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Message from the Editor-in-Chief

I am very pleased to publish second issue in 2013. As an editor of International Online Journal of Primary Education (IOJPE), this issue is the success of the reviewers, editorial board and the researchers. In this respect, I would like to thank to all reviewers, researchers and the editorial board. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to International Online Journal of Primary Education (IOJPE), For any suggestions and comments on IOJPE, please do not hesitate to send mail.

Prof. Dr. Teoman Kesercioğlu
Editor-in-Chief

Table of Contents

Articles

IOJPE

ISSN: 1300 – 915X
www.iojpe.org

International Online Journal of Primary Education 2013, volume 2, issue 2

ROBOTICS IN EDUCATION, AN APPROACH TO TECHNICAL SUBJECTS BASED IN PROJECTS

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ABSTRACT
This work aims to explore the effect of work based on projects graded at different levels of complexity in the area of knowledge of robotics. The method will increase the capabilities acquired by students, develop the metacognitive processes required to solve a project-based learning and analyzing their critical thinking. The study is focused on students of any education level and the methodology used consisted in the definition of a "problem" that had to be solved by the students used project-based method. Results will be measured in a group of secondary school students and the possibilities offered by this method will be discussed and compared to other systems of "traditional teaching", obtaining conclusions that could be extrapolated to other technical areas.
Keywords: Robotics, Project-based learning, Critical thinking, Students capabilities

INTRODUCTION

This educational project pursues to improve the academic results of the students specially (but not only) in secondary schools by means of the motivation that provides them the project-based learning (Anderman & Midgley, 1998).

Besides, by introducing problems related to robotics field in the project, it is possible to create inquiry-based educational environments that encourage student curiosity, engagement, persistence, respect for evidence, and sense of responsibility (Brewster & Fager, 2000).

The main objectives of the experience are:

a) To raise different practical teaching cases using an educational robot.

b) To see how students value various valid solution alternatives for the same problem.

c) To analyze the possibilities and educational potential that robotic assemblies with LegoMindStorm (the system used for the experience) have.
d) To analyze the advantages of this system versus "traditional" teaching methods.

The methodology used consisted in the definition of a "problem" that had to be solved by the students. In it, students are asked to make an assembly that should make a number of functions using pieces of the robot. Defined problems have been graded at different levels of complexity increasing the capabilities acquired by students. Results have been the approach and realization of several robotics projects of different levels of complexity, detailing in each one of them all the particularities and features. The result will be measured in a group of secondary school pupils and the possibilities offered by this method will be discussed and compared to other systems of "traditional teaching", obtaining conclusions that could be extrapolated to other areas of technical knowledge.

Methodology

In this experience, we search to describe the features that characterize the learning built by students participating in a class with a teaching robot. In a 4th(K-12 students) course of secondary school, in a group of 20 students of the subject Technology it was taught six lessons where the contents that were going to work were exposed briefly, explaining the tools being used, items, etc. It is important to note that this study seeks to see how involved are the students throughout the experiment in group and individually, and see the knowledge gained at the end of the experience (Walker, A. & Leary, H, 2009).

After this period, class was divided into groups of four students and directions were given to each one. The directions included what is the functionality of a robot that had to be constructed by the group. They have a great variety of pieces, sensors, motors, wheels and other components of LegoMindStorms. The construction of the robot with the given features is done by applying mathematics, physics, etc. learned in the lessons and by means of experimentation and discovery. Teacher is available at any time to answer and help with questions.

Example of a case of study

As an example, we will show one of the projects proposed to one group of students and the products obtained as part of the learning process. It consists in the construction of an automatically guided vehicle with light, contact and sound sensors. The vehicle must follow a black line using the information given by the sensors and if it finds an obstacle or receives certain inputs (sounds) it will answer to those inputs using programmed functions.

ISSN: 1300 – 915X
www.iojpe.org
2013, volume 2, issue 2

Educational objectives

Introduce students in the field of robotics, seeing its relations with mechanics, electronics, electricity, mathematics, physics, etc.

- Discover the use of some basic sensors and its usefulness in some specific cases
- Learn concepts of basic programming, as well as design and construction.
- Assess the existence of different solutions for a same problem.
- Assess the problems that appear in the assembly and see how it can be solved with the available items.

Robot design

Students began the robot assembly evaluating several solutions and seeing what were the viable by adjusting the operation asked.

Problems found and implemented solutions

Although students founded many problems and with a great variety, as an example, we show two very interesting, which forced the students to reflect on different aspects.

At the time of making the assembly, a rear wheel was set on the back part of the vehicle, but it was noted that it generated problems in turns. After asking the teacher, and assess some alternatives, students decided to modify the design including in the final solution a plastic sphere inside of a cage that allows the vehicle to turn in the desired place more accurately.

Also the students noticed that if they placed the sound sensor close to the motors, the work of the sensor was affected by the sound of the engines and activated the programmed routines. To fix it, the sensor was placed as far as possible to the motors. So, the sensor could detect the sound emitted by user (to activate programmed routines) from any position.

Programation of routine of operation

Robot programation was made with LEGO tool called Mindstorms. This tool has an easy interface, with blocks of functions that can be drop to the working area to make the program (figure 1).

IOJPE
ISSN: 1300 – 915X
www.iojpe.org
International Online Journal of Primary Education
2013, volume 2, issue 2

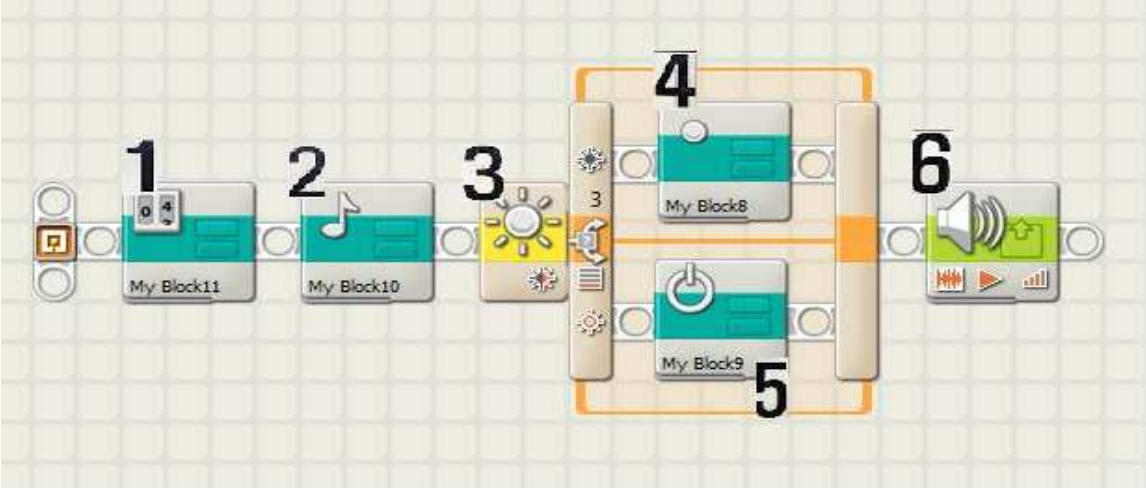

Figure 1. Blocks of functions of the project.

Construction of the robot

Finally, the configuration of the robot was:

Figure 2. Robot.

The main parts of the robot are: (1) servomotors, (2) contact sensor, (3) sound sensor, (4) light sensor, (5) control unit with program storage, (6) rear sphere.

The robot sequence

One of the solutions found by one of the groups was the following (Figure 3):

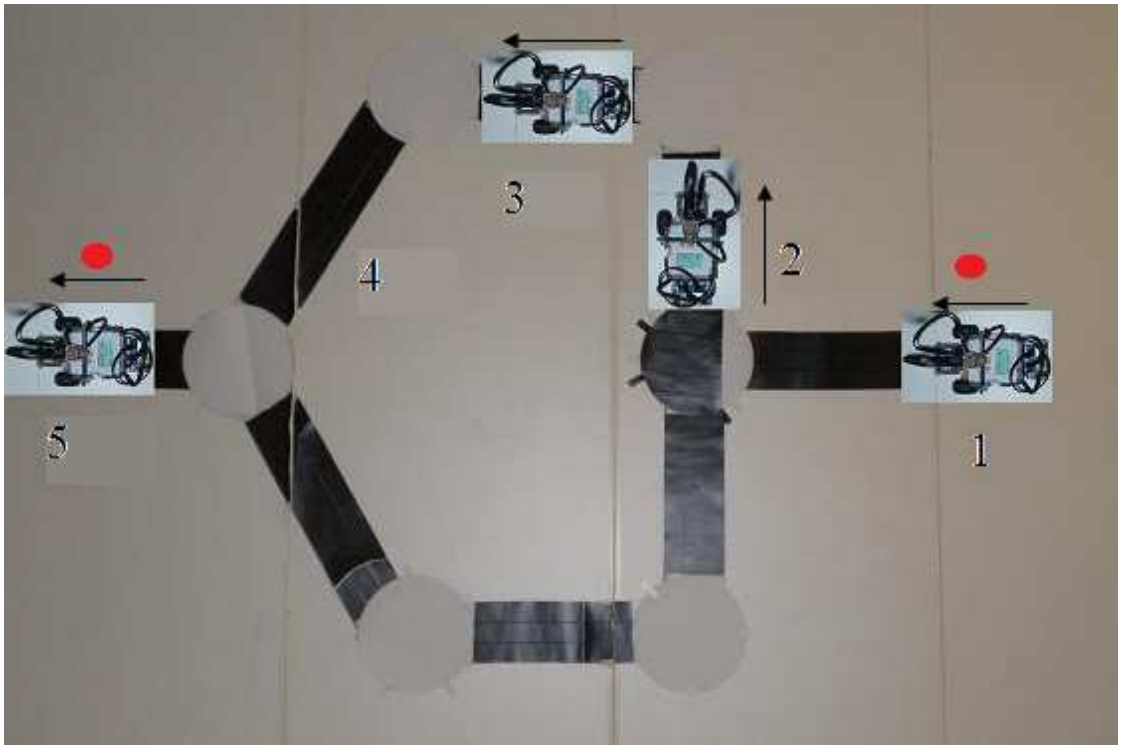

Figure 3. Assembly done by one group of students: operation when second base is black.

