

# The Evaluation of the Effectiveness of ESP Courses in Enhancing Technical Translation Proficiency: A Case Study of ESP Course for Mechanical Engineering Students

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## Abstract

The purpose of the present study was twofold. Firstly, it tried to investigate the relationship between the technical English proficiency of the students of Mechanical Engineering in the universities of Iran and their technical translation proficiency in translating technical texts of Mechanics. Secondly, it attempted to evaluate the effectiveness of one of the ESP courses being taught to the engineering students in improving their ability to translate texts of their own field from English to Persian. For the first purpose, two sets of tests were administered to 50 male and female students: a technical multiple-choice translation test and a technical English reading comprehension test. For the second purpose, the first test used above was administered two times with a two-month interval. Analyzing the data using SPSS indicated that there is a moderate significant correlation between technical English proficiency and technical translation proficiency; and that the ESP course under investigation is approximately sixty percent effective in enhancing the learners' proficiency in technical translation.

**Keywords:** ESP, ESP course evaluation, Language proficiency, Translation proficiency, Technical translation

## 1. Introduction

Casting a look at the state of the art of teaching English as a second language indicates its rapid theoretical and practical development in the last few decades. Its ever-changing nature has been influenced by some factors such as the educational requirements and objectives. These factors resulted in different views and cogent approaches to language teaching. Training competent learners is considered as one of the most important goals that all these approaches try to achieve. In order to fulfill different needs of different groups of learners, some modifications were made in the teaching of English, which in turn led to the development of teaching English for Specific Purposes (ESP), "an international movement characterized by a concern with adult students' roles as English language speakers and writers outside of the classroom, and by its grounding in pedagogy" (Johns & Dudley-Evans, 1991). In this regard, Widdowson (1983) cites Palmer's crucial statement on the importance of relating language teaching to the particular needs of learners: "We cannot design a language course until we know something about the students for whom the course is intended, for a program of study depends on the aim or aims of the students. (p. 14)"

Evaluating and measuring the progress of the students and the courses they learn have always been an obsession for educators. As the goals of education have become more complex and the number of students has enormously increased, evaluation has, accordingly, become much more difficult. Regarding the ESP courses, the evaluation requirements take on even more importance by the fact that these courses normally have specified objectives (Hutchinson & Waters, 1987).

It is very important to bear in mind that the rapidly developing sciences in different advanced countries of the world are communicated through their own languages. Thus, in the less scientifically-developed countries, rapid and

constant translation of scientific materials into the mother tongue is inevitable in order to overcome the inadequacy of the local scientific developments.

Through evaluating the ESP course for the students of Mechanical Engineering in Iran and considering the fact that nowadays all sciences and technologies are interrelated and supplement to each other, the present study tries to integrate the subjects such as Translation, ESP, and Mechanics together. Specifically speaking, the present study tries to examine whether there exists a relationship between technical English proficiency and technical translation proficiency, and to evaluate the effectiveness of the ESP course offered to the students of Mechanical Engineering in Iran in increasing their technical translation proficiency from English to Persian.

## 2. Review of Related Literature and Studies

Although translation is recommended to be used as a means only and not as an end, it is strongly advised that it be used as an end for Specific Purposes. In other words, as much as translation should be a subsidiary activity in TEFL (Teaching English as a Foreign Language), it should be an essential activity in ESP (English for Specific/Special Purposes) (Khajavifar, 1995). Therefore, some issues about ESP, ESP testing and ESP evaluation are worth mentioning here.

According to Amirian & Tavakoli (2009), “ESP is viewed as a cover term for teaching and learning English for multiple specific purposes: EAP, EOP and others” (p. 3). In the past 35 years, it has received increasing attention and has developed to become one of the most significant areas of TEFL today. Its development is reflected in the increasing number of universities offering an MA in ESP (e.g. The University of Birmingham, and Aston University in the UK) and in the number of ESP courses offered to overseas students in English speaking countries (Anthony, 1997).

Douglas (2000) defines LSP testing as a special case of communicative language testing that refers to that branch of language testing in which the test content and methods are derived from an analysis of a specific language use situation. He adds that LSP testing has been criticized for some reasons: specific purpose language proficiency is just general language proficiency filled with technical vocabulary; LSP tests are unreliable and invalid since subject knowledge interferes with the measurement of language knowledge; etc. Believing that LSP tests are reliable and valid, he rejects all these arguments and provides some theoretical justification and frameworks for LSP testing.

