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Designing an ESP Syllabus Based on Needs Analysis: The Case of Postgraduate Biology Students at Souk-Ahras University

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Abstract

Teaching English for Specific Purposes (ESP) requires selecting the required teaching and learning materials that need to be tailored to match the students' specific needs, making needs analysis a critical step to determine what to teach and how to teach. Despite increasing interest in ESP globally, little research has been directed towards its implementation in the Algerian scientific departments—particularly biology—where both the field-specific content and the relevant materials are crucial. To address this gap, this study contributes to improving ESP course design by developing a practical syllabus and tailoring relevant materials based on the students' academic needs. Therefore, the aim of this explanatory sequential mixed-methods research was twofold: It sought to identify the gaps between the existing ESP syllabus and the students' actual needs while also exploring how appropriate ESP materials could be selected and adapted to meet their academic demands. Thus, conducting a needs analysis enables teachers to uncover students' core academic needs, which in turn guides the design of effective and relevant course content and materials. Accordingly, this study grapples with two core questions: what basic academic needs do postgraduate biology students have, and which types of ESP materials are best suited to address those needs? To this end, a structured questionnaire was administered at the very beginning of the academic year 2020/2021 to 167 Master I students from the Department of Biology, University of Souk-Ahras. Additionally, an interview was conducted with two ESP teachers to gain in-depth insights into the existing syllabus. The data showed that teachers were not following any syllabus for teaching ESP, and no coordination sessions had been held, neither among language specialists nor with subject specialists. The data also indicated that a proper syllabus should be developed, taking the students' expectations into account to better align classroom learning with the demands of their field. Based on these findings, an ESP syllabus was designed, along with relevant ESP materials, to address the identified needs and provide a more suitable and effective learning experience.

Keywords: Biology, ESP, ESP materials, needs analysis, syllabus

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1. Introduction

The growing urgency of English has become more apparent recently, largely due to the rapid advancements in science and technology. These fields encourage the writers to publish in English as a way to embrace a wider variety of audiences from all over the world. It is equally important to note that even researchers who traditionally conducted their research in other languages are now called upon to publish in English. This is again to ensure the visibility and the broader accessibility of their work. Based on this small account, it is clear that the English language is not restricted to only language specialists, but also it is relevant and important for professionals across various fields and disciplines.

Recently, the Algerian higher education sector has officially acknowledged the use of English as the language of science and research; it is increasingly promoted in postgraduate programmes and scientific publications. Given that this study primarily focuses on biology students, mastering English enables them to gain access to relevant materials, fulfil the ministerial decree obliging them to write their master's dissertation in English, and reach out to individuals in the same discipline (personal communication based on informal discussions with the students). English in this case is used for specific purposes, as it is linked to specific educational demands; this suggests that when English is tailored to these demands, it becomes a bridge between general language learning and field-specific technical demands. This again reflects the importance of ESP, which should never be overlooked, as it enables the students to practice their field-specific content in the target language. Thus, ESP courses are vital to help students excel in their field.

Despite this evident need for effective ESP instruction, several studies in Algeria have pointed to serious gaps in ESP teaching for natural sciences students, including lack of formal training, limited awareness of needs analysis, irrelevant content, and poor course design and materials development (Boudersa, 2018; Ghezali, 2023). Consequently, it can be seen that some institutions still offer general courses of English, resulting in an inadequacy between the students' needs and the discipline-specific demands (Assassi, 2021; Elbah, 2024).

Aligned with these issues, the implementation of the ESP courses in the department of biology at Souk Ahras University—which serves as the case study for this research—faces significant challenges. English is currently taught under the name *Technique de Communication et d'Expression* (translated as *Techniques of Communication and Expression*). This latter is considered less important compared to other core modules within the different Biology specialisations— a common trend for modules with lower coefficients (personal information: discussions at conferences).

The module is taught by one permanent ESP teacher from another university who visits only once a month to teach. However, it is most often taught by part-time teachers who hold a licence degree or master's degree, primarily to ensure the module is not left without an instructor and that no further administrative issues arise (Head of Department, personal communication, October 15, 2020). In this case, it can be said that such employments are made without proper planning, but just to place someone in the role, which is not professional, especially since this module demands qualified teachers. This is not to diminish the qualifications of part-time teachers, as they may possess valuable skills. Unfortunately, however, teachers with a licence degree or master's degree, have typically studied the module of ESP for only one year and may therefore have limited expertise to offer. As a result, these

teachers often end up teaching general English rather than ESP, as noted during informal discussions with students during the first session.

Another major challenge lies in the limited time allocated for the course, only 90 minutes per week is dedicated to teaching this module, which is insufficient to adequately cover all the planned concepts. This limitation makes it challenging for students to grasp even half of the content they are expected to learn or the skills they are expected to acquire. It is worth mentioning that during the COVID-19 era, this module was sometimes taught online, which presented several challenges for both teachers and students, including (a) insufficient time to cover all planned content, especially when combined with technical disruptions; (b) difficulty ensuring students' active participation in discussions and activities during virtual sessions; and (c) distractions caused by home environments, which are not always suitable for learning, leading to reduced attention and productivity (personal information: Discussion at webinars).

Concerning the syllabus, there is currently no official version in place, leaving teachers free to teach whatever they deem suitable for the students (Head of Department, personal communication, October 15, 2020).

In addition to the institutional challenges, certain cultural factors, such as passive learning methods and the longstanding use of French, also pose significant challenges to the implementation of ESP courses. Many students in the Algerian universities prefer listening to lectures and memorizing information rather than getting engaged in interactive activities such as problem-solving and group discussions; thus, the shift to student-centred approaches becomes quite difficult. Furthermore, as the French language remains moderately used among students, particularly in scientific fields, and given the lack of exposure to English in daily life, students tend to perceive English as optional, which often results in low motivation and limited use of the language. Consequently, these cultural factors must be acknowledged prior to syllabus design and materials development to ensure alignment with students' academic needs and, most importantly, with their learning expectations and socio-educational background.

