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ESP Needs Analysis of Undergraduate Mechanical Engineering Students: A Case in Iran

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Abstract

Although a significant part of the Iranian university curriculum is English for Specific Academic Purposes (ESAP) courses, policy makers and curriculum developers have commonly developed the programs based on intuition and they have not considered the students' needs. The present study designed to assess the present and target situation academic language needs of undergraduate students of mechanical engineering. The data were elicited from 120 undergraduates and 7 ESP teachers in an Islamic Azad University in Esfahan province, Iran. The instrumentation included a needs analysis questionnaire and semi-structured interview. Despite the fact that the participants' perceptions of target situation needs were inconsistent, the findings revealed that the undergraduates had difficulties with most language skills and sub-skills. Moreover, they were not satisfied with their current ESP courses. Findings implied that renewing ESAP courses will be suggested.

Keywords: ESP; ESAP; Needs Analysis; Mechanical Engineering.

1. Introduction

Although in Iran the language of education is Persian, English for specific purposes (ESP) is one of the obligatory courses in universities and all undergraduate students are urged to pass one to three ESP courses. The main aim of these courses is to increase students' English knowledge to satisfy their academic and occupational needs. Despite the significance accorded to the value of ESP courses, some materials developers and curriculum designers have missed the required systematic needs analysis prior to the programs (Atai, 2002). It is, in fact, in contrast with the ESP principle that all steps in planning, implementation, evaluation, and renewal of ESP courses should be in regard to the learners' needs and based on comprehensive needs analysis.

In line with the experts in the field of ESP context, needs analysis is prerequisite for designing and developing a course, and the development of the syllabuses and materials (Brindley, 1989; Dudley-Evans & St. John, 1998, 2009; Hutchinson & Waters, 1987). Because needs have been defined from various perspectives, focusing on students' needs in designing a course is a demanding task (Moattarian & Tahririan, 2014). Hutchinson and Waters (1987) have classified needs into necessities, wants, and lacks. "Necessities" refer to the demands of the target situations, "wants" are concerned with the learners' view on what their needs are, and "lacks" relate to the gap language needs. According to this classification, the three basic sources of information for probing learners' needs are: The students themselves, the language teaching foundation, and the user institutions.

1.1 Background of the Study

In Iran, it was in the 1970s that the international expansion in ESP/EAP instruction elevated planning and implementation of these programs. Beginning with some intensive reading programs and course books in the mid 1970s (Bates & Dudley-Evens, 1975; Dudley-Evens et al., 1976; Cowan, 1974), university EAP instruction in Iran has worked for specificity in program development (Atai, 2002). In the 1980s, the Ministry of Science, Research, and Technology undertook the responsibility for nationwide EAP instruction at all Iranian universities and published eight EAP textbooks for students of sciences, humanities, sociology, engineering, medicine, and agriculture. However, the two generations of programs and course materials cited above were designed without developing any systematic profiles of the students' needs (Atai, 2002). After this period, SAMT (the official Iranian center for materials development in humanities) bore the responsibility of English language materials production. SAMT has published more than one hundred volumes of sub-technical and technical English textbooks in different fields.

The major focus in these textbooks, is on reading comprehension skills and they come after a rigid format of activities and exercises. Although the program developers and textbook writers have been working specificity, but the contents of these textbooks are not designed to address the learning needs, wants, and desires of Iranian students. This is, in fact, in contrast with the ESP principle that all steps in planning, implementations, evaluation, and renewal of ESP courses should be in regard to the learners' needs and based on comprehensive needs analysis.

1.2 Statement of the Problem

The number of undergraduate students in mechanical engineering has increased, and unfortunately, most of them do not acquire enough knowledge of English to express their views in important educational arenas and cannot operationalize their English language knowledge at academic and occupational situations. Moreover, no comprehensive needs assessment has ever been conducted for undergraduate students in mechanical engineering students in Iran. It is assumed that a better understanding of the undergraduate mechanical engineering students' real needs and expectations will assist the material developers to develop a proper ESP syllabus and help textbook writers provide the material considering the learners' needs.

