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Effect of science and technology learning with foreign language on the attitude and success of students

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Abstract

This paper focuses on teaching science in CLIL¹. Problem sentence of the research was determined as “what is the success and attitude level of elementary school 8th grade schools who receive science education in a foreign language (English)?”. The study was designed in accordance with correlational survey method, which is a quantitative method, and its universe was provided by 8th grade students who attend science and technology classes in English at private and public schools of Northern Cyprus. “Science and Technology Class Attitude Scale” and “Science and Technology Class Success Scale” were used as data collection tools. Arithmetic average, standard deviation, correlation and t-test were employed for analyzing the data. Average of the scores obtained by students from success test was 4.18 (over 20), whereas their average academic success score was 8.85 (over 10). The fact that students received low scores from success test despite their high academic success scores is thought-provoking. Different from the scores provided by success test, attitude scores of students were found to be higher than the average value (3.40, according to 5 Likert scale).

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Keywords: Teaching in foreign language (CLIL - Content and Language Integrated Learning); teaching science in CLIL; success in science; attitude for science.

1. Introduction

Native language, which is first learned from parents and close environment, and then from the secondary environment in which individual interacts, has an essential place in the life of individual and the society (Vardar, 1980). According to Marshall, development of individuals depends on their ability to make use of a language in different situations. Researches have shown that even though one can speak several languages, he/she can understand very well only one of them, express with that language and create scientific and artistic works. It is clear that this is his/her native language (Göğüş, 1990). Native language skills not only affect the formation of personality of a person; they also make it easier for him/her to perceive and configure future (Leach, 2000). From this point of view, education, which is very critical for development of individuals and society, must be offered in the best-known language, which is native language (Kavcar, 1999). Individuals who can question, explore, create, problem-solve, think freely and openly can be grown if education is given in their native language (Öztürk, 2002). One can

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think most clearly in his/her own language, which is the native language. One cannot think clearly in the wording of another language, neither can he/she express his/her thoughts clearly (Özdemir, 1990).

In today’s developed world, it is obligatory that foreign language should be given importance in addition to the native language (Akarsu, 2002). Foreign language helps one in multifaceted thinking, better understanding of what is happening, and developing thinking skills (Demircan, 2002). Foreign language teaching at early age is highly accepted today. According to this view, interest towards language and culture starts at early childhood, and it is important to take advantage of this fact (Sevil, 2003). According to Akdoğan (2005), with foreign language learning at early age, it is ensured that the child gains another language other than his/her own. Creation of a new and different culture/worldview and pattern of thought is ensured and thus he/she is made to be aware of his/her origins in a more effective and distinctive way. General language development of the child is supported, learning skill earns another positive dimension and he/she becomes acquainted with different learning techniques.

CLIL is one method for foreign language teaching. Number of schools which employ CLIL for this purpose has been increasing steadily. Demirel (2008) classifies schools which employ CLIL for this purpose into three categories: public schools which employ CLIL, private Turkish schools which employ CLIL, and private foreign schools which employ CLIL. According to Sanhan (2001), major justifications of those who argue for CLIL are as follows: “knowledge of foreign language improves tourism”, “knowledge of foreign language accelerates development”, “Turkish is not language of science”, “western languages, especially English, has become an international language”. For these reasons, it is necessary to know a foreign language, which can be learned in a school which offers education in foreign language.

In literature, attention has been paid on the fact that education in foreign language and education in foreign language are compared to each other. According to Demircan (2002), discussion is concentrated in two opposing ends: 1) CLIL is harmful; language of teaching must be Turkish in all schools; 2) CLIL is beneficial; culture can be obtained only in this way; so, the more widespread such education and training becomes, the better it is. Demircan argues that two issues are mixed, and that issues should be separated as follows: 1) teaching of foreign language, and 2) language of instruction. This paper is based on the discussion on CLIL and teaching of foreign languages. The purpose has been to determine the success and attitude statuses of students at schools whose language of instruction is not Turkish and where education is delivered in a foreign language (English). In this context, science and technology course was chosen and success and attitude levels of students who receive science teaching in foreign language were examined. During the research, success test and attitude scale was applied on the students. In addition, relation between report grades that they received in previous years and their attitude and success levels was examined. Exploration of the effect of language of instruction on success and attitude level is worth studying, as a number of different views have been developed among education scientists in the literature on this issue. According to a group of education scientists, when weight is given to language education, some problems are encountered on context learning; students are directed towards memorizing and thus both language teaching and field teaching ends up incomplete. According to another group of education scientists, on the other hand, field-specific concepts are learned when the content is taught in foreign language, and skill of thinking in foreign language is developed; which, in turn, improves the desire for language learning. In this paper, which departs from mentioned different views, success and attitude levels in science and technology classes of second stage elementary students who receive education in foreign language in Northern Cyprus have been described.

