern different types of learners, with EST students being particularly in need of effective ESP courses. It focuses on instructing students in English tailored to their requirements within the realm of science and technology.

"English for specific purposes, and consequently (EST) which is a branch of the former, is centered on the language appropriate to the activities of the discipline it serves in terms of grammar, lexis, register, study skills, discourse and genre." (Dudley-Evans, T., and St. John, 1998, p. : 2).

The field of EST began to flourish after the Second World War as a significant increase in scientific, technical, and economic advancements that began to occur. Many scholars believe that the rise of English for Science and Technology (EST) is primarily driven by the high need for scientists, leading to the language becoming dominant in the field of science. A large portion of the need for ESP originates from scientists and technologists who require English skills for various purposes related to their field. (Kennedy and Bolitho, 1984)

2.4- Scientific Discourse

The discussion of scientific and technological language has long been a topic of contention among linguists. (Widdowson, 1979) provided a thorough understanding of the nature of EST discourse. He disagreed with the idea that EST is a distinct form of discourse, arguing instead that the underlying structure of scientific texts is linked to a common mode of communication used by all scientists. He said: *"The scientific discourse is a universal mode of communication, or universal rhetoric which is realized by scientific texts in different languages by the process of textualization."* This indicates that various forms of communication, such as diagrams, charts, and formulas, are categorized as non-verbal modes. They are seen as distinct within scientific discussions. Briefly, Widdowson saw scientific discourse as a mix of two connected parts: the deep and surface structure, the former characterized by textualization through language. Widdowson later developed his theory further and introduced the idea of schemata. According to Widdowson, knowledge of scientific languages includes two levels: systematic and schematic. The initial one focuses on language as a structure that encompasses phonology and syntax-semantics. This theory was later criticized and argued that universal frames and rhetorical routines in science are interconnected, as he believed that scientific discourse relies on rhetoric, defined as the writer's process to create specific text. This procedure essentially

involves selecting and arranging information for a particular set of objectives. Thus, EST rhetoric focuses on how information within a particular type of text is structured to achieve a specific goal. Therefore, EST rhetoric considers the bigger speech segments in which information is structured.

2. 5- EST Teacher

ESP "*in theory nothing, in practice is a great deal*" (Hutchinson and Waters, 1987, p. : 53). The role of ESP teachers is crucial in the teaching process for both the teacher and the learner, and it evolves based on the specific activities being carried out in the classroom. In this respect, scholars have different opinions and a range of perspectives on the role of the ESP teacher. For Hutchinson and Waters, the role of an ESP teacher is just one of several components. Accordingly, the role of an ESP teacher includes being an instructor, facilitator, advisor, monitor, communicator, and classroom manager. An ESP teacher is then, a general English teacher who has been unexpectedly tasked with teaching students with special needs. (Stevens, 1988). Additionally, ESP teachers are meant to facilitate rather than deliver content. (Harmer, 2007). To support this idea, and along with traditional duties of an English teacher, an ESP teacher may have additional responsibilities. (Dudely Evans and St. John, 1998). They proposed the term "practitioner" over "teacher" and added that ESP teaching is diverse, so the term practitioner is used instead of teacher to highlight the additional aspects involved in ESP work.

3. Methodology

3.1 The Choice of the Method

Choosing the right research method relies heavily on various factors, including the problem's nature, the required data type, the research goal, and the population. (Turney and Robb, 1971). The current study relies on both descriptive and experimental methods that are suitable for the research objectives. It tackles the teaching of English in the Science and Technology faculty in a descriptive manner. Likewise, it is based on experimentation by testing collected data and validating or invalidating the hypotheses.

3.2-Setting and Sampling

The current study involves a sample of 50 EST students; males and females, selected randomly from various groups, all of whom were adults over 18 years old. The students were assembled, evaluated, and interrogated regarding their experiences with learning English throughout their academic career, their awareness about learning English, their needs and wants. .

3.3 Data Gathering Tools

Data was gathered via a questionnaire survey to determine the key issues related to the design of successful ESP courses in the Science and Technology faculty at the University of Relizane. Consisting of 17 diverse questions, the survey was distributed to EST students to get feedback and thoughts on their English course, and understanding of the significance of mastering ESP for their academic and professional success.

3.4 Analysis of the Results and Interpretation

The collected data were examined and explained in the following manner:

3.4.1 Background Information (Questions 1/2/3/4)

The initial section of the survey was designed to gather basic details about 50 students who were chosen to represent the EST faculty at Relizane University. The participants in the study come from varying genders, with 23 being female and 27 being male. They use French as a

medium of instruction in their study. All of them replied that they have learnt English before, except one participant. Most participants (90%) stated they have learnt English in their faculty for a period of 6 to 7 years.

