TURKISH AS A FOREIGN LANGUAGE IN GLOBALIZED WORLD: SCIENCE TERMINOLOGY INSTRUCTIONAL DESIGN (ID)

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Introduction

Teaching of Turkish as a Foreign Language has gained much attention because of a couple of reasons. It has gained attention abroad due to the activities carried by mainly Yunus Emre Institute and Turkish Cooperation and Coordination Agency (TİKA); it has gained attention in Turkey due to increased number of foreign students who are motivated to study in Turkish universities as the policy of Turkish government. The increase in the number of universities in Turkey also has great impact on the preferences of foreign students. As a result of this demand by 2014 more than 63 Turkish Teaching Centers (TÖMERs) were serving for the foreign students (Bakır, 2014).

Although teaching of Turkish as a Foreign Language has deep roots it is a newly emerging field of study in terms of academics, therefore the research in this field is not sufficient to cover all aspects of Turkish Language. In their study, Göçer and Moğul (2011) presented a compact list of studies especially graduate dissertations and printed books to contribute to the literature. After a short investigation of 17 dissertations listed in their study till 2010, it can easily be concluded that all of the studies carried out have concerns on how to teach a specific part of the language or teaching methods. However, neither dissertations nor printed books conducted a longitudinal study examining the effect of their Turkish language proficiency level on foreign students’ follow on academic success or failure. Another study on Turkish language education focused on journal articles and it included 558 articles from 44 journals which were indexed in SSCI or ULAKBİM (Turkish Academic Network and Information Center) Social Sciences Data Base between the years 2000-2011 (Varışoğlu, Şahin, & Göktaş, 2013). Although the number of articles seems to be promising only 35 of the articles were about teaching of Turkish as a Foreign Language. Another two up-to-date bibliography trial studies were carried on this topic and they included 157 articles (Kahriman, Dağtaş, Çapoğlu, & Ateşal, 2013) and 217 articles (Göçer, Çaylı, & Çavuş, 2016), though any of the articles was addressed to Turkish science terminology teaching or academic success of the foreign students. At this point some of the articles focused on the competency levels of Turkish language teachers (Mete & Gürsoy, 2013) while some tried to solve problematic areas by web-based tools (Aydın & Sarıman, 2014) or listed the problems of teaching Turkish language (Alyılmaz, 2010). The only article which put the terminology on the scope was carried out by Temizyürek, Çangal, & Yörüşün (2015) and it was about business Turkish and a terminology dictionary trial.

The scarcity of the studies or dissertations on teaching of Turkish as a Foreign Language is due to a number of reasons such as technology, imperialism, global powers etc. In contrast to English language (Krashen, 2006), Turkish language has not been considered to be “the world’s second language” and not dominated the academic world yet! Moreover, Turkish language has not developed a sub-branch called Turkish for Academic Purposes thereagainst English (Hyland & Hamp-Lyons, 2002). Nevertheless, foreign students who want to go on their academic education in a major of which medium of instruction is Turkish have to be proficient enough to ensure their academic achievement. To reach this ultimate aim, more than a general-purpose Turkish course is needed.

Apart from communicative goals of teaching Turkish language, all students enrolled to Turkish preparatory classes supposed to follow their science and engineering courses in their majors without any miscommunication problems. Not to come-across with any difficulties they have to be proficient enough to understand the discourse of the science courses. Gillanders, Franco, & Castro, (2014) revealed that vocabulary knowledge is directly interrelated with reading comprehension and understanding. Concurrent with this study Yager (1983) investigated the number of content specific or terminology use in science books and found out that the new vocabulary used in the science books is much more than a foreign language text book. One can conclude from this research that without appropriate training of terminology it will be difficult to cope with the texts covered in lessons apart from language courses. Groves (1995) also studied the same problem by avoiding the previous one’s limitations and confirmed that the scientific vocabulary use in the books of secondary students’ is too much. There are a few more studies on science terminology teaching but they are for natives of English or Spanish language and primary or secondary students (Armstrong, 2000; Lan,
One of the similar studies was conducted by Owens (2006) on Mathematics teaching and she emphasized the importance of terminology knowledge on understanding the issues, she also suggested some activities and a list of terminology. More recently, Drobysheva (2015) published a paper on the role of terminology for aviation specialists and engineers. She argues that terminology knowledge is the prerequisite to reach a professional competence.

