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EURASIA Journal of Mathematics Science and Technology Education
ISSN: 1305-8223 (online) 1305-8215 (print)
2017 13(8):4609-4633
DOI: 10.12973/eurasia.2017.00954a



Evaluation of the Curriculum of Elementary School Third Grade Science Course

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Received 15 February 2017 • Revised 4 June 2017 • Accepted 24 June 2017

ABSTRACT

This study has been conducted with the aim of descriptively evaluating the Curriculum of Elementary School Third Grade Science Course. In this study, the elementary schools in Ankara have been divided into three groups, which are “high level, medium level, and low level”, based on their success levels. The results of the study suggest that in terms of achievement level of prerequisite behaviors regarding the curriculum and achievement level of the acquisitions included in the curriculum, there is a significant difference between groups, which is in favor of the high level group. Similarly, it has been detected that in terms of both academic self-concept levels of students in the Third Grade Science Course and the quality of the education service given in the Elementary School Third Grade Science Course, there is a significant difference between groups, which is in favor of the high level group.

Keywords: curriculum evaluation, science course, science education, elementary school third grade, academic self-concept

INTRODUCTION

Human beings, who start learning the moment they are born to this world, can only effectively adapt to the changes around them and maintain their life through learning. Due to its critical importance, learning plays a crucial role in the life of human beings. There are various definitions of learning in the literature. According to Gage and Berliner (1984), learning is the process during which, individuals make changes in their behaviors as a result of their experiences. Slavin (2006) argues that learning is the change occurring in an individual due to the experiences one has had. Woolfolk (2010) states that learning is a process, which causes permanent changes in an individual’s knowledge or behaviors through experience. Senemoğlu (2013) defines learning as a change relatively permanent change in behaviors, which are products of experiences, or in potential behaviors, and adds that learning cannot be attributed to temporary changes occurring due to growth or influences in one’s body. Examining these definitions, it becomes apparent that the common point of all of them is the fact that learning occurs as a result of experiences of an individual and causes permanent changes in an individual. However, every learning occurring due to the experiences of an individual may not be as desired. Learning can occur in the desired manner only if it is through education. Ertürk (2013) discusses that education is the process, during which individuals willingly make desired changes in their behaviors through experience. As indicated by the previous definition, desired changes in individuals’ behaviors can only occur through education.

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State of the literature

- The studies in the literature that examine the science course curricula are commonly based on the views of teachers.
- There are only few studies in the literature that investigate curricula in terms of to what extent they achieve the learning objectives stated therein. The previous studies do not examine a whole science curriculum, but only a few units of a curriculum.
- In Turkey, until the academic year of 2014-2015, science courses were given starting from the fourth grade. Therefore, the previous studies that examine the curriculum of science courses have been usually conducted at the fourth-grade level or higher.

Contribution of this paper to the literature

- This study has been carried out at the first year, in which the curriculum was implemented for the first time. Evaluating a curriculum at its first year of implementation is of utmost importance for the early decisions to be made in order to increase the effectiveness of the curriculum.
- This study provides significant insight into how giving science course at the third-grade level impacts the success of students at the science course.
- As distinct from the previous studies examining a curriculum, this study also examines the factors, which affect the achievability of the objectives stated in the curriculum.

Considering the fact that an effective education could raise individuals, who contribute to the development of a country, it can be uttered that education is of utmost importance not only for individuals but also for countries. The social and economic development of a country depend on how developed education is in that country. In the age of information and technology, especially science education possesses a significant impact on the development of a country.

Ever since the proclamation of the republic in Turkey, an answer has been sought to the question on how to provide a more effective science education in schools. For that purpose, various suggestions about how to increase success level of students in science lessons, have been put forward. In light of these suggestions, current science curricula have been re-arranged or new science curricula have been developed.

The most recent adjustments in the field of science education in Turkey have been brought by the implementation of the new 4+4+4 education system. In Turkey, until the academic year of 2012-2013, the education system was implemented as 5+3+4. In other words, elementary school lasted for 5 years, secondary school lasted for 3 years, and high school lasted for 4 years. Starting from the academic year of 2012-2013, some changes were implemented in the education system, thereby the education duration in elementary school was decreased by 1 year and the education duration in secondary school was increased by 1 year, which resulted in the 4+4+4 education system. New curricula have also been developed along with this new system. Within that context, the Curriculum of the Science and Technology Course, which had been valid ever since 2005, was abrogated and new Curricula of the Science and Technology Course was developed in 2013.

Whether the Curriculum of the Science and Technology Course developed in 2013 is as effective as desired, can only be determined through evaluating the curriculum. According to Tyler (1949), which aspects of a curriculum are effective and which aspects of a curriculum need to be improved can be detected only through evaluation.

According to Erden (1998), curriculum evaluation is "the process of collecting data about the effectiveness of a curriculum through observance and various assessment tools, comparing the collected data with the criteria that are the indicators of effectiveness of a curriculum, and deciding on the effectiveness of the curriculum". Saylor, Alexander, and Lewis (1981) describe evaluation as "the process of judging the suitability of the preferences in the curriculum".

According to Gredler (1996), evaluation may be carried out at any stage of the process of developing a curriculum. The evaluations conducted at each step of the process of developing a curriculum are different from one another (Lewy, 1977). Therefore, curriculum evaluation involves many evaluation studies that are different from each other. For that reason, it is not possible to state only one approach or model when it comes to curriculum evaluation. Examining the literature makes it apparent that there are various approaches to evaluating a curriculum, which vary based on the purpose of evaluation. Examining the curriculum evaluation studies on science curricula conducted both at home or abroad, it is observed that such curricula are often examined according to the views of teachers. However, one of the most fundamental ways to deliver a decision on the effectiveness of a curriculum is to determine whether the objectives have been achieved by students at the desired level, or not. Therefore, this research is based on "Objective-Oriented Evaluation Approach" by Tyler. In Tyler's objective-oriented evaluation approach, which aims at determining to what extent objectives have been achieved, there are seven steps that are as follows (Fitzpatrick et al., 2004):

1. Determining the purposes and objectives of the curriculum
2. Classifying purposes or objectives
3. Defining objectives in behavioral terms
4. Finding situations, which demonstrate that objectives have been achieved
5. Developing or selecting assessment techniques
6. Collecting data about the performance
7. Comparing the data collected through performance with the objectives defined in behavioral terms

In this research, the Curriculum of the Elementary School Third Grade Science Course has been evaluated according to the "Objective-Oriented Evaluation Approach" by Tyler. Within that scope, each acquisition of the curriculum has been accepted as an objective and to what extent these objectives have been achieved, has been determined.

With the new Curriculum of the Science Course developed in 2013, the name of the course, which was "Science and Technology" has been changed to "Science". Furthermore, the science lessons, which used to be instructed starting from fourth grade, are now given starting from the third grade. However, with the 1926 elementary school curriculum in Turkey, collective teaching principle had been implemented in the first phase of elementary schools including first, second, and third grade, and many courses had been gathered under "Life Sciences" course. One of these courses is the science course, which was named as "Nature Examination" then (Çelenk et al., 2000). In other words, the science-related subjects in the elementary school curriculum of Turkey had been instructed within the scope of Life Sciences course in the first, second, and third grades of elementary school ever since 1962. The science-related subjects are still given within the scope of the Life Sciences course in the first and second grade, however, ever since 2014-2015, these subjects are separately instructed within the scope of "Science" course in the third grade. This is also a significant change from the perspective of elementary school science education.

Examining the Curriculum of the Science Course developed in 2013, it is observed that science-related knowledge, skills, perception etc., which are expected to be acquired by students, are stated under the title of acquisitions. These expressions listed under the title of acquisitions consist of the objectives of the curriculum. Taking a look at the acquisitions in the Curriculum of 2013 makes it apparent that it had less acquisitions than the Curriculum of 2005. There were 978 acquisitions in total for fourth, fifth, sixth, seventh, and eighth grade, in the Curriculum of 2005 whereas; there were 330 acquisitions for third, fourth, fifth, sixth, seventh, and eighth grade in the Curriculum of 2013. In other words, the total number of acquisitions in the Curriculum of 2013 only equals to one-third of the total number of acquisitions in the Curriculum of 2005 (M.E.B., 2005; M.E.B., 2013). Karatay et al. (2013) 2013 argues that the fact that decreasing the number of acquisitions increases the period of the course hour per acquisition, which creates more convenient terms for teachers, thus is actually positive.