3.4.2EST Students' Needs (Questions 5/6/7)

- 5. English plays a significant role in the area of study.
- 6. English plays a crucial role in the academic career.
- 7. English plays a crucial role in the professional career

The students' responses demonstrate how crucial English is for their academic and professional success. The outcomes are listed below:

	Agree		Disagree		Not sure	
	F	P%	F	P%	F	P%
English is important in my field of study	50	100%	00	00%	00	00%
English is important in my academic career	50	100%	00	00%	00	00%

Table 1.The Importance of Learning English for EST Students

PS. F: students' Frequency, P: percentage

All participants acknowledged the significance of English in their area of study and academic career, even though 20% were undecided about its relevance in their future professional endeavors.

3.4.3Mastering the Four Language Skills in English for EST students (Question 8)

- To what extent do you consider mastering the four language skills in English important?

This question was addressed regarding the importance of the four English language skills for EST students. Based on the responses from the participants, the four language skills hold significance. To start, both speaking and writing hold significant importance in academic English teaching for students, with a slight emphasis on writing at 60% and speaking at 30%. Additionally, both reading and listening are essential, with reading accounting for 70% of importance and listening for 60%. The subsequent graph clearly illustrates the findings.

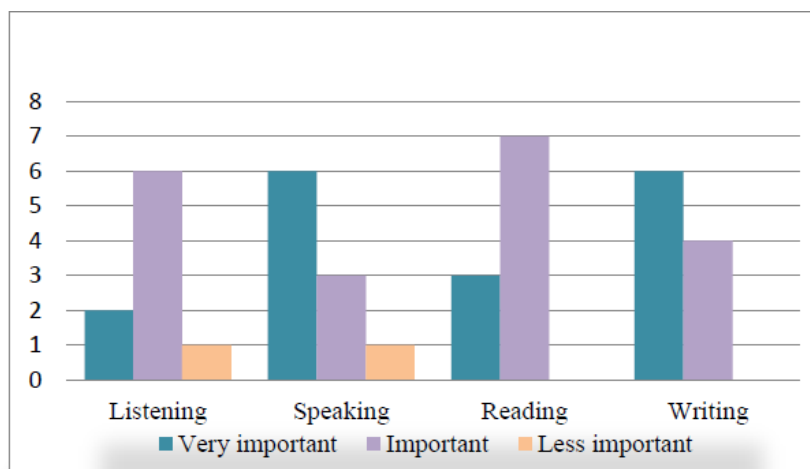


Figure 2.The Importance of Mastering the Four Language Skills in English

3.4.4 The Importance of English for Academic and Professional Success (Question 9)

➤ How important is English for success in your field?

The purpose of this inquiry was to determine the status of English in the academic disciplines. In this study, most participants acknowledged the importance of having a high level of proficiency in English for success in their field. 70% emphasized the need for a very good level, while the remaining 30% stated that being proficient in English is crucial for success in their specialization. The following figure displays the results.

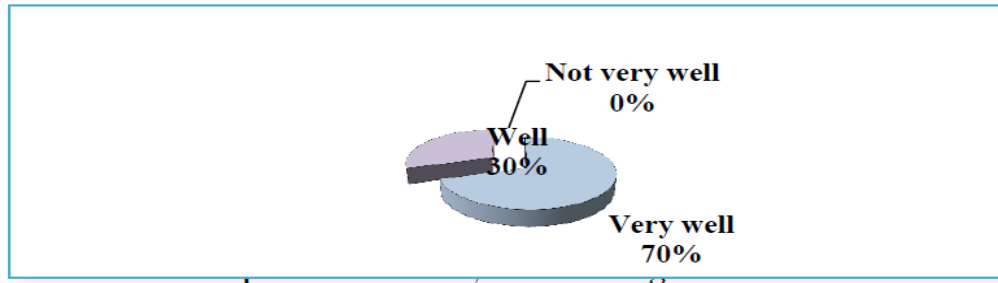


Figure3: Proficiency Level of English Students

3.4.5 Factors Affecting learning ESP for EST students (Question 10)

➤ What are the factors that affect ESP learning process?

This question aims to identify the key factors that affect the learning process in ESP teaching through a series of yes / no questions which were designed to explore students' motivation for learning English, time devoted to English classes, teachers' misconceptions of English scientific language, and knowledge of the subject specialization. The data indicated that every participant is driven to learn English due to its essential nature in today's world, showing a clear understanding of the significance of mastering the language effectively. Next, 60% expressed that the amount of time dedicated to teaching English on a weekly basis is inadequate. Additionally, 70% encounter challenges when trying to comprehend English scientific discussions. Ultimately, 80% of participants reported that their teachers tailor their instruction to meet their needs through the use of the target language in the laboratory, while 10% disagreed. Overall, it is evident that EST students are driven to learn English, which is crucial as student motivation significantly impacts the teaching and learning process. Based on the responses of the students, it appears that the issue is clearly outlined. They struggle with grasping English scientific language due to the teacher tailoring the instruction to their individual requirements. The table below demonstrates the factors influencing ESP learning process:

Factors	Answers			
	Yes		No	
	F	P%	F	P%
Motivation to learn English	50	100%	00	00%
Adequate timing	30	60%	20	40%
Understanding scientific discourse	35	70%	15	30%
The teacher's instructions	40	80%	10	10%

Table 2: Factors Affecting ESP Learning Process

3.4.6 Purpose for Learning English (Question 11)

➤ Why do you need to learn English?