The previously discussed challenges seem to affect the students' academic progress and limit their ability to engage in global scientific discussions (Saraa, 2020; Elmechta, 2022). Thus, addressing these issues has become crucial for improving the quality and relevance of ESP instruction and for developing more effective materials. To achieve this, a thorough needs analysis is essential, as it helps highlight students' specific linguistic and disciplinary requirements. Thus, focusing on biology postgraduate students, whose needs have not been yet matched with empirical needs analyses or pedagogical frameworks tailored to the Algerian ESP context— constitutes the main research gap that the present study seeks to address.

From the perspective of the Algerian academic community, investigating the specific needs of biology students makes this study both timely and necessary, as it contributes directly to the national efforts to enhance the quality and relevance of English instruction in higher education and to enable the students to be active members in the global academic community.

As stated in the abstract, the aim of this explanatory sequential mixed-methods research is twofold: to identify the gaps between the existing ESP syllabus and the students' actual needs, and to explore how appropriate ESP materials can be selected and adapted to meet their academic demands.

Accordingly, based on the aforementioned aims, this study sets forth the following objectives:

1. To examine the current ESP syllabus.
2. To conduct a needs analysis to determine the students' actual requirements.
3. To explore effective methods for designing ESP syllabus and selecting the appropriate learning materials.
4. To evaluate the effectiveness of the designed ESP syllabus.

To achieve these objectives, the following questions are put forward:

1. What are the basic needs of postgraduate students in the Department of Biology at Souk Ahras University?
2. What type of teaching materials can best fulfil their academic needs in their field of study?

Based on these research questions, the study proposes the following hypothesis: Conducting a needs analysis helps teachers to reveal the students' basic needs upon which a course can be designed with due consideration of appropriate teaching and learning materials.

2. Literature Review

Several scholars, such as Hutchinson and Waters (1987), Dudley-Evans and St. John (1998), Strevens (1988), Robinson (1991), Johns and Price-Machado (2001), have attempted to define ESP. Robinson (1991), for instance, highlighted that ESP has become a significant specialised area of teaching English that aims to provide an appropriate educational programme, followed by training and practical application of what has been learnt. He emphasises that ESP operates with three core areas: language, pedagogy, and the students' specialised field. Central to this definition, it can be understood that one area leads to the other; that is, depending on the students' specialised field, the language and pedagogy are going to be tailored accordingly. So, effective teaching and learning methods should be put into practice to deliver appropriate subject-specific content and a tailored context-specific language that seeks to address the students' challenges concerning the different skills in the target language.

Basturkmen (2010) provides a definition that aligns with Robinson's perspective, emphasising that needs analysis in ESP refers to the process on which many parameters should be identified prior to course design, including the skills needed by the students in their academic or professional careers, their current level, their needs, and the practical teaching opportunities and constraints.

Robinson's definition provides a clear understanding of the ESP different areas of focus. However, Basturkmen (2010) definition is more focused, as it explains the steps that precede the areas of ESP mentioned earlier. Basturkmen's definition reinforces the role of needs analysis as an ongoing process that can directly influence *what* is taught (content) and *how* it is taught (methodology); this denotes that needs analysis influences the ESP course design.

2.1. Types of Needs Analysis

Given the significance of needs analysis, many scholars have identified various types of needs (e.g., Chambers, 1980; Hutchinson & Waters, 1987; Jordan, 1997; Dudley-Evans & St. John, 1998). For practical reasons, this study adopts Jordan's types of needs (1997). They are summarised as follows:

2.1.1. Present Situation Analysis (PSA)

PSA focuses on the students' current level in language. It aims at identifying what they actually know. In this context, Robinson (1991) stated that PSA seeks to identify the students' level at the initial stages of a language course, examining their strengths and weaknesses.

2.1.2. Target Situation Analysis (TSA)

TSA focuses on the language, the skills, and the activities that the students need to achieve at the end of the ESP course.

2.1.3. Deficiency Analysis

The deficiency analysis focuses on the gaps (or lacks, as raised by Hutchinson & Waters, 1987) between the students' present knowledge (PSA) and what they need to develop in the future (TSA).

2.1.4. Strategy Analysis

Strategy analysis focuses on determining the learning strategies that the students prefer so that they keep engaged and motivated. It tackles issues like group size preferences, correction methods, and assessments strategies (Allwright, 1982).

2.1.5. Means Analysis

Means Analysis focuses on identifying the different factors influencing the learning environment, including time, place, teaching methods, and mode of learning (Basturkmen, 2010).

2.2. ESP Course Design Approaches

After identifying the various types of needs analysis, the next step is to deal with the three approaches that influence ESP course design, including the language-centred approach, the skills-centred approach, and the learning-centred approach, each providing a distinct perspective to how effectively put into practice the course content.

2.2.1. The language-centred approach

This approach seeks to create the closest possible connection between the analysis of the target situation and the ESP course content (Hutchinson & Waters, 1987), in other words, it focuses on the analysis of the different linguistic features (e.g., grammar, vocabulary, and sentence structure) needed in specific contexts upon which the syllabus is built, with the goal of equipping the students to perform effectively in the target context.

2.2.2. The skills-centred approach

This approach focuses on developing the four language skills (reading, writing, listening, and speaking). This approach is more dynamic than the language-centred one as it aims to enhance students' abilities in using ESP through different activities.

2.2.3. The learning-centred approach

This approach focuses on how someone acquires that competence? (Hutchinson & Waters, 1987). It supports active participation and collaboration to ensure that students are equipped with both language and skills that they can apply in a hands-on environment.

3. Research Methodology Overview

3.1 Participants

This study involved 167 biology students (151 females and 16 males) from Souk Ahras University. The students were selected through convenience sampling, as they had been assigned by the administration. Thus, the participants' availability ensures direct access for instruction, assessment, and informal observation. The participants expressed their willingness to voluntarily participate in the research after being informed of its purpose and

procedures, including taking the placement test, responding to the questionnaire, and engaging in informal discussions if necessary.