In this project, the robot operation is as follows:

The robot starts motion in point 1 and using the light sensor, the robot follows the black line until the first base. After detection of the light sensor that the base is black, robot is waiting to receive an audio signal (received by the audio sensor) that makes it turn 90º to the right. The robot continues moving (2) until an audio signal is received by the audio sensor and makes the robot turn 90 ° to the left and continues moving (3). Again, with another audio signal, the robot turns 60 ° to the left and continues forward to the next base (4). When the light sensor detects that the base is white, the robot stands and performs a rotation of 60 º to the right and it continues until a sound signal makes the program ends and, therefore, the motion (5). Next figure (Figure 4) shows the operation proposed by other group of students:

IOJPE
ISSN: 1300 – 915X
www.iojpe.org
International Online Journal of Primary Education
2013, volume 2, issue 2

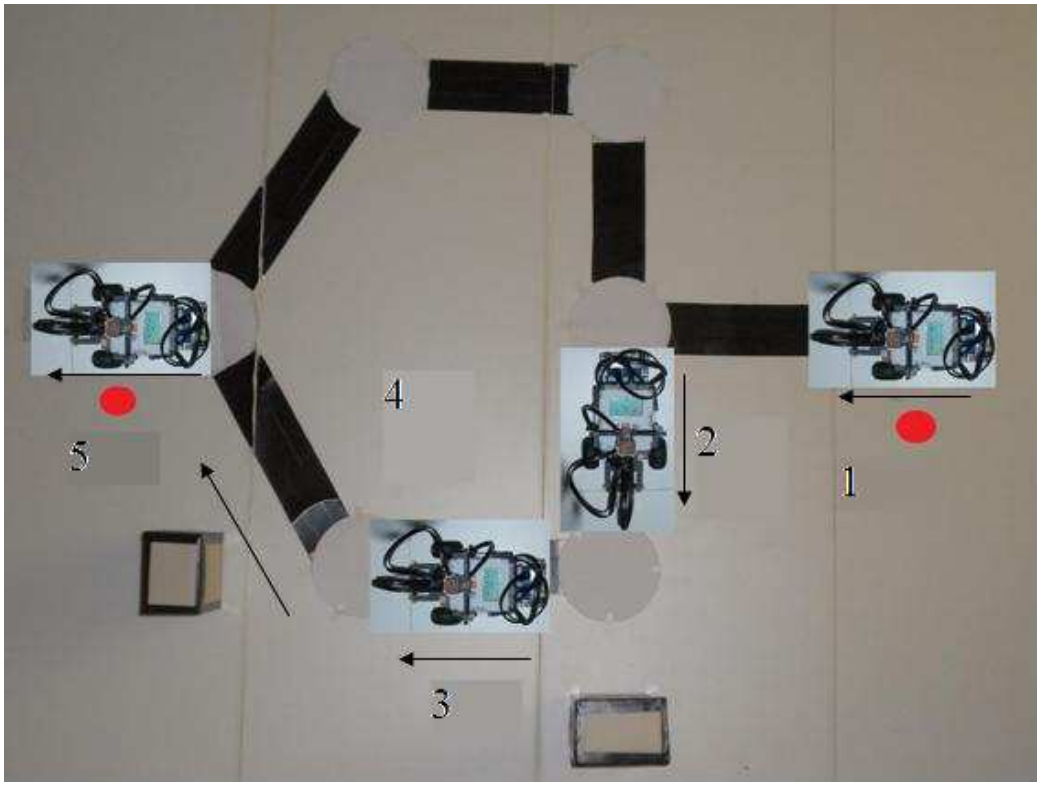

Figure 4. Assembly done by one group of students: operation when second base is white.

In point 1 the robot is at the starting point. After detecting that the base is white (light sensor) sends a signal indicating the path to choose andkeeps waiting to receive the audio signal (audio sensor) to turn 90 ° to the left and move forward. When the robot contacts the wall (touch sensor), back and performs a clockwise rotation of 60 ° and continues moving forward. When it detects that the base is white (light sensor), it is positioned and performs a rotation of 60 ° to the left and then the robot continues until it detects the following white base (light sensor), ending the program with an audio signal made by the user.

Results and evaluation

This methodology has been used in two different schools during 2 years. These projects have been used with groups of 20 students of 4th degree of secondary school in Technology subject. In them, we have evaluated some different levels: The perception of students, academic results and teachers feelings. A brief questionnaire was made to evaluate students' perceptions. The test was made to 80 students and the results were:

ISSN: 1300 – 915X
www.iojpe.org
2013, volume 2, issue 2

Table 1. Results of the questionnaire

Questions to students	Yes	No	No answer
1. Does the project incorporate revision and reflection?	78	0	2
2. Is the project focus on significant content useful for the "real life"?	65	7	8
3. Has the project allowed to make some choices about the products created guided by the theacher?	80	0	0
4. Has the project encourage you to make a process of asking questions, using resources and develop your own learning?	80	0	0
5. Do you think this method is positive to improve your skills and knowledge?	75	1	4

Besides, academic results were better compared with previous years and teachers said that they were encouraged by the method. Teachers were also satisfied with the experience and they showed their interest to continue with the method in the subject.

Discussion

So, after the work is done, one of the questions that arise is "What is the best way to involve students and achieve the best results, not only academicals but also in skill useful for real life: project method learning or traditional method?".

Traditional learning method is based in the lessons explained by a teacher in a classroom, using blackboard, books and so on, and alternating them with the realization of exercises and test. Doesn´t matter if the students are "bad" or "good", the risk of boring is very high and even in the case they achieve the desired results, practice is so poor and it is not easy include some real cases in explanations.

Opposite, we can say that project method learning is based in two principles: experimentation and discovery. It is known that students use to understand and remember all those concepts acquired by experience. Implications of students in making the project are very high usually and with a few theoretical explanations, all the knowledge is getting by doing, learning in most cases, more than with traditional methods. So, an adequate mixture of both methods will give us, without any doubt, the best results both academicals and experimentals, but a good training of teachers will be essential to adapt their practice to new generations.

Acknowledgements
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DEVELOPMENT OF AN INSTRUMENT TO DETERMINE SCIENCE TEACHERS' IMPLEMENTATION OF INQUIRY BASED SCIENCE EDUCATION IN THEIR CLASSROOMS

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ABSTRACT
The main aim of this article is to develop and validate an instrument on the usage of Inquiry-based Science Education by science and technology teachers in their classrooms. The questionnaire was developed on the basis of a literature review and prior instruments developed on inquiry-based science education (IBSE). The first version of the questionnaire was in English to seek international validation from expert. The instrument was subsequently carefully translated into Turkish. The Turkish translated version of the questionnaire, consisting of 27 Likert-type items, rating IBSE teaching and learning according to the frequency with which teachers apply these in their classroom, was distributed to 788 Turkish science teachers working in public schools in Turkey. The instrument was found to be internally consistent with high reliability scores. The results, based on the factor analysis, showed three factors named as structured, guided and open inquiry. Outcomes from this study revealed that the instrument is useful for assessing the extent to which science teachers using scientific inquiry in their classroom. The results provide evidence that the instrument is valid for further implementation on a wider scale and in larger samples.
Keywords: Inquiry based science education (IBSE), science teacher, Instrument.

INTRODUCTION

The quality of science education, which affects the future of countries, has priority internationally (European Commission 2004; 2007). There is a clear consensus that rich science education environments provide education to individuals to become scientific literate people (Abd-El-Khalick et al. 2004; Minner et al. 2010). According to The National Research Council (NRC 2000), scientific inquiry and teaching practices are defined as a set of interrelated processes by which students pose questions about the natural world and investigate phenomena; in doing so, students acquire knowledge and develop a meaningful understanding of concepts, principles, models and theories. Inquiry is a critical component of a science program at all grade levels and in every domain of science, so much so that designers of curricula and programs need to ensure that the approach to learning, as well as the teaching and assessment strategies, reflect the acquisition of scientific understanding through inquiry. Students can then appreciate science in a way that reflects how science actually works (NRC, 2000, p. 214).

Science educators have suggested that many benefits accrue from engaging students in inquiry-type science activities. Studies indicate that the use of innovative and authentic inquiry-based practical approaches support not only student's learning of high-level investigative skills, but also enhance and develop students' meaningful learning, conceptual understanding, understanding of the nature of science, critical-thinking and communication skills (Kask & Rannikmäe, 2009; Laius et al., 2008; Trumbull, et al, 2005). Teachers play important roles in planning and implementing the type and suitability of science practical activities. It is shown in many studies that such experiences can have a

powerful influence on students' understanding of science and their interest in science teaching (Boardman et al., 1999; Dana et al., 2000; Smith & Anderson, 1999; Zembal-Saul & Oliver, 1998; Blumenfeld et al., 2006; Hofstein et al., 2005).

It is clear from many studies that European students' interest in science, mathematics and technology has been declining while their grade levels have increased. Another alarming issue for Europe is the recruitment of students for science and technology related careers. According to ROSE project results, few girls wish to become scientists and even for boys, the percentage is low. While, in Europe, around 50% boys gave a positive response to the question: "I would like to get a job in technology," very few girls indicated that they would like to pursue such a career option (Sjoberg & Schreiner, 2010). These kinds of results from project reports highlight the urgent need for more effective action in the teaching and learning of science in schools. According to a report published by the European Commission (2007), the science education community mostly agrees that pedagogical practices based on inquiry-based methods are more effective for the teaching and learning of science.