Hutchinson & Waters (1987) propose two prominent ESP levels of evaluation: learner assessment and course evaluation. These two forms of evaluation, they maintain, are not always distinct. In other words, evaluation of the learners reflects not only the learners’ performance but also to some extent the effectiveness or otherwise of the course. In ESP, there are three basic types of learner assessment: placement tests, achievement tests and proficiency tests; and according to Alderson & Waters (as cited in Hutchinson & Waters, 1987) there are four main aspects of ESP course evaluation to be considered: a) What should be evaluated? b) How can ESP courses be evaluated? c) Who should be involved in the evaluation? d) When (and how often) should evaluation take place?

Four completed local research and two foreign works on translation and ESP are deemed relevant to the subject matter of this study.

### Local

Amirian & Tavakoli (2009) in an article entitled “Reassessing the ESP Courses Offered to Engineering Students in Iran (A Case Study),” first, studied the language skills and components of ESP textbooks offered to students at universities in Iran; and second, they investigated to what extent these ESP courses have been successful in fulfilling the job requirements of the prospective engineers. Finally, the following results were revealed: firstly, the usefulness of ESP university courses cannot be denied since they have been successful in establishing background knowledge at least on terminology and reading proficiency of that specific field in the prospective engineers’ minds; secondly, ESP courses for university students cannot be so vast that can account for the idiosyncratic needs of individual people with individual prospective job requirements.

Khajavifar (1995) in her MA thesis, “The Relationship between Technical English Proficiency and Translation of Technical Texts” attempted to investigate the efficiency of the courses English 1 and 2, and Technical English. And the final results were as follows: (1) English 1 and 2 courses are effective courses and add to the students’ General knowledge of English; (2) There is a direct relationship between the subject ‘General English proficiency and their knowledge in Technical English; (3) There is a positive relationship between the subjects’ technical English proficiency and their ability to translate Technical texts.

Malek Hosayni (1994) in his MA thesis, “Developing and Validating Translation Test in ESP” determined the role of objective translation test in assessing ESP students’ general proficiency. The results indicated that: (1) There is a positive relationship between ESP student’s performance on reading comprehension test and translation test, and that

translation test is a valid and reliable device for assessing ESP students' English proficiency in their own fields of study; (2) There is a positive relationship between ESP students' performance on translation test and their majors; (3) There is a positive relationship between ESP students' performance on translation test and their universities.

In his MA thesis entitled "The Effect of Using Translation on Reading Comprehension of ESP Learners", Āvand (1994) investigated the effect of using translation (the contribution of the mother tongue) on reading comprehension of Iranian ESP learners. The results of the analysis of the data showed a significant relationship between using translation and reading comprehension. In short, the findings were indicative of the effective role of translation, and accordingly the necessity of emphasizing the contribution of the mother tongue to teaching of ESP materials.

### Foreign

In their paper, "Translation as a Learning Tool in English for Specific Purposes", Kavaliauskienė & Kaminskienė (2007) firstly examined students' perceptions of mother tongue application and mental translation in learning ESP, and secondly described the activities which raise learners' awareness of language use. Believing that the comparison between the L1 and L2 through translation can help learners to activate language usage and serve as a tool to polish up learners' English, they achieved some results such as (1) all the learners usually rely on their mother tongue in learning ESP; (2) the autonomously generated translation activities help raise learners' awareness of language transfer and may facilitate linguistic development, etc.

Tudor (1987) in his article, *Using Translation in ESP*, claimed that a number of recent publications have indicated a renewed interest in the use of translation in ELT (English Language Teaching). Little has been done, however, to assess the possible contribution of translation to ESP. He described the use of translation activities with one group of ESP learners in Germany. Two activities were described in which mother-tongue input material and a variety of translation tasks were used. Tudor added that in addition to giving rise to relevant and motivating communicative activities, this fostered the acquisition of new language resources by the learners through the provision of precisely defined communicative goals - 'stretching' learners' existing competence in a controlled manner by means of the first language input.

Here some issues about translation itself, specifically technical translation, and the informative text type to which the technical texts belong are worth discussing.

According to Bruti (2008), the purpose of informative texts is to enhance the knowledge of their readership on a specific subject through collecting information from different sources; they also aim to achieve terminological precision and avoid adding connotations while being rich in definitions. The main characteristics of these texts are clarity, systematicity and coherence. They may consist of narrative, descriptive and argumentative parts linked with each other differently.