While interpreting the data, some intermediate variables were carefully taken into consideration, particularly in cases where discrepancies appeared between the placement test results and the questionnaire responses. Thus, variables such as the students' self-assessment of language proficiency and their motivation to learn ESP were considered to ensure a more accurate interpretation of the findings.

Table N°01: Students' Profile

Option	Total students	Gender breakdown
Plant and Environmental Biology	24	Male: 01, Female: 23
Fundamental and Applied Ecology	32	Male: 05, Female: 27
Applied Biochemistry	40	Male: 06, Female: 34
Animal Ecotoxicology	35	Male: 01, Female: 34
Aquatic Ecosystem	36	Male: 03, Female: 33
Total	167	167

Table 1 provides a breakdown of the participants according to their specialisations and gender. The sample consisted of 24 students (one male and 23 female), 32 students (five male and 27 female), 40 (six male and 34 female), 35 (one male and 34 female), and 36 (three male and 33 female) specialised in the following specialisation, respectively: Plant and Environmental Biology, Fundamental and Applied Ecology, Applied Biochemistry, Animal Ecotoxicology, and Aquatic Ecosystem. The diversity in specialisations highlights the terminology of each apart, the unique technical concepts, and the unique demands. These differences further highlight a challenging problem, which is the need to address each field separately to meet its specific language and requirements. So, while trying to incorporate distinct concepts, such as terminology and authentic materials to address the unique needs of each field, a unified syllabus was developed to emphasise the commonalities shared across all specialisations.

As far as the ESP teachers are concerned, the study involved two part-time instructors. Both had nearly three years of experience teaching ESP to biology students. While neither held advanced degrees beyond the Licence level, and they are relatively new to ESP teaching, their perspectives were crucial for understanding contextual constraints and the overall ESP teaching settings related to the biology department, including classroom realities and institutional challenges. They were selected purposefully, as they were the only ESP practitioners teaching the "*Techniques of Communication and Expression"* module during the period of data collection (2020-2021).

Although the sample size is small, it fits well with the qualitative research principles, where the goal is not about drawing statistical generalisations but rather gaining depth of understanding (Dörnyei, 2007; Creswell, 2015). The interviews findings helped to further interpret the quantitative data and served to contextualise the results within the ESP real world context.

3.2. Instruments

The instruments used in this study for data collection included placement tests, a questionnaire, and an interview. Each of these instruments is described in detail below:

The placement tests were designed to evaluate the students' current level (PSA) in the four language skills (listening, speaking, reading, and writing) and to identify areas requiring

improvement (deficiency analysis) (Richards, 2001). As for the listening section, it tried to assess the students' listening abilities by evaluating their comprehension through various tasks that emphasise each field-specific terminology, including audio clips and true/false questions. Concerning the speaking section, it aimed to test the students' fluency by encouraging them to use relevant vocabulary. The tasks included self-introduction and image description. The reading section aimed to evaluate the students' abilities in text comprehension through different tasks, like comprehension questions, true/false questions, and identifying synonyms and antonyms within a given scientific text. Regarding the writing section, it dealt with tasks such as data description, data analysis, and writing short paragraphs.

The second data collection tool was the questionnaire. This tool was designed to address the five types of needs set by Jordan (1997): TSA, PSA, deficiency analysis, strategy analysis, and means analysis. Each type of needs analysis was placed under a separate section in the questionnaire, with each section comprising a set of questions (Appendix A).

Finally, an interview (Appendix B) was conducted with two ESP teachers to better understand the overall status of ESP. The interview aimed to elicit qualitative insights regarding the ESP syllabus, the available teaching materials, the teacher training, personal development, and collaboration.

For more methodological clarification, table 02 shows how the study variables were evaluated through each instrument; it presents the key variables examined in this study, the instruments used to evaluate them, and the procedures followed for their analysis. This provides a concise procedural design that complements the detailed descriptions above.

Table N°02: Procedural Design for Evaluating the Research Variables

Variable	Type	Instrument Used	Evaluation Focus	Analysis Method
Students' English proficiency	Dependent	Placement Test	Listening, speaking, reading, and writing proficiency in scientific contexts	Internal scale designed by the researcher, which includes 4 levels: beginner, elementary, intermediate, and upper-intermediate
Students' ESP needs	Dependent	Questionnaire (Jordan's 1997 model)	TSA, PSA, deficiency, analysis, strategy analysis, and means analysis	Descriptive statistics (percentages)
Course relevance and adequacy	Dependent	Teachers' interviews	Perceptions of relevance of current ESP courses	Inductive thematic analysis based on Braun and Clarke (2006) six-phase framework: (1) familiarisation with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report
ESP instruction challenges	Dependent	Teachers' interviews	Teachers' insights on teaching materials, teaching experience, collaboration, and training	Same as previous: Inductive thematic analysis (Braun & Clarke, 2006)

3.3. Research Design and Methodology

This mixed-methods study follows the explanatory sequential design that aims first to collect and analyse the quantitative data to provide overall understanding of the research problem, followed by the collection and analysis of the qualitative data to further explain the quantitative findings, and finally integrating the results (Morse, 1991; Ivankova, Creswell & Stick, 2006; Creswell, 2015). The rationale behind choosing this design lies in the complex nature of needs analysis. Thus, having just quantitative data helps highlight statistically

significant trends in the students' language proficiency and needs but may fail to adequately represent the key challenges faced by both teachers and students. So, this design believes that combining both types of data gives a complete picture of the research problem and a better understanding of the results, as measurable results will be enhanced by personal insights (Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2010; Creswell, 2014). Methodologically speaking, this design aligns well with the study's objectives, which do not focus only on assessing the students' current levels and actual needs but also on understanding how course design can be better tailored. Therefore, the explanatory sequential design provides both breadth and depth, ensuring that the study captures measurable outcomes supported by contextualised, experience-based explanations.

3.4. Description of the ESP Course Design Procedures

As highlighted earlier in the literature review, designing an ESP course requires identifying the students' gaps in their fields of study and thinking about effective ways to address these gaps with adequate materials. So, designing an ESP course is not a single-shot approach, it rather involves various steps, starting with needs analysis and moving forward to tailoring suitable teaching content and materials that should be delivered through an appropriate teaching approach. The following titles highlight the key steps that this study followed to create a well-structured ESP course.