Thus, in general, paucity of the studies done on the teaching of Turkish as a Foreign Language and specific to science terminology teaching and its effects on the achievements of tertiary level non-Turkish students, the researcher decided to investigate this issue. Moreover, except from Drobysheva’s work (2015) all the terminology studies were about the natives speakers of English; therefore, this study will contribute to the current literature in terms of Turkish language, science terminology teaching to foreign students, and instructional design of a terminology course. After a careful analysis of learner needs and instructor expectations, a Turkish science terminology course is designed -adjacent to Turkish prep courses- by using ADDIE instructional design model.

The present study aimed at providing an insight to the following research questions:

1. What are the needs of university level engineering students in learning Turkish language?
2. What is the effectiveness of the terminology course which is designed by following the steps of ADDIE instructional design model?
   2.1. Is there a significant difference between the experimental and control groups in terms of science exam achievements?
   2.2. What are the perceptions of students, who took terminology course, and their teachers?

Method

Research Design

Current study employed a pre-test post-test experimental research design (Creswell, 2009). To apply such a design, both groups (control and experimental) were administered a science proficiency test before and after the treatment, moreover to see whether the language proficiency affect the science results both groups were administered Turkish Language Proficiency test. Apart from experimental design, semi-structured interview is held with freshmen (1st and 2nd graders) and science instructors during need assessment phase, and to strengthen the research implications prep students and instructors are interviewed about their perceptions after the terminology treatment.

Setting and Participants

The study was conducted at a state university in Istanbul-Turkey where foreign students are educated academically to be engineers in four different majors and trained physically to fulfill the requirements of their future careers and their countries as well. The students, who enroll to this university through bilateral agreements with the sending countries, are to study one academic year of Turkish language preparatory courses, in addition to Turkish language, students are given Math (three hours per week), Physics (two hours per week) and Chemistry (two hours per week) courses for nearly 10 weeks. The aim of these science courses is to prepare them for academic lessons and equalize the students who have different educational background. Following the prep class they take a language proficiency exam and eligible ones get the right to start their academic journeys in one of the engineering majors. All the students took part in this study have been living in a target language-rich environment in this boarding university.

For the convenience of the study purposive sampling method were chosen and prep, freshmen and sophomore students constituted this study’s population. In this study 39 freshmen and sophomore (1st and 2nd graders) students were considered to be the control group and four of them
took part in the semi-structured interview by which problematic areas in their academic studies and their expectations from a Turkish Language course was deduced. The number four is decided as one sample from each CEFR (Common European Framework of Reference) level (Council of Europe, 2014) of Turkish language. Demographic info of the control group is given in Table 1. These proficiency levels were recorded at the same week with science post-test through a standardized test called Istanbul University Language Center Turkish Proficiency Exam.

Table 1.
Demographic Information of the Control Group.

<table>
<thead>
<tr>
<th>CEFR Levels</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>C1</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationalities-Ages</td>
<td>20</td>
<td>19</td>
<td>20</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Albania</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Georgia</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kirghizstan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mongolia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Mauretania</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Somalia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Jordan</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total (Levels)</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>17</td>
<td>30</td>
</tr>
</tbody>
</table>

From 11 different countries 39 students only one of them is labeled as A2 level, seven of them labeled as B1 level, 14 of them labeled as B2 and 17 of them considered to be C1 level. According to CEFR descriptor, B1 and B2 language levels are called independent user and C1 and above proficient user (Council of Europe, 2014) which means they do not have any communication problems. Therefore they are supposed not to have difficulty in communication.

Target population and experimental group consisted of 30 foreign students who were following Turkish prep courses during the study. Their ages range in between 18 to 19 and they are from eight different countries. Four of them also interviewed after the treatment to see their perceptions. Turkish language proficiency levels (as of last week of the first term and 14 weeks of instruction) were realized as three A1 level, 20 B1 level and seven B2 level. Demographic information of the experimental group can be seen in Table 2.

Table 2.
Demographic Information of the Experimental Group.

<table>
<thead>
<tr>
<th>CEFR Levels</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nationalities-Ages</td>
<td>19</td>
<td>18</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Albania</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Georgia</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Kirghizstan</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Somalia</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Jordan</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Total (Levels)</td>
<td>3</td>
<td>20</td>
<td>7</td>
<td>30</td>
</tr>
</tbody>
</table>
Although the number seems small for an experimental research-if the researcher reaches the ultimate aim of academic success through terminology teaching- the results will affect the following years’ success. For the current study, three science instructors from each field were involved in semi-structured interviews for need analysis, terminology development, and instruction phases; 3 science instructors were involved in post-instruction interviews. The fields and work experiences of the instructors’ are given in Table 3.

