Chabahar Maritime University

Iranian Journal of English for Academic Purposes ISSN: 2476-3187
IJEAP, 2019, 8(1) (Previously Published under the Title: Maritime English Journal)

Instructors and Learners' Attitudes about English for Science and Technology: Learning and Target Needs of Mechanical Engineering Students

[1]Ali Malmir*
[2]Mahsa Bagheri

IJEAP-1905-1390

Abstract

The current investigation sought to examine the learning and target needs of mechanical engineering (ME) students based on the learners and instructors' attitudes though an explanatory mixed-method design. To elicit learners' perceptions of English for Science and Technology (EST), 114 ME undergraduate students and 13 EST instructors from four Iranian state universities took part in a large quantitative phase followed by a smaller qualitative enquiry. The data were gathered from two sets of questionnaires, semi-structured oral interviews, and focus group discussions. Descriptive statistics including mean and standard deviation as well as qualitative interpretations were employed for data analysis. Quantitative and qualitative results revealed that ME learners and instructors had comparatively diverse opinions about leaning and target needs of EST students. They agreed that reading skills were the most essential EST learning and target needs. Learners supported the essentialness and prominence order of speaking, listening, and writing skills; while instructors stated that writing, listening and speaking were the most significant language skills after reading. Such an inconsistency was also witnessed for the inevitability and importance of the target needs of mechanical engineering students among the learners' and instructors' perceptions. The findings of this study can aid EST learners, instructors, and curriculum developers to better cope with teaching and learning concerns in EST courses.

Keywords: EST, Attitudes, Needs Analysis, Learning Needs, Target Needs

1. Introduction

The term English for Science and Technology was first used in mid-sixties, referring to and the utilization of English for scientific and technical purposes (Halliday, 1993a). Orr (2005) defined EST as "the branch of English language education which focuses on training in specific domains of English to accomplish specific academic or workplace tasks" (p. 9). Later, however, the studies on EST expanded the definition to include scientific citations, reports, slide usage, student writing assignments, and other contexts related to scientific and technology (Parkinson, 2013; Porcaro, 2013). According to Rao (2014), the acronym EST stands for all activities and studies related to English language learning and its usage in technical fields of study including both the oral and written English discourse dealing with learners at the tertiary level for whom English learning takes on a service role for their specific needs in study, work, or research. The domain of EST has exponentially expanded during the past four decades

[1] Assistant Professor of Applied Linguistics (Corresponding Author), malmir@hum.ikiu.ac.ir; Department of English Language, Imam Khomeini International University, Qazvin, Iran

[2] MA Student of Applied Linguistics, bmahsa13@yahoo.com; Department of English Language, Imam Khomeini International University, Qazvin, Iran

in tandem with the growth of science and technology and the materials published in English journals (Hyland, 2006). Engineering in various academic majors is one of the groups that needs EST courses because of its ever-increasing scope. However, the engineering students' needs for English as pointed out by Pocaro (2001), can also vary from one major to the other.

Despite an enormous body of literature on the needs analysis of ESP/EAP students from their own and experts' views in many EFL/ESL contexts (e.g., Belcher, 2006; Bosher & Smalkoski, 2002; Flowerdew, 2013; Long, 2005; West, 1994) and in Iran (e.g., Atai & Nazari, 2011; Khany & Tarlani-Aliabadi, 2016; Mazdayasna & Tahririan, 2008; Soodmand Afshar & Movassagh, 2016), the need of engineering major students has not been adequately scrutinized. This lacuna is even profounder when the real needs of Iranian undergraduate mechanical engineering students are concerned. Only few studies have been conducted to examine the target and learning needs of engineering undergraduate students in the context of Iran (e.g., Atai & Shoja, 2011) in general and mechanical engineering in particular (e.g. Nemat Tabrizi & Mojoudi Renani, 2016). One of the rare studies about the needs of mechanical engineering students was conducted by Nemat Tabrizi and Mojoudi Renani (2016); however, this study only investigated target situation language needs of ME students and disregarded their learning needs. Furthermore, Nemat Tabrizi and Mojoudi Renani (2016) only examined the ME students' target needs from the learners' attitudes through using a questionnaire for all language skills and subskills. Accordingly, the present study sought to address both EST teachers and learners' perceptions of target and learning needs in the field of mechanical engineering through two questionnaires, covering the four main language skills and subskills accompanied by oral interviews and focus group discussions.

2. Literature Review

Dudley-Evans and St. John (1998) defined a need as a measurable discrepancy between a current state of affairs and a desired future state which can be interpreted as a gap in what the learners need and what they are provided with in language courses. Hutchinson and Waters (1987) made a distinction between target and learning needs. By target needs, they meant those needs defined in relation to the situation in which the learners will eventually need to function. On the other hand, learning needs include those needs which are manageable at present learning situation. According to Hutchinson and Waters (1987), "target needs" include learners' necessities, lacks and wants. By looking at learners' necessities, one can recognize what the learners have to know in order to play an effective role in the target situation; by investigating their lacks, the gap between their present and future language proficiency will be bridged and finally, their other needs will be satisfied through studying their wants. In this regard, different studies in different fields of study have been conducted in recent years.

Regarding the analysis of target and learning needs for EST engineering students, some earlier studies can be mentioned (e.g., Hudson, 1991; Liu, Chang, Yang, & Sun, 2011; Orr, 1998; Porcaro, 2013). Porcaro's (2013) study uncovered that the goal of EST in Japan was to promote engineering students' reading abilities since these students' primary reason for learning and using English was to read and comprehend technical texts in the specialized journals that are mainly published in English. Liu et al. (2011) studied non-English major college students' reasons for attending both EGP and ESP courses as well as their needs in terms of necessities, wants, and lacks in six universities in Taiwan. According to the findings, the students found reading, writing, speaking, and listening skills as the most important skills both as their necessities and wants, respectively. However, concerning their lacks, they gave priority to writing and speaking skills.