Problematic sentence of the research has been determined as “what is the success and attitude level of 8th grade elementary school students who receive science teaching in a foreign language (English)?” Following secondary objectives have been developed in order to answer this problem:

- What is the distribution of scores of 8th grade students depending on science and technology success test?
- What is the distribution of scores of 8th grade students depending on science and technology success scale?
- What is the correlation between success test and attitude scale of 8th grade students, and 7th grade point average, 7th grade English course passing grade, and 7th grade Turkish course passing grade?
- Is there a significant difference in grades received by 8th grade students from science and technology success test according to gender variable?
- Is there a significant difference in grades received by 8th grade students from science and technology success test according to school type variable?
- Is there a significant difference in grades received by 8th grade students from science and technology attitude scale according to gender variable?
- Is there a significant difference in grades received by 8th grade students from science and technology attitude scale according to school type variable?
2. Method

2.1. Research Model

The study has been designed as appropriate for correlational survey model. In correlational survey model, the purpose is to determine the covariance existence and/or degree between two or more models (Karasar, 2009). Such studies can provide viewpoint for researchers as regards the existence of a causal relationship; however, they cannot be interpreted as definitive causalities. Correlation studies is a type of research which is effective in exploration of relations between variables and determination of the level of such relations, as well as providing necessary cues for further and more advanced studies on these relations (Büyüköztürk et al., 2009).

In this study, relations between success test score and attitude scale score, 7th grade academic GPA, 7th grade science and technology courses passing grade, 7th grade English passing grade, and 7th grade Turkish passing grade have been examined. Dependent variables of the study were success score, attitude score, 7th grade academic GPA, 7th grade science and technology courses passing grade, 7th grade English passing grade, and 7th grade Turkish passing grade whereas gender and school type were independent variables.

2.2. Universe and sample

Universe of this study is provided by 8th grade students of private and public schools in Northern Cyprus who receive science and technology courses in English language. The sample is chosen randomly as one school from each district which is believed to be representative. Of the 78 students who constitute the sample, 57 were enrolled at 7 different public schools and 21 were enrolled at 3 different private schools. Public schools whose students were in the sample were Bayraktar Türk Maarif High School, Atleks Sanverler Secondary School, Şehit Zeka Çorba Secondary School, Şehit Turgut Secondary School, Değirmenlik High School, Bayraktar Secondary School, and Şehit Ruso Secondary School; private schools whose students were in the sample were Yakın Doğu Private High School, Girne Amerikan Private High School and Levent Private High School. 30 girls and 27 boys were chosen from public school, whereas 14 girls and 7 boys were chosen from private schools.

2.3. Data collection

In this study, science and technology course attitude scale and science and technology course success test were used as data collection tools. Applied science and technology course success test was constructed by randomly selecting among 7th grade SBS (level determination exam) applied in 2007 (pilot), 2008 and 2009 by Ministry of National Education, Directorate General of Education Technologies. In the introduction part of the success test, a personal information form was added which asked gender, school type and academic grades of participants. Success test consisted of 20 questions, and scoring included 3 errors deleting 1 correct answer, which is in line with to the SBS format. While success test was being prepared, subjects common in education curricula in Northern Cyprus and Turkey and their contents were carefully selected when the units from which questions were chosen were determined. Below is a list of these subjects:

- Electricity
- Force and movement
- Systems of our body
- Our world and universe
- Structure and characteristics of substance
- World of living beings
- Sound and light

Science and technology attitude scale used in the study was developed by Baysen, E., who is one of the researchers, and pilot test applications were conducted on a group consisting of 200 students in autumn semester of 2009. The scale consists of 30 items of 5 Likert type. Reliability coefficient of the scale was calculated as 0.80.

2.4. Analysis of the data

In examination of success test and attitude scale scores, arithmetic average and standard deviation was used; in evaluating relations between success test score, attitude scale and academic scores, correlation and success scores
according to school type were sued; and final, in evaluating whether attitude scores created significant difference in terms of gender and school type, t-test was utilized.

3. Results (Findings) and discussion

Descriptive statistics as regards success and attitude scores are given in table 1.