Table 3.
Demographic Information of the Science Instructors.

<table>
<thead>
<tr>
<th>Fields</th>
<th>Number of Instructor</th>
<th>Work Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>3</td>
<td>6, 8, 14</td>
</tr>
<tr>
<td>Physics</td>
<td>2</td>
<td>5, 16</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

As it is stated before the Turkish language proficiency levels of learners were determined by a standardized test called Istanbul University Language Center Turkish Proficiency Exam. Considering, it is a standardized test; no need is required to evaluate the reliability and validity of the test. All the students involved in the research process were male because of the institution’s character. Students in the control and experimental groups were chosen to study in this university, according to the criteria determined by the higher authorities of the institution.

Procedure

All the students, who enrolled to the university for the Turkish prep class, were administered a science exam prepared by the institution’s instructors as the pre-test of the experimental design. All the students have 30 hours of instruction in a week and except from science courses they just take pure Turkish prep courses.

The control group of the study took 10 weeks of instruction in Math (three hours per week), Physics (two hours per week) and Chemistry (two hours per week) by using the syllabus of a regular commercial book. And during this process they follow the book and try to finish it by the end of the term and so that they can have their end-of-term science exam as the post-test. The control group experienced this process in previous years so that the researcher examined the negative sides of the program.

The experimental group also took 10 weeks of instruction in Math (three hours per week), Physics (two hours per week) and Chemistry (two hours per week) additionally they are exposed to Turkish science terminology which are prepared by three field expert (Math, Physics, and Chemistry) three hours per week as the treatment. Three course hours are allocated from Turkish language course. What to teach, how to teach, and which terminology to teach were identified by ADDIE instructional design model by the help of institution’s personnel. To visualize the procedure of the research design Figure 1 is given below.

The treatment for the experimental group is determined through a couple of processes. To make these processes more systematic, one of the most common instructional designs ADDIE, which was originally developed by Florida State University for military trainings, is chosen. Another reason for selection of this ID is that the developed course is not like a full major course instead a patch for the ongoing program. And terminology of science is very concrete; it is not open for any comments. In Figure 2 ADDIE ID (University of Connecticut, n.d.) and its components are shown.
What is done for each step during the terminology course development is briefly explained below.

**Analysis**

For the beginning of the design, the researcher analyzed the learners’ (n=39) needs in science education. This analysis is conducted through science exams (pre-test and post-test) and semi-structured interview (n=four). Additionally, science instructors’ (n=three) views were taken into consideration in this phase. Turkish language course book series (named "Istanbul"), A1, A2, and B1 levels were also examined in terms of science vocabulary load (Groves, 1995) to see whether the number is enough or not.

**Design**

Align with the analysis results, objectives were set, assessment tool for summative evaluation was decided. Time frame for terminology sets was adjusted. And while deciding on such issues the researcher tried to be systematic and logical. Because, any misleading decision at this point would be resulted in undesirable results.

**Develop**

Following the first two steps, three field experts (Math, Physics, and Chemistry) who are lecturing more than four years in prep classes, one Turkish language instructor and the researchers developed the prototype of the lesson and the field experts decided on the terminology list and how to give
those to the learners. The language instructor with the researcher analyzed the current course books to identify any terminology in them. At the end of this phase they decided on the activities and terminology listed. They also determined on the hours (one hour of terminology course for each science field per week) of instruction. At the end of development phase 32 pages of terminology list is compiled and categorized parallel to units they covered and it is distributed to learners. A sample list of terminology is given in Figure 3.