According to Newmark (1993), "in an informative technical text, the translation's function is to give the information clearly, neatly, and elegantly (this is its 'literary' quality), preferably in professional language (technical and ordinary)" (p. 2). He adds that there is no need to present the whole information explicit in the original, provided it is implicit in the translation and the reader is likely to understand it. In the same line, he holds that the translators always have the right to rewrite informative texts if they are sure that their versions will become better than their originals. Thus they may impose their own style on them (p. 79).

As a clear definition for technical translation, Williams and Chesterman (2002) maintains that:

Technical translation covers the translation of many kinds of specialized texts in science and technology, and also in other disciplines such as economics and medicine. The translation of these texts requires a high level of subject knowledge, and a mastery of the relevant terminology. (p. 12)

Technical translations are generally specialized to a particular field, subject, profession or business and are, therefore, all about the details, even more so than any other translation project. Even a slight misrepresentation of the language could be disastrous for the end user if something is installed improperly, connected incorrectly or crossed inadvertently (MOGI's Translation Team, 2009). In order for a technical translation to be successful, Ideal Lingua Translations Company (2011) states, skillful translators as professionals in the subject area are required. Most technical translators are, therefore, former engineers, scientists and lawyers. However, technical knowledge per se does not suffice; rather, outstanding language and writing skills are necessary to enable the translator to convey clearly and precisely technical content in one language into another.

### **3. Research Questions and Hypotheses**

Hutchinson & Waters (1987) state that the evaluation of the learners reflects not only the learners' performance but also to some extent the effectiveness or otherwise of the course. Accordingly, the present study tries to evaluate the

effectiveness of one of the ESP courses which is being taught in the universities of Iran, *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002), in enhancing the students' ability to translate texts of Mechanics through evaluating their performance in technical translation test. Moreover, the study attempts to examine the relationship between technical English proficiency and technical translation proficiency.

The present study seeks the answer to the following questions:

1. Is there any relationship between technical English proficiency and technical translation proficiency?
2. To what extent is the ESP course *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002) effective in enhancing the students' ability to translate texts of Mechanics?

In order to answer these questions, the following directional hypotheses are formulated respectively:

1. There exists a significant positive relationship between the students' technical English proficiency and their technical translation proficiency.
2. The ESP course *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002) is above 50% effective in enhancing the students' ability to translate texts of Mechanics.

#### 4. Methodology

##### 4.1 Subjects

As the participants of the present study, 50 students i.e. 25 male and 25 female students were randomly selected among the senior students of Shiraz University majoring in the 'Fluid Thermal Approach' branch of Mechanical Engineering. They had been admitted in the academic year 1384-85/2005-06. The participants were those who had passed the General English course with scores ranked above the 50<sup>th</sup> percentile of all the above-mentioned students and they were studying their specific purpose English course at the time of this research. Generally speaking, the study attempted to choose a homogeneous sample with regard to nationality, language background, educational level and age.

##### 4.2 Materials

As to the purposes of this study, two sets of tests were developed and prepared which will be described below.

1. A 20-item multiple-choice reading comprehension test in Mechanical Engineering: it included seven passages with their corresponding multiple-choice reading questions; i.e. twenty questions. The passages and questions used in this test were extracted from 10 MA technical English reading comprehension tests. The tests were the entrance examinations of the universities of Iran between the years 1997 and 1999. These passages were selected in such a way that their contents almost covered the terminology of all fields of Mechanical Engineering dealt with in the universities of Iran at the BS level, including Heat Transfer, Fluid Mechanics, Engineering Thermodynamics, Strength of Materials, Mechanical Engineering Design, Mechanical Vibrations and Electricity.
2. A 21-item multiple-choice translation test in Mechanical Engineering from English to Persian: each item was an English sentence with four Persian equivalents only one of which was the best and the most accurate translation of that sentence. These English sentences were extracted from the passages of the first two sections of the ESP textbook of the present study, i.e. the sections 'Reading Comprehension' and 'Further Reading'. Since the main themes of some units of this book overlapped, the present study merged them into one and finally made seven thematically-independent units out of a total of sixteen units; i.e., seven units with the same seven subjects mentioned for the first test. To attach equal importance to these subjects, three sentences were selected for each of them; i.e., twenty one sentences in total. Those sentences that had relatively more technical terms of Mechanics and more complex grammatical structures were preferred. The four Persian equivalents of each sentence were designed by the researcher.

To answer the first and the second research questions, the two sets of tests and only the second test were administered respectively to the same group of participants.