3.4.1. Conducting a Needs Analysis

To conduct a needs analysis, the five types of needs mentioned earlier (TSA, PSA, deficiency analysis, strategy analysis, and means analysis) were assessed using various methods discussed earlier.

3.4.2. Defining the Learning Objectives

Based on the needs analysis, the course objectives have been defined; they are summarised below:

By the end of the ESP course, the students will be able to:

-Understand biology-related terminologies.

-Participate in group discussions on biology-related topics.

-Interpret data from biology-related research articles.

-Produce well-organised pieces of writing on biology-related topics.

3.4.3. Choosing a Course Design Approach

Based on a needs analysis and the learning objectives, it was found that a combination of the three approaches—language-centred approach, skills-centred approach, and learning centred approach—is likely suitable to follow. In this case, the language-centred approach works well with the first learning objective set previously because it focuses more on linguistic features. The second approach, skills-centred approach, contributes to achieving the four set objectives, as it supports the development of the four language skills. The learning-centred approach also complements all objectives, as it focuses on active engagement, collaboration, and a hands-on environment.

3.4.4. Developing the Syllabus

Based on the aforementioned steps, the ESP syllabus was developed. The researcher employed a blended approach, combining both product-oriented (grammatical, skill-based, situational, and functional-notional) and process-oriented (task-based and content-based) syllabi to ensure a balanced integration of theory and practice. As far as the vocabulary instruction is concerned, an emphasis on the field-specific terminology was placed to enrich

the students' linguistic repertoire. While grammar lessons focused on the structures that are commonly used in the target discipline (biology). As for the methodology, an emphasis was placed on the essential skills for scientific writing and research, including proper citation, data collection, data analysis, and data presentation.

The syllabus focused on developing the four language skills. For the receptive skills, the students are exposed to authentic materials, emphasising effective reading and listening comprehension. As for the productive skills, practical applications were implemented, including writing reports, academic papers, emails, and giving presentations.

Authentic materials were used to fulfil the learning objectives, including grammar books, dictionaries, scientific articles for each specialisation, manuals, and books. As for the assessment approaches used, the researcher employed formative and summative evaluations. In the former, regular feedback was provided, while in the latter, final projects were completed.

3.5. Validating the Designed Syllabus

Although the researcher acknowledged the importance of expert validation, as supported by many scholars (e.g., Hutchinson & Waters, 1987; Robinson, 1991; Graves, 2000; Basturkmen, 2010). Unfortunately, she was unable to find anyone ready to validate the designed syllabus, neither a language specialist nor a subject specialist. Despite reaching out to several language specialists, they did not respond to her request, and others apologised. The subject specialists expressed reluctance to review the content.

4. Results Interpretation of the Data Collection Tools

Before moving to the data interpretation, it is important to highlight some key analytical tools and statistical procedures used in the present study. As this study adopted a diagnostic approach to needs analysis for specific syllabus design, it was neither feasible to use inferential statistics or inferential tools to generalise findings tools, nor appropriate to compare population with a standard sample.

Therefore, using the descriptive statistics—notably percentages— proved meaningful in answering the research questions, and they were sufficient and appropriate to identify the linguistic needs and challenges of a specific group of students within a local context. In fact, this way aligns with the principles of needs analysis studies, where practical insights are often prioritised over statistical generalisability (Richards, 2001; Brown, 2016). This practice-oriented study, therefore, provides insights that are locally relevant and pedagogically valuable, even if not statistically generalisable.

4.1. The Placement Test Results and Analysis

The placement test results were calculated using the mean score of the different areas, alongside the corresponding percentage for each area. The results are best displayed in Table 3. The mean score was calculated using the following mathematical formula:

$$\text{mean} = \overline{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Where:

x_i stands for each individual score,

n stands for the total number of the scores,

$\sum_{i-1}^{n}$ stands for the sum of all scores.

As for the percentage of each mean, it was calculated using the following formula: Percentage (%) = $\left(\frac{mean\ score}{maximum\ possible\ score}\right) \times 100$, where the maximum possible score for each area is 15.

To determine if the mean score averages reflect beginner, elementary, intermediate or upper-intermediate levels, various percentage benchmarks to categorise the scores were set: 50% for elementary levels, 70% for intermediate, 80% for upper-intermediate, and percentages below 50% are considered beginner. Table 3 shows that most students seemed to have an intermediate level in listening with 75%, which was near the boundary between intermediate and upper-intermediate; this reflects their comprehension of the designed tasks set to assess this skill. The students also reached the intermediate level in speaking, as 70% of them have completed the given tasks. Students achieve the same level in reading at 70%, demonstrating a good comprehension of the task's questions. Table 3 also shows that the students require improvement in writing and methodology, as their percentages are notably very low at 27% and 25%, respectively. This reveals that the designed tasks did not match the students' current level in both areas, so adjustments and further improvement are essential.

Table N°03: The Students' Current Proficiency

The Assessed aspect	The Mean average	Percentage
Listening	11.257485	75.04%
Speaking	10.592814	70.61%
Reading	10.550898	70.33%
Writing	4.1616766	27.74%
Methodology	3.8383233	25.58%

4.2. The Questionnaire Results and Analysis

4.2.1. PSA

From Table 4, it appears that students have an intermediate level in English, as raised by a large majority that represents 89.22% (149 students). Meanwhile, 07.78% of students consider their level to be beginner, and 02.99% classify themselves as upper-intermediate. None of the students selected elementary. This result aligns well with the findings of the placement test, which indicate that the students' overall level across the investigated areas corresponds to an intermediate proficiency.

Table N°04: The Students' Current English Proficiency

The level of proficiency	Number of students	Percentage
Beginner	13	07.78%
Elementary	00	00%
Intermediate	149	89.22%
Upper-intermediate	5	02.99%
Total	167	100%

Table 5 summarises the students' challenges in understanding the learning materials in English. The challenges fall within key areas such as grammar, vocabulary, reading strategies, and reading comprehension. This indicates that the tasks designed in the placement tests align

with the students' current level; therefore, to further confirm these findings, additional tasks that are slightly beyond their current proficiency are needed to validate the findings.