However, the reality of classroom practice is that in the majority of European countries, these methods are only being implemented by relatively few teachers (Abd-El-Khalick et al., 2004; Kask et al., 2008; European Commission, 2007). Reports from European Commission continue to explain the advantages of inquiry-based science education and the recommendations clearly promote the use of IBSE for the teaching and learning of science in Europe (Cavas, 2012). However, it is not clear to what extent teachers use inquiry teaching and learning in their classrooms, as there is no clear report or studies which show the usage of inquiry methods by teachers. A similar situation exists in the USA. For example, Crawford (2006) mentioned that they are far from attaining a national stated goal of a shift in emphasis towards more inquiry-centered K-12 classrooms. She indicates that not all in the K-12 science teaching community embrace these recommendations. It is also reported that many teachers have difficulty to create inquiry based classrooms that support students in developing informed views of scientific inquiry and the nature of science (Chiapetta & Adams, 2000; Lederman, 1992; Marx et al., 1994; Minstrell & van Zee, 2000; Windschitl, 2004; Windschitl et al., 2008).

In the light of the above discussion, it seems that there is a need to clarify teachers' preferences related to their use of inquiry-based science education in the classroom. For a science teacher to enact teaching science as inquiry, the teacher is required to develop approaches that situate learning in authentic problems, model actions of scientists in guiding and facilitating students to make sense of data, and support students in developing their personal understandings of science concepts (Crawford, 2007). The complexity of teaching science as inquiry in a K-12 school setting, and the demands on a teacher to take on a myriad of roles, may be important reasons why this kind of teaching is so rare (Crawford, 2007). The main aim of this study is to develop a valid and reliable instrument which determines science teachers' usage of inquiry-based science education in their classroom. The data collected from science teachers is expected to give further insights for designing and re-constructing better teaching strategies and learning environment orientations.

Theoretical Background

Inquiry has been a well-known teaching and learning science education method in many countries for the last decade. However, there is no clear definition about the inquiry. Actually, the term "inquiry," meaning, "search for truth," appears frequently in writings by philosophers but not so often in the work of social science researchers. The earliest known philosophical writings are thought to have been written around 1500 B.C. Then, as now, philosophers wrestled with questions about the nature of existence, knowledge, morality, reason and purpose or meaning (Michael, 2002). It is clear that there are many contributions from the longstanding dialogue about the nature of learning and teaching, in particular from the work of Jean Piaget, Lev Vygotsky, and David Ausubel. Contributions from these well-known theorists were blended into a philosophy of learning known as constructivism (Cakir,

2008) which was then used to shape instructional materials. These materials, based on constructivism, were named as inquiry-based and include hands-on activities to increase motivation of students and to engage them in concretizing science concepts. Scholars have promoted inquiry-based teaching methods for science classrooms since the time of Dewey (1997).

Inquiry

Wells (2001) argues that "Inquiry is not a 'method' of doing science, history, or any other subject, in which the obligatory first stage, in a fixed, linear sequence, is that of students formulating random questions to investigate. Rather, it is an approach to the chosen themes and topics in which the posing of real questions is positively encouraged, whenever they occur and by whoever they are asked. Equally important as the hallmark of an inquiry approach is that all tentative answers are taken seriously and are investigated as rigorously as the circumstances permit." Clearly the questions posed need to have importance and would be expected to provide a direction for a more positive image of science if students were determining the importance in this case.

In this study, we define inquiry mainly as "asking questions." noting that inquiry is actually much more. Inquiry includes science process skills to find answers for the question defined. It includes also socio-scientific problematic situations, because many questions can be based on the daily life.

The current study bases its view of inquiry on models of the inquiry cycle, described by the National Research Council (NRC) (1996) and developed by Dunkhase (2003) and Llevellyn (2002), through which the inquiry cycle is considered to involve 7 important stages:

- Identifying and posing appropriate scientifically oriented questions;
- making prediction / developing hypothesis;
- designing and conducting investigations;
- identifying variables;
- collecting data;
- analyzing data to develop patterns;
- communicating and connecting explanation.

Inquiry teaching

Inquiry teaching refers to the pedagogical approach that model aspects of scientific inquiry (Deboer, 2006). Inquiry teaching is an approach to teaching that involves students in a process of exploring the natural and material world that leads to asking questions and making discoveries in the search of new understanding.

Research has convincingly demonstrated the benefits of inquiry teaching, which contribute to:

- students' cognitive development (Hofstein, Navon, Kipnis & Mamlok-Naaman, 2005; Wallace, Tsoi, Calkin & Darley, 2003),
- the development of flexible and adaptive thinkers, and the encouragement of students' creative thinking and handling risk-taking situations (Zion, 2007; Gürses, Açıkyıldız, Doğar & Sözbilir, 2007; Trumbull, Bonney & Grudens-Schuck, 2005).

Furthermore, research has also pointed to the importance of the students' affective domain - motivation and positive attitudes towards undertaking science learning (Blumenfeld, Kempler, Krajcik, 2006; Chin & Kayalvizhi, 2005).

Levels of inquiry teaching

Based on the level or degree of students' involvement in the active learning process, three different *settings of inquiry teaching* can be differentiated. Differences, relating to the manner in which the experimental procedure or design is developed, can also be considered. Table 1 shows these settings.

Table 1. Different settings of inquiry teaching

Model of inquiry teaching	**Question investigated presented/posed by**	**Procedure prescribed/ designed by**	**Procedure for data analysis/ interpretation & making conclusion**
Structured inquiry	Presented by teacher	Prescribed by teacher	Procedure teacher directed and prescribed; student interpreted.
Guided inquiry	Usually presented by teacher	Usually designed or selected by students	Usually teachers guided, but student interpreted
Open-inquiry	Posed by students	Designed by students	Student led procedures and interpretation

Structured inquiry relates to a teaching approach, which involves an active teacher, but passive students: the student activities are directed and guided by the teacher. The students are given little freedom to do something by themselves. In structured inquiry, the students investigate a teacher-presented question through an exactly prescribed procedure, often coming from the textbook or a worksheet. Although the student is usually asked to interpret the outcomes, this tends to follow reasoning in a narrow subject matter context (Wee *et al*., 2004).

Guided inquiry involves the teacher, for the most part, in presenting the investigation question, but usually allows students to design or select procedures. Its strength over structured inquiry is that it includes student-created design/planning involvement as well as interpreting findings and drawing conclusions. This form of inquiry teaching does involve students in taking some responsibility for their activities and is a step on the way to the full involvement of students as is the case in open inquiry (Zion, 2007).

In open-inquiry, also called authentic inquiry, the teacher takes the responsibility to define the knowledge framework in which the inquiry is to be conducted, but leaves the students with the task of considering a wide variety of possible inquiry questions. In the course of open inquiry, the students investigate topic-related questions through student-designed procedures and take responsibility for the data collection, analysis reporting and the drawing of conclusions. The students experience decision-making throughout each stage of the inquiry process (Krajcik, Czerniak & Berger, 2003; Wee *et al*., 2004; Zion, 2007).

Problems related to Teaching and Learning Science as Inquiry

The implementation of inquiry lessons by science teachers is influenced by a multitude of factors. For example, Carlsen (1993) and Hashweh (1987) found that science teachers who implement inquiry-based instruction need to understand the prominent concepts in their discipline. This understanding encompasses not only the facts and principles of the discipline, but also the processes and nature of science (Duschl, 1987). Furthermore, although this knowledge is connected and accessible to the science teacher (Gess-Newsome & Lederman, 1993), a lack of competence often leads to knowledge that is fragmented or compartmentalized and does not help the teacher in crafting instruction that best represents science as inquiry (Rannikmäe, 2008).

Although inquiry is included in curricula of many countries and recommended by science educators and researchers worldwide, reports of problems in its implementation in the science classroom are commonplace.

- Inquiry teaching needs the science teacher to possess strong science knowledge, understanding and abilities in utilising experimental skills. Many teachers tend to use a simplified or deformed interpretation of inquiry (van der Valk & de Jong, 2009; Akerson, Hanson & Cullen, 2005; Shedletzky & Zion, 2005; Windschitl, 2004). Teachers with naïve or deformed understanding of scientific inquiry are not able to teach authentic inquiry (Chinn & Hmelo-Silver, 2002).
- Teachers are expected to design a suitable learning environment in which learners can seek, share, construct knowledge and develop skills through undertaking an inquiry process. Research has reported that teachers are not able to do that (Abd-El- Khalick et al., 2004; Justice et al., 2009; Sandoval, 2005; Hofstein, Shore & Kipnis, 2004, Laius et al, 2009).
- Students perceived poorly planned and executed structured inquiry by teachers as boring and this fact decreases the positive attitude towards learning in science within school (Millar, 2005). On the other hand – some students express a strong sense of frustration of not "knowing the right answer," instead of the expectation that students arrive at an outcome on their own using the inquiry process (Wenning, 2005).

The literature consists of many articles which supports inquiry learning in science courses. However, the researchers in these studies indicate that it is yet to be applied extensively in the average teacher's daily practice (Asay & Orgill, 2010; Goodrum et al., 2001).

Methodology

In order to develop a reliable and valid instrument which determine teacher's usage of IBSE in their classroom, a five stage development model is used (Campbell, 2010) These stages are: (a) category development and the formation of an item pool, (b) use of both national and international content experts to establish content validity, (c) refinement of the item pools based on reviewer comments, (d) pilot testing, and (e) statistical item analysis leading to additional refinement and finalization of the instruments.

Category and Item Pool Development

The survey instrument was developed by the researchers after an extensive review of the literature and used scales in different educational backgrounds guided by the theoretical base of the study.

In order to provide face and content validity, more than 6 meetings were held with Turkish and Estonian content experts who reviewed the items within each category. The content experts were selected according to criteria related to their experience in inquiry based science education, pre-service and in-service science teacher continuous professional development and related publications focused on inquiry as an instructional strategy in the science classroom. Before each meeting, expert content reviewers were asked to provide comments regarding the validity of the questionnaire for determining teachers' usage of IBSE in their science classrooms. The comments from experts provided the establishment of content validity.