1.3 Research Questions

The following research questions have been addressed in this study:

1. What are the target situation language needs of the undergraduate students of mechanical engineering of Islamic Azad University Khomeinishahr Branch?
2. To what extent have the present ESP courses been successful in satisfying the needs of undergraduate students of mechanical engineering?

1.4 Purpose of the Study

The main aim of this study was to investigate the English language learning needs, wants, and desires of the undergraduate mechanical engineering students at Islamic Azad University Khomeinishahr Branch, in Iran. To provide a detailed description of needs analysis, it was necessary to consider the views of various stakeholders including students and instructors.

1.5 Significance of the Study

Regarding the factors influencing ESP instruction and material development, students' needs analysis has been considered to play a pivotal role. This study was conducted to investigate the English language learning needs, wants, and desires of the undergraduate mechanical engineering students at Islamic Azad University Khomeinishahr Branch.

This study will benefit different groups of people. It will be helpful in developing ESP materials and can assist ESP researchers and textbook writers to design and provide proper textbooks, which are related to students' needs. Accordingly, it will also benefit the mechanical engineering students themselves to have a clear view of their needs and ability in utilization their English knowledge at academic and occupational situations.

1.6 Review of Related Literature

The literature in this regard has witnessed a surge of related research with a similar purpose but in different contexts and with different participants. For example, Venkatraman and Prema (2007) conducted a study on the engineering students at SASTRA University in India to ascertain the English Language needs of the students and their expectations of their ESP courses. In this study the researchers designed a modern curriculum in English and Communication studies for engineering students. Besides, they proposed a competency-based training for English teachers to provide more audience-targeted instruction in EST.

With the same purpose in mind, Abrahim (2008) conducted a needs analysis study in Malaysia to investigate the practicing engineers need at the workplace in order to communicate in English language. Findings showed that at universities, more time should be devoted to oral and writing communication. Moreover, experiencing real life such as group meetings and public speaking were necessary to them. Finally, the study reveals the necessity of designing a more in-depth communication syllabus for engineering students. Al-Tamimi and Shuib (2010) carried out another study to investigate the English language needs of petroleum engineering students at Hadramout University of Sciences and Technology in Yemen. The findings showed that all the language skills are important to acquire to students. Moreover, most of the students felt that they cannot use English effectively and they preferred to take English for occupational purpose courses. The researchers suggested that in designing English language course, speaking and listening skills should be emphasized and the duration of English courses should be increased.

A similar study was conducted by Mohamad Salehi (2010) at Sharif University in Iran to probe the English language needs of engineering students. The results indicated that note taking and translation skills were considered inappropriate and unimportant skills in their future careers. It was also found that technical writing skill was very important, however, it has been ignored totally. Additionally, Kaewpet (2011a) examined the communication needs of Thai civil engineering students. Since, the students' needs were various it is important to conduct a learning needs analysis to plan in advance for any ESP courses.

Another study was executed by Hanafi Zaid and Kamarudin (2011) to probe the oral communication needs of mechanical engineering students at Universiti Tecknologi Malaysia. The results investigated that the most important skill needed by the students was oral presentation and most of the students felt that they cannot communicate in English in workplace.

In the Iranian context of ESP courses, Atai and Shoja (2011) carried out another needs analysis study to investigate the language needs of Iranian students of computer engineering. The findings showed that written skills and language components were important. Besides, General English Proficiency level of the students was low. The researchers proposed the renewal of the ESAP course and suggested a model framework for needs analysis. Also, Sattar and Zahid (2011) investigated the linguistic needs of Textile engineering students at National Textile University in Pakistan. They proposed that developing more appropriate language courses and supplementary materials for the students were necessary.

Rahman (2012) examined the needs for reading skills among the undergraduate computer engineering students at Putra University in Malaysia. The results revealed that most of the students had problems in reading skills such as skimming, scanning, and decoding meaning of the subject matter. Another needs analysis study was conducted by Kim (2013) to investigate the language needs of engineering students in Korea. It revealed what students, engineering professors, and industry workers require in ESP courses.