Table N°05: Difficulties in understanding English materials

Difficulty	Percentage
-Difficult words	71.43%
-Long sentences	78.15%
-Finding key information	33.61%
-Understanding the main idea	50.42%
-Others	25.21%

4.2.2. TSA

Table 6 displays the expected tasks that students of biology aim to perform. For clarity purposes, the researcher has paraphrased the students' answers, when necessary, as their language is not consistent, and most often, they write in French or they mix it with English. The responses imply that the students are struggling to achieve these tasks effectively. Therefore, more attention to these areas is highly required. The most frequently reported responses are displayed in the table below.

Table N°06: Expected Tasks to perform in English academic studies

The tasks expected to be performed
-Reading scientific papers
-Making oral presentations
-Writing lab reports
-Writing essays
-Writing dissertations
-Communicating with international peers

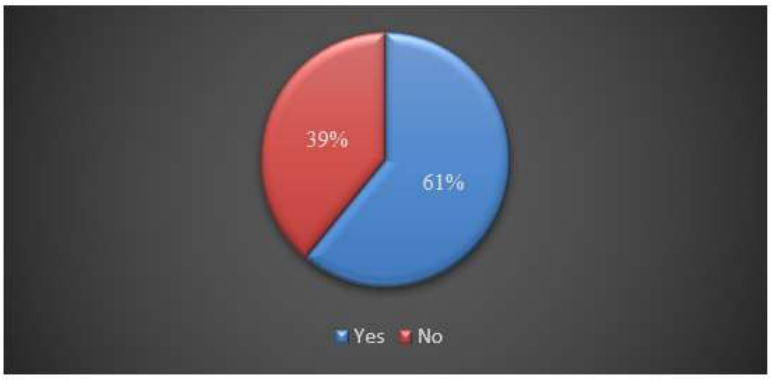


Figure N°01: Students' Intentions to Use English in Their Future Careers

Figure 1 indicates the students' intentions to use English in their future careers. It shows that a large majority that represents 61% of the respondents, answer positively. Their answers again, have been paraphrased for the aforementioned reasons. The students agree on using English for the following reasons:

-Pursuing doctoral studies.

-Reading scientific papers.
-Publishing in international journals.
-Participating in international conferences.
-Writing applications tailored for international job opportunities.
-Working in international laboratories.

4.2.3. Deficiency Analysis

Table 7 presents the students' prioritised language skills based on their needs. The students ordered the skills with a number between 1 and 4, where 1 stands for the highest priority and 4 stands for the lowest one. It is clear that the students place more importance on reading and writing with 80% and 70% respectively. Listening (40%) and speaking (30%) follow in the second position. While speaking ranks third at 30% and the remaining skills share equal percentages of 10%. In the fourth position, we have listening and speaking with 50% and 30%, respectively. The findings show that the students seem to prioritise the most problematic skills and reinforce what has been raised in the previous sections.

Table N°07: Prioritised Language Skills for Biology Students: A Ranking of Needs

Skills	1	2	3	4
Listening	00%	40%	10%	50%
Speaking	10%	30%	30%	30%
Reading	80%	10%	10%	00%
Writing	70%	20%	10%	00%

Table 8 displays the key areas where students feel they lack proficiency in each language skill. Once again, the researcher has paraphrased the most commonly reported answers.

Table N°08: Key Areas of Language Skill Deficiency as Perceived by Students

The students' deficiencies
-Difficulty in understanding field-specific terminology
-Difficulty in participating in debates
-Challenges in understanding English in the academic context
-Challenges in producing a piece of writing due to the limited vocabulary
-Challenges in producing grammatically correct sentences
-Challenges in understanding complex sentences structures
-Lack of familiarity with academic writing conventions
-Lack of the exclusive exposure to the language

4.2.4. Strategy Analysis

Figure 2 aims to reveal the students' preferences for approaching different tasks. This enables the researcher to support the students in working within their comfort zones, allowing them to develop their abilities at a manageable pace. The figure clearly shows that an overwhelming majority of the students prefer pair discussions with 54%. Group discussions follow at 34%. While a slight minority of the students (12%) prefers individual assignments.

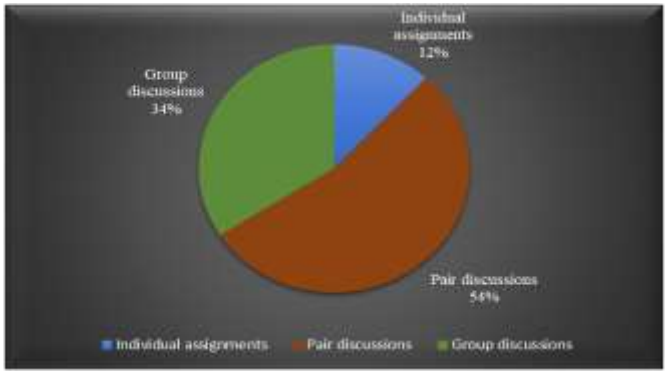


Figure N°02: Preferred Learning Style—Individual, Pair, or Group Work

Table 9 is designed to uncover the students' preferred task type and their preferred mode of learning, with the aim of encouraging them to complete their learning tasks the way they like, and receiving the learning content in the mode that best suits them. The data show that a great majority of the participants (88%) is in favour of the classwork, while only a small minority is in favour of the homework. This shows that the students prefer to be monitored by their teachers. As for the mode of learning, an overwhelming majority that represents 60% prefers hybrid learning, as they believe that online learning provides them with an extra opportunity to learn at their convenience.