Some important studies on the engineering student' needs analysis have been conducted in the Iranian EST context (e.g., Atai & Shoja, 2011; Eslami, Eslami-Rasekh, & Quiroz, 2007; Mazdayasna & Tahririan, 2008; Soodmand Afshar & Movassagh, 2016). Eslami et al. (2007) described the perceptions of 693 undergraduate students and 37 instructors of medicine, engineering, and humanities regarding the learners' English language needs. Their study showed that although students were more interested in communicative activities, grammar-translation method with emphasis on translation and grammar was still the prominent teaching method used in ESP classes. Mazdayasna and Tahririan's (2008) research also revealed that reading comprehension was the most important skill required by Iranian engineering students.

Atai and Shoja (2011) investigated the English language needs of computer engineering students in Iran. They found written skills and components important for the participants. Besides, the general English proficiency of students was found to be lower than expected. The researchers suggested the revision of the current ESP courses and a new framework for needs analysis. In a more comprehensive study, Soodmand Afshar and Movassagh (2016) compared the perceptions of students, teachers, and syllabus designers of different fields of study including engineering majors regarding their needs. Findings confirmed the fact that it was necessary to make a compromise between learners and instructors' perceptions of needs by negotiating and renegotiating with the learners. Besides, the instructors needed to focus on language skills other than reading and translation in order to address the learners' target needs.

The sole study directly related to the topic of the present study was carried out by Nemat Tabrizi and Mojoudi Renani (2016); nonetheless, the aforementioned study only focused on the target situation needs of 120 ME students from their own perspective at Islamic Azad University. The study used a general questionnaire for all language skills and subskills and current ability level and semi-structured interview procedure as developed by Atai and Shoja's (2011). Results of the study showed that learners' attitudes about their target needs were inconsistent with each other and they had serious problems with all language skills. The participants also expressed their dissatisfaction with the status quo of the EST for undergraduate mechanical students.

The aforementioned studies about the needs of EST students mainly focused on the learning needs of these learners based on either their own or instructors' attitudes, for example, Nemat Tabrizi and Mojoudi Renani (2016) only studied the target needs of learners from their own views. Furthermore, the reported studies used questionnaires with limited items that could not capture the EST students' learning needs (e.g. Atai & Shoja's (2011). Besides, none of the above-mentioned studies attempted to probe the target needs of students from learners versus instructors' perceptions. Another shortcoming of the majority of the earlier studies is that they only elicited the main languages skills and some general macro skills for reading and writing needs (e.g. Mazdayasna & Tahririan, 2008; Nemat Tabrizi & Mojoudi Renani, 2016). Thus, the present research was launched to investigate the learning and target needs of undergraduate mechanical engineering students based on their own and instructors' perceptions throughout a more valid and comprehensive questionnaire followed by oral interviews and focused group discussions. Specifically, this study was framed to answer the following questions:

1. What are the Iranian EST mechanical engineering undergraduate students' learning needs from the learners' and instructors' perspectives?

2. What are Iranian EST mechanical engineering undergraduate students' target needs from the learners' and instructors' perspectives?

3. Method

3.1 Participants

The participants of this study were 114 junior and senior B.S. mechanical engineering students of both genders (*71 males and 43 females*) with the age range of 20 to 27 (*M=23.5, SD=2.3*) who studied at Imam Khomeini International University of Qazvin (IKIU), the Science and Research and Tehran-West branches of Islamic Azad University, and the University of Tehran. The study participants were selected based on convenience sampling because the researchers could not administer any homogeneity test or choose the participants randomly. They had passed their general and technical EST courses prior to the study. Some of the students had an experience of learning English in language institutes from 2 to 4 years and their mother tongues were mostly Persian. In addition, 13 EST instructors of ME with either Master's or PhD degrees were consulted from the ME departments of the same universities. It is worth mentioning that in the latter group of participants, instructors with high and experiences (plus 7 years) in teaching EST were included. Their ages fluctuated between 34 and 52 (*M=40.4, SD=6.5*).

3.2 Instruments

This study used four types of instruments, including students' learning and target needs questionnaire, instructors' perception of learning and target needs for ME student's questionnaire, semi-structured oral interview, and focus group discussion. The features of these instruments are illustrated in following sections.

3.2.1 Learners' Questionnaire

The first instrument of the present study was the translated and modified version of learners' questionnaire (Ekici, 2003) with some changes for being administered to the ME students. The learners' questionnaire was composed of 4 main parts with further subdivisions. The first part, personal background information, was dedicated to learners' background EST information with 6 items. The second part i.e. learning needs section with 46 items covered all the language skills as follows: participants' learning needs regarding speaking (items 1-14), listening (items 15-26,) reading (items 27-35), and writing (36-46) skills. All the items were arranged in two columns or subsections using a 5-point Likert scale: the first column aimed at finding out about students' perceptions of *the importance of the learning needs* and the second column required the students *to rate their own skill/proficiency* with respect to the mentioned learning needs. Students, in the third part, were required to rank basic language skills from 1 to 6 to check which skills were more important to them and to check if any of them was ignored during their EST courses. Part four, i.e. target needs section with 47 items, had the same structure like part two extracted students' target needs regarding speaking (items 1-11), listening (items 12-25), reading (items 26-38), and writing skill (items 39-47) skills. Like part two, the items sought to elicit two types of information in a five-point Liker scale format: the first column focused on the target needs and their importance and the second column attempted to rate students' self-reported mastery of the mentioned target needs. The translated version of the questionnaire was given to sample of 34 EST students of mechanical engineering at the Islamic Azad University, West Tehran Branch showing a reliability index of .84. The validity of the questionnaire was established through consultation with two EAP/ESP experts who had previously published some related articles in ELT journal with impact factors beyond 1.5 such as in *English for Specific Purposes* and *English for Academic Purposes*, they were associate professor with more than 15 years of teaching ESP/EAP

courses. The content of the questionnaire each items was also checked for its clarity and appropriateness based on the main theories and conceptualizations in the field. All the needed modifications were added after the pilot study. Those items with low reliability, item discrimination (ID), item difficulty indices were totally abandoned or their lexicogrammar was revised. Choice distribution was another factor in deciding to keep or change the items.