Although all above mentioned studies confirmed the significance of identifying learners' needs, to the best of the researchers' knowledge, no needs analysis research has been explored for mechanical engineering students in Iran. The present study sought to develop an ESP syllabus of academic English language needs of undergraduate students of mechanical engineering. To assess learners' needs precisely, the views of students, content instructors, ESP instructors will be considered.

2. Method

This study was designed on a mixed method qualitative-quantitative survey basis. The study involved semi-structured interviews with undergraduate students, English instructors, and content instructors. It also included a questionnaire which was administered to the undergraduate students of the field.

2.1 Participants

A sample of 120 undergraduate students of mechanical engineering studying at an Islamic Azad University in Iran filled out a needs analysis questionnaire, which revealed the details of their wants. The sample comprised 120 male students with an age range of 19-25 years. The sampling method was convenience sampling.The students who filled out the questionnaire were from three educational levels, i.e. sophomores, juniors, and seniors. In addition to the questionnaire, the semi-structured interview was conducted with language instructors and content instructors.

2.2 Instruments

In this study two instruments were used: (1) a questionnaire and (2) interview. The questionnaire and interview probed the gap between the undergraduate students' present language abilities and their demands. The questionnaire used in this study was developed by Atai and Shoja (2011). The adopted questionnaire had three main parts: the participants' personal demographic information, a 20 item section to show the amount of importance of the language skills and sub skills for the students' academic success, and a 32item section to identify the students' present level of ability in the language skills and sub skills (see Appendix A). In order to prevent any misunderstanding, the researchers translated the questionnaire into the participants' L1 (i.e., Persian).

The second instrument that was used in this study was semi-structured interview protocol. It was also developed by Atai and Shoja (2011). The semi-structured interview protocol was developed for ESP teachers and subject specific teachers, based on the theoretical framework of the study (see Appendix B). The interview protocol was finalized based on the feedback received from a panel of EAP experts and subject specific teachers. The content of the interview protocol comprised of the same issues already addressed and examined through the questionnaires as well as some further relevant questions on the ESAP context under study (Atai & Shoja, 2011). The semi-structured interview was conducted with the language instructors and content instructors.

2.3 Procedure

First, the undergraduate students of mechanical engineering were informed what the questionnaire was about and whether they agreed to participate in the study, they could complete the questionnaire and send it back to the researchers. Then, the questionnaire was distributed to 120 students. Finally, semi-structured interview with ESP teachers and content teachers was conducted. The semi-structured interview was divided into two parts including seven questions. The first part was answered by ESAP teachers and the second part by mechanical engineering teachers. The researcher interviewed the language and content instructors. Instructors were asked to answer the questions and it was recorded.

3. Results

The items of the needs analysis questionnaire were analyzed both quantitatively and qualitatively by making use of descriptive statistics. Each item of questionnaire is presented by frequency, percentage and mean. In first part of the questionnaire, the participants responded to 20 items on important language skills and sub skills that help mechanical engineering undergraduate students succeed in their academic studies.

Table 1

Frequency, Percent and Mean of Importance of Language Skills or Components for Academic Success