<table>
<thead>
<tr>
<th>Table 1. Success and Attitude Levels of Students who receive Education in Foreign Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Attitude scale score</td>
</tr>
<tr>
<td>Success test score</td>
</tr>
<tr>
<td>Academic average</td>
</tr>
<tr>
<td>English passing grade</td>
</tr>
<tr>
<td>Turkish passing grade</td>
</tr>
<tr>
<td>Science passing grade</td>
</tr>
</tbody>
</table>

When the scores obtained from success test are examined, the lowest score was found as -3.70 and the highest score was found as 15. Average of the scores received by students from success test was 4.18, whereas 10 students (12.8%) received negative scores. 40 students (51.3) received scores above average. According to obtained attitude scale results, lowest score was found as 72 and highest score was found as 137. Average of attitude scale was 101.67. When 7th grade passing scores of the students are examined, it was found out that the lowest passing grade was 5 and the highest passing grade was 10. Average passing grade for English classes was 8.70. Seventh grade science and technology course passing grade average of students was 8.47. Lowest passing grade was 4, and highest passing grade was 10. Seventh grade Turkish course passing grade of students was 8.37. Lowest passing grade was 5, and highest passing grade was 10. Academic grade average of students was 8.85, with 5 being the lowest grade and 10 being the highest grade.

Table 2. Relation between success and attitude scores and course passing grades of students who receive science education in foreign language

<table>
<thead>
<tr>
<th>Attitude scale score</th>
<th>Success test score</th>
<th>Academic average</th>
<th>English passing grade</th>
<th>Turkish passing grade</th>
<th>Science technology passing grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude scale score</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Success test score</td>
<td>.17</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic average</td>
<td>.38***</td>
<td>.13</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>English passing grade</td>
<td>.36**</td>
<td>.18</td>
<td>.74**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Turkish passing grade</td>
<td>.29*</td>
<td>.09</td>
<td>.74**</td>
<td>.54**</td>
<td>1</td>
</tr>
<tr>
<td>Science technology passing grade</td>
<td>.33**</td>
<td>.16</td>
<td>.85**</td>
<td>.66**</td>
<td>.54**</td>
</tr>
</tbody>
</table>

** significant at .01 level
* significant at .05 level

When table 2 is examined, it can be seen that the correlation between success score and other variables (attitude scale score, academic average, English-Turkish-Science and Technology course passing grades) was at low level and statistically insignificant. Although the correlation between attitude scale score and other variables (academic average, English-Turkish-Science and Technology course passing grades) was low, it was found to be significant at .01 level. The level of correlation between attitude towards science and technology course and academic average (.38), English course passing grade (.36), science and technology course passing grade (.33) and Turkish course passing grade (.29) were determined.
Table 3. T-Test results as regards the relation between success and attitude scores of students who receive science education in foreign language and gender variable

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>ss</th>
<th>sd</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Girls</td>
<td>44</td>
<td>4.07</td>
<td>3.7</td>
<td>.30</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>34</td>
<td>4.33</td>
<td>4.01</td>
<td>.35</td>
<td>.72</td>
</tr>
<tr>
<td>Attitude</td>
<td>Girls</td>
<td>44</td>
<td>101.22</td>
<td>12.48</td>
<td>.35</td>
<td>.72</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>34</td>
<td>102.26</td>
<td>12.88</td>
<td>.35</td>
<td>.72</td>
</tr>
</tbody>
</table>

Whether success and attitude scores changed according to gender variable was tested, however no significant difference was detected.

Table 4. T-Test results as regards the relation between success and attitude scores of students who receive science education in foreign language and school type variable

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>ss</th>
<th>sd</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success</td>
<td>Private</td>
<td>21</td>
<td>5.71</td>
<td>3.47</td>
<td>2.2</td>
<td>.03*</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>57</td>
<td>3.62</td>
<td>3.80</td>
<td>.31</td>
<td>.75</td>
</tr>
<tr>
<td>Attitude</td>
<td>Private</td>
<td>21</td>
<td>102.4</td>
<td>11.37</td>
<td>.31</td>
<td>.75</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td>57</td>
<td>101.4</td>
<td>13.09</td>
<td>.31</td>
<td>.75</td>
</tr>
</tbody>
</table>

* significant at .05 level

It was examined with t-test whether success and attitude scores changed with school type variable. Although no significant difference was detected between attitude levels, success levels significantly differentiate according to school types. When success test averages are examined, it can be seen that average scores are 5.71 for private schools and 3.62 for public schools. The fewness of students at private schools was accepted as a limitation for the research, but it made the researchers think that teaching science in CLIL quality was better at private schools compared to that of public schools. This finding shall be retested by means of increasing the size of research sample.