In the Curriculum of 2013, there were 7 units per each grade including the third, fourth, fifth, and seventh grade, and 8 units per grade for the sixth and eighth grade. The seven units, which are included within the scope

of the Curriculum of Elementary School Third Grade Science Course and evaluated within the context of the study, are as follows (M.E.B., 2013):

1. The Five Senses
2. Introduction to Force
3. Introduction to Materials
4. Lights and Sounds around Us
5. A Journey to the World of Living Creatures
6. Electrical Devices in Our Life
7. Introduction to Our Planet

Objective and Significance of the Study

The fundamental objective of the study is to descriptively evaluate the effectiveness of the Curriculum of Elementary School Third Grade Science Course. Within that context, the aim of the study is to determine the level of achievement of objectives included in the Curriculum of Elementary School Third Grade Science course, the level of students' possession of the prerequisite behaviors that are related to the Third Grade Science course as well as their academic self-concept levels, and the quality of the teaching service provided in the Third Grade Science course. Due to the fact that the Curriculum of Elementary School Third Grade Science course was applied for the first time in the academic year of 2014-2015, there are no studies in the literature, which are about evaluating a curriculum and attainment of the objectives stated in a curriculum. Therefore, there appears to be a need to conduct such a study, which could help determine the effectiveness of the Curriculum of Elementary School Third Grade Science course. This is because it is only possible to decide whether a curriculum is effective and whether a curriculum meets the expectations or not, by evaluating that curriculum in effect. In this research, it has been aimed to collect information about the effectiveness of the Curriculum of Elementary School Third Grade Science Course by evaluating it. It is expected that the collected information will contribute to the studies that will be conducted in order to improve the curriculum.

Within the scope of this study, the Curriculum of Elementary School Third Grade Science course was evaluated in its first year of implementation (academic year of 2014-2015). It is believed the fact that this study, in which the strengths and weaknesses of the curriculum is determined, was conducted in the first year of implementation of the curriculum will significantly contribute to the early decisions about the curriculum and will provide important information at the stage of implementing and updating the curriculum.

Developing a curriculum is a process that requires continuity. It is necessary to keep developing a curriculum even after it is put into implementation. According to the data retrieved as a result of the evaluation of a curriculum, the deficiencies spotted in the curriculum should be taken into consideration and taken as a basis in accordance with which the curriculum should be modified. It is assumed that this study, in which the level of achievement of the objectives stated in the Curriculum of Elementary School Third Grade Science course and the factors affecting the level of achievement of these objectives have been obtained, will be a guide for future studies that are related to developing the curriculum.

Problem Statement

What are the clues related to the level of achievement of the objectives stated in the Curriculum of Elementary School Third Grade Science course and the factors affecting the achievement level?

Sub-problems

1. What is the level of achievement of prerequisite behaviors detected in the Curriculum of Elementary School Third Grade Science course? Is there a significant difference among the low, medium, and high level schools in terms of elementary school third grade students' level of achievement of prerequisite behaviors detected in the Curriculum of the Grade Science course?

2. What is elementary school third grade students' level of achievement of behaviors detected in the Curriculum of the Science course? Is there a significant difference among the low, medium, and high level schools in terms of elementary school third grade students' level of achievement of the behaviors stated in the Curriculum of the Grade Science course?
3. What is the academic self-concept level of elementary school third grade students in terms of Science course? Do the academic self-concept levels of elementary school third grade students in terms of Science course present a significant difference among low, medium, and high level schools?
4. What is the quality of the teaching service provided in the Elementary School Third Grade Science course? Is there a significant difference among the low, medium, and high level schools in terms of the quality of the teaching service provided in the Elementary School Third Grade Science course?

METHODOLOGY

Research Design

In this study, since it has been aimed to describe the Curriculum of Elementary School Third Grade Science course in its current state, single and relational screening models, which are listed in the category of general screening models, have been used. According to Karasar (2006), single screening model is a research model, through which the formation of variables one by one or on amount basis is determined. Relational screening model targets at determining whether there is covariance between two or more variables and/or the level of that covariance.

Sampling and Population of the Study

The population of the research consists of elementary school third grade students in Ankara. In this study, the elementary schools in Ankara have been divided into three groups, which are "high level, medium level, and low level", based on their success levels; proportional cluster sampling method has been employed to determine the sampling of each school group. In this study, the elementary schools in Ankara were ranked based on their average of 2011 SBS (Placement Test) in order to determine high level, medium level, and low level schools. According to this ranking the schools, which fell under the first 27% of the pie chart, were considered high level; the schools, which fell under the final 27% of the pie chart, were considered low level; and the schools, which were between these two levels, were accepted as medium level schools. The study was conducted in 9 schools selected from 8 different central districts of the province of Ankara. The scope of the study consists of 2 high level schools, 4 intermediate level schools, and 3 low level schools.

The sampling size of 95604 students, who consist of the population of the study, was calculated by using the following formula (Büyükoztürk et al., 2014):

$$n_0 = [(t \times S) / d]^2 \quad (1)$$

$$n = [n_0 / (1 + (n_0 / N))] \quad (2)$$

The meanings of the symbols in the formula are explained below:

n: Sample size

N: Population size

S: Estimated standard deviation value for the population

d: amount of deviation

t: Table value corresponding to the reliability level of 95%

When values are placed in the formula stated above, the sampling size equals to 597. Moreover, the study has been conducted with the participation of 632 students. **Table 1** presents the number of students belonging to each level when the 632 students, who are included in the high, medium, and low level schools, are classified.

Table 1. Sampling sizes

	High Level	Medium Level	Low Level	Total
Number of Students	164	269	199	632

In the research, the schools, which were observed, were also determined through maximum diversity sampling method, which is one of the purposeful sampling methods. In this direction, one classroom was selected from each of the 3 schools, which were classified as high, medium, and low level, consequently, 3 classrooms were observed in total.

Instruments

“Level Identification Test for Elementary School Third Grade Science Course”, “Cognitive Entry Behaviors Test for Elementary School Third Grade Science Course”, and “Observation Form” were developed by the researchers within the scope of the study. Furthermore, the “Academic Self-Concept Scale”, which has been translated into Turkish by Senemoğlu (1989) from the ‘Self-Concept of Mathematical Ability’ scale of Brookover, was rearranged according to the Elementary School Third Grade Science course.

Level identification test for elementary school third grade science course

In order to develop the Level Identification Test for Elementary School Third Grade Science Course, a table of specifications were created by primarily paying attention to the acquisitions and content of the curriculum. 3 questions were written per each acquisition of the curriculum, based on the table of specifications. For that matter, 84 questions were written for 28 acquisitions stated in the curriculum. Taking the development level of the students into account, the questions were prepared as three-choice questions.

The opinions of experts were sought with regard to scientific accuracy, content validity of the level identification test, and understandability of the questions. Within that scope, the opinions of 8 people, who are experts in the field of classroom teaching, curriculum development, assessment & evaluation, and science, were obtained in regard to the level identification test. The coherence among the experts, whose opinions were retrieved, was calculated by Krippendorff alpha technique. The calculations suggest that alpha value is 0.81. This value indicates that there is a high level of coherence among the experts, whose opinions were sought. In accordance with the feedback received from the experts, necessary modifications were conducted on the level identification test, which was subsequently rearranged. In addition to this, so as to determine the understandability and level convenience of the questions of the level identification test, 5 elementary school fourth grade students were asked to loudly read the questions; the questions were modified according to the feedback received from the students.

The level identification test consisting of 84 items was divided into 3 forms consisting 28 items, by taking development levels of students into consideration. Each trial form of the level identification test was applied to 212 elementary school fourth grade students in total in three different sessions. These sessions were carried out in the last week of May of the academic year of 2013-2014. The data collected from the trial implementation were analyzed via “ITEMAN” software; difficulty and discrimination indexes of each question were calculated. As a result of the analysis, we were attentive while selecting the items, whose item difficulty level was intermediate and discrimination index was above 0,30; among three items evaluating the same acquisition, the best one was selected and final test form was achieved. The final form of the level identification test of the Elementary School Third Grade Science course consists of 28 items. KR-20 reliability coefficient of the test has been calculated as 0.88.