Table N°09: Distribution of Student Preferences for Tasks and Learning Modes

Task type	Percentage	Preferred mode of learning	Percentage
Classwork	88%	**Online**	10%
Homework	12%	**Onsite**	30%
Both	00%	**Hybrid**	60%

4.2.5. Means Analysis

As this section aims to identify different factors related to the classroom environment, it was deemed necessary to ask the students about their preferences concerning the different classroom settings. Figure 3 indicates that a vast majority of students (45%) supports a U-shaped setting, with the open end or side of the U facing the teacher and the whiteboard. This setting encourages class discussion and fosters inclusivity as it provides nearly an equal opportunity for each student to get involved. A considerable percentage of students (39%) is in favour of the circle/seminar setting where the students sit in a circle without tables; it fosters debates as the students engage easily. A small percentage of 11% and 5% is assigned to the auditorium/lecture setting and the traditional classroom setting, respectively. The data indicate that the students are interested and motivated to learn English, as they seek a classroom setting that emphasises active involvement and collaboration, both of which contribute to academic progress. The researcher considered the students' preferences, with some adjustments, particularly since both settings work well with smaller group of students. Therefore, depending on the group size, a decision should be made regarding which setting is suitable to ensure the classroom remains organised.

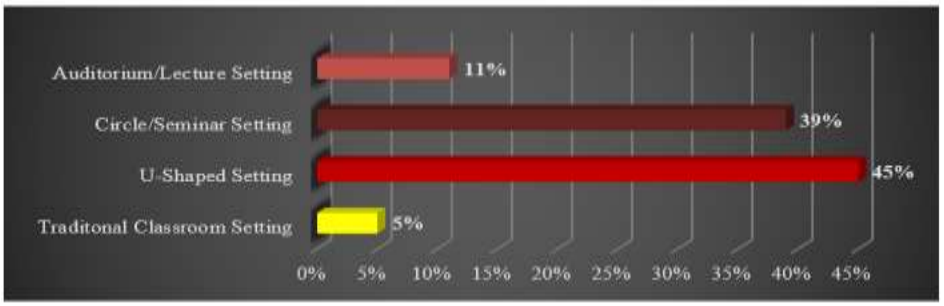


Figure N°03: Students' Preferred Classroom Setting

This item aims to identify the students' preferred timing for sessions in both modes of learning, trying to schedule the sessions at times that can best suit their personal schedule and meet their expectations. Thus, enhancing the learning progress whenever possible. As shown in Table 10, an equal distribution of 50% is given to both morning and afternoon sessions for the onsite mode. This latter puts the researcher in a flexible position, as she did not have the authority to determine onsite session schedules. Regarding online sessions, it can be seen that none of the students prefer morning sessions, while 45% favour afternoon sessions and 55% prefer evening sessions. This shows the students' preference to learn later in the day, which often helps them stay focused and develop their learning skills more effectively. Based on the findings, the onsite session hours were kept as they are, while the online sessions have been scheduled during the afternoon, considering that during this period, students are generally more focused and engaged compared to the evening sessions.

Table N°10: Session Timing Preferences

The time	Onsite classes	Online classes
Morning	50%	00%
Afternoon	50%	45%
Evening	××××	55%

4.3. The Interview Results and Analysis

This study uses the thematic analysis approach for the interview interpretation, which requires going over the recording multiple times to identify the recurring data, categorising them altogether, and putting them under the same theme (Rice & Ezzy, 1999; King, 2004; Dawadi, 2020). It is worth mentioning that the participants' recordings were manually transcribed after careful and thoughtful listening for each, where the researcher captured not only the spoken words but also the hesitation markers, which are often used to express uncertainty or the need for thinking. Thus, the analysis did not begin with pre-existing themes, as they emerged inductively from the data. The data are interpreted under different themes, as follows:

4.3.1. The Challenges of Teaching ESP without a Standardised Syllabus

The two teachers claimed that the lack of a standardised syllabus compelled them to take the initiative and design their own syllabus, emphasising that even the necessary materials were not available, which in turn forced them to provide them themselves. The following excerpt better exemplifies this:

[Excerpt 1, teacher B]

"Well…. concerning the syllabus, it was not given to me; [uuuuuh] at that time, I decided to create it myself just not to lose time [but you know] because I started late…" This excerpt highlights that the teacher did not make any attempt to ask someone else for help, which suggests that she prioritised quick action over collaboration because of time constraints, or possibly preferred working individually. In either case, there should be a sense of collaboration; otherwise, there might be variation in the course content, objectives, and assessment across different groups of students.

4.3.2. Lack of Collaboration among Teachers

As previously inferred in Theme 1, the teachers tend to work individually. Their responses are further validated under this theme, highlighting the reasons behind this preference.

[Excerpt 2, teacher B]:

"Since this is not my first-year teaching here, I had a bad experience with collaboration. [pause] I was lost, [uh] I asked a teacher to help, but [uh-huh] he told me he's not ready to help because he had some engagements, and [hmmmm] another promised to send me some materials, but he never did [pause], until the time was almost up for me to design the syllabus. That is why I decided to work alone….. [speech continues, but this excerpt is sufficient for analysis]."

This excerpt explains the decision stated previously in excerpt 1. One important reason for that decision is that the teacher had previously asked for help; however, she faced refusal and empty promises. As a result, she decided to never ask again and work alone. The teacher's pauses and filler words indicate the feeling of being abandoned in a difficult situation, which urges her to get through the process of the syllabus design alone.

4.3.3. Lack of Experience in Designing an ESP Syllabus

From theme 2, it is noticed that the interviewees lack experience in syllabus design because of two main reasons: (1) the fact that they are newly appointed teachers and (2) the fact they hold a license degree, which may not allow them to be fully able to design a syllabus. Yet, the interviewees claim that while they are familiar with the course content, they are not aware of how to design a syllabus. This indicates that in such cases, collaboration is highly required and essential.

4.3.4. Limited Opportunities for ESP Training and Efforts for Personal Development

[Excerpt 3, teacher A]

"…. To be honest, I did not have any opportunity to receive any training in ESP, including syllabus design [mmmmmm] maybe because I'm a part-time teacher, so no official training was available for us [pause] ….. **[The interviewer intervenes]** "Did you make any attempt to look for other training opportunities, maybe through workshops or online courses?" **[Teacher A again]:** "Yeah, [uhhhh] I tried to look for private training, but I failed [pause]. That's why I relied on myself [uhhh] believe me [pause]. It was not easy at all, especially since everything was done without any guidance and support."