3.2.2 Instructors' Questionnaire

The questionnaire related to examining instructors' perceptions regarding the students' learning and target needs was the translated version of instructors' questionnaire as developed and validated by Ekici (2003) with some added modifications including 3 parts. The first part, i.e. learning needs section with 46 items attempted to obtain instructors' perceptions of learning needs of ME students for speaking (14 items), listening (11 items), reading (8 items), and writing (10 items) skills. All the items were arranged into a one-column 5-point Likert scale with the aim of finding out about instructors' perceptions regarding the importance of the learning needs for ME students. Part two, consisted of 47 five-point Likert items, purported to determine instructors' perceptions of ME students' target needs regarding for speaking (11 items), listening (14 items), reading (13 items), and writing (9 items) skills in only one column. The uneven number of the items for each skill was the result of the modifications, revisions, and necessary deletions after the pilot study. The third part asked the instructors to rank basic language skills from 1 to 5 to check which skills were more important to them. The liability of the translated questioners (r= .81) was cheeked by a group of 25 EST instructors at Imam Khomeini International University (IKIU) and Islamic Azad University of Qazvin.

3.2.3 Semi-Structured Oral Interview

A semi-structured interview including seven questions was conducted with all the 13 of the instructors of ME departments of universities under study regarding ME students' language needs, English language proficiency level, familiarity with technical terms, awareness of their English language needs and abilities necessary for their success. It is worth mentioning that the original interview protocol was designed by Soodmand Afshar and Movassagh (2016) for checking EAP needs of students from various fields of study including computer engineering, agriculture, arts and humanities, medicine and nursing, and basic sciences. Therefore, the researcher made some changes in questions so that the protocol can be applicable to participants of present study. The interviews were audio-recorded and transcribed for data analysis. They took from 20 to 40 minutes. These oral interviews were also conducted with 28 participatory EST students (about 25%) based on random sampling and their consent to take part in these interviews. According to Edwards and Holland (2013), semi-structured interview can help the researcher delve better into the target issue through more dynamic and flexible answer-question chains based on the elicited information. All the oral interviews were digitally (either audio or video) recorded and transcribed.

3.2.4 Focus Group Discussion (FGD)

Apart from the individual interview, a series of focus group interviews were run by the researchers in order to investigate the perceptions of the EST students and teachers toward the learning and target needs of the ME students. Focus group discussion (FGD) has shown its effectiveness, reliability, and validity by many earlier studies (see Andrew & Jonathan, 2006; Nyumba, Wilson, Derrick, & Mukherjee, 2018). One of the researchers was the facilitator and the other one was an assistant in the conducted FGDs. The facilitator researcher introduced the main topics and wrote it on the whiteboard

for the partcipcnats. The two FGDs were conducted at Imam Khomeini International University (IKIU), Qazvin each lasting around 90 minutes. For manageability considerations, the 10 percent of the students who took part in the FGDs, were selected from IKIU based on random sampling and learners' volition. These FGDs were audio-recorded under the supervision of the assistant researcher with the permissions of the 11 participants. The facilitator researcher helped leaners with the terminology needed for the FGDs and asked various questions about learners' attitudes towards their learning and target needs in terms of different skills and subskills. The students talked freely with each other and the researcher, expressed opposing ideas, confirmed or challenged each other's attitudes. The assistant researcher intervened if the specific topic was adequately discussed and if students could not contribute anymore.

3.3 Procedure

The present study data collection procedure was completed in four phases. In the first phase, three intact classes of ME undergraduate students of University of Tehran (N=39), IKIU (N=25), and Islamic Azad University, Science and Research branch (N=28) were selected through convenient sampling. As for the instructors, 13 instructors from the universities under study willingly accepted to participate in the current research. During the second phase, the learners' learning and target needs questionnaire was distributed to ME students their class time by permission of their instructors which took about 35 minutes. Regarding the students of University of Tehran, however, the learners' questionnaire was distributed out of their class time in several days since the researcher could not get the permission of doing so during their class time. As for the instructors, both the instructors' questionnaire and the ESP identification form were given to them in person or through email. In the third phase, the semi-structured oral interview was carried out independently with three of the instructors out of class. In the fourth phase, the researchers conducted two focused group discussions with 10 percent of students.

3.4 Data Analysis

The present study applied an explanatory mixed-method design using both quantitative and qualitative data. The statistical analyses of the questionnaires were carried out through SPSS program (version 23). In this regard, related descriptive statistics namely means of the data were calculated. The qualitative data obtained from observations and semi-structured interviews; however, were reported by the researchers through descriptions and qualitative interpretations. Coding, retrieving, determining regularities, and finding patterns were done using Hyper RESEARCH 2.8. software (released in 2007) for qualitative analysis. This software can be freely downloaded and installed on computers or tablets and has many applications including chunking the audio and video files, changing the audio files into written text, providing frequency for sentences, clauses, and words, and coding the similar themes into the same category or table. In the current study, Hyper RESEARCH was firstly used for transcribing the oral interviews and FGDs, and secondly for coding grouping the transcribed sentences on the basis of content resemblance.

4. Results

4.1 Research Question One

To this end, the researcher calculated the mean scores related to each item in both learners' and instructors' questionnaires through SPSS. Participants' answers about perceptions regarding their need to speaking skill have been summarized in the following table.