<table>
<thead>
<tr>
<th>KELİMELİK MAVRAN</th>
<th>RESİM/FOTOĞRAF</th>
<th>AÇIKLAMA</th>
<th>ÖRNEKLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Api Angle</td>
<td><img src="image" alt="Api Angle Image" /></td>
<td>Başlangıç noktası ortak olan iki eğimin biregim kümesi.</td>
<td>Şekilde [AB iğn. ile [BC iğn. arasında]_api 37 derecedir.</td>
</tr>
<tr>
<td>Aportasy Angle Bisector</td>
<td><img src="image" alt="Aportasy Angle Bisector Image" /></td>
<td>Aportasy: Ugünen bir açının orta noktası iğn., köşe iğn. kesişimi doğrulu parçasına aportasy demir.</td>
<td>[CD ABC açının aportasydır.</td>
</tr>
</tbody>
</table>

*Figure 3. Science terminology list sample.*

**Implement**

Designed and developed program delivered within 10 weeks of instruction to the learners in the experimental group. During this implementation step class organization is supported with the template proposed by Martinez and Benitez (2011).

**Evaluate**

During the evaluation of the whole process part, the researcher and the stakeholders made suitable changes when needed on the design. For the summative evaluation part of the terminology training institution-made exam is administered. To better understand the change that students and instructors feel another interview was done.

**Data Collection Tools**

Three basic data collection tools were used in the current study. Namely, semi-structured interview questions for students, who did not take terminology course, and for their instructors; two science exams for the pre-test and post-test; semi-structured interview questions for experimental group and their instructors.

*Semistructured interview forms for students, who did not take terminology course, and for their instructors*

As this study conducted through semi-structured interview; questions were prepared and revised by the researcher, then for the reliability and validity of the questionnaires co-researcher and experts’ views were taken to finalize the questions. The main purpose of the questions was to unveil the language problems of foreign students that they encounter during their academic life and put forward a solution for their betterment. Questions, which were asked to four students from each major and three science instructors, were prepared in Turkish language to remove any vague point. Each interviewee was interviewed for almost 30 minutes from 10 questions and their probes. The respondents were informed about the study and they were given pseudonyms names for ethical reasons. The interviews were recorded in written form and transcribed later, then coded.
Science exams

Science exams that are used in this study consisted of 100 items; 50 items from Math, 25 items from Physics and 25 items from Chemistry. Questions were in test-type and 120 minutes were allocated for the exam. Questions were asked to another 20 students for piloting, as a result some questions were revised. Two independent raters rated the paper for the inter-rater reliability. For inconsistent results third rater rated the papers. All the questions, naturally, included at least one terminology covered in the instructions and handouts. Cronbach Alpha Coefficient Level of the inter-rater reliability was found to be .82 which means reliability of the speaking scores reliable enough.

Semi-structured interview forms for students, who took terminology course, and for their instructors

For these questions another four students from experimental group and three science instructors were chosen. These questions were also prepared through a couple of processes as the previously mentioned questions were. The aim of these questions to see the effect of the treatment in this case terminology course designed through ADDIE ID steps.

Analysis of Data

After data collection step, SPSS (v.22) software was used to analyze the quantitative data. In the current study science exams, both pre and post, constituted the quantitative data. To see whether there is meaningful difference between pre-test and post-test results of the control group; and post-test results of control and experimental groups, one sample t-test and independent samples t-test was utilized.

Two semi-structured interviews were analyzed by utilizing the three steps of qualitative research as content analysis; interviewing, transcribing and coding. Each code then categorized under themes. According to unveiled themes from coding, language needs of the learners for control group and perceptions of experimental group were shed light to the research.

Findings

The motive of the study is the real need of the institution that the researchers are working in and the results are supposed to contribute to the academic successes and as a matter of course self-confidence of the students as well. Therefore, the researchers, first and foremost, tried to unveil the underlying reasons of academic dissatisfaction of both learners and instructors. Therefore, initially, semi-structured interviews were done with learners who did not take terminology course and for their instructors in order to find out the needs of the stakeholders.

Secondly, as a pre-test, institution based science exam was administered to control and experimental groups to see their entrance levels and a post-test was administered after the treatment to identify the effect of terminology training.

For the last part, experimental group’s and their instructors’ views were taken to see the difference in the flow of lessons and perception of students and instructors based on terminology knowledge.

What are the needs of university level engineering students in learning Turkish language?

From the data collected through semi-structured interviews, the researchers identified five themes related to the needs of the learners who are supposed to go on their academic education in one of the majors in a foreign country from the eye of learners and instructors; why to learn Turkish; Turkish language perception; content specific vocabulary (terminology); input-reach environment; language materials.
Why to learn Turkish

The first theme that the coding unveiled is the reason of learning Turkish. Although the first theme seems not to very related with the needs of the learners this theme is the underlying motive behind studying this language and living away from their homelands. All of the four learners and three instructors agreed on the reason of learning Turkish. S1 (student one), S2, S3, and S4 said “I want to learn Turkish to be able to go on my education”, similarly T1 (teacher one), T2, and T3 said “they are here to be engineers as a matter of fact Turkish is a means of understanding their topics”. S1 added “I also want to learn Turkish to better understand a different culture which will contribute my future career.”