	Not Important	Rather important	Important	Very important	Mean
1. Reading subject specific texts in English	16(33.3%)	27(22.5%)	46(38.3%)	31(25.8%)	2.77
2. Understanding teachers' slides in English	18(15.0%)	20(16.7%)	54(45.0%)	28(23.3%)	2.77
3. Writing scientific articles	25(20.8%)	44(36.7%)	38(31.7%)	13(10.8%)	2.33
4. Writing homework and assignments in English	23(19.5%)	44(37.3%)	27(22.5%)	24(20.3%)	2.44
5. Taking class examinations in English	28(23.3%)	39(32.5%)	39(32.5%)	14(11.7%)	2.33
6. Preparing English slides	23(19.2%)	39(32.5%)	39(32.5%)	19(15.8%)	2.45
7. Comprehending English lectures on mechanical engineering	9(7.5%)	20(16.7%)	44(36.7%)	47(39.2%)	3.08
8. Participating in international events	24(20.0%)	17(14.2%)	41(34.2%)	38(31.7%)	2.78
9. Knowledge of grammar	10(8.3%)	40(33.3%)	43(35.8%)	27(22.5%)	2.73
10. Knowledge of general vocabulary	9(7.5%)	23(19.2%)	46(39.3%)	42(35.0%)	3.01
11. Knowledge of technical vocabulary	8(6.7%)	23(19.2%)	44(36.7%)	45(35.7%)	3.05
12. Pronunciation	7(5.9%)	29(24.4%)	37(31.1%)	46(38.7%)	3.03
13. Using bilingual general dictionaries (from English to Persian)	15(12.5%)	21(17.5%)	51(42.5%)	33(27.5%)	2.85
14. Using bilingual general dictionaries (from Persian to English)	8(6.8%)	36(30.5%)	47(39.8%)	27(22.9%)	2.79
15. Using bilingual technical dictionaries(from English to Persian	16(13.6%)	33(28.0%)	42(35.6%)	27(22.9%)	2.68
16. Using monolingual technical	20(16.7%)	35(29.2%)	34(28.3%)	31(25.8%)	2.63

dictionaries (from English to English)					
17. Translating technical texts (from Persian to English)	6(5.0%)	47(39.2%)	34(28.3%)	33(27.5%)	2.78
18. Translating technical texts (from English to Persian)	11(9.2%)	35(29.2%)	37(30.8%)	37(30.8%)	2.83
19. Writing e-mails to teachers and field experts	26(21.7%)	26(21.7%)	44(36.7%)	24(20.0%)	2.55
20. Using Internet to do research	21(17.5%)	28(23.3%)	30(25/0%)	41(34.2%)	2.76

According to Table 1, the highest mean of the following language skills for undergraduate students' academic success were: 'comprehending English lectures on mechanical engineering (3/08)', 'knowledge of technical vocabulary (3/05)', 'pronunciation (3/03)', and 'knowledge of general vocabulary (3/01)'. It indicates that the least mean is related to 'writing scientific articles (2/33)', 'taking class examinations in English (2/33)', 'writing homework and assignments in English (2/44)', and 'preparing English slides (2/45)'.

The ESP teachers stated that all of the above-mentioned language skills and sub skills were important for the undergraduates' academic success. They believed that some of the items were less important than others, including 'writing e-mail messages to teachers and field experts' and 'preparing slides'. The ESP teachers considered general English as important as technical English. They believed that the items such as 'using general dictionaries', 'knowledge of grammar', and 'knowledge of general vocabulary' were important, too. As a whole, the ESP teachers confirmed the importance of all language skills (reading, writing, listening and speaking) for undergraduate students.

Another important point investigated in this study was the students' present level of ability in language skills. To this end, the participants responded to a 32-item section in the questionnaire.

Table 2

Frequency, Percent and Mean of Students' Present Level of Ability in the Language Skills and Components

	I can't do this at all	I can do this with a lot of effort	I can do it with a little help	I can do this on my own	Mean
1. Reading and comprehending subject specific texts in English	26(21.7%)	55(45.8%)	22(18.3%)	17(14.2%)	2.25
2. Skimming the text	17(14.2%)	49(40.8%)	53(44.2%)	1(0.8%)	2.32
3. Scanning the texts	25(20.8%)	42(35.0%)	42(35.0%)	11(9.2%)	2.33
4. Taking notes while reading	24(20.0%)	33(27.5%)	48(40.0%)	15(12.5%)	2.45
5. Distinguishing important points from less important ones in English texts	17(14.2%)	43(35.8%)	43(35.8%)	17(14.2%)	2.50