##### 4.2.1 Reliability of the Tests

Since the tests utilized in this study were researcher-made ones, they were piloted with 15 similar test takers and an alpha Cronbach method was applied to guarantee their reliability. As demonstrated in Table 1, Cronbach alpha coefficient, measured by the degree of internal consistency, for the technical English test and the technical translation test was 0.793 and 0.801, respectively. Needless to say, such figures prove that these tests were adequately reliable for the purpose of the study.

##### 4.3 Procedures

The main purpose of the study and the tests was clarified and explained to the participants. For the first research

question, two sets of tests were administered to the participants with a one-week interval between sessions. In addition, they were not informed of the dates of sessions. The tests were ordered as follows: (1) the multiple-choice technical translation test in Mechanical Engineering; the participants were allowed 20-25 minutes for completing this test during the first session, i.e. two months after the beginning of the ESP course; it is worth mentioning that the above-mentioned time was similar to the corresponding time allotted to the 15 test takers in the pilot study; and (2) the technical multiple-choice reading comprehension test in Mechanical Engineering; the participants were allowed 20 minutes for completing this test during the second session, i.e. one week after the first test. Then, the scores of the first test were correlated with the scores of the second test. The coefficients of correlation of the two sets of scores were computed in order to determine the extent to which the technical English proficiency and the ability to translate technical texts are related.

For the second research question, the same technical multiple-choice translation test used for the first question was administered to the same group of participants for the second time with a two-month interval between sessions, the first session, at the beginning of the ESP course, and the second session, as it was mentioned above, two months after the beginning of the course. Some of the participants might have acquired the knowledge of technical English and/or translation from the sources other than the book of the ESP course of the present study. The time of this two month period was assumed to be enough to reduce this potential negative effect. Then, the percentage of the participants whose marks had increased in the second translation test in comparison with the first translation test was computed using percentage analysis. This very percentage reflected the extent to which the ESP course under question was effective in enhancing the participants' technical translation proficiency.

#### *4.4 Scoring Procedure*

The three test papers were scored by the researcher of the present study. For the first test, dichotomous scoring was used; that is, 1 for the correct response or 0 for the incorrect one was allocated to each of the twenty items.

In order to objectively score the translation test used in this study, three criteria were set and used. For the purposes of the present study, the one choice which was the answer to each item of this test was the best and the most accurate translation of the corresponding English sentence in terms of (1) lexical choice (technical terminology), (2) grammar and complexity and (3) fluency and the state of being communicative. The other three wrong choices lacked any of these three criteria. Besides these benchmarks, the study benefited, if necessary, from the technical translation theories of Newmark (1988) discussed in Section 2 in order to design the best choice. To each of the twenty one items in this test, one point was allocated.

All the items in both tests had equal values. So, a score could range from 0 to 20 in the first and 0 to 21 in the second test. The students were not penalized for their wrong answer(s).

### **5. Results and Discussion**

#### *5.1 The First Directional Hypothesis*

In the science of Mechanical Engineering in most universities of Iran, specifically those where the textbooks of the technical courses are in English, there are some learners who are very good at reading and understanding the technical texts of their major but since they are seldom forced to translate their technical knowledge into Persian, they have learned mechanics mostly in English, the majority of technical terms in their minds are in English, they are not quite familiar with the Persian equivalents of the terms, and in general they are not that good at translating those texts. Therefore, the relationship between technical English proficiency in the field of Mechanical Engineering and technical translation proficiency for the texts of mechanics was questioned in the present study. This relationship takes on importance when it comes to choosing a proficient translator for the translation of textbooks, books, articles, etc. on mechanics. Who does translate these kinds of texts better, former mechanical engineers due to their proficiency in technical English or expert translators due to their academic knowledge of translation and wider knowledge of English, as the source language, and Persian, as the target language? If a (very) high correlation happens to be between the above two types of proficiency, one may claim that sufficient knowledge of technical English always results in a good technical translation and it is exclusively incumbent upon the professionals in the field of Mechanical Engineering to translate the corresponding technical texts. However, if such a correlation happens not to be between them, one may doubt that the best technical translation is the translation of a mechanical engineer who is good at technical English; in other words, the lower the correlation, the less important the role of such an engineer in presenting a good technical translation and the more important the role of a skillful translator having academic knowledge in translation. This was the first problem dealt with in this study.