The current inquiry seeks to understand the specific reasons why EST students enhance their language skills, emphasizing their lacks, necessities and wants. Students were inquired about the purpose of learning English and the extent of their need. The table below illustrates EST students' skills needs:

Skills	Purpose for Learning English	Never		Sometimes		Always	
		F	P%	F	P%	F	P%
Writing	Writing e-mails	05	10	10	20	35	70
	Writing scientific reports, letters and articles.	00	00	05	10	45	90
	Writing research papers	00	00	25	50	25	50
	Taking notes in lectures/conferences	05	10	20	40	25	50
Reading	Reading scientific manuals for instructions.	10	20	20	40	20	40
	Reading Scientific newspapers and magazines	15	30	15	30	20	40
	Reading English textbooks and lecture handouts	05	10	35	70	10	20
	Reading graphs, charts and tables	05	10	40	80	51	10
Speaking	Extracting information for your research.	05	10	40	80	05	10
	Talking to foreign researchers	05	10	25	50	20	40
	Speaking in conferences and seminars	01	10	05	50	04	40
	Attending Web-English-Talks	20	40	15	30	15	30
Listening	Taking part in daily conversations	10	20	35	70	05	10
	Understanding discussions on mechanics issues	05	10	30	60	15	30
	Understanding visitors / guests from native speaking English countries.	10	20	25	50	15	30
	Understanding spoken presentations in seminars / conferences.	05	10	15	30	30	60
	Understanding English radio and TV programs on scientific documentaries.	10	20	20	40	20	40

Table3: EST students' English skills needs

3.4.6.1 Writing Skill

The survey shows a remarkable need for English writing skills among participants. Writing emails is identified as one of the most important needs by 70% of respondents, with a further 20% using it occasionally and 10% never. However, the most crucial need for learners is in the

area of academic writing: 90% of participants state that they consistently require English for writing scientific reports, letters, and articles. Moreover, note-taking in English during lectures and conferences is frequently mentioned. The aforementioned results strongly suggest the learners' focus on developing their writing abilities.

3.4.6.2 Reading Skill

As far as the second skill is concerned, the participants show that, reading skill is occasionally necessary for understanding scientific manuals for guidance, perusing scientific newspapers and magazines, as well as analyzing graphs, charts, and tables. It is also consistently necessary to obtain information for their research, with 80% stating that they need reading skills for this purpose.

3.4.6.3 Speaking Skill

Speaking is another important skill for students who stated that they sometimes need to talk to foreign researchers and even speaking in conferences. Similarly 40% argued that they always need to speak English with foreign researchers, in conferences, and seminars. Notably, 70% mentioned that they occasionally require English for participating in everyday discussions.

3.4.6.4 Listening skill

The last skill that is evaluated in this survey is listening; 60% of participants stated that they occasionally require English to comprehend discussions about mechanical problems, whereas, 30% reported that they consistently need English for this purpose. Additionally, half of the participants stated they need listening skills for comprehending visitors and guests from native-speaking countries, with the exception of one respondent who claimed to always need it. Additionally, most of them (90%) believed that listening skill is always necessary for comprehending spoken presentations during seminars and conferences. For the last suggestion, there is a balance of 40% between those who stated they always require listening to understand English radio and TV programs on scientific documentaries and those who have consistently need it for the same purpose. For more details see table 2.5.

3.4.7 English Proficiency and Research Development (Question 12)

- Do you think that the lack of English proficiency is an obstacle in your research development? Justify

English is highly needed in scientific domains, according to the comments of the participants English proficiency is an obstacle for engineering students, 80 % reply that the most important think in their academic research is to write their articles in English and to publish in international journals in which English is a must since it is nowadays the language of science Finally the three last questions were addressed for a reason in which the purpose of the scientific research is to find solution to the problem; the questionnaire is used to find some of them. The questions shedding light on the learners' wants in terms of what kind of situation they prefer to learn in? , what is the favorite atmosphere that may help them succeed in learning ESP?

3.4.8 Students' English Learning Style (Questions 13, 14, 15)

- 13: How do you prefer to learn English?
- a. In pairs b. In small groups c. I individually

The students' number affects the learning process. After investigating the learning situation, it was found that English courses are held in amphitheatres where the number of students is more than 200 students. In addition, without microphones, and this may affect students' motivation towards ESP courses.