Table 1: The Learners' Perceptions Regarding their Learning Needs for Speaking Skill

Item	Learning Needs Importance		Learning Needs Proficiency	
	Mean	Result	Mean	Result
1. asking questions	3.36	Moderately important	3.01	Average
2.answering questions	3.78	Moderately important	3.22	Average
3. expressing yourself	3.76	Moderately important	3.01	Average
4. summarizing	3.62	Moderately important	3.08	Average
5. describing	3.84	important	3.18	Average
6. comparing	3.39	Moderately important	3.09	Average
7. solving problems	3.75	Moderately important	3.28	Average
8. reasoning	3.89	important	3.25	Average
9. conference presentation	3.97	important	2.72	Below average
10. criticizing	3.41	Moderately important	2.92	Below average
11. class speech and lecture	3.76	Moderately important	2.93	Below average
12. producing correct pronunciation	3.97	important	3.28	Average
13. wording quickly	3.71	Moderately important	3.05	Average
14. using correct intonation and stress	3.70	Moderately important	3.10	Average

Learners said they need speaking skill for lecturing at conferences (*M=3.97*), producing correct pronunciation (*M=3.97*), reasoning (*M=3.89*), and describing their course-related subjects (*M=3.84*), while learners need speaking skill the least for asking questions (*M=3.36*), comparing things (*M=3.39*) or criticizing someone or something (*M=3.41*). As far as participants' proficiency in speaking skill is concerned, they are not able to speak English for having presentation at the conferences (*M=2.72*), criticizing someone or something (*M=2.92*) nor lecturing in their ESP classes (*M=2.93*) while their proficiency regarding other speaking abilities was average. Table 2 shows the means obtained for students' answers about the importance of listening skill as well as their proficiency in each item related to this skill.

Table 2: Learners' Perceptions Regarding their Learning Needs for Listening Skill

Item	Learning Needs Importance		Learning Needs Proficiency	
	Mean	Result	Mean	Result
15. obtaining gist	4.15	important	3.45	Average
16. obtaining specific information	3.76	Moderately important	3.15	Average
17. listening for taking notes	3.60	Moderately important	3.08	Average
18. listening for translating	3.74	Moderately important	3.37	Average
19. recognizing language structure	3.25	Moderately important	2.97	Below average
20. understanding complex sentences	3.44	Moderately important	2.71	Below average
21. deducing the meaning of unfamiliar words	3.56	Moderately important	3.07	Average
22. evaluating the importance of information	3.62	Moderately important	3.09	Average
23. extracting the information not explicitly stated	3.34	Moderately important	2.92	Below average

24. recognizing the speaker's attitude	3.31	Moderately important	3.10	Average
25. recognizing intonation and stress patterns	3.38	Moderately important	3.09	Average
26. recognizing speech organization pattern	3.30	Moderately important	3.13	Average

The most important reason for mastering listening skill was to obtain gist of (*M=3.76*). To obtain specific information (*M=3.97*) as well as to translate (*M=3.74*) were the second and the third most important reasons. The least important reasons; however, were to recognize language structure (*M=3.25)* and speech organization pattern (*M=3.30*). As for the learners' listening proficiency, the means reveal that except for items 19, 20 and 23 of which the learners have the least proficiency, they are relatively proficient in the other items.

Table 3: Learners' Perceptions Regarding their Learning Needs for Reading Skill

	Learning Needs Importance		Learning Needs Proficiency	
item	Mean	Result	Mean	Result
27. predicting	3.18	Moderately important	3.07	Average
28. scanning	3.62	Moderately important	3.33	Average
29. reading intensively	3.91	Moderately important	3.33	Average
30. guessing the meaning of unknown words from context	4.06	Important	3.55	Average
31. referencing	3.54	Moderately important	3.21	Average
32. identifying main ideas	4.08	Important	3.59	Average
33. finding supporting ideas	3.61	Moderately important	3.16	Average
34. summarizing	3.78	Moderately important	3.21	Average
35. speed reading	3.85	Moderately important	3.41	Average

According to Table 3, to identify the main idea of a text (*M=4.08*) is the most important reason for students' need to reading skill while making predictions (*M=3.18*) and references (*M=3.54*) are the least important reasons. Moreover, Table 3 shows that students' proficiency of reading skill in all items provided was average. The use of proper vocabulary, the clear expression of ideas, and the structure of sentences are the most important writing areas for students while the use of correct punctuations, development of ideas, and the structure of sentences are needed skills in which the students have the least proficiency. The ME teachers' and ESP instructors' ideas about ME undergraduate students needs towards speaking skill are examined and shown below (Table 4).

Table 4: Instructors' Perceptions Regarding ME Students' Speaking Skill as their Learning Needs

	Importance of the Leaning Needs	
Item	Mean	Level
1. asking questions	3.69	Moderately important

2. answering questions	4	Important
3. expressing themselves	4	Important
4. summarizing	3.77	Moderately important
5. describing	4.15	Important
6. comparing	3.69	Moderately important
7. solving problems	3.38	Moderately important
8. reasoning	3.62	Moderately important
9. making presentations	4.69	Important
10. criticizing	3.15	Moderately important
11. class lecture and presentation	4.15	Important
12. producing correct pronunciation	3.46	Moderately important
13. wording quickly	3.23	Moderately important
14. using appropriate intonation and stress	3.31	Moderately important

Based on instructors' views, students need speaking skill mainly for lecturing either at conferences or during their ESP courses, describing and explaining ME related subjects, answering questions, and expressing their ideas. According to the following table (Table 5), instructors believe that obtaining gist with mean score of (*M=4.38*) is the most important reason of ME students for listening skill. Translating along with examining the importance of information both with mean scores of (*M=3.92*) are the next important reasons; whereas, the ability to recognize speech patterns with mean score of (*M=2.92*) is found to be the least needed ability for these students.