In order to find an answer to this problem, two different tests- Technical English Test/TE-T and Technical Translation Test/TT-T (administered two times with a two-month interval; i.e. TT-T1 and TT-T2) - were

administered. Table 2 depicts the descriptive statistics of the three tests, including the total number of the participants, the minimum, maximum, mean values and standard deviation. The total scores of the two different tests are 20.00 and 21.00, respectively. The maximum scores of the three tests are approximately at the same level. Mean score of the TE-T (15.7400) is the highest. 14.5400 for the TT-T2 and 12.7000 for the TT-T1, as the lowest, are the mean values of the translation tests. In the TT-T1, there exists the most variation in the scores in comparison with the TE-T (2.73160) and the TT-T2 (2.58891). Table 2 shows these statistics.

The scores of the subjects obtained from the TE-T were correlated with their scores on the TT-T1 and also with their scores on the TT-T2 to answer the first research question. The coefficients of correlation of the three sets of scores were computed using Pearson product-moment coefficient. Table 3 demonstrates the correlation of coefficient among these three tests.

The results showed significant correlations between the scores on the technical English test and the first technical translation test ( $r = 0.646$ ), between the scores on the technical English test and the second technical translation test ( $r = 0.621$ ) and also between the scores on the first technical translation test and the second technical translation test ( $r = 0.637$ ). Since there exists a positive significant correlation between the two translation tests, both the correlation between the technical English test and the first translation test and between the technical English test and the second translation test take on importance for the purposes of the present study. The positive significant correlations between the TE-T and the TT-T1 and between the TE-T and the TT-T2 show that generally there exists a positive significant correlation between the technical English test and the technical translation test. Accordingly, the first directional hypothesis, claiming that there is a direct relationship between the technical English proficiency of the students of Mechanical Engineering and their proficiency in the translation of technical texts of Mechanics, is confirmed. This means that the participants who have performed well on the technical English test have also performed well on the technical translation test and vice versa. In other words, those who have sufficient knowledge in Technical English will perform successfully in Technical Translation; however, this is not always the case since the correlations obtained are moderate. It is concluded that the best technical translation of a text of Mechanics is not always what a mechanical engineer proficient in technical English presents; in other words, in order for such a translation to be produced, close cooperation between these mechanical engineers and skillful translators having academic knowledge of translation seems necessary.

It is concluded that the above findings turned out to approximately conform to those obtained by Khajavifar (1995). She administered three tests to the participants: a Michigan test, a technical reading comprehension test and a technical translation test. She obtained very high correlations between General English test and technical English test, and between technical English test and technical translation test. She tried to answer the research questions using Pearson product-moment coefficient and a one-way analysis of variance (ANOVA).

### 5.2 The Second Directional Hypothesis

Among the technical courses being taught to the students of Mechanical Engineering in most universities of Iran, the ESP course assumes to be the most important one which teaches technical English of mechanics to the students. One of the textbooks of this course that is the focus of the present study is *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002). The section of 'translation activities' is considered as one of the most significant parts of each chapter of this book and its aim seems to be the enhancement of the technical translation proficiency of the students and the teaching of English technical terms and expressions of Mechanical Engineering and their corresponding Persian equivalents. If this aim is satisfied, this book and the related course will help the learners a lot in better understanding the original English textbooks of their technical courses and also the materials of these courses, which have been translated from English into Persian, in translating English technical texts of mechanics, in giving them a brighter professional future and equipping them so that they encounter fewer difficulties in their work. Generally speaking, the presence and the absence of this ESP course in the curriculum seem to result in important changes in the career prospects of the students in terms of technical English proficiency and technical translation proficiency. In addition, if this course, like any other courses, is not effectively administered by the professors, its efficiency will be decreased, and a lot of time and energy (of the instructors and students) and money will be wasted. In order to examine to what extent the ESP course with its textbook meets the above-mentioned aim, it needs to be evaluated. Therefore, the second problem of this study deals with such evaluation.

In order to answer this problem, the percentage of the participants whose marks had increased in the second technical translation test in comparison with the first technical translation test was computed. After comparing the two sets of scores, it was realized that the marks of 30 out of 50 participants had increased in the second technical translation test by at least 1 and at most 9 marks. This means that the performance of  $((30/50)*100)$  percent, i.e. 60

percent, of the participants in the technical translation test has improved.

Figure 1 (for the first twenty five participants) and Figure 2 (for the second twenty five participants) also depict the comparison between the scores of the TT-T1 and the TT-T2 and the variations (increase, decrease, no variation) in the scores from the first test to the second test. (The scores have been presented in two Figures to enhance the clarity of the charts). The lower part of each column represents the scores of the TT-T1 and the higher part represents those of the TT-T2. The figures above each stacked column are the amount of variations in the scores.