Cognitive entry behaviors test for elementary school third grade science course

First of all, in order to develop the Cognitive Entry Behaviors Test For The Elementary School the Third Grade Science Course, the acquisitions stated in the Curriculum of the Elementary School the First and Second Grade Life Sciences Course were examined; expert opinions have been obtained and 13 acquisitions, which are believed to be a prerequisite for the Elementary School the Third Grade Science Course, have been determined. Considering these acquisitions and the Curriculum of the Elementary School the First and Second Grade Life

Sciences Course, a table of specifications was developed. 3 questions were written per each acquisition demonstrated in the table of specifications. In that direction, 39 questions were written about 13 acquisitions from the curricula of elementary school first grade and second grade life sciences course, which are considered as prerequisites for elementary school third grade science course. Taking the development level of the students into account, the questions were prepared as three-choice questions.

The opinions of experts were sought with regard to scientific accuracy, content validity of the cognitive entry behaviors test, and understandability of the questions. Within that scope, the opinions of 7 people, who are experts in the field of classroom teaching, curriculum development, assessment & evaluation, and science, were obtained in regard to the cognitive entry behaviors test. The coherence among the experts, whose opinions were retrieved, was calculated by Krippendorff alpha technique. The calculations suggest that alpha value is 0.82. This value indicates that there is a high level of coherence among the experts, whose opinions were sought. In accordance with the feedback received from the experts, necessary modifications were conducted on the cognitive entry behaviors test, which was subsequently rearranged. In addition to this, so as to determine the understandability and level convenience of the questions of the cognitive entry behaviors test, 5 elementary school third grade students were asked to loudly read the questions; the questions were modified according to the feedback received from the students.

The cognitive entry behaviors test consisting of 39 items was divided into 2 forms consisting 21 and 18 items, by taking development levels of students into consideration. Each trial form of the cognitive entry behaviors test was applied to 221 elementary school third grade students in total in three different sessions. These sessions were carried out in the last week of May of the academic year of 2013-2014. The data collected from the trial implementation were analyzed via "ITEMAN" software; difficulty and discrimination indexes of each question were calculated. As a result of the analysis, we were attentive while selecting the items, whose item difficulty level was intermediate and discrimination index was above 0,30; among three items evaluating the same acquisition, the best one was selected and final test form was achieved. The final form of the cognitive entry behaviors test of the Elementary School Third Grade Science course consists of 13 items. KR-20 reliability coefficient of the test has been calculated as 0.77.

Academic self-concept scale

Within the scope of the study, with the aim of determining academic self-concept levels of the students with regards to the Elementary School Third Grade Science Course, the "Academic Self-Concept Scale", which has been translated into Turkish by Senemoğlu (1989) from the 'Self-Concept of Mathematical Ability' scale of Brookover, was rearranged according to the Elementary School Third Grade Science course. In order to conduct a reliability study, the scale was implemented to 221 students in the last week of May of the academic year of 2013-2014. The results of the analysis suggest that reliability of the scale is 0.80.

Observation form

An observation form has been developed by researcher with aim of finding out the quality of the teaching service provided in the Elementary School the Third Grade Science course. The items in the observation form include the behaviors expected from teachers in order to conduct a quality teaching. In order to determine each teaching behavior in the observation form, they firstly examined the behaviors that are expected from the teachers in the curriculum of elementary school third grade science course, then reflected them on the observation form. Furthermore, the literature (Slavin, 2006; Woolfolk, 2010; Ertürk, 2013; Senemoğlu, 2013) relevant to determining teacher behaviors was also reviewed; the teacher behaviors, which are necessary for providing a qualified teaching service, are included in the observation form. The observation form had four degrees including "Always observed", "Frequently observed", "Rarely observed", and "Never observed". For this observation form, the opinions of 7 people, who are experts in the field of classroom teaching, curriculum development, and assessment & evaluation, were sought. According to the expert opinions, the observation form has been rearranged and necessary modifications have been completed. The coherence among the experts, whose opinions were retrieved, was calculated by Krippendorff alpha technique. The calculations suggest that alpha value is 0.85. This value indicates

that there is a high level of coherence among the experts, whose opinions were sought. So as to retrieve more reliable data during the observations, a second observer accompanied the researcher. Both of the researchers carried out their observations by being aware of and keeping the success level of schools in mind. The reliability of the observation form has been discovered by calculating the Sperman Brown rank order correlation coefficient between the scores given by two observers. The calculations suggest that this coefficient value is 0.89. This result indicates that there is an extensive relation between the observation scores of two observers.

Implementation of the Data Collection Tools

“The Cognitive Entry Behaviors Test for Elementary School Third Grade Science Course”, which has been developed within the scope of the study, was implemented in the high, medium, and low level schools at the beginning of the academic year of 2014-2015. “The Level Identification Test for Elementary School the Third Grade Science Course” and “the Academic Self-Concept Scale”, which has been translated into Turkish by Senemoğlu (1989) from the ‘Self-Concept of Mathematical Ability’ scale of Brookover and has been rearranged according to the Elementary School the Third Grade Science course were implemented in the high, medium, and low level schools both at the beginning and end of the academic year of 2014-2015.

With the aim of determining the quality of the teaching service provided in the Elementary School the Third Grade Science Course, in the fall semester of the academic year of 2014-2015 one classroom was selected from each school level including high, medium, and low level schools, and observed for 15 weeks. All three classrooms were observed for two hours a week, which equals to 90 hours in total. A second observer accompanied the researcher throughout the observations. The structured observation form developed by the researcher has been used throughout the observations.

Processing and Analysis of the Data

With regards to the first sub-problem of the study, the percentage of accurate answers given to each item in the cognitive entry behaviors test has been calculated in order to determine the level of achievement of the prerequisite behaviors related to the Curriculum of the Elementary School the Third Grade Science course. In addition one-way analysis of variance (ANOVA) has been conducted in order to find out whether there is a significant difference among the low, medium, and high level schools in terms of elementary school third grade students’ level of achievement of prerequisite behaviors detected in the Curriculum of the Third Grade Science course. In case of any significant difference is detected, Scheffe test would be carried out to determine among which groups there was a difference.

Regarding the second sub-problem of the study, the percentage of accurate answers given to each item in the level identification test has been calculated in order to determine the level of achievement of the objectives stated in the Curriculum of the Elementary School the Third Grade Science course. In addition one-way analysis of covariance (ANCOVA) has been conducted in order to find out whether there is a significant difference among the low, medium, and high level schools in terms of elementary school third grade students’ level of achievement of the objectives stated in the Curriculum of the Third Grade Science course. In the covariance analysis the post-test scores, which were rearranged according to the scores the students had obtained in the pre-test, were utilized. In case of any significant difference is detected, Bonferroni test would be carried out to determine among which groups there was a difference.

Regarding the third sub-problem of the research, the average of the pre-test and post-test score implementations of the scale was calculated so as to determine the academic self-concept level of the elementary school third grade students in terms of science course. In addition, paired samples t test was carried out in order to find out whether there was a significant difference between the pre-test and post-test scores of the students, who studied at the high, medium, and low level schools, in terms of the implementation of the scale. In addition one-way analysis of covariance (ANCOVA) has been conducted in order to discover whether there is a significant difference among the low, medium, and high level elementary schools in terms of their third grade students’ academic self-concept levels about the Science course. In the covariance analysis the post-test scores, which were

rearranged according to the scores the students had obtained in the pre-test, were utilized. In case of any significant difference is detected, Bonferroni test would be carried out to determine among which groups there was a difference.

Regarding the fourth sub-problem of the study, the data collected from the observation form were used in order to determine the quality of the teaching service provided in the elementary school third grade Science course. Frequency, percentage, and arithmetic mean values were calculated for each teacher behavior in the observation form, according to the grading in the observation form. In addition since normality estimation has not been met, Kruskal Wallis-H test has been conducted in order to find out whether there is a significant difference among the low, medium, and high level schools in terms of the quality of the teaching service provided in the elementary school third Grade Science course. In case of any significant difference is detected, Mann Whitney U test would be carried out among dual groups so as to determine among which groups there was a difference.

FINDINGS

Findings on the First Sub-Problem

The percentage of accurate answers given to each item in the cognitive entry behaviors test has been calculated in order to determine the level of achievement of the prerequisite behaviors related to the Curriculum of the Elementary School Third Grade Science course; these values have been accepted as the levels of achievement of the prerequisite behaviors related to the curriculum. The criterion of achieving the prerequisite behaviors has been determined as 0.75. **Table 2** demonstrates the percentages related to the levels of achievement of the prerequisite behaviors detected in the Curriculum of Elementary School Third Grade Science course.