The final instrument consists of four parts.
The first part, which consist 4 questions, focuses on the demographic information about science teachers including gender, grade level, teaching subject and length of science teaching experience.
The second part consists of 11 Likert-type items which measure science teachers' perception about their students' expectations from their science courses.
In the third part, three different inquiry settings are given to teachers and they are asked to indicate their preferences as a percentage.
The fourth part of the questionnaire includes 27 items. The subjects were asked to respond using a five-point scale (from *almost never* to *almost always*). The score 1 represented the option "*almost*

never" while score 5 on the scale represented the category "*almost always*". All of the items were positively written.

Table 2. The dimensions of the questionnaire (4th part).

First dimension "Stages of IBSE"	Second dimension "Levels of inquiry"	
1. Identifying and posing appropriate scientifically oriented questions	Structured	*I supply scientific questions to be answered by my students*
	Guided	*My students and I discuss and create scientific questions together which my students then attempt to answer*
	Open	*My students are given opportunities to create scientific questions as part of teaching*
2. Contextualizing research questions in current literature/resources	Structured	*I provide my students with the relevant literature and other resources to develop their plans for investigations*
	Guided	*I guide my students to think about the relevant literature and other resources they need to find to develop their investigations*
	Open	*My students find related literature and resources by themselves to develop their investigations*
3. Making prediction / Developing hypothesis	Structured	*I help my students to develop hypotheses about the solution to a scientific problem*
	Guided	*I provide my students with a hypothesis which the students test through investigations*
	Open	*My students are given opportunities to develop their own hypotheses aligned with scientific questions*
4. Designing and conducting investigations	Structured	*I give my students step-by-step instructions so that they can conduct investigations*
	Guided	*I guide my students to plan investigation procedures*
	Open	*My students design their own procedures for undertaking studies*
5. Identifying Variables	Structured	*I tell my students the variables they need to control in undertaking their investigations*
	Guided	*I guide my students on identifying the variables to be controlled in an investigation*
	Open	*My students identify the variables that they need to control in carrying out investigations*
6. Collecting data	Structured	*I give my students step-by-step instructions for obtaining data/making observations*
	Guided	*I guide my students on how to collect data to solve a scientific problem*
	Open	*My students determine which data to collect for their investigations*
7. Analysing data to develop patterns	Structured	*I undertake to interpret the data collected by my students and ask them to make a record*
	Guided	*I guide my students to develop conclusions to scientific evidence*
	Open	*My students use data to develop patterns and draw conclusions by themselves*
8. Communicating and connecting explanation (Drawing conclusions)	Structured	*I give my students step by step instructions to allow them to develop conclusions from their investigations*
	Guided	*I guide my students to use experimental data to explore patterns leading to conclusions*
	Open	*My students develop their own conclusions from their investigations*
9. Socio-scientific Issues	Structured	*I provide guidelines for students to relate the results of their investigations to make decisions about socio-scientific issues*
	Guided	*I guide my students to consider their scientific results when making decisions on socio-scientific issues*
	Open	*My students propose and use scientific evidence to evaluate risks such as those related to environmental or health related issues*

Seven IBSE stages (identifying and posing appropriate scientifically oriented questions; Making prediction / Developing hypothesis; Designing and conducting investigations; Identifying Variables; Collecting data; Analyzing data to develop patterns; Communicating and connecting explanation), whereby each was described on three levels of the inquiry teaching (structured, guided and open).

1. Identifying and posing appropriate scientifically oriented questions — This category focuses on the extent to which teachers are responsible for identifying and posing appropriate scientifically oriented.
2. Contextualizing research questions in current literature/resources — This category focuses on the extent to which teachers are responsible for contextualizing research questions in current literature/resources.
3. Making prediction / Developing hypothesis — This category focuses on the extent to which teachers are responsible for making prediction / developing hypothesis
4. Designing and conducting investigations — This category focuses on the extent to which teachers are responsible for designing procedures for conducting investigations.
5. Identifying Variables — This category focuses on the extent to which teachers are responsible for identifying variables
6. Collecting data — This category focuses on the extent to which teachers are responsible for data collection during investigations.
7. Analysing data to develop patterns — This category focuses on the extent to which teachers are responsible for analysing data to develop patterns.
8. Communicating and connecting explanation (Drawing conclusions) — This category focuses on the extent to which teachers are responsible for Communicating and connecting explanation.
9. Socio-scientific Issues — This category focuses on the extent to which teachers use socio-scientific issues in their classroom.

Why the instrument is original?

Several instruments have been designed to determine teachers' usage of IBSE in the classroom. However, in general, these instruments are designed using logic and stages of scientific inquiry. The instrument developed in current study is based on 7 stages of scientific inquiry and described three levels of teaching for each stage. This allows measuring the steps used commonly in the science classroom by science teachers and the dominant level of inquiry teaching used. Data collected make possible evidence-based in-service courses to develop science teacher's professionalism to teach inquiry. The instrument developed in this study not only includes items from science process skills, but also includes items related to involvement of socio-scientific issues.

Administration

The questionnaire was administered to a convenience sample of 788 science teachers (434-primary science teachers; 354-physics, chemistry and biology teachers). Official permission was attained from the Izmir Education Directorate and the questionnaires were officially made available to the science teachers online. The sample size is considered to be good and consistent with sizes that have been used by other researchers developing instruments (Marek et al., 2003; 2008; Smith, 1993; Smolleck &Yoder, 2008).

As seen in Table 3, 35% of the teachers were male and 65% female. The grade levels at which the teachers were responsible for teaching were distributed approximately equally. Almost half of the science teachers were working at the primary level in state schools.

Table 3. Characteristics of the participants

	%
Gender	
Male	35
Female	65
Grade level	
6	18
7	18
8	17
9	15
10	11
11	11
12	10
Teaching subject	
Primary science	55
Physics	15
Chemistry	14
Biology	16
Teaching experience	
1-5	16
6-10	12
11-15	23
16-20	25
20- +	24

Data Analysis

The data were analyzed by utilizing SPSS 13.0 for Windows. Descriptive statistics were used to describe and summarize the properties of the mass of data collected from the respondents.

Internal Consistency

Internal consistency is defined as the extent to which items in the instruments are ‘‘at least moderately, positively (after recoding) inter-correlated. The most common statistical index of internal consistency reliability is Cronbach’s coefficient alpha’’ (Leong and Austin, 2006, p. 136). It is used in instrument development to measure whether items that are intended to measure the same construct (structured-guided and open inquiry) produce similar scores (Campbell, 2010).

In order to determine reliability of the whole scale and sub-scales, Cronbach alpha coefficients were calculated are as shown in Table 4.

Table 4. Cronbach’s-alpha reliability for the scales

Subscale	Scale Label	N	Cronbach Alpha
1	Structured Inquiry	9	0.88
2	Guided Inquiry	9	0.93
3	Open Inquiry	9	0.90
	Total	27	0.94

Table 4 shows that the whole scale and each sub-scales are reliable with alpha values > 0.70.

Factor Analysis

In order to clarify the factors (structured, guided and open inquiry) on the items, data reduction using factor analysis was conducted on the dataset. [Pallant (2005) explains the differences and identities between Factor analysis (FA) and Principal Component Analysis (PCA):

It takes a large set of variables and looks for a way that the data may be ‘reduced’

or summarised using a smaller set of factors or components. It does this by looking for 'clumps' or groups among the inter-correlations of a set of variables. This is an almost impossible task to do 'by eye' with anything more than a small number of variables. There are two main approaches to factor analysis that you will see described in the literature—exploratory and confirmatory. Exploratory factor analysis is often used in the early stages of research to gather information about (explore) the interrelationships among a set of variables. Confirmatory factor analysis, on the other hand, is a more complex and sophisticated set of techniques used later in the research process to test (confirm) specific hypotheses or theories concerning the structure underlying a set of variables. The term 'factor analysis' encompasses a variety of different, although related, techniques. One of the main distinctions is between what is termed principal components analysis (PCA) and factor analysis (FA). These two sets of techniques are similar in many ways and are often used interchangeably by researchers. Stevens (1996, pp. 362–363) admits a preference for principal components analysis and gives a number of reasons for this. He suggests that it is psychometrically sound and simpler mathematically, and it avoids some of the potential problems with 'factor indeterminancy' associated with factor analysis (Stevens, 1996, p. 363).] Any strong reason why this quote is necessary?

The scale was analyzed using principal component analysis (PCA) method from SPSS. Prior to performing PCA, the suitability of the data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above. An inspection of the scree plot revealed a clear break after the third component. Using Catell's (1966) scree test, it was decided to retain three components for further investigation. To aid in the interpretation of these three components, Varimax with Kaiser rotation was performed. The three factor solution explained a total of 62.36 % of the variance, with the first factor extracted contributing 30.45 %, the second, 17.80 and the third, 14.11. Factor 1 was labeled as "Structured Inquiry", the second as "Guided Inquiry" and the last as "Open Inquiry". Each of these subscales includes 9 items.

The results of the factor analysis are given in appendix (Table 5)

Conclusions

In this study, an instrument has been developed to determine how science teachers use IBSE in their classroom. The results of this study show that the instrument can be used in comprehensive studies with wider samples. If the instrument is used as part of triangulation, then the validity of further research findings can be enhanced. The instrument will be made available for further research.