Table 4 demonstrates the frequencies and the percentages of the participants whose scores have increased or decreased by one mark or more, or haven't changed at all in the TT-T2 in comparison with the TT-T1. For example, the scores of 15 out of 50 participants, i.e. 30% of the participants, in the TT-T2 have become 4 marks higher than their scores in the TT-T1; and the scores of 6 out of 50 participants, i.e. 12% of the participants, in the TT-T2 have become 3 marks lower than their scores in the TT-T1.

As it is shown in Table 4, the maximum amount of positive variation (9 marks) is higher than that of negative variation (3 marks). On the other hand, the maximum percentage of the participants (30%) is related to a positive variation (4 marks). These two statements serve as two convincing evidences for the 60% improvement in the students' performances. As it is observed, the scores of 13 test takers in the TT-T2 have decreased in comparison with their scores in the TT-T1. There might exist various uncontrolled mal-functioning variables leading to this unexpected outcome. Among these variables, one can count the intuitive nature of translation; the effect of the information sources other than the ESP textbook of the present study on the participants' knowledge about technical translation and technical English during the two-month interval between the two translation tests; the extent of the effectiveness of the ESP course and its book on enhancing the technical translation proficiency; fatigue, unwillingness to participate, and the affective mood.

Figure 3 illustrates the percentages of the participants with their corresponding variations of the scores in the form of clustered columns.

The afore-mentioned improvement has other evidences that will be described in the following lines.

Referring back to Table 2, one can find out that the minimum score in the technical translation tests has increased from 2 in the first one to 9 in the second one, i.e. by 7 units. Although the maximum score has decreased from 20 in the first to 19 in the second one, i.e. by 1 unit, it can be ignored in comparison with the considerable increase in the minimum score. In addition, the mean score has increased from 12.7000 in the first translation test to 14.5400 in the second translation test, i.e. by 1.8400. On the other hand, the standard deviation has decreased from 4.03682 in the first to 2.58891 in the second test, i.e. by 1.44791. Since the first translation test has been administered at the beginning of the ESP course of the present study, the higher level of deviation may indicate that the participants have acquired the background knowledge necessary to answer the translation questions from different information sources, e.g. books, courses, institutes, etc. other than the textbook of the ESP course. Thus, this higher level of variation in the scores is associated with the higher level of variation in the sources accessible to the participants. In contrast, the lower level of deviation obtained for the second translation test, administered two months later, shows that the scores have become more homogenous and closer to each other. This may be the result of acquiring the above-mentioned knowledge from the more relevant and regulated information sources the most outstanding of which is the textbook of the ESP course of the present research. Therefore, this lower level of variation in the scores is attributed to the lower level of variation in the sources and the higher level of control on them.

Since the evaluation of the learners reflects not only the learners' performance but also to some extent the effectiveness or otherwise of the course (Hutchinson & Waters, 1987), one may claim that the percentage obtained for the evaluation of the learners in this section (60%) approximately reflects the degree of the effectiveness of the ESP course of the present study. As a result, the second directional hypothesis, stating that the ESP course *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002) is above 50% effective in enhancing the students' ability to translate technical texts of Mechanics, is accepted; that is, this course is approximately 60% effective. Therefore, it can acceptably meet the learners' needs to translate texts of mechanics. It is worth mentioning that to the extent of forty percent something must be wrong with the course design: according to Hutchinson & Waters (1987), "the objectives may be too ambitious given the resources available; the analysis of the learners' initial competence may be wrong; the methodology may be inappropriate" (p. 145). Identifying the root cause of this deficiency, however, is beyond our discussion limit.

## 6. Conclusion

As a consequence of data analysis and discussion concerning the problems under investigation, a number of concluding remarks can be stated as follows:

1. Those former engineers and students who have sufficient knowledge of technical English in the field of Mechanical Engineering do not always produce a good technical translation of the texts of Mechanics. For the purposes of this study, a benchmark against which a good technical translation might be determined was provided. In such a translation, the errors regarding four elements should be kept to a minimum: lexical choice which includes on the one hand general words, expressions, idioms, etc, and on the other relevant technical terms, expressions, neologisms, etc.; grammar and complexity of the sentences; the translation's being communicative and fluent; subject area knowledge. In order for such a translation to be produced, besides a high level of subject knowledge, mastery of the relevant terminology and enough previous experience in translating technical texts, outstanding language (both English and Persian languages) and writing skills are required for the former engineers and students of engineering to convey clearly and precisely the technical content in English into Persian. Therefore, it is recommended that these mechanical engineers should have a close cooperation with proficient translators having academic knowledge of translation; in other words, we'd better leave the technical English part of a technical text of Mechanics to these mechanical engineers and shift the onus for the editing part of that from the viewpoint of general language (English and Persian) and writing onto the veteran highly-educated translators.