Excerpt 3 indicates that the university offers no training opportunities, and the teachers emphasise that such initiatives may be reserved for permanent teachers. Despite this, the interviewees have made considerable attempts to explore external training options as a way to enhance their personal development. Unfortunately, none was available. In fact, this is encouraging and reflects that the interviewees take charge of their own progress, which is

further demonstrated by their ability to navigate syllabus design alone despite being unfamiliar with such activities.

4.3.5. The need for Specialised ESP Teaching Materials

The unavailability of the necessary ESP materials in the department or the faculty library was also highlighted. This shortcoming presents further challenges, especially since the interviewees are not subject specialists who would have a better understanding of which biology-related material is suitable for each speciality. The interviewees report that due to this gap, they rely more on materials they develop themselves, which often include general concepts that do not focus on any particular speciality.

5. Discussion

Overall, based on the analysis of the research tools, this study successfully met its main aims. By examining the current ESP syllabus and conducting a needs analysis, the researcher identified the gaps between the available syllabus and the students' requirements. The researcher sought to address those gaps to enhance the students' academic growth. She first categorised them and then prioritised them in terms of importance and relevance. Reaching this step in research allowed for the fulfilment of the first two objectives, leading the researcher to explore effective methods for designing an ESP syllabus and selecting the appropriate learning materials, which constituted the third objective. Subsequently, the researcher explored the students' preferred learning methods and instructional strategies to gain insights about what to select in terms of materials to serve the students' needs. Based on these insights, the researcher selected the appropriate ESP materials that directly catered those needs.

Concerning the research questions, by identifying the aforementioned gaps effectively, the first question: "What are the basic needs of postgraduate students in the Department of Biology at Souk Ahras University?" is effectively answered. The findings indicate that students face challenges in several key areas, including listening, participation in field-related discussions, reading comprehension, writing, and methodology. Similarly, these identified gaps helped address the second research question: "What type of teaching materials can best fulfil their academic needs in their field of study?" Thus, the provided materials were selected, ensuring diversity in terms of content and type. The materials encompass dictionaries, books, articles, videos, and more.

As far as the study's objectives are concerned, it can be concluded that this study met all of them, except for the final objective related to evaluating the effectiveness of the designed ESP syllabus, which could not be achieved due to the unavailability and reluctance of experts to provide assistance. This challenge is not unique to the present study, as several studies (e.g., Gatehouse, 2001; Belcher, 2006; Basturkmen, 2010) have previously reported some difficulties in evaluating ESP syllabi, including limited availability of field experts, institutional constraints, and the absence of practical implementation opportunities. In fact, such limitations occur when ESP is still in its developmental stages and where collaboration is minimal.

Finally, the findings also support the hypothesis, stating that conducting a needs analysis helps teachers reveal the students' basic needs, based on which a course can be designed with due consideration of appropriate teaching and learning materials. The findings of the present study align with prior research studies that highlight the pivotal role of needs analysis in ESP course design. Researchers such as Hutchinson and Waters (1987) and Basturkmen (2010)

considered needs analysis an essential step in identifying the students' needs, which in turn shapes the design of tailored course content and the development of appropriate teaching materials. Similarly, Dudley-Evans and St. John (1998) claim that needs analysis is the foundational element that guides the different stages of course design, starting from the objectives to selecting content and methodology. Ultimately, this process enhances the students' engagement and improves overall course effectiveness.

The findings of the current study contribute to the theoretical understanding by enriching the growing body of literature and reinforcing the importance of needs analysis, as outlined by many researchers (e.g., Hutchinson & Waters, 1987; Dudley-Evans & St. John, 1998; Basturkmen, 2010). They emphasise that needs analysis does not only help identify what content should be taught, but it also highlights how this content should be taught. The findings also validate the feasibility of the explanatory sequential mixed-methods design for understanding the research problem by encompassing both measurable aspects and personal experiences. In practical terms, the designed syllabus, informed by the study findings, can offer curriculum designers and ESP instructors a way to tailor workable ESP courses and support students' engagement and improve learning outcomes.

6. Conclusion

In conclusion, the findings of this study confirm the importance of conducting a needs analysis prior to designing an ESP course and selecting appropriate instructional materials to help the students effectively develop the challenging language areas required for their academic progress. Based on the findings, the researcher designed a course syllabus that directly addresses the challenging areas highlighted by the students, including grammar, vocabulary, speaking, reading, writing, and methodology. A detailed description of each area is presented as follows:

Starting with grammar, the objectives of this rubric aim to focus on the most important grammatical concepts that fit well within the conventions of the field of biology, including the following: (a) the present simple and present continuous, both of which are highly used in scientific writing. While the former is widely used to describe general truths and scientific processes, the latter is commonly used to describe experiments and observations, (b) the passive voice, which most often supports objectivity—an essential criterion in scientific writing—puts much emphasis on the process rather than the doer, (c) the modal verbs, which are essential in scientific fields as degrees of certainty, are frequently used, and (d) conditionals to discuss experimental conditions and predict outcomes. Concerning the designed activities, they mainly involved gap-filling and sentence transformation. The materials used to achieve the designed activities included scientific articles and scenarios**.**

Regarding vocabulary, its objectives were designed to cover different types of vocabulary. It provides general biological terms to enhance understanding of general concepts across different biological disciplines and to facilitate cross-disciplinary communication. Given that many biological terms are derived from Latin and Greek, the syllabus highlights Latin and Greek affixes and roots to ensure understanding of ambiguous terms. The activities designed for this rubric include word formation, gap-filling, matching terms with definitions, and vocabulary extraction from reading texts, all of which were assigned and fulfilled using the Oxford Dictionary of Biology.