Table 5: Instructors' Perceptions Regarding ME Students' Listening Skill as their Learning Needs

Item	Learning Needs Importance	
	Mean	Result
15. obtaining gist	4.38	Important
16. obtaining specific information	3.62	Moderately important
17. listening for taking notes	3.62	Moderately important
18. listening for translating	3.92	Important
19. recognizing language structure	3.38	Moderately important
20. understanding complex sentences	3.31	Moderately important
21. deducing the meaning of words and unfamiliar word groups	3.62	Moderately important
22. evaluating the importance of information	3.92	Important
23. extracting the information not explicitly stated	3.15	Moderately important
24. recognizing the speaker's attitude	3.08	Moderately important
25. recognizing intonation and stress patterns	3	Moderately important
26. recognizing speech organization patterns	2.92	Of little importance

Students need reading skill mainly for determining the main ideas (*M=4.38*) of a text and guessing the meaning of unknown words (*M=4*). Paying attention to referents and references of a text is also found to have little importance in this regard (*M=3.23*). Regarding writing skill, instructors believed that learners need to be able to express their ideas clearly, organize their writing properly, write well-structured sentences, and also make appropriate connections between their ideas (see Table 6).

Table 6: Instructors' Perceptions Regarding ME Students' Writing Skill as their Learning Needs

Item	Learning Needs Importance

	Mean	Result
36. structuring sentences	4.15	Important
37. addressing topic	3.85	Important
38. developing ideas	3.85	Important
39. grouping ideas	3.69	Moderately important
40. linking ideas	4	Important
41. organizing the product	4.31	Important
42. using appropriate vocabulary	3.85	Important
43. expressing clearly	4.46	Important
44. using correct punctuation	3.46	Moderately important
45. spelling correctly	3.85	Important
46. adapting appropriate tone and style	3.62	Moderately important

4.2 Research Question Two

The aim of the second question of present study was to reveal the target needs of ME undergraduate students in Iran according to the learners' and instructors' perceptions. Participants' perceptions about their target needs to speaking skill and their current proficiency in each aspect of it is presented in the following table.

Table 7: Learners' Perceptions Regarding their Target Needs for Speaking Skill

Item	Target Needs Importance		Target Needs Proficiency	
	Mean	Result	Mean	Result
1. speaking with native speakers	4.16	Important	3.07	Average
2. speaking with non-native speakers	3.57	Moderately important	3.17	Average
3. speaking with colleagues	3.66	Moderately important	3.07	Average
4. speaking with foreign costumers	3.83	Important	2.97	Below average
5. speaking in the office	3.75	Moderately important	2.94	Below average
6. speaking in the international companies	4.15	Important	2.89	Below average
7. speaking in academic contexts	4.10	Important	2.84	Below average
8. speaking at the conferences	4.09	Important	2.89	Below average
9. speaking in social settings	3.80	Important	3.14	Average
10. speaking in your own country	3.28	Moderately important	3.16	Average
11. speaking in foreign countries	4.24	important	3.14	average

As observed in Table 7, ME students mentioned that they need speaking skill in future to speak in foreign countries, with native speakers English, in international companies, in academic contexts and at the conferences while their evaluation of their current proficiency in such areas was below average. As for their future need to listening skill, the learners deemed the ability to participate in face-to-face conversations (*M=4.25*), to listen to native speakers (*M=4.23*) and to attend discussions efficiently (*M=4.14*) were the profoundly essential target need.

Table 8: Learners' Perceptions Regarding their Target Needs for Listening Skill

Item	Target Needs Importance		Target Needs Proficiency	
	Mean	Result	Mean	Result
12. listening to native speakers	4.23	Important	3.22	Average
13. listening to non-native speakers	3.71	Moderately important	3.20	Average
14. listening to the radio	3.49	Moderately important	2.89	Below average
15. listening to the news	3.72	Moderately important	3.18	Average
16. listening to movies	3.89	Important	3.44	Average
17. listening to music	3.56	Moderately important	3.15	Average
18. listening to satellite programs	3.28	Moderately important	3.03	Average
19. listening to presentations	3.94	Important	3.01	Average
20. listening to meetings	3.83	Important	2.99	Below average
21. listening to conferences	3.87	Important	2.94	Below average
22. listening to seminars	3.89	Important	2.84	Below average
23. listening to discussions	4.14	Important	2.97	Below average
24. listening to conversations on the phone	3.94	Important	3.05	Average
25. listening to face-to-face conversations	4.25	important	3.24	average

Besides, as for their current proficiency in listening subskills, they felt more weakness in listening to seminars, radio, conferences, discussions and meetings. According to the Table 9, learners considered reading academic texts (*M=4.17*) and handbooks (*M=4.11*) as well as using internet (*M=4.07*) and their course-related magazines (*M=4.02*) the most important aspect of this skill for their future success. They also believe that reading the agenda of meetings and plots are two areas in which they have the least proficiency.

Table 9: Learners' Perceptions Regarding their Target Needs for Reading Skill

Item	Target Needs Importance		Target Needs Proficiency	
	Mean	Result	Mean	Result
26. academic texts	4.17	Important	3.16	Average
27. handbooks	4.11	Important	3.23	Average
28. newspaper	3.54	Moderately important	3.01	Average
29. business letters	3.75	Moderately important	3.03	Average
30. internet	4.07	Important	3.36	Average
31. magazines	4.02	Important	3.10	Average
32. reports	3.93	Important	3.06	Average
33. plots	3.84	Important	2.99	Below average
34. e-mails	3.99	Important	3.36	Average
35. documents	3.82	Important	3.03	Average
36. the agenda of a meeting	3.76	Moderately important	2.86	Below average
37. equipment catalogues	3.99	Important	3.08	Average
38. invoices	3.71	Moderately important	3.02	average

Finally, according to the participants, writing articles (*M=4.14*) and e-mails (*M=4.02*) are the most important areas for their future success and their proficiency in all provided subskills is below average except for writing e-mails and taking notes. Moreover, instructors asserted that students will need speaking skill mainly for communicating at conferences (*M=4.31*), in academic contexts (*M=4.15*) and

also with native speakers in future (*M=4*) while they need this skill the least when speaking in their own country (*M=2.31*) or with their colleagues (*M=2.58*). Instructors hold that listening to the news (*M=4.38*) and understanding seminars (*M=3.92*) as well as subject-related films (*M=3.92*) were highly important for EST; however, understanding conversations either face-to-face (*M=3*) or on the phone (*M=3.08*) were the least important.