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Appendix

Table 5 . Descriptive Statistics, Factor Loadings and Item-Total Correlations of the Scale

Factors	Items	Mean	SD	Factor Loadings	Correlations
	1	4.04	.84	.747	.634
	2	3.77	.89	.591	.599
	4	4.00	.82	.765	.661
	7	4.01	.83	.776	.731
F1	8	3.89	.84	.717	.705
	9	4.04	.78	.786	.724
	14	3.99	.79	.776	.746
	22	3.98	.82	.785	.730
	23	3.98	.80	.767	.721
	3	3.76	.89	.665	.503
	6	3.71	.88	.675	.458
	15	3.49	.88	.649	.500
	16	3.25	.92	.785	.410
F2	18	3.63	.87	.473	.628
	19	3.22	.89	.825	.385
	21	3.09	1.06	.794	.310
	24	3.24	.93	.810	.382
	27	3.65	.87	.404	.660
	5	3.28	.88	.651	.579
	10	3.10	.94	.805	.526
	11	3.18	.90	.802	.551
	12	2.91	.95	.866	.464
F3	13	3.08	.97	.761	.502
	17	3.88	.80	.646	.587
	20	3.90	.82	.667	.369
	25	3.20	.95	.719	.400
	26	2.98	.90	.810	.444

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Table 6. Mean scores, Standard Deviation and Frequency Analysis for the questionnaire, part B

Items; Students	**Mean**	**SD**	**Frequencies**				
			1	**2**	**3**	**4**	**5**
1. are willing to develop hypotheses related to scientific questions they want to investigate	2.66	.97	11	32	38	15	3
*2. wish to attempt to carry out investigations without my guidance**	*2.36*	*.96*	*19*	*39*	*30*	*10*	*2*
3. expect that they learn how to plan investigation procedures	3.20	1.11	8	18	31	30	12
*4. wish to create their own scientific questions for investigation**	*2.47*	*.97*	*16*	*38*	*32*	*12*	*2*
5. are willing to find relevant literature and other resources by themselves to answer scientific questions	2.65	1.00	12	36	32	17	3
6. expect that they will learn how to identify variables to be controlled in carrying out investigations	2.95	1.08	10	25	34	24	8
7. are willing to collect experimental data in carrying out their own investigations	2.81	1.05	10	29	35	19	6
8. see the value of learning to use data to determine the general patterns leading to conclusions	2.83	.96	9	26	41	20	3
9. expect that they will learn how to present conclusions from their investigations**	**3.18**	**1.01**	**4**	**22**	**33**	**32**	**8**
10. demand full investigation instructions when carrying out experimental work	2.96	1.10	10	26	33	24	8
11. expect to ask scientific questions**	**3.06**	**1.08**	**6**	**25**	**34**	**23**	**10**

* lower mean scores; **higher mean scores

Table 7. Mean scores and Standard Deviation for items related to Structured Inquiry

Items – related to Structured Inquiry	Mean	SD
3. I give my students step by step instructions to allow them to develop conclusions from their investigations	3.76	.89
6. I give my students step-by-step instructions so that they can conduct investigations	3.71	.88
15. I tell my students the variables they need to control in undertaking their investigations	3.49	.89
16. I provide my students with the relevant literature and other resources to develop their plans for investigations	3.25	.93
18. I give my students step-by-step instructions for obtaining data/making observations	3.63	.87
19. I provide my students with a hypothesis which the students test through investigations	3.22	.89
21. I undertake to interpret the data collected by my students and ask them to make a record	3.09	1.07
24. I supply scientific questions to be answered by my students	3.24	.93
27. I provide guidelines for students to relate the results of their investigations to make decisions about socio-scientific issues	3.65	.87
Total	3.45	.88

Table 8. Mean scores and Standard Deviation for items related to Guided Inquiry

Items – related to Guided Inquiry	Mean	SD
1. I guide my students to use experimental data to explore patterns leading to conclusions	4.04	.84
2. My students and I discuss and create scientific questions together which my students then attempt to answer	3.77	.89
4. I guide my students to consider their scientific results when making decisions on socio-scientific issues	4.01	.82
7. I guide my students on identifying the variables to be controlled in an investigation	4.00	.83
8. I help my students to develop hypotheses about the solution to a scientific problem	3.90	.84
9. I guide my students to think about the relevant literature and other resources they need to find to develop their investigations	4.04	.78
14. I guide my students on how to collect data to solve a scientific problem	3.99	.80
22. I guide my students to plan investigation procedures	3.98	.82
23. I guide my students to develop conclusions to scientific evidence	3.98	.81
Total	3,97	.87

Table 9. Mean scores and Standard Deviation for items related to Open Inquiry

Items – related to Open Inquiry	Mean	SD
5. My students use data to develop patterns and draw conclusions by themselves	3.28	.88
10. My students design their own procedures for undertaking studies	3.10	.94
11. My students develop their own conclusions from their investigations	3.18	.90
12. My students determine which data to collect for their investigations	2.91	.95
13. My students propose and use scientific evidence to evaluate risks such as those related to environmental or health related issues	3.09	.97
17. My students are given opportunities to develop their own hypotheses aligned with scientific questions	3.88	.80
20. My students are given opportunities to create scientific questions as part of teaching	3.90	.83
25. My students find related literature and resources by themselves to develop their investigations	3.20	.95
26. My students identify the variables that they need to control in carrying out investigations	2.99	.90
Total	3,28	.90

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RESEARCHING ABOUT RELATIONS BETWEEN PROBLEM SOLVING SKILLS IN MATHS AND COMPREHENSION SKILLS IN TURKISH FOR 7TH AND 8TH GRADE STUDENTS'

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ABSTRACT
The purpose of this study is searching the relationship between primary 7th and 8th grade students' problem solving skills in mathematics and Turkish skills. In Turkish part reading, writing, listening and speaking skills are mentioned, in maths part problem solving process is mentioned. The sample of this study is occurred by 100 7th grade and 100 8th grade students, a total of 200 students in Yalçın Çiftçioğlu Primary School, Dr. Sadık Ahmet Primary School, Fatih College and Academy College in Büyükçekmece, İstanbul. Problem test by 20 questions is applied to the students who are in this sample study and reading, listening, writing and speaking skills assessment forms which intended to determine Turkish skills are filled by their Turkish teachers. Clinical interview method as a method of data collection is used in realization of this research. Data will be collected by video recordings, observation, interview which reflect students' problem solving skills. Problem test which involves equation problems are applied to the students and looking at the relationship between the score obtained from this test and the scores obtained from Turkish skills assessment forms create the size of quantitative research. In research, analysis of qualitative data was made by PASW statistics 18 package program. As a result of research a positive correlation was found between mathematics problem solving skill and general Turkish skills reading, listening, writing and speaking skills. Looking at the results in 7th grade students' the relationship between reading ability and math scores are more powerful than others. In 8th grade students the relationship between math scores and listening skills was found to be more powerful than others. In the light of this work, language skills acquired in Turkish lessons are related to problem solving process, so it has been concluded that especially these skills need to be addressed in Turkish lessons.
Keywords: Turkish skills, problem solving skills, maths

INTRODUCTION

Math is hard to understand in our country, even all over the world and therefore it is considered to be a dislike or unpopular course. While searching for answers on various factors in education process why not love math lesson? Justice discussed, we have seen benefit addressing as an important factor the problem of expression. Because the presentation of the problem is considered ın general habit of repetition of the abbreviated sentences related to the problem. Whereas after student understand phrases came to him as a problem, he will find the solution by his problem world which his own sentences will constitute in his brain. The true center of building problem and problem solving is the brain of the student. For this reason, student should realize the sentences he read or the narration made by the teacher (Albayrak and Erkal, 2003).

According to cognitive theorists, in problem solving, understanding and comprehension is important. In Barb and Quinn (1997)'s study, they used Polya's method and according to this method attention is drawn to the necessity of to better understand the problem in problem solving process and process is made intended to solve it. In problem understanding what is being asked and in order to find being asked understaning what is required is pre condition to achieve the solution. One of the major difficulties encountered in solving the problem of understanding of the problem is due to not be read properly. Students with general reading difficulties have difficulty in understanding a problem (Baykul, 2002; Polya, 1957).

Charles and Lester explained that one of the factors that affect the process of problem solving is the ability of reading (Karataş and Güven, 2004). It is understood that all these courses about reading comprehension maintain a close relationship with mathematics. Turkish and mathematics courses in the area of expression and skills courses have affective features which complement each other in the formation of students' cognitive and sensual comprehension skills (Albayrak, 2001).

Understanding of concepts, using the concept, reading the problem, description of the problem or in the continuity of the solution to the problem description, in terms of children reach the results, it occurs that Turkish and mathematics courses have features which complement each other. Contemporary life, especially success is based on the fact that reading and writing, the simplest activities of daily life, the most complex social, economic, scientific and political activities in every field we have seen that this vehicle is being used (Albayrak and Erkal, 2003). In the light of all these studies, it occurs that Turkish lesson including in the process of problem solving, reading comprehension, writing, listening and expressing skills the necessity of entering in to cooperation with mathematics. Especially it is emphasized that how will be the results of this cooperation in the lower secondary education. With this research, it is put forward especially in terms of understanding and shaping the importance of the success of Turkish. How the relationship between Turkish and mathematics lessons should be in this sense solutions can be developed in the direction of the important points. The purpose of this study is searching the relationship between primary 7th and 8th grade students' problem solving skills in mathematics and Turkish skills.

Method

This part includes research model, sample, data gathering techniques and explanations concerning data collection.

Research Model

The purpose of this research that will be carried on 7th and 8th grade students is to examine the correlation between their mathematical problem solving skills and Turkish skills. In this research, qualitative and quantitative research method will be used.

Population and sample

The population of this research consists of 7th and 8th grade students in Büyükçekmece, Istanbul. Since it is not possible to perform a test on all students mentioned, sampling is adopted. To represent the population, using random sampling, 200 students were chosen from four different schools; 100 students from 7th grades, 100 students from 8th grades.

Table 1. Distribution of students according to age

Sex	N	%
Female	103	51,5
Male	97	48,5
Total	200	100

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2013, volume 2, issue 2

Data collection

To be able form the theoretical base of the research, local and foreign resources have been scanned; in addition expert sat that subject has been consulted. After a literature review, it has been revealed that there are no mathematical problem tests that also measure students' Turkish skills. By scanning previous year's exam questions, a problem test, therefore, has been prepared which includes equation problems students have difficulty in solving. In this test, words which reduce the probability of the students to understand the problem easily have been used on purpose. 20 questions have been prepared for each grade. After the validity and reliability values of the achievement tests have been analyzed, the following results have been acquired; Kr-20 reliability of the sample test for 7^{th} grades is .80 and Kr-20 reliability of the sample test for 8^{th} grades is .71. The questions of which discrimination index is lower than 20 have been removed out of test.