6. Understanding the relationships between ideas, cohesive devices like 'however' and pronouns in texts	26(21.7%)	56(46.7%)	30(25.0%)	8(6.7%)	2.17
7. Critical reading	29(24.2%)	56(46.7%)	21(17.5%)	14(11.7%)	2.17
8. Understanding teachers' slides in English	30(25.0%)	48(40.0%)	36(30.0%)	6(5.0%)	2.15
9. Writing summary of subject specific texts	29(42.2%)	43(35.8%)	39(32.5%)	9(7.5%)	2.23
10. Guessing the meanings of unknown words from the context	23(19.2%)	57(47.5%)	30(25.0%)	10(8.3%)	2.23
11. Guessing the meanings of unknown words from prefixes and suffixes.	18(15.0%)	61(50.8%)	34(28.3%)	7(5.8%)	2.25
12. Understanding graphic presentations like graphs and charts in relation to subject specific texts	18(15.0%)	56(46.7%)	35(29.2%)	11(9.2%)	2.33
13. Preparing English slides	26(21.7%)	44(36.7%)	40(33.3%)	10(8.3%)	2.28
14. Writing scientific articles	38(31.7%)	45(37.5%)	24(20.0%)	13(10.8%)	2.10
15. Writing homework and assignments an English	28(23.3%)	47(39.2%)	38(31.7%)	7(5.8%)	2.20
16. Taking class examinations in English	23(19.2%)	51(42.5%)	43(35.8%)	3(2.5%)	2.22
17. Comprehending English lectures on mechanical engineering	36(30.0%)	33(27.5%)	37(30.8%)	14(11.7%)	2.24
18. Participating in international events	35(29.2%)	57(47.5%)	20(16.7%)	8(6.7%)	2.01
19. Note-taking from lectures related to the field	33(27.5%)	30(25.0%)	42(35.0%)	15(12.5%)	2.33
20. Asking questions in seminars related to the field	33(27.5%)	52(43.3%)	24(20.0%)	11(9.2%)	2.11
21. Using bilingual general dictionaries (from English to Persian)	14(11.7%)	35(29.2%)	54(45.0%)	17(14.2%)	2.62
22. Using bilingual general dictionaries (from Persian to English)	15(12.5%)	44(36.7%)	48(40.0%)	13(10.8%)	2.49
23. Using bilingual technical dictionaries (from English to Persian)	8(6.7%)	44(36.7%)	52(43.3%)	14(11.7%)	2.61

24. Using monolingual technical dictionaries (from English to English)	31(25.8%)	46(38.3%)	31(25.8%)	12(10.0%)	2.20
25. Translating technical texts (from Persian to English)	28(23.3%)	45(37.7%)	41(34.2%)	6(5.0%)	2.21
26. Translating technical texts (from English to Persian)	31(25.8%)	47(39.2%)	28(23.3%)	14(11.7%)	2.21
27. Knowledge of grammar	17(14.2%)	44(39.2%)	44(39.2%)	15(12.5%)	2.48
28. Knowledge of general vocabulary	19(15.8%)	39(32.5%)	49(40.8%)	13(10.8%)	2.47
29. Knowledge of technical vocabulary	15(12.5%)	38(31.7%)	49(40.8%)	18(15.0%)	2.58
30. Pronunciation	22(18.3%)	28(23.3%)	49(40.8%)	21(17.5%)	2.58
31. Writing e-mails to teachers and field experts	33(27.5%)	42(35.0%)	27(22.5%)	18(15.0%)	2.25
32. Using Internet to do research	26(21.7%)	37(30.8%)	37(30.8%)	20(16.7%)	2.43

According to Table 2, the highest mean of the undergraduates' present level of ability in the following language skills were: 'using bilingual general dictionaries (2/62)', 'using bilingual technical dictionaries (from English to Persian) (2/61)', 'knowledge of technical vocabulary (from English to Persian) (2/58)', 'pronunciation (2/58)', 'distinguishing important points from less important ones in English texts (2/50)', 'using bilingual general dictionaries (from Persian to English) (2?49)', 'knowledge of grammar (2/48)', 'knowledge of general vocabulary (2/47)', 'taking notes while reading (2/45)', and 'using internet to do research (2/43)'.