Table 10: Instructors' Perceptions Regarding ME Students' Listening Skill as their Target Needs

Item	Target Needs Importance	
	Mean	Result
12. understanding native speakers	3.46	Moderately important
13. understanding non-native speakers	3.23	Moderately important
14. listening to radio	3.31	Moderately important
15. listening to the news	4.38	Important
16. listening to satellite programs	3.62	Moderately important
17. listening to music	3.62	Moderately important
18. understanding films	3.92	Important
19. listening to presentations	3.38	Moderately important
20. listening to meetings	3.31	Moderately important
21. understanding conferences	3.62	Moderately important
22. understanding seminars	3.92	Important
23. understanding discussions	3.15	Moderately important
24. understanding conversations on the phone	3.08	Moderately important
25. understanding face-to-face conversations	3	Moderately important

Reading had paramount importance for reading large gamut of academic genres including books, papers, magazines and so forth but reading newspapers and business letters were the least needed skills in future. Finally, to be able to read articles (M=4.69), technical reports and documents (M=4.08) are found to be the most important prerequisites for ME students in future while the other subskills are considered to be moderately important.

The qualitative data gathered using the ESP semi-structured oral interview with EST instructors and 10 % of the ME students and via focus group discussion with 10% of the students. Thematic analysis using numerous approaches like member checking, triangulation, and peer debriefing were employed for qualitative data collection. The final patterns and results were decided upon through triangulation for the outcome of oral interviews and focus group discussions. Yet, peer debriefing was implemented through consulting with independent outsider researchers to also grantee intercoder-reliability necessary for content analysis.

Based on the gathered data, ESP instructors stated that both academic and occupational needs are important for learning English in current ESP courses: five teachers, providing reasons such as necessity of having academic and industrial relations in the world today, emphasized on the importance of the two together but the others said that academic needs for English are more important since the current industrial relations with other countries is limited and universities, faculties, or departments put emphasis merely on academic needs. Except for one instructor, the other instructors mentioned that EST learners should be able to successfully watch and read educational films, PowerPoints, books and pamphlets, related articles, technical documents and plots as well as catalogues as the useful tools for

learning specialized knowledge in this field of study. Besides, one of the instructors found "technical discussion" as a proper need for ME students.

The importance of language skills for EST courses is rated by the instructors as follows: 6 instructors rated listening skill as very important; 5 instructors rated it as moderately important while the other 2 instructors rated it as not important at all. Regarding speaking skill, 4 instructors found it to be very important for such courses; 7 instructors found it moderately important and the other 4 instructors found it unimportant. As for the reading skill, nearly all the teachers considered it to be highly important. Eight of the instructors asserted that writing skill was very important for ME EST courses and the four others considered it a moderately important competency. Furthermore, 7 teachers believed that translation is of high importance for ME students' ESP courses, 3 teachers believed that it is moderately important and the other 3 teachers believed it to be unimportant. According to gathered data, 6 instructors believed that none of the mentioned language skills should be ignored in ESP classes; however, due to some limitations such as lack of class time or students' lack of proficiency, listening and speaking skills should be less focused upon. On the other hand, 7 instructors stated that speaking and listening are the main language skills which must not be ignored in ESP classes.

Instructors' ideas underscored the importance of English language for ME students. Dr. Farbod (a pseudonym), for instance, noted that "*since mechanical engineering is one of the ever advancing sciences today with new methods and equipments which are mainly in English, students need to have a good command over this language*". In addition, the other instructors mentioned that all documents, plots, reports and catalogues in this field of study are prepared in English even if they are only used in Iran, so, the students need to have a fair proficiency in this language in order to meet their needs. Dr. Aryan (all the names are pseudonyms) commented that "*providing ESP courses together with technical writing courses for ME students is a highly required asset in improving their English proficiency so that they would have the necessary knowledge of English for communication either oral or written after graduation.*"

According to instructors participating in the interview, unfortunately students are not aware of their needs regarding English language or they realize them so late. This unawareness leads to their ignorance of learning this language efficiently during their educational years which in its turn causes their inefficiency as future engineers. Dr. Hirbod, in this regard, suggested that students should be informed about their educational and professional needs to English during their first year of academic studies. Dr. Kiani, however, has a relatively different view. He believes that it's better to provide students with the overall future needs of their field of study so that they could figure out the important role of English in their success both as mechanical engineering students and future engineers by themselves. He also thinks that instructors have the main role in providing such information.

During the oral interviews and focus group discussions, the ME engineering students mentioned that they mainly needed reading and translation skills as the first priority; the writing skill was the second urgent need for writing research papers sending emails and application forms. They thought of listening and speaking skills as less important. However, some interviewees very strongly argued for the need of moderate oral proficiency for comprehending audiovisual technical material and have short technical conversations with native English engineers and scholars and those non-native competent speakers of English in their major. This is in contrast with what was found in questionnaires administered to instructors who maintained the undeniable role of English speaking and listening skills in educational and professional lives of the ME students.

5. Discussion

The most significant findings of the current study can be classified in two main categories: those related to learning needs and those about target needs of mechanical engineering EST students as provided through the quantitative and qualitative phases. Learners mentioned that the ability to have presentations at conferences, to talk about their related subjects and to describe them are the most important speaking subskills, even though their proficiency in these subskills was shown to be at best average. On the other hand, the EST instructors asserted that the learners needed to have sufficient skill in explaining their subject-related issues, in answering questions efficiently and in expressing their own ideas during class time in addition to those mentioned by the learners. The comparison of the learners' and teachers' perceptions, therefore, reveals that both groups almost agree with each other on the necessary speaking subskills as the learning needs. Feak (2013) has also supported the some of the aforementioned aspects of ESP speaking skill.