4. Conclusion and Recommendation

When the researches in literature are examined, the views related to CLIL phenomenon can be categorized into four different groups, namely:
1. Those who support education in a foreign language (CLIL)
2. Those who think that CLIL can be applied but some obstacles can occur during application
3. Those who think that CLIL should not be applied despite its limited benefits
4. Those who are against CLIL

Stern (2003) presented the justifications of researchers who are for CLIL. According to Stern, basic argument of those who support CLIL are that it would develop a bilingual cognition and that foreign language shall enlighten the areas where native language is unable to reach. This view was supported by science teaching in CLIL research results conducted at pre-school level in Mexico (Gamboa and Linse, 2006), elementary and secondary school level in South Africa (Macdonald and Moodie, 2006), at higher education level in Finland (Kukkonen, 2006), at elementary school level in Spain (Castro and Nieto, 2007, and Urmenta and Sola, 2008) and at secondary school level in Romania (Constantin and Kassab, 2009).

In the literature there are also those researchers who believe that education in foreign language could be applied but there would emerge some problems in application. Tajmel and Schoen (2007) examined the education offered to immigrants in Germany (49 students at 8th grade). They observed that these students experienced problems as they received science teaching in CLIL, but found out that these problems could be eliminated and that it is important that immigrants learned German so as to enjoy adaptation to Germany. In yet another research, Ibrahim et al. (2009) evaluated the science teaching in CLIL process of teaching staff at Malaysia University. They mentioned some negativities like confusion of education in foreign language and teaching of a foreign language, assuming CLIL without a preparatory phase, and qualitative and quantitative failures of teaching staff; however, the researchers indicated that teaching in a foreign language (English) could be conducted effectively and presented some suggestions for application.
There are also a limited number of researchers who believe that CLIL should not be applied despite its, albeit limited, benefits. According to Aksan (1994), it is a reality that education in foreign language offers some benefits to the students. Reading and comprehension, speaking and writing skills in a foreign language can be developed through CLIL. In addition, graduates can find jobs more easily due to their command of a foreign language. Kocaman (1990), on the other hand, suggested that the only favorable aspect of CLIL was the fact that it allowed for more room for using foreign language knowledge.

Researchers which find out the negative impacts of CLIL are mostly studied in Turkey. In researches conducted by Erdem and Morgil (1992), Mirici et al. (2000), Örs (2002), Ülper (2006) and Köksal (2007), the emphasis was on the views that students, teachers, parents, managers and inspectors within Turkish education system had negative views on CLIL, that Turkish scientific language was being damaged, that a low-quality and rote learning was observed, that personal creativeness was hindered, that Turkish words could not be generated and foreign terms were being accepted, that awareness and love for native language faded, and that access to course books emerged as a problem.

Taking into consideration the researches conducted in the literature, research results are summarized below. First of all, the results of the success test applied to students consisting of 20 students were evaluated and it was observed that the average was 4.19. The average academic success cores of students was 8.85 (out of 10). It is thought-provoking that, despite the high academic success averages, the success test scores of students remained low. In order to be enrolled at public schools offering CLIL, a student’s academic average must be at least 8. On the other hand, students who receive CLIL at private schools belong to higher socio-economic status, and receive their education at classes with fewer pupils which are equipped with qualified tools and equipment. Despite all the foregoing, students became unsuccessful at SBS exams, which are influential in determining their futures, which is being questioned. It can be tested whether this can be correlated to CLIL with studies with larger samples, or experimental works can be conducted.

Another finding of this study is related to the attitude towards science and technology course of students who receive education in a foreign language. Different from success test scores, the attitude levels of students were found to be higher than the average value (3.40, according to 5 Likert scale). The correlation between course passing grades and attitude levels of students was found to be significant. In particular, correlation between passing grade for English course and attitude towards science and technology course (0,36) and passing grade for science and technology course and attitude towards science and technology course (0,33) turned out high, which deserves further evaluation. The fact that, in CLIL classes, students whose English success is high could develop positive attitude towards other courses as well (in this study, as observed in science and technology class) must be underlined.

The researchers did not come across any study on science teaching in CLIL in Northern Cyprus. For this reason, it was not possible to compare and evaluate findings obtained in the research. Within the scope of obtained findings, following suggestions have been developed by researchers:

- Master’s thesis in the area of science teaching in CLIL must be encouraged. Effect of CLIL on science and technology classes must be examined (in terms of concept learning, laboratory works, resource scanning and learning).
- Descriptive and experimental work can be conducted for comparing science learning in native language and science learning in a foreign language.

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