The evaluation forms used in the research concerning Turkish skills have been taken from teacher's guide book. That's why; these forms haven't been evaluated in terms of validity and reliability. These forms include items regarding reading, listening, speaking and writing skills. Five sub items which are necessary to use in math lessons have been chosen out of the mentioned main skills and they have been put together to prepare a test of 20 items. These forms have been filled by the Turkish teachers of the students to whom achievement tests have been applied in accordance with students' level of fulfilling the attainments in the form. The scoring system is as such; Never:1, Hardly:2, Partially:3, Highly:4, Totally: 5. An objective evaluation, thus, has been aimed. Pioneered by Piaget, clinical interview is a technique which investigates the form of information structure and the process of reasoning (Clement, 2000, p.547). In this technique, students are interviewed to be able to analyze their opinions in depth. Clinical interview gives important clues concerning the nature of reasoning and also it helps understand how students create their own world, how they reason, how they process their cognitive thinking and how they make up their minds (Ginsburg, 1981).

In our study, clinical interview has been made with 20 students with poor, average and good success levels on problem test. 10 of these students are at 7^{th} grade, 10 are at 8^{th} grade. It has been aimed at clinical interviews to observe thinking processes and to analyze their ways while solving a problem. While choosing clinical interview questions, it has been paid attention to choose questions which reflect their understanding the question, making an equation about the problem and their approaches to the problems which contain confusing Turkish words. Another objective is to observe their reading, understanding what they read, listening, speaking and writing skills using mathematical texts through which their Turkish skills are analyzed.

Data analysis

In the research, the analysis of quantitative data has been made with PASW statistics 18. While analyzing qualitative data, recorded data has been put on paper in detail. The qualitative data has been analyzed in four steps as Yıldırım and Şimşek (2006) stated; coding data, finding themes, arranging data according to codes and themes and interpreting findings. To analyze the content, similar data has been arranged within the frame of specific concepts and themes, and then this data has been interpreted by organizing in a way the readers can comprehend. Students have been evaluated according to their grades, sexes and mathematical success levels while analyzing the data. Codes are formed as follows:

- 7^{th} and 8^{th} indicate their grades at school.
- Y, O and D indicate their success in mathematics;

Y: Successful students
O: Average students

D: Poor students

Students' success levels have been formed on the basis of their mathematic exam grades in the previous term.

- E and K indicate their sexes.
- G indicates the interviewer.
- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 indicate the order of students during the interview.

In this way, the effect of students' Turkish skills has been determined on their performance of problem solving. In the conclusion, a general evaluation has been made by combining findings from qualitative data with the ones from quantitative data.

Findings

Sub-problems as a result of statistical procedures and findings obtained from the analysis of the findings of the interpretations are given in this section of the research.

Can 7th and 8th class students read and understand equation problem? Sub-problem's findings and interpretations:

Related with this sub-problem, students were asked questions by using math texts and retrieved comments. Based on the answers given by the students it can be said they understand the text that they read mostly but they couldn't hold quantitative data in their memories. It can be mentioned the parts read they can transfer it as general outline. We can mention that there are words that make it difficult to understand math problem for almost all the students. Words such as; Inaccurate, too, as, more, time, and, or, time, equal to must be paid attention. According to the answers of the students, it can be said that a thumping majority believed that it is not enough to understand the problem.

At which level is the 7th and 8th students' the effects of writing skill are told on problem solving skill? Sub-problem's related findings and interpretation:

On the basis students answers, almost all the students' writing skill is important during problem solving can be said and while writing problem sentences, because of incorrect spelling they made incorrect solving.

What is the effect of 7th and 8th class students' listening equation problem, indicating their own sentences on their problem solving? Sub-problem's related findings and interpretation:

Students have referred to the importance of reading, listening and writing skills. It can be said that the majority of students believe speech skills does not effect to solve mathematical problems.

Can 7th and 8th class students make the solution by just listening before reading problem? Sub-problem's related findings and interpretation:

As a result of the interviews, some of the students' interpretations about qualifications of it is enough just listening to solve the problem: On the basis students' answers it can be said that most of the students can solve the math problem by just listening and about all of the students believe that they can make mistake because of not paying attention to small details.

Interpretations and findings related with qualitative data

In this section the findings of the quantitative study are presented.

Table 2. The relationship between 7th class Students' Turkish skills and math problem solving skills

Turkish skills	Math score
General Turkish skill score	r=0,414
Reading skill score	r=0,401
Writing skill score	r=0,331
Listening skill score	r= 0,398
Speaking skill score	r= 0,235

When the table 2 examined, it can be said that there is a positive relation between 7th class students' grades for Turkish skill course and math grade. While students' grade for Turkish evaluation forms is rising, math grade is rising are seen.

Table 3. The relationship between 8th class students' Turkish skills and math problem solving skills

Turkish skill	Math score
General Turkish skill score	r=0,560
Reading skill score	r=0,529
Writing skill score	r=0,516
Listening skill score	r= 0,566
Speaking skill score	r= 0,517

When the table 3 examined, it can be said that there is a positive relation between 8th class students' grades for Turkish skill course and math grade. While students' grade for Turkish evaluation forms is rising, math grade is rising are seen.

Results and Suggestions

If we look at the result of problem test and Turkish skill evaluation forms, the students who achieved problem test, their Turkish skill level are high. So we can mention that Turkish and Math courses are related. The main point about the studies we have to do, to understand math and problem solving skill, is indicating inadequacy of students' Turkish course and to study about related removing this.

We are faced negative effective words because of our mistakes for problem solving test sand misunderstanding of solving process. We can classify these words and clauses; nouns, adjectives, adverbs, conjunctions and prepositions. We can have problems such words: "times more, from the beginning, from the end, all, equal" as nouns; "second, third, former, the next, twins, at least, what order, maximum, first, each" as adjectives; "much, early, at the same speed, at the same time, more, incomplete, orderly, later" as adverbs; "with, as, only, after that" as prepositions; "and, or" as conjunctions. These words and clauses must be taken in hand in Turkish lessons and give them meanings supply good results. It can be said to allude not only on the theoretical meaning but also on the meaning of the words in the sentences; 6th class studied "noun, prepositions, conjunctions, punctuations and adjective types"; 7th class studied "verbs and adverbs types"; 8th class studied "gerunds and infinitives".

So, based on daily life for the students to understand problem situations and mathematical texts can be prepared by bringing together the power words. Thus, the relationship between Turkish skills and problem solving skills in mathematics these kinds of texts can be reflected in the students and omissions can be resolved.

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Secondary education 7th and 8th grade students' the relationship between mathematical problem-solving skills and Turkish the results of this study are: After applications of mathematics to the students' general skills in Turkish Regarding the relationship between the scores of the test problem, a positive relationship was seen. This statement shows us while increasing Turkish skill grades, math achievement increases. Then all of a Turkish skill levels were scored separately, the relationship of mathematics score. Results shows that the relation between 7th class Turkish reading skill and math grade at a high level. The lowest relation talking skill and math grade is examined.

According to the results after clinical interviews, students' problem-solving failures that was caused by the lack of a number of Turkish, reading, writing, listening and speaking. It was observed that they have problems about processing although they understand the text who read, there are words make it difficult to understand while reading the problem, it is not enough to understand the problem, carelessness and processing errors results trouble. It was concluded that speaking skill which is one of Turkish skill doesn't affect directly problem solving process. It was seen that students can solve the problems containing less quantitative data by just listening, but there are high ratio to make mistake on the problem which is solved just by listening. In the frame of all surveys that have been made, math problem solving skill is related with Turkish skill can be said. For the students who have trouble about solving math questions, Turkish skill improving studies must be done will be beneficial. reading, writing and listening skill especially must be taken in hand concluded.

Based on the results of this study, the researchers for teacher training institutions, turkish, mathematics teachers were made some suggestions.

- Students must be applied reading, listening and writing activities very often during Turkish lessons.
- 6th, 7th and 8th class students are not only being given theoratical meaning of conjunctions,prepositions, adverbs told but also must be stood on the application and meaning in the sentences.
- In math lessons not only process level but also writing by using math texts, listening and speaking skill included linguistic activities must be done.
- Mathematical words should be given to the use correctly.
- Students in the class should discuss the use of mathematical language.
- Students must be encouraged to read their books according their level.
- By discussing of problem solving in this course, students use the language of mathematics can be developed.
- Meanings of words mixed nature of problems within the framework of cooperation with the Turkish and Mathematics teachers can be explained by Turkish Teachers.
- Students can be printed daily lives thinking about math problems. Thus, problem posing and writing skills as well as the opportunity to develop skills in Turkish can be submitted.
- The teacher who wish to print problem can provide the opportunity to do a speaking activity for students every time giving to a different students.
- It is suggested that in the frame of this study, in the primary 4th class level a similar study, in fact a larger sample of this study in 7th and 8th class.