Turkish language perception

Another subsidiary theme (as it is not directly related to the needs) is Turkish language perception. S2 reported that “before coming to Turkey I was a bit worried as my language does not include Latin alphabet” and S3 “when I was decided to come Turkey I felt nervous due to communication issues”. S4 also added “I’m very curious in my life and I wanted to discover new places, people and languages still getting an engineering education in different language made me a bit distressed.” From the responds of the participants it can be deduced that all the participants experienced a compelling period in terms of language barrier.

Content specific vocabulary (terminology)

The most important theme that the researchers wanted to deal with is the terminology. The reason of its being so crucial is that the researchers were able to present a treatment for students’ and instructors’ demand. S1 said “...it was fine during prep class and I did my best and practiced all time. I even shared my room with a Turkish student to use every moment efficiently however something went wrong when science and engineering courses started. I couldn’t reach the pace of the lesson there were so many new vocab...”. S2 added “I scored B2 in Turkish proficiency exam and I was bold... coming to science lessons I am stuck... like prep I had to memorize new words.” S3 reported that “uhh...science courses... they are like a new language... this is not Turkish." S4, a bit confident, “I’m ok with the new words but they slow down my pace ...Turkish students are more advantageous.”

When the science instructors were interviewed they agreed on the lack of extra work on the terminology. T1 stated “...I’m luckier... my lesson hours more than other lessons however I’m struggling to balance Turkish students’ pace and foreign students pace... Out of the class we do not have any communication problems but they are not proficient in my classes”. T2 added that “I spent a great deal of time explaining the field terms... I have many administrative staff to deal with and I do not extra time”. T3 reported “Learning Turkish is not enough for academic language... books are very tough for them...”

Input-reach Environment

Another theme that seven participants mentioned is the environment. They all emphasized the luckiness of the learners that they are educated in a boarding school where they have plenty of time to practice the language.

Language materials (terminology booklet)

The last theme that researchers decided on is the language materials. In this the while the learners are focused on the communicative aspects and face validity of the Turkish books (named Istanbul) the science instructors focused on follow on training and terminology lists of the books.
On one hand, S2 stated that “when they handed my books on the very first day I delighted, it seemed joyful with lots of colorful activities” similarly S4 added “in my previous school all the books were black and white... It is good to have such a source”. On the other hand, T1 said “I’m not a material expert however we need to prepare these kids for further studies... These books have nothing about Math...”. T2 also find these books in adequate “The books should support what we are trying to do... They should contain extra things for specific purposes”. T3 finds the current books’ fashion quiet normal but put forwards some suggestions “these books are for teaching Turkish not for teaching Chemistry... Additional sources should be given to these kids... This is what I’m doing in my classes; I give them a short list of vocabulary to support them in my classes”.

From five themes unrevealed from the interviews showed that each stakeholder is in need of assistance. The students are already struggling to comprehend the “new language” and students’ comprehension is slower than the native students. This comprehension pace is also affected negatively with many terminological discourse intake. Unrevealing the negative effect of shortness of science terminology, aforementioned terminology course designed and implemented through ADDIE ID.

What is the effectiveness of the terminology course which is designed by following the steps of ADDIE instructional design model?

After a carefully conducted need analysis, ID development and implementation process it is time to see if the science terminology fulfills the needs of the stakeholders. Research question of the current study is constructed upon the achievements of control and experimental group. Before presenting the comparisons of these two groups, it would be necessary to give control group’s pre-test and post-test scores. As it is stated previously, control group also took science lessons but without terminology treatment which means they are supposed the increase their scores but to what extent? In Table 4 one-sample t-test results of the control group is given.

Table 4.
Pre-test Post-test Results of the Control Group.