Furthermore, regarding listening skill, both students and instructors stated that obtaining gist and translation were the most important reasons for listening in English. However, the participants had different ideas regarding their listening subskill; the learners believed that listening to obtain specific information is important while the instructors found the examination of the importance of the information necessary. In addition, the learners considered their proficiency in these subskills not more than average. This finding is supported by the results for the study conducted by Belcher (2006). Ferris and Tagg's (1996) research findings also revealed that listening to technical reports and academic lectures and discipline-related audios are among the highly required learning needs of ESP learners.

As for the third language skill i.e. reading, both learners and instructors consented on the importance of identification of the main idea of a text and also guessing the meaning of unknown words; however, the learners considered themselves to be relatively proficient in each of these subskills by choosing "average" option of their questionnaire. Both group of respondents in the quantitative and qualitative phases mentioned that reading was the most important learning need of ME students. This finding is in line with the findings of some studies in Iran (e.g., Atai & Nazari, 2011; Nemat Tabrizi & Mojoudi Renani, 2016; Mazdayasna & Tahririan, 2008; Soodmand Afshar & Movassagh, 2016) and aboard about (e.g., Crawford, 2003; Ward, 2009) the need of most ESP/EAP students and as illustrated in the aforementioned literature EST is a subset of ESP/EAP.

Moreover, regarding writing subskills as EST students' learning needs, all participants had almost the same perceptions with instructors' to be more thorough i.e. while instructors found the ability to express the ideas clearly, to organize the writings properly, to structure sentences correctly and to link various ideas logically as the most important subskills in writing for the learners, the students only mentioned the proper vocabulary selection and the clear expression of ideas in which the learners had only average proficiency. This finding corroborates with the findings of some earlier research about the position of writing as the third or fourth language skill for ESP students (e.g., Gimenez, 2009; Hylnad, 2013) and Nemat Tabrizi and Mojoudi Renani' (2016) study in this regard.

The second category of the findings is pertinent to the target language needs of mechanical engineering students based on their own and the respected ESP instructors' ideas. The learners with respect to speaking skill commented that they will need to talk to English native speakers either in foreign countries or international companies as well as in academic contexts such as conferences and seminars while instructors limited the importance of this skill to communication with English native speakers at conferences or academic settings for students' future professional success. These differences

between understandings of two groups of participants could be due to lack of information on the part of students regarding their future needs to English speaking skill. Besides, as for the students' proficiency, it was found that students felt extremely weak in these subskills. Feak (2013) has provided a full-length of the studies that support the ESP learners' learning and target needs from their own view or from the viewpoint of ESP experts.

More differences were found between perceptions of ESP learners and teachers regarding target listening needs of the learners; although learners considered themselves to have average and below average proficiency level in subskills proposed for target listening needs, they pointed out that attending in face-to-face conversations and discussions as well as listening to English native speakers were the most important subskills, while the ESP teachers mentioned listening to the news, seminars and subject-related films as the important target listening subskills. This finding is consisted with some the outcomes of some studies that have reported the ESP instructors' perceptions learners target listen9ng needs (Belcher, 2006; Ferris & Tagg, 1996; Flowerdew & Miller, 1997).

As for the reading skill, the instructors found almost all the proposed subskills including academic texts, handbooks, magazines, reports, plots, documents and catalogues equally important as students' target needs, but according to the learners, reading academic texts, handbooks, magazines and using internet were the main needed subskills in future. Finally, regarding writing skill, learners in the quantitative and qualitative phases stated that they will merely write articles and e-mails in English as engineers, however, instructors believed that ME engineering students will need to write English business letters, reports and documents as well. Such difference could be related to students' lack of information about their future requirements as engineers. Some earlier studies confirm this finding (e.g., Atai & Nazari, 2011; Crawford, 2003; Nemat Tabrizi & Mojoudi Renani, 2016; Soodmand Afshar & Movassagh, 2016; Ward, 2009).

6. Conclusion and Implications

The first significant conclusion of the study was that both groups of participants considered reading as the most required learning need; however, they did not agree upon the other three general skills. Learners advocated importance sequence as speaking, listening, and writing skills whereas instructors believed that writing, listening and speaking were the important language skills after reading. Regarding learning needs of ME undergraduate students, it was found that having presentations at conferences, obtaining gist and translation, identifying the main idea of texts and guessing the meaning of words as well as expressing ideas clearly were the most important sub-skills considered both by the learners and instructors. However, the proficiency of students in such sub-skills were found to be at best average which shows the inefficiency of provided ESP courses to meet learners' learning needs.

The second collusion was both groups of participants also considered reading as the most imperative target need as for the learning nears including the need for reading discipline-related texts from different genres such as books, magazines, websites, journals, catalogues, and technical reports that. Speaking and listening were the second and third target needs for mechanical engineering students and writing stood at the bottom of the list. In fact, ME students argued that they will need to speak with English native speakers either in academic or professional settings, and listen to the news and seminars or native speakers in face-to-face conversations. On the other hand, instructors paid priority to writing

over listening and speaking, claiming that students need to write in English for their future careers and education.

The results of the present study can be beneficial for the ME students by becoming aware of their English language learning and target needs so that they can find their strengths and weaknesses in each, improve their language abilities, and become more proficient and efficient students and engineers in future. This study can also help EST teachers in the field of ME to understand the importance of conducting needs analysis for their EST courses and help them to make the classroom settings more relevant to students from their preferred teaching methodology to different types of materials used. Furthermore, the results of the study suggested that EST instructors need to pay more attention to reading skill which is almost totally required. Finally, the current study tried to shed more light on the most necessary language skills and sub-skills for ME learners both in their educational and occupational settings which can help the syllabus designers to make better decisions while developing language courses for ME students.