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A NEW COMPOSITE LEARNING AND TEACHING METHOD TO ACHIEVE SUCCESS FOR THE ACADEMICALLY UNSUCCESSFUL STUDENTS

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ABSTRACT
This article is about adult students' learning of Interior Architecture design course and efficacy and efficiency of new method of instructional design experience employed in 2011-2012 spring semester. A student group of 14 whom were all consist of irregular students, who at least once experienced unsuccessfulness in their university education. The aim of the instructional design was to achieve CC average grade for the class, which was expected to encourage students for their further studies with confidence moreover would demonstrate the success of the experience. Instructional design consisted of two main methods, personal SWOT analysis with in depth interviews and unprofessional counselling, and as education style Constructionists' approach of self improvement and development within Active Learning environment. 2,15 pt out of 4 point grading system demonstrated the success besides where students' assessments averaging 4,4 out of 5 likert scale reinforced the results and students' approval of the new instructional design implemented.
Keywords: Active learning and constructivism, Unsuccessful Students; Personal SWOT Analysis, Instructional Design for Design Courses

INTRODUCTION

Design courses are not similar to lecture courses like history or language courses, which held in studios with more interaction with students. They are more like painting or drawing courses but somewhat different than those, which holds creativity, technology and routine drawing work and knowledge in itself. This composite character is a challenging task for the instructors who are teaching and conducting the course. Design is creative, innovative, and technical solution to life problem and express the solution on paper/digital medium to be produced in life environment. In the past it is accepted that the courses are conducted as master-apprentice system of education however in time many design and design education methods have been developed and employed. (Cairns, 1997) Design courses are the backbones of interior architecture education similar to other design education lines, like architecture, graphic design, fashion design and art education, in which these courses in these curriculums usually have the higher credits and the highest contact hours comparing to other courses. In our school, Çankaya University Interior Architecture Department, design courses are 7 credits and occupy 10 contact hours a week, which are chain courses being prerequisite to one another run 8 semesters sequentially. However this type of curriculum layout creates problems for the students who are unsuccessful in design course even if once, whose education period increases at the end, means time and finance loss for the students. This year in order to solve the problem, policy of the school has been changed and all design courses began to be given both in fall and in spring semesters. In the previous system the classes were comprising of both successful and unsuccessful students, where the most successful ones lead the studios and the others try to

catch them, resulted in better educational standards. However with the new policy, academically unsuccessful students accumulated in repeating courses.

The design III (third year first semester) course which was given in spring semester of 2011-2012 had all irregular students which were academically unsuccessful in design courses at least once or having low cumulative grades. It was a challenge to teach this group and also an opportunity to see the reasons behind being academically unsuccessful. Therefore as expected, in order to achieve a good education level, a special emphasis must be given to programming and methodology of the course. Several methods and theories have implemented where Constructivist learning theory is one of the base of this approach.

Hypothesis of the study

The importance of personal life and studio environment are important key factors for students' success besides educational programming, therefore instructional designs should include conveying knowledge and personal development of students at the same time. Active learning and constructivist style education methodology can be applied in design courses which would be useful methods for students' better learning.

Instructional design of Design 301 course basically consisted of two methods which have been employed, "Personal Development Of Students" which has started with analysis of students, underlying factors of their unsuccessfulness and the other method is "Course Development" of the design course. Aim of these methods are to increase intrinsic motivation of students' personal development and academic success.

In this paper while trying to understand the reasons behind academic unsuccessfulness, the methodologies employed to improve professional knowledge, skill and motivation of students, which was expected to lead to their success will be explained and discussed. Success of the methodology is tested primarily by students themselves which they evaluate the instructional design and course management employed. . In our school evaluation of students final work is made by a group of faculty, both by course instructors and invited ones in a jury. Therefore the students' grade average of design 301, which is consisted of unsuccessful students is compared with the grade average of design 302 course which is comprised of successful students give a good assessment of the instructional design implemented.

Instructional Design of 3rd year Design Course in 2011-2012 Spring

Method I. Personal Development of Students

The method comprised of 'In depth interview with the students to find out their problematic' , 'Personal SWOT analysis', 'Counselling, how to handle personal problems and school tasks together' Collaboration and participation with students are the key factors while conducting the course. They are told to overcome

difficulties they had confronted before and if possible solve them with our aid. However students did not concentrate on the main reasons of their unsuccessfulness until the interviews and discussions held.

Personal SWOT Analysis

The ideal achievements expected from students and interior architects are discussed in the classroom and a checklist of these criteria created. The checklist covers both academic knowledge and abilities which should be acquired and ideal personal behavior and attitudes which should be employed during their education and professional life. More than 100 criteria is listed upon general discussion with the students and with some elimination of similar and repetitive ones, though can be summarized around 20, in order to praise their participation a shortlist of 49 criteria are decided. To give some example: To be a good student: 'Student should have a programmed life', 'Must work in order', 'Must have good relation with teachers and other students'; In order to get good grades: 'Must work hard', 'must perceive three dimension', 'must have critics from teachers frequently', 'use time efficiently'; To be a good interior Architect: 'Must be an intellectual', Must be social', Must be creative and imaginative', 'Must understand human (clients' and users') psychology'. These criteria in hand students are asked to fill SWOT Analysis table. They are expected to fill the table whether they feel that they are strong (as Strength) in that criteria, or weak (as Weakness), whether they feel that that criteria is the one which make them superior to other students (Opportunities) and whether they see some threats regarding these criteria and holder (other friends) of these. Evaluation of SWOT analysis was not that successful since the students could not differentiate the threats and weaknesses, although it was explained in detail, and they were not interested in personal SWOT analysis, as not seeing its usefulness. However according to 3-point likert scale answers almost all of the students stated similar weaknesses, in 'hardworking', 'being a steady worker', 'using time effectively and efficiently', 'deficiency in long concentration time', 'getting unprofessional opinion on their project', 'being good at presentation of the project either by hand or by computer'. 'Being a good researcher', 'Being a curious person', 'Having good perception ability', 'Being a social person', 'Having good communication with friends and teachers', 'Thinking easily in three dimension', 'Having good information about new technologies', 'Understanding human psychology' are the criteria which they saw their strength.

Interview and Self Evaluation for Personal Development

Personal SWOT (strengths, weaknesses, opportunities, threats) (Gizir, 2005; Kuzu, Uysal, 2008, Jakson, Joshi, Erhardt, 2003) analysis made by the students through questionnaire survey and evaluated individually with the instructors and how they would cope with the lack of knowledge and skills beside other problems. However personal SWOT analysis of students by itself did not demonstrate the reasons behind their weaknesses, therefore in depth interview with students held throughout the class. Each student was interviewed about their previous educational life and level of success, families, their economic conditions, their problematic habits, problems which interfere with their work performances.

This study demonstrates the real reasons behind their unsuccessfulness. Almost all of the students have some sort of problems which interfere in their studies. 4 out of 14 students had concentration problem

diagnosed during their early school ages and were given medicine to treat hyperactivity. One of the student have psychological disorder, and the other one had a personal health problem, in remission of after surgery. Three students' close relatives have health problems which adds up 9 students, 64%, which are affected by health issues. 10 students, 74 %, have economical problems, and 4 of them, 28,5 % must work professionally in order to pay school fee and help their families economically. 5 of them, 36% of students who have either divorced parents or whose parents are not in good moods. Almost all, indulges in internet chatting, computer games and especially the girls indulges in family affairs.

In depth interviews with students has helped to find out their rooted problems other than school, and adaptation to handle both school and family problems are discussed and with some tolerance and encouragement they could control some of the adverse effect of their nonschool related problems.

Method Ii: Instructional Design And Development

Besides personal development methods applied to improve students' performances, better learning course education methodology and programming are also taken into consideration in instructional design of Design 301 course**.**

Design courses in general have certain routines, project subject is given, students are expected to get information about the subject, early sketches are expected to be developed by the students and step by step with the aid of the criticism of the faculty projects develop and as a final students are expected to complete the drawing and model making requirements, and final grade is given either by a jury or class instructor(s) depending on the university and its traditions. Generally students are expected to design and develop their projects by themselves and they are assumed to know all necessary supportive information either as cumulative knowledge given by other courses or from other academic sources, like libraries, etc. However years of experience showed that usually students can hardly convey the knowledge transferred in other courses to design courses and this difficulty usually arises throughout the course. This is also a known phenomena of educators. (http://www.flaguide.org) Also courses are conducted in discipline with little flexibility and tolerance in congruency with the submission requirements, submission dates and attendances.

Constructivism and SODAP Education Methods

In this Inar 301 Design course knowing students' academic unsuccessfulness and considering the students' background several education methodologies are employed and conducted for better learning of students.

View of constructivists' approach basing on how people learn suggests students must learn by observation, and study so that construct their own way of learning. (Brooks & Brooks,1993; Paiget,1973), which is considered thoroughly throughout the instructional design of the design course. Students are guided and monitored with positive encouragement in which they are allowed to develop their own skills.

"Constructivism is basically a theory -- based on observation and scientific study -- about how people learn. It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experience", http://www.thirteen.org/edonline Active learning with constructivists' learning style employed, especially group work, discussions, and encouraging students to learn through asking, researching and discussing.

SODAP Learning method developed in 2000s by the author: SODAP (Gokhan, 2001)**, *(See – Observe/Organise-Draw/Design/Discuss – Analyse/Apply – Produce/Practice/Participate),*** which was based on the various learning methods. Social Cognition Learning Model (Vyogotsky, 1962); Social Learning Theory (Observational Learning)- (Bandura, 1986); Behaviorism (Phillips and Soltis, 1994); Constructivism(Brooks & Brooks; Piaget); Multiple Intelligence Model- (Gardner); Brain Based Learning (Caine); Learning Styles Theory (Kolb); Right Brain Verses Left Bran (Mc Carthy); Communities And Practice Approach- (Institute For Research And Learning); Aesthetic Realism Method (Eli, 1967); are some of the learning styles and methods analyzed to develop SODAP. The courses were developed also basing on learning cone (Edgar,1969) which aim for better learning of students. SODAP method were practiced in Workshop courses once held in Cankaya University Interior Architecture Department, due to high credits which those courses occupy, all of them had somewhat made into transformation to classical courses with classical methods. However the experience demonstrated the benefit of different education methodology. In 2011-2012 Design course SODAP words tried to be implemented within the education method.

Continuous tracking of the students' attendance and their work and assessment: An online group is established to communicate with students and expecting it to be interactive. Almost all information and announcements are made with the aid of this group. This group communication is also useful to encourage and to motivate them. Assessments are made with discussions and students are informed about their faults and missing works.