The statistics show that the majority of students (80%) prefer learning English in small groups, 20% choose to learn in pairs, while none prefer to learn it individually. The table below illustrates the results:

How to learn English		
	F	P%
In pairs	10	20
In small groups	40	80
Individually	00	00

Table 4: Students' Preference for Learning English

- Question 14: Which of the following make(s) the learning process easier for you?
- Audio materials.
 - Video materials.
 - Handouts and/ or other printed materials.

ESP courses for science and technology play a pivotal role in ESP instruction, in which the teacher is a material provider, selecting the appropriate materials that lead to a successful ESP course. In the same vein, this question opens the door to students to select which material makes the learning process easier for them. The results are mentioned in the following figure :

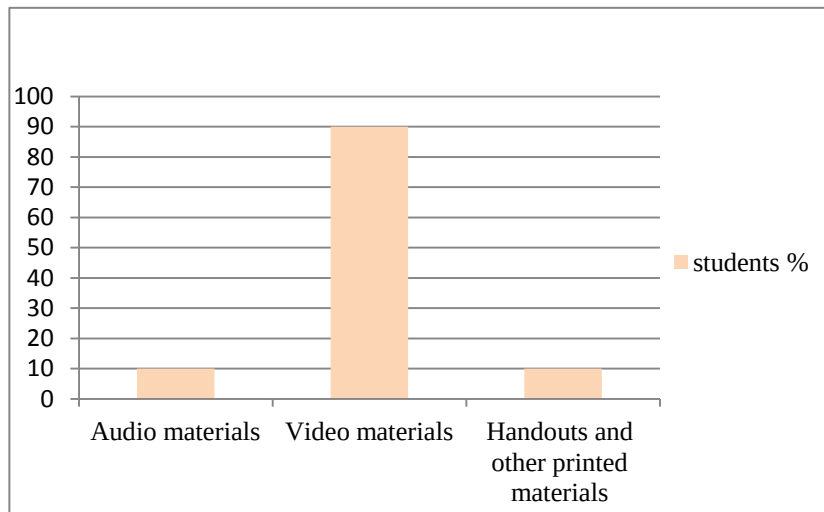


Figure 4: Learners' Preferred Methods for Learning English

- Question 15: How often would you like the course to be held?
- Twice a week
 - Three times a week
 - More than three times a week (precise)

Timing is an influencing factor in every learning process, since time in ESP instruction is limited, it should be well calculated. The investigation shows that English course was held once a week, and this is not sufficient.

4. Summary of the Main Results

The main results of the survey show that all the students at the Faculty of Science and Technology, Relizane University recognize the importance of learning English. They expressed a strong desire to improve their English skills, focusing primarily on speaking. They also emphasized the need to enhance their writing skills so as to overcome the difficulties they face in writing and publishing their articles. Similarly, they think they have to improve their speaking skills to excel in meetings and conferences, with the much hopes that the their needs will be accounted in planning ESP curriculum.

5. Suggestions and Recommendations

The data presented in this study confirm that the ESP instructor performs various roles and faces multiple obstacles. To offer solutions, ESP teachers and science and technology professionals should be provided with guidance and recommendations. Initially, it is important to introduce a training program that will help improve the skills and knowledge of teachers, resulting in a significant boost to their professional abilities. It is also important for curriculum developers to prioritize ESP courses by extending class time and encouraging students to learn English through the use of suitable materials. Next, it is crucial to establish collaboration between teachers in the English department and the science and technology departments. Thirdly, the high turnover of skilled teachers at Algerian universities is caused by the situation of part-time teachers, so decision-makers need to address their issues.

6. Conclusion

Teaching English to Science and Technology students is a critical issue, as many of them feel that ESP is crucial for their studies and future career, yet the courses provided by the instructors in their faculty do not meet their language and learning needs. This research helped identify the primary factors that negatively affect the process of learning effective ESP. Students view writing and speaking as the two most crucial language skills for achieving success in both academic studies and future professional careers among the four language skills. Throughout the process of learning ESP, students frequently experienced difficulties due to the complexity of the content, inappropriate timing, and unclear guidance from teachers, according to their reports. Increasing the importance of teaching ESP in general and EAP specifically for EST students at the Algerian university is essential in addressing this issue. Furthermore, implementing team teaching and fostering collaboration between subject experts and English instructors might be suitable remedies. In conclusion, effective ESP teachers are required to create successful ESP courses for their students. In order to reach this objective, educators must take on various pedagogical responsibilities which include recognizing their students' needs, selecting the appropriate curriculum, designing suitable materials, organizing carefully chosen

tasks and projects, and ultimately assessing the success of their courses in terms of their students' progress.

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