References

Andrew, P., & Jonathan, T. (2006). Focus group method and methodology: Current practice and recent debate. *International Journal of Research & Method in Education, 29*(1), 23–37.

Atai, M. R., & Nazari, O. (2011). Exploring reading comprehension needs of Iranian EAP students of health information management (HIM): A triangulated approach. *System, 39*(1), 30–43.

Atai, M. R., & Shoja, L. (2011). A triangulated study of academic language needs of Iranian students of computer engineering: Are the courses on track? *RELC Journal, 42*(3), 305–323.

Belcher, D. (2006). English for specific purposes: Teaching to perceived needs and imagined futures in worlds of work, study, and everyday life. *TESOL Quarterly, 40*(1), 133–56.

Bosher, S., & Smalkoski, K. (2002). From needs analysis to curriculum development: Designing a course in health-care communication for immigrant students in the USA. *English for Specific Purposes, 21*(1), 59–79.

Crawford C. B. (2003). Metadiscourse and ESP reading comprehension: An exploratory study. *Reading in a Foreign Language, 15*(1), 28–44.

Dudley-Evans, T., & St John, M. (1998). *Developments in English for specific purposes: A multidisciplinary approach*. Cambridge: Cambridge University Press.

Edwards, R., & Holland, J. (2013). *What is qualitative interviewing?* New York, NY: Bloomsbury Academic.

Ekici, N. (2003). *A needs assessment study on English language needs of the tour guidance students of faculty of applied sciences at Baskent University: A case study* (Unpublished Master's thesis). Baskent University, Ankara, Turkey.

Eslami, Z. R., Eslami-Rasekh, A. & Quiroz, B., (2007). Needs analysis of Iranian EAP students. *ESP across Cultures, 4*(1), 21–37.

Feak, C. B. (2013). ESP and speaking. In B. Paltridge, & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 35–54). Malden, MA.: Wiley-Blackwell.

Ferris, D., & Tagg, T. (1996). Academic listening/speaking tasks for ESL students: Problems, suggestions, and implications. *TESOL Quarterly, 30*(3), 29 –320.

Flowerdew, L. (2013). Needs analysis and curriculum development in ESP. In B. Paltridge, & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 325–346). Malden, MA.: Wiley-Blackwell.

Flowerdew, J. & Miller, L. (1997). The teaching of academic listening comprehension and the question of authenticity. *English for Specific Purposes, 16*, 2–46.

Gimenez, J. (2009). Beyond the academic essay: Discipline-specific writing in nursing and midwifery. *Journal of English for Academic Purposes, 7*, 51–64.

Halliday, M. A. K. (1993a). On the language of physical science. In M. A. K. Halliday, & J. R. Martin (Eds.), *Writing science* (pp. 54–68). London: The Falmer Press.

Hudson, T. (1991). A content comprehension approach to reading English for science and technology. *TESOL Quarterly, 25*(1), 77–104.

Hutchinson, T., & Waters, A. (1987). *English for specific purposes*. Cambridge: Cambridge University Press.

Hyland, K. (2006). Study skills or academic literacy? In K. Hyland (Ed.), *English for academic purposes: An advanced resource book* (pp. 16–23). New York: Routledge.

Hylnad, K. (2013). ESP and writing. In B. Paltridge, & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 95–114). Malden, MA: Wiley-Blackwell.

Khany, R., & Tarlani-Aliabadi, H. (2016). Studying power relations in an academic setting: Teachers' and students' perceptions of EAP classes in Iran. *Journal of English for Academic Purposes, 21*, 72–85.

Liu, J. Y., Chang, Y. J., Yang, F. Y., & Sun, Y. C. (2011). Is what I need what I want? Reconceptualizing college students' needs in English courses for general and specific/academic purposes. *Journal of English for Academic Purposes, 10*, 271–280.

Long, M. H. (2005). Overview: A rationale for needs analysis and needs analysis research. In M. H. Long (Ed.), *Second language needs analysis* (pp. 1–16). Cambridge: Cambridge University Press.

Mazdayasna, G., & Tahririan, M. H. (2008). Developing a profile of the ESP needs of Iranian students: the case of students of nursing and midwifery. *Journal of English for Academic Purposes, 7*, 277–289.

Nemat Tabrizi, A. R., & Mojoudi Renani, F. (2016). ESP Needs Analysis of Undergraduate Mechanical Engineering Students: A Case in Iran. *International Journal of Humanities and Cultural Studies, 3*(2), 1696-1707.

Nyumba, T. O., Wilson, K., Derrick, C., Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. *Methods in Ecology and Evolution 9*(1), 20–32.

Orr, T. (1998). ESP for Japanese universities: A guide for intelligent reform. *The Language Teacher, 22*(11), 19–31.

Orr, T. (2005). Professional standards in English for specific purposes. *OnCUE, 13*(1), 9–16.

Parkinson, J. (2013). English for science and technology. In B. Paltridge, & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 155–174). Malden, MA: Wiley-Blackwell.

Porcaro, J. W. (2001). Integrating authentic materials and language skills in English for science and technology instruction. *English Teaching Forum, 39*(2), 30–32.

Porcaro, J. W. (2013). Teaching English for science and technology: An approach for reading with engineering English. *English Teaching Forum, 2*(1), 32–39.

Rao, C. S. (2014). English for science and technology: A learner centered approach. *English for Specific Purposes*, *15*(42), 1–10.

Soodmand Afshar, H., & Movassagh, H. (2016). EAP education in Iran: Where does the problem lie? Where are we heading? *Journal of English for Academic Purposes, 22*, 132–151.

Thomas, G. (2011). *How to do your case study: A guide for students and researchers*. Thousand Oaks, CA: Sage.

Ward, J. (2009). EAP reading and lexis for Thai engineering undergraduates. *Journal of English for Academic Purposes, 8*, 294–301.

West, R. (1994). Needs analysis in language teaching. *Language Teaching, 27*(1), 1–19.