The study also aimed to help the students enhance their speaking skills through interactive and guided activities. These included, oral presentations, pair discussions, group debates, and experiment descriptions, all of which were guided by the teacher. The designed activities aim to enable the students to successfully get engaged in scientific debates and effectively present their viva voce. The activities were supported by scientific videos and taking turns to discuss a particular topic chosen randomly from a box.

The objectives of the reading rubric were designed to familiarise the students with the scientific conventions of writing. They aim to expose them to how biological research is written, focusing on language, structure, and how the findings are communicated and organised. The designed activities focused on skimming, scanning, previewing, predicting, and reading comprehension questions. During this rubric, different biological works were provided, including scientific articles, research papers, abstracts, and books (e.g., *Biological Sciences: Developing Reading Skills in English ELT Series* by Valerie, 1985).

The writing skill was intentionally placed at the end of the syllabus to enable students to put into practice their newly acquired knowledge from previous areas such as reading, grammar, vocabulary, and speaking, all of which would enrich the students' terminology to enable them to write an acceptable piece of writing. The objectives of this rubric are designed to develop the students' abilities to produce clear and coherent scientific writing that can effectively communicate their findings. This rubric covers various concepts, including writing laboratory reports, abstracts, research proposals, and data description and analyses, which altogether enhances the students' ability to engage in research and communicate effectively within their field of study. The designed activities deal with writing research questions and objectives for a scientific topic, structuring a short research proposal with the researcher's guidance, revising sample scientific texts with grammatical mistakes, and filling in missing sentences in incomplete abstracts. The students were provided with some books as learning materials to further help them develop their writing, such as *Short Guide to Write about Biology* (Pechenik, 2016), *Science Research Writing for Non-native Speakers of English* (Glasman-Deal, 2010), and *Writing Papers in the Biological Sciences* (McMillan, 2012).

The objectives of the methodology section focus on various methodological concepts, including an introduction to different data collection tools, which enables the students to select the appropriate tool that best fits the nature of their future studies. An identification of the research design and the sampling techniques is addressed—the former helps students evaluate their work effectively, while the latter ensures the validity, reliability, and generalisability of their findings. In-text citation and referencing are also emphasised to better develop the essential writing skills for ethical documentation, supporting credibility. The *Publication Manual of the American Psychological Association* (American Psychological Association, 2020) was provided as a learning material.

Like any study, this research has certain limitations that should be acknowledged. The study's main limitation is related to time constraints, which prevented the researcher from conducting an achievement test to assess the validity of the designed syllabus. This limitation also prevented the researcher from fully covering each rubric, in terms of incorporating additional concepts. Thus, it was important to put emphasis on certain concepts over others, even though they are no less important than the prioritised ones.

With regard to the research results, the following recommendation is put forward:

The concerned stakeholders, including curriculum designers, ESP instructors, and academic decision-makers, should all emphasise the crucial role of collaboration among ESP teachers in designing a relevant and consistent ESP syllabus. Equally important is the collaboration between language specialists and subject specialists to guarantee a balanced syllabus in terms of linguistic accuracy and subject-specific content, should also be highlighted. This is because neither language specialists are familiar with the idiosyncrasies of each specialty within the discipline, nor are subject specialists aware of the essential linguistic principles necessary for effective development of the target language.

Future studies should seek to validate the designed syllabus through expert review to identify any remaining gaps, and modify it accordingly. This validation process would ensure the syllabus aligns with both pedagogical standards and students' needs. Future studies should also try to conduct a full-scale study to fully cover all the suggested concepts without prioritising some over others, enabling the students to gain a thorough understanding and develop their skills in each designed area.

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Appendix A
Teachers' Questionnaire

This questionnaire is designed to understand your needs, preferences, and challenges in learning ESP. Your answers will help improve the course and make it more useful and practical. Your responses will be kept confidential and used only for research purposes. Thank you for your participation!

Section 1: Present Situation Analysis (PSA)

1- How would you rate your current level of English proficiency?

-Elementary ☐
-Beginner ☐
-Intermediate ☐
-Upper-intermediate ☐
-Advanced ☐

2- What kind of difficulties do you usually face when trying to understand English field-content or materials?

-Difficult words ☐
-Long sentences ☐
-Finding key information ☐
-Understanding the main idea ☐
-Others ……..

Section 2: Target Situation Analysis (TSA)

1- What academic tasks do you need to perform in English in your field of study?

……
……
……

2- Do you plan to use English in your future career?

-Yes ☐ -No ☐
-If yes, please justify…….....

Section 3: Deficiency Analysis

1- Please rank the following language skills from 1 to 4 based on their importance, where 1 is the most important and 4 is the least important.

-Listening ☐
-Speaking ☐
-Reading ☐
-Writing ☐
-Please describe the most challenging aspects in each skill

……
……
……

Section 4: Strategy Analysis

1- During classroom tasks, do you prefer to work:

-Individually (individual assignments) ☐
-In pairs (pair discussions) ☐
-In groups (group discussions) ☐

2- Do you prefer:

-Classwork ☐
-Homework ☐
-Both ☐

3- Which mode of learning do you find most effective? Justify your answer.

-Online ☐
-Onsite ☐
-Hybrid ☐
……
……
……

Section 5: Means Analysis

1- Which classroom seating arrangement do you prefer to learn English:

-Auditorium/Lecture setting ☐
-Circle/Seminar Setting ☐
-U-shaped Setting ☐
-Traditional Classroom Setting ☐

2- Do you prefer to attend onsite or online ESP sessions in the:

- Morning ☐
- Afternoon ☐
- Evening ☐

Appendix B
Teachers' Interview

1. Have you received a standardised syllabus when you were assigned to teach the ESP course? If not, how did you manage its non-availability?
2. What kind of materials were available to support your teaching? If none were available, have you developed your own?
3. Have you tried to collaborate with other teachers when preparing your ESP syllabus?
4. Have you received any formal training in ESP teaching or syllabus design?
5. Did you make any attempt to look for other training opportunities, maybe through workshops or online courses?"
6. Are there enough relevant materials available in your department or university library?
7. How specialised are the materials you use for teaching?
8. Do you rely on general English sources or more field-specific materials?