Examining the **Table 2**, it becomes apparent that the students studying in the high-level school possess all of the 13 prerequisite behaviors at the level of 0.75 and above; the students studying at the medium level schools possess only 5(38.46%) of the prerequisite behaviors at the level of 0.75 and above. However, the students studying at the low level schools do not have any of these prerequisite behaviors at the level or 0.75 or above. Taking an overall look at the level of possession of the prerequisite behaviors in all groups, the students only possess 3 behaviors at the level of 0.75 and above.

Table 2. Levels of achievement of the prerequisite behaviors detected in the curriculum of elementary school third grade science course

Prerequisite Behaviors	High Level Group (%)	Medium Level Group (%)	Low Level Group (%)	All Groups (%)
1. Determines what can be done for one's personal care.	0.82	0.77	0.69	0.76
2. Takes responsibility of protecting one's health and explains what should be done in schools to protect one's health.	0.79	0.55	0.44	0.58
3. Explains the relationship among healthy growth & development, personal care, sports, and balanced & proper diet.	0.78	0.51	0.43	0.56
4. Distinguishes the role sense organs play in recognizing the environment.	0.84	0.76	0.62	0.74
5. Associates the functions of organs with a healthy life.	0.85	0.68	0.61	0.70
6. Realizes that every living creature needs a home.	0.83	0.76	0.63	0.74
7. Realizes the differences and similarities between the natural environment and the artificial environment.	0.82	0.76	0.66	0.75
8. Realizes the events of freezing, melting, boiling, and evaporation by observing adults cooking in the kitchen.	0.85	0.77	0.69	0.77
9. Comprehends that matters do not disappear but only change forms, by observing water as it transmutes.	0.78	0.45	0.37	0.51
10. Observes the solid, liquid, and gas states of matter and classifies matters based on his/her observations.	0.82	0.45	0.39	0.53
11. Making interferences about the consequences that may occur when safety rules are not obeyed at home.	0.80	0.63	0.57	0.66
12. Explains why resources at school should be consciously consumed.	0.80	0.61	0.55	0.64
13. Researches the events occurring as a result of the rotation of the World around its own axis and the axis of the Sun; distinguishes the differences and similarities between the two.	0.79	0.49	0.43	0.55

One-way analysis of variance (ANOVA) has been conducted in order to find out whether there is a significant difference among the low, medium, and high level schools in terms of elementary school third grade students' level of achievement of prerequisite behaviors detected in the Curriculum of the Third-Grade Science course. Should there be any significant difference found following the results of the analysis, Scheffe test would be carried out to determine among which groups there was a difference. The data retrieved are presented in **Table 3** and **Table 4**.

Table 3. Descriptive statistics about the cognitive entry behaviors test

Groups	n	$\bar{X}/13$	ss
High Level Group	164	10.58	2.02
Medium Level Group	269	8.19	2.07
Low Level Group	199	7.09	2.41

Table 4. Anova results about the cognitive entry behaviors test

Variation Source	KT	sd	KO	F	P
Inter-group	1130.041	2	565,020	119,701	.000*
Intra-group	2969.048	629	4,720		
Total	4099.089	631			

*p<0.05

Examining the **Table 3** and **Table 4**, the results of the ANOVA analysis conducted with the scores the students obtained from the cognitive entry behaviors test suggest that the arithmetic average of the high level group is 10.58; the arithmetic average of the medium level group is 8.19; and the arithmetic average of the low level group is 7.09. Furthermore, there is a significant difference among the arithmetic averages of the high, medium, and low level groups, which is at the level of 0.05. **Table 5** presents the results of the Scheffe test, which was carried out to find out among which groups this difference existed.

Table 5. Scheffe test results about the cognitive entry behaviors test

Groups	Mean Difference	
	Medium Level Group	Low Level Group
High Level Group	2.39339**	3.48882**
Medium Level Group		1.09542**

*p<0.05 **p<0.01

Examining the **Table 5**, it becomes visible that there is a significant difference between the high level and medium level group, which is in favor of the high-level group; between the high level and low level group, which is in favor of the high-level group; between the medium level and low level group, which is in favor of the medium level group. According to the retrieved data, it can be uttered that the students at the high level group are more successful than the students at the medium level and low level groups; the students at the medium level group are more successful than the students at the low level group in terms of possessing prerequisite behaviors.

Findings on the Second Sub-Problem

The percentage of accurate answers given to each item in the level identification test has been calculated in order to determine the level of achievement of objectives stated in the Curriculum of the Elementary School Third Grade Science course; these values have been accepted as the levels of achievement of the objectives specified in the curriculum. The criterion of achieving the objectives has been determined as 0.75.

Table 6 presents the percentages related to the levels of achievement of the objectives stated in the Curriculum of Elementary School Third Grade Science course and z values, which demonstrate whether there is a significant difference among these percentages.

Table 6. Pre-test and post-test achievement percentages of the objectives specified in the curriculum of elementary school third grade science course and z values indicating whether these values are significantly different

Objectives	High Level Group			Medium Level Group			Low Level Group			All Groups		
	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value
1. Recognizes the sense organs.	0.60	0.88	-6.70	0.58	0.80	-5.37	0.48	0.77	-6.56	0.56	0.81	-10.39
2. Observes the moving creatures and expresses their movement specifications.	0.56	0.86	-6.41	0.51	0.84	-10.00	0.43	0.76	-7.65	0.50	0.82	-14.06
3. Realizes that touching, tasting, and smelling certain matters could damage a living creature's body.	0.69	0.91	-5.43	0.68	0.90	-6.43	0.47	0.79	-7.05	0.61	0.87	-11.04
4. Classifies the surrounding matters based on their states.	0.46	0.84	-8.24	0.36	0.66	-7.35	0.36	0.51	-3.18	0.39	0.66	-10.53
5. Classifies the light sources into two as natural light sources and artificial light sources.	0.59	0.96	-8.02	0.57	0.94	-11.31	0.38	0.79	-9.75	0.51	0.90	-17.65
6. Observes that sound intensity is a determinant for hearing and realizes that not all sounds can be heard via human ear.	0.42	0.88	-12.05	0.39	0.69	-7.35	0.36	0.59	-4.53	0.39	0.71	-12.27
7. Classifies the sound sources into two as natural sound sources and artificial light sources.	0.56	0.89	-6.53	0.52	0.87	-11.33	0.33	0.81	-10.48	0.47	0.85	-16.33
8. Classifies creatures as living creatures and non-living creatures by using the examples in one's environment.	0.52	0.78	-6.06	0.37	0.67	-7.70	0.31	0.52	-4.69	0.39	0.65	-10.78
9. Classifies electrical tools and instruments based on the type of electrical source they use.	0.55	0.94	-10.36	0.53	0.91	-11.06	0.37	0.77	-11.54	0.48	0.88	-19.65
10. Expresses that the shape of the world is similar to a sphere.	0.58	0.94	-8.07	0.57	0.92	-11.99	0.46	0.81	-7.77	0.54	0.89	-15.90
11. Expresses the fundamental functions of sense organs.	0.52	0.87	-7.83	0.49	0.80	-9.35	0.46	0.63	-3.95	0.49	0.77	-12.00
12. Comprehends what needs to be done to protect the health of sense organs.	0.62	0.89	-5.98	0.57	0.85	-8.35	0.45	0.75	-6.36	0.54	0.83	-12.01
13. Explains the concept of force by observing the impact of attraction and repulsion forces on moving and non-moving objects.	0.33	0.77	-12.92	0.25	0.53	-6.34	0.28	0.43	-3.67	0.28	0.56	-11.28
14. Discusses the dangers the moving objects may cause in everyday-life.	0.51	0.84	-7.94	0.48	0.68	-5.19	0.47	0.59	-2.52	0.48	0.70	-8.30
15. Explains the fundamental characteristics defining a matter by using one's five sense organs.	0.48	0.81	-6.34	0.46	0.79	-10.53	0.38	0.61	-5.26	0.44	0.74	-12.76
16. Makes an interference that light is required to see anything, as a result of his/her observations.	0.62	0.89	-7.73	0.60	0.87	-9.46	0.48	0.80	-8.04	0.56	0.85	-14.64

Examining the **Table 6** in terms of the pre-test applied at the beginning of the academic year, none of the students seems to be able to achieve any objective at the level of 0.75 or above. Looking at the **Table 6** in terms of the post-test applied at the end of the academic year, it is visible that the students, who were at the high level group,