2. The focus of this study was the ESP course offered to the students of Mechanical Engineering at the B.S. level in the universities of Iran with one of its textbooks *English for the Students of Mechanical Engineering (Fluid Thermal Approach)* by Jalalipour (2002). It can be concluded that the usefulness of this ESP university course in enhancing the technical translation proficiency of the prospective engineers cannot be denied. Specifically speaking, it is about 60% successful in fulfilling this objective. For the purposes of the present study, this percentage of effectiveness is acceptable.

## 7. Limitations of the Study

The following limitations might somehow influence the values of the reliability, validity and correlation coefficients of the tests, and the generalizability extent of the results of the research to other situations and participants.

1. The size of the statistical population of this study ( $N = 50$ ) is too small to be able to generalize the findings.
2. The effect of the participants' gender on the results of the research has been ignored.
3. As it was mentioned, during the two-month interval between the first and the second technical translation tests, some of the participants might have acquired the knowledge of technical English and/or translation, especially technical translation, from the sources other than the textbook of the ESP course of the present study. Although the time of these two months was assumed to be enough to reduce this potential negative effect, it may indeed be shorter or longer than the necessary time to minimize this effect to the possible extent.
4. There were not enough sources regarding the issues such as technical language proficiency, technical translation and its proper methods.

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Table 1. Reliability Coefficients of Technical English Test and Technical Translation Test

| Tests                 | Cronbach's Alpha | No. of Items | No. of Participants |
|-----------------------|------------------|--------------|---------------------|
| Technical English     | .793             | 20           | 15                  |
| Technical Translation | .801             | 21           | 15                  |

Table 2. Descriptive statistics of the tests

|                    | N  | Minimum | Maximum | Mean    | Std. Deviation |
|--------------------|----|---------|---------|---------|----------------|
| TE-T               | 50 | 5.00    | 19.00   | 15.7400 | 2.73160        |
| TT-T1              | 50 | 2.00    | 20.00   | 12.7000 | 4.03682        |
| TT-T2              | 50 | 9.00    | 19.00   | 14.5400 | 2.58891        |
| Valid N (listwise) | 50 |         |         |         |                |

TE-T, technical English test; TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test

Table 3. Correlation coefficients

|       |                     | TE-T   | TT-T1  | TT-T2  |
|-------|---------------------|--------|--------|--------|
| TTE-T | Pearson Correlation | 1      | .646** | .621** |
|       | Sig. (2-tailed)     |        | .000   | .000   |
|       | N                   | 50     | 50     | 50     |
| TT-T1 | Pearson Correlation | .646** | 1      | .637** |
|       | Sig. (2-tailed)     | .000   |        | .000   |
|       | N                   | 50     | 50     | 50     |
| TT-T2 | Pearson Correlation | .621** | .637** | 1      |
|       | Sig. (2-tailed)     | .000   | .000   |        |
|       | N                   | 50     | 50     | 50     |

\*\* . Correlation is significant at the 0.01 level (2-tailed).

TE-T, technical English test; TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test

Table 4. The frequencies and the percentages of the participants with the variation amounts of their scores from the TT-T1 to the TT-T2

|                    | Variation in the Scores | Frequency | Percent | Cumulative Percent |
|--------------------|-------------------------|-----------|---------|--------------------|
| Negative Variation | -3                      | 6         | 12.0    | 12.0               |
|                    | -2                      | 7         | 14.0    | 26.0               |
| No Variation       | 0                       | 7         | 14.0    | 40.0               |
| Positive Variation | 1                       | 1         | 2.0     | 42.0               |
|                    | 2                       | 1         | 2.0     | 44.0               |
|                    | 3                       | 4         | 8.0     | 52.0               |
|                    | 4                       | 15        | 30.0    | 82.0               |
|                    | 5                       | 8         | 16.0    | 98.0               |
|                    | 9                       | 1         | 2.0     | 100.0              |
|                    | Total                   | 50        | 100.0   |                    |

TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test

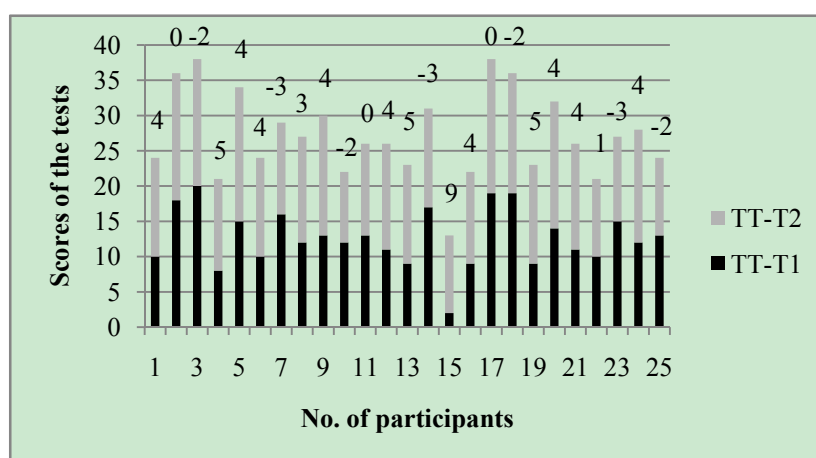


Figure 1. Comparison between the scores of the TT-T1 and the TT-T2 and the variations in the scores (for the first twenty five participants)

TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test

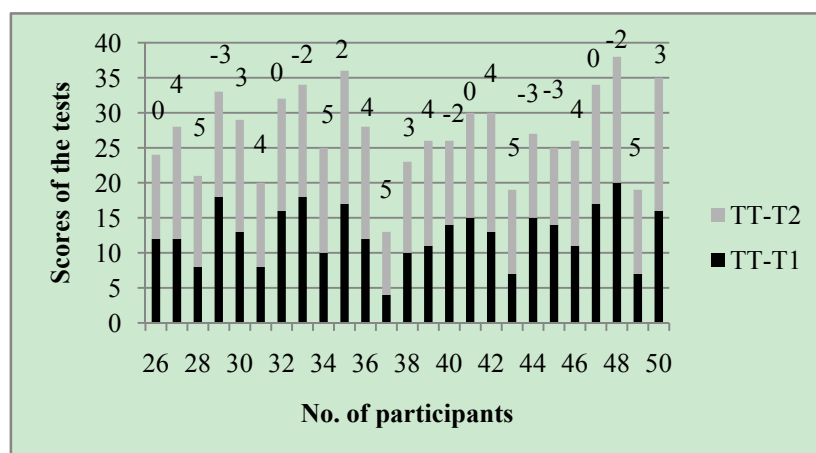


Figure 2. Comparison between the scores of the TT-T1 and the TT-T2 and the variations in the scores (for the second twenty five participants)

TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test

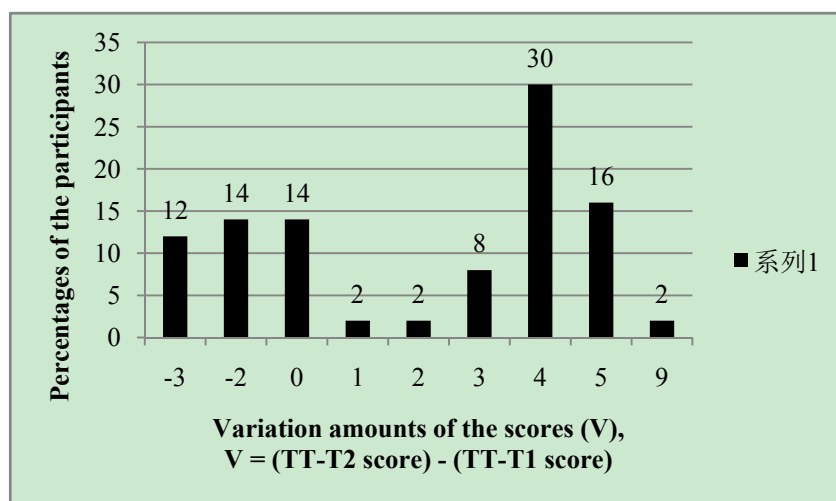


Figure 3. Percentages of the participants and their variation amounts of the scores form the TT-T1 to the TT-T2  
TT-T1, the 1<sup>st</sup> technical translation test; TT-T2, the 2<sup>nd</sup> technical translation test