<table>
<thead>
<tr>
<th>Test</th>
<th>\bar{x}</th>
<th>N</th>
<th>SD</th>
<th>\bar{x}_1 - \bar{x}_2</th>
<th>T</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>Pre</td>
<td>29.77</td>
<td>39</td>
<td>13.72</td>
<td>-14.10</td>
<td></td>
<td>.00</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>43.87</td>
<td>39</td>
<td>14.38</td>
<td>-5.50</td>
<td>38</td>
<td>.00</td>
</tr>
</tbody>
</table>

p<.05

It can be deduced from Table 4 that there is a statistically significant difference (p<.05) between the pre-test and post-test results of the control group. The group increased its mean average 14.10 point. Although there seems to be an increase, considering these scores are out of 100, the results are not satisfactory enough.

Is there a significant difference between the experimental and control groups in terms of science exam achievements?

After the analysis of control group’s pre-test and post-test result the researchers analyzed the achievements of control and experimental group. As it is seen in Table 5, the p value is realized as .00 at the p<.05 which shows that there is a statistically significant difference between the post-test scores. In comparison to the post-test scores of control group, experimental group showed a considerable increase and the only difference in their context was the terminology treatment.

Table 5.
Post-test Results of the Control and Experimental Group.

<table>
<thead>
<tr>
<th>Test</th>
<th>\bar{x}</th>
<th>N</th>
<th>SD</th>
<th>\bar{x}_1 - \bar{x}_2</th>
<th>T</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Post</td>
<td>43.87</td>
<td>39</td>
<td>14.38</td>
<td>-20.90</td>
<td>67</td>
<td>.00</td>
</tr>
<tr>
<td>Experimental</td>
<td>Post</td>
<td>64.77</td>
<td>30</td>
<td>9.84</td>
<td>-8.81</td>
<td></td>
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What are the perceptions of students, who took terminology course, and their teachers?

For the last part of the study, the researchers tried to identify the difference that the students and instructors perceived from their lessons which are assisted through science terminology. Similar to the result of need analysis phase the researchers identified five themes from the semi-structured interviews held with the experimental group and their instructors. The themes are: Why to learn Turkish; Turkish language perception; content specific vocabulary (terminology); input-reach environment; language materials.

Why to learn Turkish

Students who are asked this question responded this question concurrent to their predecessors. Their first purpose is to adapt to new culture through the language. Moreover the medium of instruction is Turkish which necessitates the learning of this language. S1 said that “I am here (Turkey) to represent my country and I need to fulfill the expectations”. While this student approached the issues from more patriotic reasons S3 added “I am here to learn another language without any effort and pay”. S4 reported that “the better I learn Turkish the better my academic records will be (I hope) (LAUGHTERS)”. And finally S1 added “I am trying to learn Turkish to understand everything what is going on around me”. Teachers' comments on this theme did not changed they all agree on the future academic life has the most important role.

Turkish language perception

This theme is more apparent considering the need analysis group’s interview results. One interviewee out of four S3 reported “I’m lucky because in my country Turkey has popularity and my family always watches Turkish serials... I am familiar with Turkish”. S1 said “Yeah...Turkish language is confusing... but it is fun to learn it in its natural place...”. S2 and S4 added “each language has its own complications but Turkish has much more... and we are far from home...”. As it is expected, except from the S3, students are anxious about the new life and language.

Content specific vocabulary (terminology)

Three hours of science terminology treatment within the scope of Turkish for Specific Purposes (TSP) has positively influenced the perceptions of the interviewee. Motivated to learn a new language is supported by extracurricular science terminology increased their self-esteem as they felt themselves more knowledgeable. S1 said “...when we started science course I stuck however instructors informed me that they have extra courses for the science words... it relaxed me” similarly S2 said “I studied two times more... my Turkish book and science words to understand the lesson”. S3 reported that “freshmen students said the science courses would be tough but with the help of terminology I had no difficulty”. And S4 added “the problems in science course books are not difficult for me but I don’t get the problem because of vocabs... fortunately they had a plan for this...”. Science instructors also contented with the treatment. T1 stated “…I wonder why we did not think such a course before... I face any interruption during the presentation of the course... They did not ask me any vocab...”. T2 added that “I was always thinking about the problem of their academic levels however supporting the students with only terminology changed their pace in the class”. And finally, T3 reported “I’m one hundred sure that they must have similar thing (engineering terminology) for their next year curricula.”

Input-reach environment

The entire participant emphasized the positive impact of the learning Turkish in its natural environment.
Language Materials

Apart from need analysis results, students and teachers are asked to comment on the terminology booklet.