Table 6 (continued). Pre-test and post-test achievement percentages of the objectives specified in the curriculum of elementary school third grade science course and z values indicating whether these values are significantly different

Objectives	High Level Group			Medium Level Group			Low Level Group			All Groups		
	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value	Pre-test (%)	Post-test (%)	z value
17. Comprehends the relationship between sound intensity and distance.	0.54	0.86	-6.76	0.50	0.75	-8.61	0.46	0.73	-7.85	0.50	0.77	-13.63
18. Comprehends that loud sounds may cause hearing loss.	0.37	0.80	-8.86	0.32	0.63	-8.15	0.30	0.57	-6.61	0.33	0.65	-13.60
19. Understands that each sound has a source and sound spreads in every direction.	0.37	0.78	-8.75	0.34	0.68	-7.87	0.32	0.51	-4.27	0.34	0.65	-11.87
20. Explains the differences between natural environment and artificial environment.	0.56	0.87	-8.07	0.52	0.80	-7.91	0.43	0.62	-3.87	0.50	0.76	-10.78
22. Comprehends the importance of economically using resources such as electricity and water and starts to use them economically.	0.35	0.80	-12.03	0.19	0.61	-12.74	0.18	0.55	-12.23	0.22	0.64	-21.91
23. Understands and implements the importance of situations necessary for a healthy life in his/her everyday-life.	0.45	0.76	-7.06	0.38	0.53	-3.61	0.35	0.49	-2.76	0.39	0.58	-7.09
24. Explains the significance of electricity in everyday-life by providing examples of electric tools and instruments from one's immediate surroundings.	0.48	0.84	-9.72	0.43	0.69	-7.33	0.40	0.59	-4.06	0.43	0.70	-11.27
25. Discusses the harm of battery wastes on the environment and what can be done to prevent it.	0.37	0.76	-8.18	0.22	0.59	-9.23	0.22	0.44	-5.34	0.26	0.59	-13.35
26. Researches what needs to be done for the safe use of electricity in terms of safety of life and property and comprehends the situations, which may cause electric shock.	0.46	0.76	-6.33	0.42	0.54	-2.93	0.41	0.53	-2.57	0.42	0.59	-6.38
27. Comprehends that the Earth is covered with earth and water and there is an air layer surrounding us.	0.50	0.84	-9.30	0.36	0.77	-12.32	0.30	0.54	-5.18	0.38	0.71	-15.05
28. Compares the areas covered by soil and water on the Earth with the ones demonstrated on the model.	0.52	0.80	-6.72	0.42	0.73	-8.01	0.36	0.62	-5.97	0.43	0.71	-12.00

achieved all 28 of the objectives at the level of 0.75 and above. The students at the medium level group were able to achieve 15 (53.6%) of the 28 objectives in total at the level of 0.75 and above. It was also found out that the students at the low level group achieved 10 (35.7%) of the 28 objectives in total at the level of 0.75 and above. Taking an overall look at each group's level of achievement of the objectives, it is observed that no objective in the pre-test was achieved at the level of 0.75 or above, however in the post-test the students achieved 13 (46.4%) of the 28 objectives at the level of 0.75 and above. Moreover, examining the z values in the **Table 6** makes it apparent that there is a significant difference between the pre-test and post-test percentage values regarding all of the objectives in the curriculum.

One-way analysis of variance (ANOVA) has been carried out in order to find out whether there is a significant difference among the low, medium, and high level schools in terms of the test scores obtained by the students. Should there be any significant difference found following the results of the analysis, Scheffe test would be carried out to determine among which groups there was a difference. The data retrieved are presented in **Table 7** and **Table 8**.

Table 7. Descriptive statistics about pre-test

Groups	n	$\bar{X}/28$	ss
High Level Group	164	14.20	2.64
Medium Level Group	269	12.59	2.89
Low Level Group	199	10.62	3.07

Table 8. Anova results about the pre-test

Variation Source	KT	sd	KO	F	p
Inter-group	1166.111	2	583,055	70,154	.000*
Intra-group	5227.687	629	8,311		
Total	6393.797	631			

*p<0.05

Examining the **Table 7** and **Table 8**, the results of the ANOVA analysis conducted with the scores the students obtained from the pre-test suggest that the arithmetic average of the high level group is 14.20; the arithmetic average of the medium level group is 12.59; and the arithmetic average of the low level group is 10.62. Furthermore, there is a significant difference among the arithmetic averages of the high, medium, and low level groups, which is at the level of 0.05. **Table 9** presents the results of the Scheffe test, which was carried out to find out among which groups this difference existed.

Table 9. Scheffe results about the pre-test

Groups	Mean Difference	
	Medium Level Group	Low Level Group
High Level Group	1.60776**	3.57201**
Medium Level Group		1.96425**

*p<0.05 **p<0.01

Examining the **Table 9**, it becomes visible that there is a significant difference between the high level and medium level group, which is in favor of the high-level group; between the high level and low level group, which is in favor of the high-level group; between the medium level and low level group, which is in favor of the medium level group. According to the retrieved data, it can be uttered that the students at the high level group are more successful than the students at the medium level and low level groups; the students at the medium level group are more successful than the students at the low level group in terms of the scores they obtained from the pre-test.

One-way analysis of covariance (ANCOVA) has been conducted so as to find out whether there is a significant difference among the low, medium, and high level schools in terms of elementary school third grade students' level of achievement of the objectives stated in the Curriculum of the Third Grade Science course. In the covariance analysis the post-test scores, the scores the students obtained from the pre-test were taken as statistical control variant and the post-test scores, which were rearranged according to the scores the students had obtained in the pre-test, were used. Should there be any significant difference found following the results of the analysis, Bonferroni test would be carried out to determine among which groups there was a difference.

Table 10 demonstrates the averages of the post-test scores of the students studying at high, medium, and low level schools and the averages of the post-test scores, which were rearranged according to the scores they had collected from the pre-test.

Table 10. Students' averages of post-test scores and averages of the post-test scores, which were rearranged according to their pre-test scores

Groups	Post-Test Average	Corrected Post-Test Average
High Level Group	23.71	22.46
Medium Level Group	20.87	20.73
Low Level Group	17.88	19.11

Examining the **Table 10**, it becomes visible that the average of the post-test scores, which was corrected according to the scored obtained from the pre-test, equals to 22.46 in the high-level group, 20.73 in the medium level group, and 19.11 in the low level group. **Table 11** presents the results of the co-variance analysis (ANCOVA), which was carried out with the purpose of determining whether there is a significant difference among the corrected post-test scores of the high, medium, and low level schools.

Table 11. Results of the Co-Variance analysis related to the level of achievement of the objectives stated in the curriculum

Variation Source	KT	sd	KO	F	p
Pre-test	2521.498	1	2521.498	171,197	.000*
Group	826,855	2	413,428	28,070	.000*
Error	9249.557	628	14,729		
Total	284765.000	632			

*p<0.05

Table 11 suggests that there is a significant difference of 0.05 among high, medium, and low level schools, in terms of the level of achievement of the objectives stated in the curriculum. **Table 12** presents the results of the Bonferroni test, which was carried out to find out among which groups this difference existed.

Table 12. Results of the Bonferroni test related to the level of achievement of the objectives stated in the curriculum

Groups	Mean Difference	
	Medium Level Group	Low Level Group
High Level Group	1,731**	3,348**
Medium Level Group		1,618**

*p<0.05 **p<0.01

Table 12 demonstrates that in terms of the level of achievement of the objectives specified in the curriculum, there is a significant difference between the high level and medium level group, which is in favor of the high level group; between the high level and low level group, which is in favor of the high level group; between the medium level and low level group, which is in favor of the medium level group. Based on the collected data, in terms of the level of achievement of the objectives specified in the curriculum the students at the high level group are more successful than the students at the medium level and low level groups; the students at the medium level group are more successful than the students at the low level group.

Findings on the Third Sub-Problem

The average of the pre-test and post-test score implementations of the scale was calculated so as to determine the academic self-concept level of the elementary school third grade students in terms of science course. The paired samples t test was carried out in order to find out whether there was a significant difference between the scores the students obtained from the pre-test and post-test implementations of the scale. The data retrieved are demonstrated in **Table 13**.