In this manner, it shows that the lowest mean is related to 'participating in international events (2/01)', 'writing scientific articles (2/10)', 'asking questions in seminars related to the field (2/11)', 'understanding teachers' slides in English (2/15)', 'understanding the relationships between ideas, cohesive devices like 'however' and pronouns in texts (2/17)', 'critical reading (2/17)', 'using monolingual technical dictionaries (2/20)', 'writing homework and assignments in English (2/20)', 'translating technical texts (from English to Persian) (2/21)', and 'translating technical texts (from Persian to English) (2/21)'.

Based on the interviews, the ESP teachers said that the undergraduate students were weak concerning all of the above-mentioned language skills except some of them; e.g.: 'preparing English slides', and 'writing e-mails to teachers and field experts'. According to the ESP teachers, the undergraduates had difficulties in most of the above-mentioned items. For example, they could not write scientific articles in English, take class examinations in English, comprehend English lectures on mechanical engineering, and participate in international events and so on. As it was elicited through interviews, the ESP teachers' perceptions were in line with the results of the corresponding questionnaire. They believed that the undergraduate students have problems with all language skills and sub-skills. They mentioned that the undergraduates were not only weak at technical English, but also at general English. Therefore, it might be

concluded that at the present situation, academic language abilities of the undergraduates were not at a satisfactory level.

4. Discussion

The results of this study indicated that the four language skills (reading, writing, listening and speaking) were of great significance for the undergraduate students of mechanical engineering; and to satisfy the needs of the students, the integration of these skills is necessary. According to the obtained results of the questionnaire and interview, it appeared that most of the teachers and the students were not satisfied with the current ESP courses. They believed that these courses could not satisfy their specific needs; in other words, there was a gap between the current ESP courses and target situation needs of the students. This, in fact, denoted that ESP curricula have not yet been successfully developed in satisfying the students' needs. It can be implied that this problem is originated from inaccurate needs analysis. As Yarmohammadi (2005, p. 4) believes "language teaching in Iran does not follow any specific purposes, that is, it can be characterized as language for no specific purpose"; the importance of acknowledging the students' needs in designing ESP courses is highlighted.

Moreover, it was also revealed that sometimes there was a discrepancy between the undergraduates' needs and what the ESP teachers think as important for the academic success of students. For instance, 'writing scientific articles' was one of the most important skills by the ESP teachers while it was not so important from the students' standpoint. With regard to the point, "it seems that students declared their preferences according to both the academic role of English in their field and their desires and personal needs. However, ESP teachers seem to set priorities based on the target needs of students" (Atai & Shoja, 2011).

5. Conclusion

This study was conducted to realize the ESP needs of the undergraduate students in mechanical engineering and to learn whether the present ESP courses match their needs. According to the findings, it can be concluded that the stakeholders and course designers not only have not considered the students' level of language skills and abilities, but also they have presupposed an ideal proficiency level for them. Moreover, the curriculum developers and syllabus designers in Iran have not analyzed the students' needs in ESP courses. Therefore, the students do not feel satisfied with the current ESP programs.

The findings of this study may provide a database for academic English language needs of mechanical engineering undergraduates. The discrepancies between the present status of the ESAP program and the needs of undergraduate students of mechanical engineering accentuate renewing the courses. The Iranian ESP policy makers and curriculum developers should reconsider the necessity and significance of undergraduates' ESP needs in developing the materials of ESP books. Further, considering the highly specific nature of the kind of language required for students' future successful performance, we suggest ESP teacher training courses in order to enable the teachers to gear their instructional activities to the demands of the students' present abilities and L2 needs.

The study, however, suffers from some limitations, as in other studied. The main limitation of the present study was that it was conducted only in one specific Islamic Azad

University in Iran, and if it was conducted in several Iranian universities, it could provide a better understanding of the undergraduate mechanical engineering students' language needs. The other limitation was that only two instruments (i.e., questionnaire and interview) were used in this study. Some other research instruments such as observation and analysis of the authentic texts could be incorporated into the study for further studies.

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