S1 stated that “I was thinking to write down all the vocabulary when we covered in class... when my teacher handed me this stuff I’m relaxed”. S2 also stated that “The booklet was fine especially the words are in the same order with the flow of the lesson”. S3 added “it eased my burden and it also helped us to be secure... I, for example, do not like to be on the spot... if you don’t provide me the list, I don’t ask and I may not learn...”.

Instructors also satisfied with the situation; T1 said “Turkish language instructors and we did (thank you by the way) a great job I believe... we purified our lessons and just focused on the problems...”. T2 reported that “all the experiments were like a burden but know I don’t need to explain the words but experiments itself”. T3 “besides the effect that the booklets done in my class the cooperation was also very delightful... I never thought to work with a Turkish teacher before... I must be more open...”.

Conclusions and Discussions

The aim of this study was to add insights to Turkish as a Foreign Language field; to solve the real-life problems of a group of foreign learners who follow their academic studies in Turkish language; to assist instructors who have been struggling to teach their instruction in Turkish and also; to put forward a terminology course ultimately. The researchers have been motivated from the fact that no study exists on how to teach Turkish science terminology to foreign language learners. Therefore, they decided analyze the current situation and suggest a remedy by choosing of the most appropriate ID in this case ADDIE.

As the first step of ADDIE, to see the real needs of the foreign students, the researchers conducted semi-structured interviews with the control group. The results are used to design a Turkish science terminology course as a supplementary course to Turkish prep courses. Then, it is aimed to see the effectiveness of the developed program an achievement exam was administered, furthermore to unveil the perceptions of experimental group and their instructors about new course another semi-structured interview is held.

The need analysis of the current study based on semi-structured interviews with learners and instructors however, similar need analysis studies in Turkish based on both interviews and a need analysis survey (Tok & Yıgın, 2013; Çalışkan & Çangal, 2013; Boylu & Çangal, 2014). Also, the surveys mostly used in these articles are adapted versions of Iwai et al.’s (1999) study. Tok & Yıgın (2013) found four motives to learn Turkish namely; economy, education, tourism, political, marriage. Boylu & Çangal (2014) also revealed similar needs such as communication inside class, individual interests and needs, education and business opportunity and merchandising. Therefore, this study is concurrent with the findings of previous studies in terms of education. Current study, however, is conducted in a homogeneous environment with same age participant group that the result of the need analysis is limited to education especially engineering education.

Following the analysis phase, ADDIE ID steps are utilized, a course is designed and a terminology glossary is developed. As it is stated before there is a paucity of research done on Turkish for Specific Purposes the only study belongs to Temizyürek et al. (2015). They emphasized the need for such a field and they prepared an English-Turkish-Bosnian dictionary, which they included 326 words, composed of banking terminology within the scope of Business English. Likewise, Owens (2006) work on the science terminology issue (for native speakers of English) and he proposed a “Simplified Mathematical Dictionary” at the end of his study. Lan (2013) also focused on discursive elements in fourth grade science lessons and instead of a specific word list he suggested teachers to explicitly instruct the learners. On one level, the current study is concurrent with the first two studies as this study proposed 421 words Turkish science terminology list with illustrations.
In line with Groves (1995) study, unveiling that in three basic science lesson 421 scientific terminologies is being exposed to learners of a new language is another key point. This number is much more than the number of vocabulary covered in A1, A2 and B1 level Turkish books.

Furthermore, different from the preceding works, present study employed an experimental research design to see whether the new developed list and instructional design fulfill the expectations of the learners, instructors, institution and the researchers. The achievement test results showed statistically significant difference in regard to science post-test and this finding is concurrent with the findings of Armstrong (2000). It can be deduced from the fact that giving assistance to language learners in acquiring different terminology in an appropriate way increases their academic success. Armstrong (2000) also stated that his study helped the science teacher professional development as the participants learnt to use language arts vocabulary strategies. Presents study, likewise, albeit not within the scope of this study, contributed to the professional development of science and Turkish language instructors.

In the light of semi-structured interviews conducted after the treatment, it can be said that students are motivated and their self-confidence is increased at the same time instructors’ job satisfaction is increased too. Another crucial point is the perception of the stakeholders to each other also revealed; while one of the students said “the problems in science course books are not difficult for me but I did not understand the problem because of vocabulary”, one of the science instructors said “I was always thinking about the problem of their academic levels however supporting the students with only terminology changed their pace in the class”.

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