Table 13. Results of the Paired samples t test related to the academic self-concept scale

Groups		n	$\bar{X}/40$	ss	sd	t	p
High Level Group	Pre-test	164	34.26	4.39	163	-8,523	.000*
	Post-test	164	37.12	3.55			
Medium Level Group	Pre-test	269	32.42	5.21	268	-9,143	.000*
	Post-test	269	35.05	3.95			
Low Level Group	Pre-test	199	30.60	5.91	198	-7,675	.000*
	Post-test	199	33.19	4.48			

*p<0.05

Looking at the **Table 13**, there is a significant difference among the average scores all three groups obtained from the pre-test and post-test implementations of the scale. It has been found out that from pre-test to the post-test, the average scores of the students in the high level group increased up to 37.12 from 34.26; the average scores of the students in the medium level group increased up to 35.05 from 32.42; and the average scores of the students in the low level group increased up to 33.19 from 30.60. In other words, it has been detected that the academic self-concept of the students in all three groups increased in terms of the Science course.

Besides, one-way analysis of covariance (ANCOVA) has been conducted in order to discover whether there is a significant difference among the low, medium, and high level elementary schools in terms of their third grade students' academic self-concept levels about the Science course. In the covariance analysis the post-test scores, the scores the students obtained from the pre-test implementation of the scale were taken as statistical control variant and the post-test scores, which were rearranged according to the scores the students had obtained in the pre-test, were used. Should there be any significant difference found following the results of the analysis, Bonferroni test would be carried out to determine among which groups there was a difference.

Table 14 demonstrates the averages of the scores the students studying at high, medium, and low level schools obtained from the post-test implementation of the scale and the averages of the post-test scores, which were rearranged according to the scores they had collected from the pre-test implementation of the scale.

Table 14. Averages of the scores the students obtained from the post-test implementation of the scale and the averages of the post-test scores, which were rearranged according to the scores they had collected from the pre-test implementation of the scale

Groups	Post-Test Average	Corrected Post-Test Average
High Level Group	37.12	36.33
Medium Level Group	35.05	35.01
Low Level Group	33.19	33.89

Examining the **Table 14**, it becomes visible that the average of the post-test scores, which was corrected according to the scores obtained from the pre-test implementation of the scale, equals to 36.33 in the high-level group, 35.01 in the medium level group, and 33.89 in the low-level group. **Table 15** demonstrates the results of the co-variance analysis (ANCOVA), which was carried out with the purpose of determining whether there is a significant difference among the corrected post-test scores of the high, medium, and low level schools.

Table 15. Results of the Co-Variance analysis related to the academic self-concept of students

Variation Source	KT	sd	KO	F	p
Pre-test	2877.850	1	2877.850	245,975	.000*
Group	501,080	2	250,540	21,414	.000*
Error	7347.441	628	11,700		
Total	785745.000	632			

*p<0.05

Table 15 suggests that there is a significant difference of 0.05 among high, medium, and low level schools, in terms of the academic self-concept levels of the elementary school third grade students. **Table 16** presents the results of the Bonferroni test, which was carried out to find out among which groups this difference existed.

Table 16. Results of the Bonferroni test related to the academic self-concept level of students

Groups	Mean Difference	
	Medium Level Group	Low Level Group
High Level Group	1,319**	2,441**
Medium Level Group		1,122**

*p<0.05 **p<0.01

Examining the **Table 16**, it is apparent in terms of the academic self-concept levels of students that there is a significant difference between the high level and medium level group, which is in favor of the high-level group; between the high level and low level group, which is in favor of the high-level group; between the medium level and low level group, which is in favor of the medium level group. According to the retrieved data, the academic self-concept level of the students at the high level group is higher than those of the students at the medium level and low level groups; and the academic self-concept level of the students at the medium level group is higher than that of the students at the low level group.

Findings on the Fourth Sub-Problem

With the purpose of determining the quality of the teaching service provided in the Elementary School Third Grade Science course; frequency, percentage, and arithmetic mean values were calculated for each teacher behavior in the observation form, according to the grading in the observation form.

Frequency, percentage, and arithmetic mean of the teaching behaviors observed in the elementary school third grade science course are displayed in **Table 17**.

Table 17. Frequency, percentage, and arithmetic mean of the teach behaviors observed in the elementary school third grade science course

Teacher Behaviors	High Level Group				Medium Level Group				Low Level Group																						
	Always Observed	Frequently Observed	Rarely Observed	Never Observed	Always Observed	Frequently Observed	Rarely Observed	Never Observed	Always Observed	Frequently Observed	Rarely Observed	Never Observed																			
	f	%	f	%	f	%	f	%	f	%	f	%																			
1. Grabbing the attention of students to the subject to be instructed	11	73	4	27	-	-	-	-	3	73	3	20	-	-	3	1	7	6	40	8	53	-	-	2.53							
2. Telling students the name of the subject to be instructed and explaining the importance of the subject at the beginning of the lesson	15	100	-	-	-	-	-	-	4	15	100	-	-	-	4	15	100	-	-	-	-	-	-	4							
3. Checking students' prior knowledge about the subject to be instructed and enabling them to associate it with their existing knowledge	14	93	1	7	-	-	-	-	3	93	3	20	10	67	2	13	-	-	3	307	2	13	5	33	8	53	-	-	2.6		
4. Using convenient stimulants in the process of learning-teaching (hints, reinforcer, feedback, correction)	12	80	3	20	-	-	-	-	3	8	53	4	27	-	-	-	-	-	2	93	1	7	9	60	5	33	-	-	2.73		
5. Using course hours in an effective manner	11	73	4	27	-	-	-	-	2	13	73	2	13	12	80	1	7	-	-	3	73	2	13	10	67	4	27	-	-	2.8	
6. Utilization of verbal communication in an effective manner (emphasizing, toning)	11	73	4	27	-	-	-	-	2	13	73	2	13	11	73	2	13	-	-	3	2	13	9	60	4	27	-	-	2.87		
7. Using body language in an effective manner	9	60	6	40	-	-	-	-	3	6	60	3	20	9	60	3	20	-	-	3	2	13	7	47	6	40	-	-	2.73		
8. Using different methods and techniques that are convenient with the lesson subject	11	73	4	27	-	-	-	-	3	20	8	53	4	27	-	-	-	-	2	93	1	7	8	53	6	40	-	-	2.67		
9. Utilization of visual materials that could grab the attention of students to the lesson (pictures, posters, models etc.)	9	60	6	40	-	-	-	-	3	6	60	3	20	10	67	2	13	-	-	3	7	47	1	7	9	60	5	33	-	-	2.73
10. Providing everyday-life examples about the knowledge learned during the lesson	12	80	3	20	-	-	-	-	3	8	53	2	13	10	67	2	13	-	-	3	7	47	1	7	8	53	6	40	-	-	2.67
11. Detecting and immediately resolving deficient and inaccurate learnings of students	9	60	6	40	-	-	-	-	3	6	60	3	20	10	67	2	13	-	-	3	7	47	-	-	9	60	6	40	-	-	2.6
12. Providing students with the chance to learn in cooperation with one another	11	73	4	27	-	-	-	-	1	7	47	4	27	7	47	4	27	3	20	2	4	-	-	7	47	6	40	2	13	2.33	
13. Involving activities that could improve the research skills of students	9	60	6	40	-	-	-	-	3	6	60	3	20	11	73	1	7	-	-	3	13	1	7	8	53	6	40	-	-	2.67	

*1.0-1.75 Never observed; 1.75-2.50 Rarely observed; 2.50-3.25 Frequently observed; 3.25-4.0 Always observed

Table 17 (continued). Frequency, percentage, and arithmetic mean of the teach behaviors observed in the elementary school third grade science course

Teacher Behaviors	High Level Group					Medium Level Group					Low Level Group															
	Always Observed	Frequently Observed	Rarely Observed	Never Observed	\bar{X}	Always Observed	Frequently Observed	Rarely Observed	Never Observed	\bar{X}	Always Observed	Frequently Observed	Rarely Observed	Never Observed	\bar{X}											
	f	%	f	%		f	%	f	%		f	%	f	%												
14. Creating environments, where students question knowledge and discuss with one another, and being a guide for students during these discussions	12	80	3	20	-	-	3.8	4	27	8	53	3	20	-	-	3.07	1	7	7	47	7	47	-	-	2.6	
15. Involving activities that could improve the creative thinking skills of students	11	73	4	27	-	-	3.73	2	13	12	80	1	7	-	-	3.07	1	7	11	73	3	20	-	-	2.87	
16. Creating a democratic classroom atmosphere, in which students could comfortably express their own opinions	12	80	3	20	-	-	3.8	4	27	8	53	3	20	-	-	3.07	1	7	10	67	4	27	-	-	2.8	
17. Enabling students to actively participate in the lessons	10	67	5	33	-	-	3.67	5	33	7	47	3	20	-	-	3.13	1	7	9	60	5	33	-	-	2.73	
18. Enabling students to obtain knowledge on their own and guiding them throughout this process	12	80	3	20	-	-	3.8	3	20	9	60	3	20	-	-	3	1	7	8	53	6	40	-	-	2.67	
19. Giving students the opportunity to implement projects, in which they can use the knowledge learned in the lessons	-	-	-	-	15	100	1	-	-	-	-	-	-	15	100	1	-	-	-	-	-	-	-	15	100	1
20. Developing problem situations, which help students to improve their problem solving skills	10	67	5	33	-	-	3.67	1	7	10	67	4	27	-	-	2.8	-	-	8	53	7	47	-	-	2.53	
21. Providing students with the opportunity to evaluate themselves and fellow classmates	2	13	6	40	3	20	4	27	2.4	1	7	6	40	3	20	5	33	2.2	-	5	33	5	33	5	33	2
22. Involving activities, which could enable students to develop a positive attitude towards sciences (games, songs etc.)	12	80	3	20	-	-	3.8	1	7	10	67	4	27	-	-	2.8	1	7	7	47	7	47	-	-	2.6	
23. Enabling students to associate what they have learned from the lessons with their everyday-life, other subjects of science, and other lessons	10	67	5	33	-	-	3.67	1	7	11	73	3	20	-	-	2.87	1	7	6	40	8	53	-	-	2.53	
24. At the end of the lesson, enabling students to summarize what they have learned from the lesson	15	100	-	-	-	-	4	15	100	-	-	-	-	-	-	4	15	100	-	-	-	-	-	-	4	
25. Giving students suggestions to help them come to the next lessons in a prepared manner	15	100	-	-	-	-	4	15	100	-	-	-	-	-	-	4	15	100	-	-	-	-	-	-	4	

*1.0-1.75 Never observed; 1.75-2.50 Rarely observed; 2.50-3.25 Frequently observed; 3.25-4.0 Always observed

Table 17 suggests that in the high-level group, 23 (92%) of the 25 teacher behaviors specified in the observation form were always observed, whereas; 1 (4%) of them was rarely observed and 1 (4%) of them was never observed. When it comes to the medium and low level groups, 22 (88%) of the 25 teacher behaviors specified in the observation form were frequently observed, whereas; 2 (8%) of them were rarely observed and 1 (4%) of them was never observed.

Similarly, examining **Table 17**, the teacher behaviors including “Telling students the name of the subject to be instructed and explaining the importance of the subject at the beginning of the lesson”, “At the end of the lesson, enabling students to summarize what they have learned from the lesson”, and “Giving students suggestions to help them come to the next lessons in a prepared manner” were “Always observed” in all three school groups. Even though the behavior of “Providing students with the chance to learn in cooperation with one another” was “Always observed” in the high-level group, it was “Rarely observed” in the medium and low level groups. Moreover, the behavior of “Providing students with the opportunity to evaluate themselves and fellow classmates” was “Rarely observed” in all three group schools, whereas; the behavior of “Giving students the opportunity to implement projects, in which they can use the knowledge learned in the lessons” was “Never observed” in any of the three school groups.

With the aim of determining whether there is a significant difference among the low, medium, and high level schools in terms of the quality of the teaching service provided in the elementary school third Grade Science course, Kruskal Wallis-H test has been conducted with the total scores obtained from the observations. The data retrieved from the Kruskal Wallis-H are presented in **Table 18**.

Table 18. Results of the Kruskal Wallis-h test about the quality of the teaching service

Groups	n	Mean Rank	sd	X ²	p
High Level Group	15	37.47			
Medium Level Group	15	19.67	2	30.04	.000*
Low Level Group	15	11.87			

*p<0.05

Taking a look at the **Table 18** the results of the Kruskal Wallis-H test, which was carried out by using the total scores obtained from the observations, indicate that the mean rank of the high level group is 37.47; the mean rank of the medium level group is 19.67; and the mean rank of the low level group is 11.87. In addition to this, it was found out that there is a significant difference among the groups in terms of the quality of the teaching service provided in the Elementary School Third Grade Science course. So as to determine among which groups there was a difference, Mann Whitney U test was carried out among dual groups. The data retrieved from the Mann Whitney U test are demonstrated in **Table 19**.

Table 19. Results of the Mann Whitney u test about the quality of the teaching service

Groups	n	Mean Rank	Total Rank	U	p
High Level Group	15	22.73	341		
Medium Level Group	15	8.27	124	4	.000*
High Level Group	15	22.73	341		
Low Level Group	15	8.27	124	4	.000*
Medium Level Group	15	19.4	291		
Low Level Group	15	11.6	174	54	.015*

*p<0.05

Examining the **Table 19**, there is a significant difference between the high level and medium level group, which is in favor of the high level group; between the high level and low level group, which is in favor of the high level group; between the medium level and low level group, which is in favor of the medium level group. Based on the retrieved data, it can be asserted that the education service provided in the high level group is more effective than those given in the medium and low level group, whereas; the education service provided in the medium level group is more effective than that provided in the low level group.

DISCUSSION

Taking the results of the study as well as the collected data into account, it has been observed that the curriculum is only effectively implemented in the schools who are considered as high level group in terms of their success level. Only schools at the high level group have achieved all of the objectives stated in the curriculum at the level of 0.75 or above. The schools at the medium level group have only achieved half of the objectives at the level of 0.75 and above, while; the schools at the low level group have not even achieved half of the objectives at the level of 0.75 or higher. In another expression, only the high level group has achieved the objectives of the curriculum at the desired level. This finding displays similarities with the findings of the research, in which Evirgen (2013) has evaluated the Curriculum of the Elementary School Seventh Grade Science and Technologies Course. Evirgen (2013) has found out the students studying schools that are considered as high level schools due to their success level have achieved most of the acquisitions, whereas; the level of achievement of the acquisitions has gradually decreased in the students studying at medium or low level schools. In light of the data obtained from the study, it is asserted that this situation may have two reasons. The first reason may be the fact that the pre-learning of the students studying at the medium and low level schools is inadequate. The data collected from the cognitive entry behaviors test present information that makes this possibility more likely. Also, according to the data retrieved from the cognitive entry behaviors test, the students in the high level group have achieved all 13 behaviors, which are considered as the prerequisites for the Third Grade Science Course, at the level of 0.75 and above, whereas; the students at the medium level have possessed only 5 of the 13 behaviors at the level of 0.75 or above. The students studying at the low level schools have not achieved any of the 13 behaviors at the level of 0.75 or above, at all. Considering that according to Senemoğlu (2013), cognitive entry behaviors, which are significant variables affecting the learning products in Bloom's Mastery Learning Model, in other words, prerequisite behaviors are pre-learnings that make it easier or possible to learn a lesson or unit; the data obtained from the cognitive entry behaviors test indicate that only the students in the high level group have had the pre-learnings required for the Third Grade Science Course. With regard to the students at the medium and low level group, it can be asserted that they do not possess the pre-learnings required to obtain the objectives specified in the Curriculum of the Third Grade Science Course. The research carried out by Senemoğlu (1989) supports this view. In the study conducted by Senemoğlu (1989), it has been found out that the cognitive entry behaviors are the strongest precursors of learning level in the lessons, which constitute the last link of a gradual chain.

The average of the scores the students obtained from the pre-test may be another indicator that the pre-learning of students has an impact on the attainment of objectives. This is because, in terms of the average of the scores the students had obtained from the pre-test, there is a significant difference between the high level and medium level group, which is in favor of the high level group; between the high level and low level group, which is in favor of the high level group; between the medium level and low level group, which is in favor of the medium level group. In the curriculum evaluation study conducted by Şahan (2007) and Payam (2015), similar findings were obtained and the data of this study suggest that the pre-learnings of students affect the attainment of objectives. Furthermore, the results of the study conducted by Şahin Yanpar (1998) support the findings on this study. The results of Şahin Yanpar's (1998) study indicate that cognitive entry behaviors are the strongest variable predicting the learning level in the elementary school fourth grade Social Sciences course; pre-test is the strongest variable predicting the learning level in the elementary school fourth grade Mathematics course; and pre-learnings are the strongest variable predicting the learning level. Furthermore, when the literature is reviewed, in many of the previous studies findings stating that pre-learning affects students' academic success, have been found (Thompson & Zamboanga, 2004; Hailikari et al., 2008; Nunez et al., 2014; Ayodele, 2017).

Another reason why only the high level group was able to achieve the objectives of the curriculum at the desired level may be due to the quality of the education service provided in schools. The findings collected from the observations in schools support this possibility. As a result of the observations, it has been determined that in terms of the education quality, there is a significant difference between the high level and medium level group, which is in favor of the high level group; between the high level and low level group, which is in favor of the high level group; between the medium level and low level group, which is in favor of the medium level group. That is to say, as a result of the observations, the education service provided in the high level group is more effective than

those provided in the medium and low level group. Bloom (1976) argues that the quality of the education service generally has the ability to explain at least one quarter of the variability observed in the cognitive success assessments and an education service of low quality has a bad influence not only on the learning that has been executed but also on the learning to be executed in future. Thereby, it is possible to say one of the reasons why the high level group has been more successful than the medium and low level group in terms of the level of achieving objectives, may be because of the quality of the education service provided in these schools.

Considering the findings collected through observing schools, it becomes apparent that even though the behavior of "Providing students with the chance to learn in cooperation with one another" was "Always observed" in the high-level group, it was "Rarely observed" in the medium and low level groups. In other words, the students studying in the high level schools are more frequently provided with the chance to learn in cooperation than the students studying in the medium and low level schools. Also, the fact that the students at the high level group are more frequently given the chance to learn in cooperation may positively impact the students' success in science courses. Many of the previous studies conducted in the literature also support this view. In the researches carried out by Doymuş et al. (2004), Baines et al (2007), Kınal et al. (2007), Şenol et al. (2007), Bozkurt et al. (2008), Thurston et al. (2008), Gök et al. (2009), Ajaja and Eravwoke (2010), Aksoy and Gürbüz (2012), Ebrahim (2012), Parveen and Batool (2012), Kozcu Çakır et al. (2013) and Meder (2014) it has been determined that students learning in cooperation positively affects their success in science lessons.

The observations conducted in schools suggest that the teacher behavior of "Providing students with the opportunity to evaluate themselves and fellow classmates" was "Rarely observed" in all three groups. In another expression, in all three school groups, the teachers have rarely included self-evaluation or peer assessment activities. The results of the observations conducted by Akdeniz et al. (2002) and Demirtaş (2012) in science courses, also display similarities. In the study conducted by Akdeniz et al. (2002), it has been found out that only 25% of teachers provide students with the chance to evaluate themselves. Moreover, one finding of the study carried out by Demirtaş (2012) states that teachers do not give students the opportunity to evaluate their work or group works in science courses. In the studies conducted by Alp (2007), Şeker (2007), Belli (2009), and Buluş Kırıkkaya (2009) with the purpose of obtaining teacher opinions, it was determined that teachers do not include self-evaluation or peer assessment activities at an adequate level.

The findings obtained through the observations in schools indicate that the behavior of "Giving students the opportunity to implement projects, in which they can use the knowledge learned in the lessons" was not observed in any of the groups. That is to say, the teachers in any of the school groups did not include project works throughout the process of teaching-learning. The studies carried out by Unayağyol (2009) and Demirtaş (2012) also present similar findings. In the study conducted by Unayağyol (2009), it has been found out that project-based learning is the least frequently used method employed by teachers in science course. Furthermore, one finding of the research carried out by Demirtaş (2012) demonstrates that teachers rarely include project assessment studies in science courses. The fact that in science lessons, in which the everyday-life events and situations are instructed, students are not given the opportunity to implement projects, in which they can use the knowledge learned in the lessons, is a significant deficiency from the perspective of science education.

The observations in the study prove that two significant teacher behaviors including "Providing students with the opportunity to evaluate themselves and fellow classmates" and "Giving students the opportunity to implement projects, in which they can use the knowledge learned in the lessons" are not adequately executed by teachers in any of these three school groups. Thus, it should be taken into consideration that besides teacher behaviors, other factors such as intelligence, learning capacity, talent etc. could also be effective on the ability of the students, who study at high level groups, to achieve all of the objectives in the curriculum.

Another finding obtained from the study is that the academic self-concept of the students studying at high level schools is higher than that of the students studying at medium and low level schools, just like their level of achievement of the objectives specified in the Curriculum of the Elementary School Third Grade Science course is higher than that of the students at the medium and low level schools. Hence, the reason why the academic self-concept level of the students display a significant difference among high, medium, and low level groups in terms

of elementary school third grade Science course, may be due to the success levels of the students in the Science course. In other words, the success of students in Science course may positively affect their academic self-concept level in terms of this course. The studies conducted by Çakır et al. (2000) and Demirbaş and Yağbasan (2010) in science courses also support this view. The scale used in this study was adapted to the science course and employed in both studies. In the study carried out by Çakır et al. (2000), it was found out that in the sixth grade science course the variable, which explains the academic self-concept in the most challenging manner, is report cards displaying the science grades of a student thus accepted as an indicator of how successful a student is. A similar finding was obtained in the research carried out by Demirbaş and Yağbasan (2010), which states that the higher the students' science course grade get compared to the previous semester, the higher their academic self-concept scores become in terms of the sixth grade science course. Besides, in the literature, there are many studies demonstrating the relationship between academic concept and academic success (Muijs, 1997; Sanchez & Roda, 2003; Wilkins, 2004; Ghazvini, 2011; Dramanu & Balarabe, 2013; Kumari & Chamundeswari, 2013; Oluwatosin & Bamidele, 2014; Ayodele, 2016).

This study has been conducted within the scope of the Curriculum of Elementary School Third Grade Science Course, which includes the science-related subjects specified in the Curriculum of Elementary School Third Grade Life Sciences Course. Further studies could be conducted on the Curriculum of Elementary School Third Grade Life Sciences Course by only focusing on the science-related subjects in it. Moreover, this study evaluates a science course curriculum, which is applied at the level of third grade for the first time. Therefore, longitudinal studies could be carried out to examine the relationship between the success of elementary school third grade students in Science course and their success in the fourth grade Science course.

CONCLUSION

The findings obtained through this study, in which elementary school third grade science course curriculum is evaluated, suggest that the objectives of the curriculum are more achievable for the students studying at the schools in the group with a higher level of success. However, the objectives of a curriculum must be achievable for all students. Therefore, different student profiles must be taken into consideration while determining the objectives of a curriculum, so that the objectives can appeal to all of the students. In that direction, the objectives in the Curriculum of Elementary School Third Grade Science Course, which was examined within the scope of the study, need to be revised. In this research, it has been found out that prerequisite learning is one of the reasons why the students, who study at school of intermediate and low success group schools, are unable to achieve the objectives in the curriculum. Based on these findings, it can be suggested that the objectives in the Curriculum of Elementary School Third Grade Science Course be revised by taking account of the objectives relevant to the science education in the curriculum of elementary school first and second grade life sciences course.

Since the students studying at intermediate and low success level schools do not possess the prerequisite learnings required to achieve the objectives, the teachers teaching at these schools have more responsibility for that matter. The teachers working in these schools must detect the learning deficiencies of students about the subjects in the elementary school first grade life sciences course and the elementary school second grade life sciences course. These learning deficiencies must be eliminated by teachers before they start to implement the curriculum of elementary school third grade science course. Therefore, teachers teaching at elementary school first grade and second grade must not forget that the science education they deliver within the scope of life sciences course are preparatory courses for the third grade science course.

The observations in the study suggest that the teachers working at all three school groups did not carry out any project activities in the elementary school third grade science course, at all. This situation in Turkey may result from the fact that until the academic year of 2014-2015, in other words, until the curriculum of elementary school third grade science course was implemented for the first time, science courses used to be given at the fourth grade level. This is because teachers were introduced to a new course at the third grade level with this curriculum. Therefore, teachers may have been challenged with finding project samples for the third grade level science course. Project samples could be added to the curriculum, so that they can serve as a science education guide for teachers. In the observations, it was detected that teachers did not include self-evaluation or peer assessment activities in the

courses at an adequate level. Therefore, samples about the tools of self-evaluation and peer assessment could also be added to the curriculum. By doing so, teachers can also be promoted to use such assessment tools.

ACKNOWLEDGEMENT

The paper is prepared based on a dissertation of the first writer from Hacettepe University.

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