Students needed to be cultivated in terms of art, architecture and interiors, therefore continuous feeding of information is another process, either through visual means or explaining the things in detail to furnish them with knowledge, and skills. Some skills are developed by students with additional instructions and information

Design Studio Methodology can be followed in Fig 1. Studio is conducted with understanding, tolerance, respect, love of designing respect with high level of interaction but in discipline. Th,s medium encouraged students to perform better. (Table 2) Also as seen in Fig 1, design subject and study continued in stages, and in each stage necessary information was given with visual and physical instruments, some information was repeated few times until they would understand and implement the information correctly, and in each stage why they have to study that stage and do/draw such things are explained and with discussions they are convinced that whether we ask or not they suppose o do it for the sake of good design. Group work, and studying in the studio is encouraged and communication among students was also encouraged. Whenever there seems a problem of difficulty in continuing, , depending on their lack of

information we elaborate the subject with the aid of slide shows, definitely with interaction within the studio.

An internet discussion group was established, to increase communication. However it worked usually one way, conveying the information or announcement on internet. Moreover students are asked to use digital medium for their presentations, which had reduced their workload.

Students' creativity has been achieved through encouraging them to start with basic design point of view, in other words starting with a non-functional design and transfer the developed ideas to functional one, which is new design methodology.

Three midterm and two main midterms are graded besides their attendances and participation in the classroom. Invited jury members grade the final products.

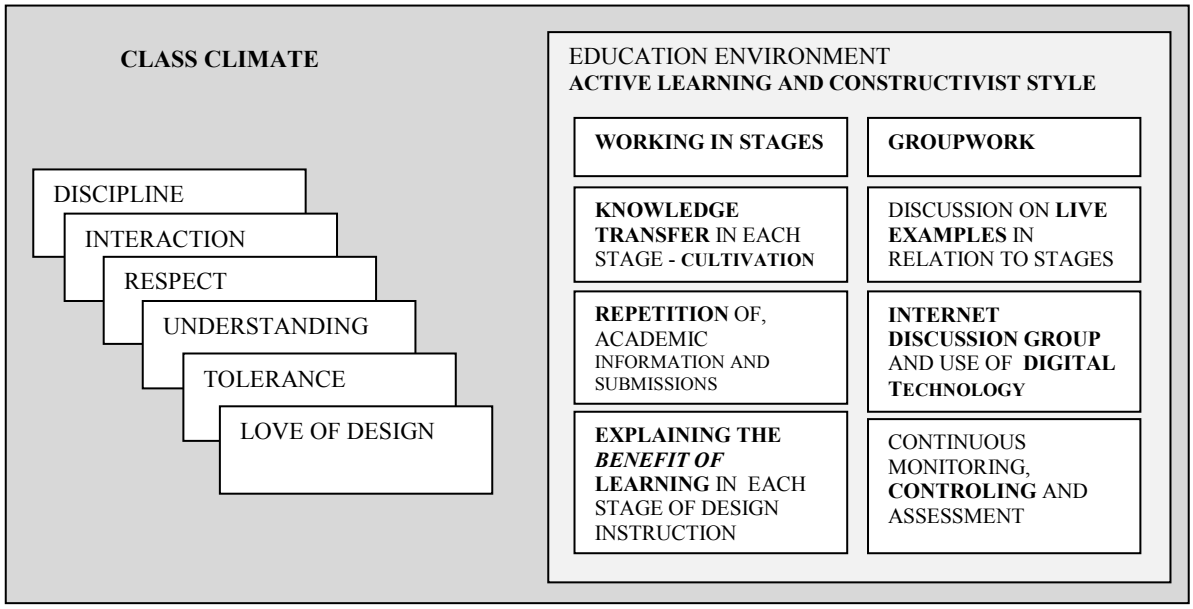

Figure.1. Principles of Composite instructional design method employed in design class Inar 301 in 2011-2012

Findings

Final Grading and Comparison With Other Classes

The above mentioned methods all, which I call "Composite Learning Method" helped most of the students. All 14 students who enrolled the design class attended and followed the course, however one of

the student did not submit final drawings therefore got NA grade. Two of the students made late submission with excuse, therefore their grades were lowered a degree. The grading system in our school is 4 point, and fractions system. AA - 4; BA - 3,5; BB -3; CB – 2,5; CC – 2; DC - 1,5; DD – 1; FD – 0,5; FF – 0; and NA is not attended. Therefore all the final grades of the students are converted to numbers in order to compare. Comparison is made with design 302 class which consist of all regular/successful students, at least past last semester. Grade averages are shown in Table 1.

Table 1 Students who take design classes of Inar 301 and their average performances in previous design courses Inar 101, 102, 201, 202, the research subject 2011-2012 spring semester and group's summer semester grade averages in Inar 302 and for comparison Spring 2011-2012 Inar 302 of regular successful students. (Calculated basing on the sources of Cankaya University Student Affairs Department)

	Fall Inar 101	**Spring Inar 102**	**Fall Inar 201**	**Spring Inar 202**	**Spring Inar 301**	**Summer Inar 302**	**Spring Inar 302**
Grade averages of the group studied	1,88	1,57	1,38	1,35	2,15	2,65	
Average of Inar 302 students who are all successful							2,16

The group of students who were irregular therefore became regular after following Inar 302 design course they took in Summer School. In table 1 the groups average grade can be followed which demonstrate direct raise in their design grades. In Summer School the following Inar 302 design course is given by me and same colleague faculty, in which we tried to employ similar instructional design method. Grade average of the study subject group demonstrate their positive reaction to the method employed with their higher average grade, which is the highest of the past 5 years' average grades of design courses. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu. Insert your heading text and choose the appropriate heading level from the style menu.

Students' Evaluation of the Course

In order to assess the course instructional design students were surveyed in order to evaluate the method employed and the course. (Table 2) Questioned were prepared to obtain quick and direct opinions of the students and mean evaluation of their 5 point likert scale answers evaluated. They are expected to give written opinions about the subject, instructing methods, and general programming of the course. Almost all of the students demonstrate contentment in the course, they wrote notes stating that they had really enjoyed the process, and learned a lot, they were very pleased with the method employed, and interactive active learning backed up with visual material ended up with their own learning development in free discussion medium. Moreover they add "basic design" as a starting point for the projects helped them to design more creative projects. Furthermore they admit that if any discrepancy occurred it was due to their

personal problems and themselves. The only adverse opinion was about the group work enforced from the very first start of the studies, which they usually complaint about the difficulty in working as a group, creating a time schedule which would fit all. Unfortunately after the second stage of the design course students are freed from group work which was not in their tradition of studying. One of the student stated that he would prefer to study during classes more, during lecturing and discussion, which was the key part of the course method.

Table 2 Student group's average evaluation of the course and instructional method in likert scale 5 according to survey made

Questıons	Mean	Questıons	Mean
Are you content with: a. the subject of design	4,6	Your opinion about active learning method	4,8
b. Size of the building	4,4	You have been given many information during classes were they helpful?	4,3
c. Function studied	4,5	Drawing on the board?	4,1
d. Stages	4.1	Slide show about the subject with explenation and discussion?	4,8
e. FINAL Requirements	4,6	Visiting the existing building and similar functions in-situ?	4,2
Did you have enough tme to analyse and research about the project?	4,8	Exhibiting sample drawings as examples and discussing on them.?	4,5
Did analysis of the existing building, functional analysis of new program and allocation plan studies been helpful?	4,9	You have employed a personal SWOT analysis and questioned about your personal problems and how to handle them, were they helpful?	4,2
Has group study been helpful?	3,5	AVERAGE	4,42

The average of students' evaluation is 4,4 in likert scale 5, which is quite high. The highest point is evaluated for the analysis and allocation plan studies. In traditional design studios students are expected to study and present their works by themselves while in this class it has been explained with examples and interactively discussed in depth so that every one of them understood what we are expecting as instructors from this level of projects designed. Which brings second highest point to discussions on live example slides.

Table 2 Student group's average evaluation of the course and instructional method in likert scale 5 according to survey made. Students are expected to criticize the pictures of interiors shown and discussion follows. They said that this type of discussions about the design subject made them understand the critical points of design; a verification of constructivists' and SODAP learning methods. In studio environment students were allowed to ask any question, criticize the process of design methodology implemented in the studio, made them feel in free and respectful environment, as they were no more degraded and humiliated. Usually they were discussing their personal problems openly to find solutions, or just sharing their problem.

Conclusion

The students all had personal problems, which interfere to their educational life, while two have health problems, some other have family problems, four of them are working, but almost all of them could hardly prevent themselves from today's seducing digital environment, opportunities and lifestyle. For some students, their academically unsuccessfulness was a continuous aspect even rooted in their prior school periods, due to this fact their general knowledge is below average, though they are clever enough to get better grades. The study demonstrated that methods to raise self confidence and feel of success are the key factors to cope with the academically unsuccessful students. The Composite Learning Method comprised of two, the first one which is, analysis of students' personal problems and counsel them to manage class studies and course weight and the second one is comprised of SODAP and Constructivists' learning methods found successful in the Interior Architecture course conducted in 2011-2012 spring semester. Table1 and Table2 verifies the success of this experimental study.

Study demonstrated the main effects of academic environment on success of the students are: Effect of Previous high school education; Effect of number of students/number of faculty ratio; Effect of course load taken by the students; Effect of teaching methodology.

The changes in technology, science and free market provide opportunities to improve our lifestyle and comfort to today's modern life, while taking quite a large amount of time to catch these opportunities, as continuous working hours, traffic, and almost unlimited entertainment facilities in the town, on televisions and on digital media. There is too much to learn and too less time to do everything provided, moreover there are too many deceptive phenomena and activities which tempt everyone besides students. Struggle of families with the conditions of these fast changing environment affect their children, the students, who also are affected by the society and recent lifestyles as well. Furthermore economical crises which create earthquakes in societies effect families' economic conditions thus students'. Four of the students out of fourteen had to work or help their father's work.

Study proves the hypothesis set at the beginning of the design course therefore the value of this study. Moreover study demonstrated a necessity of a new instructional design which must consider students' self, besides conveying educational information and technology. Study also demonstrated that one of the reasons of unsuccessfulness is the opportunities of modern life, which requires more succinct and effective instruction and course development

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THE STUDY OF VISUAL QUESTIONS IN MATHEMATICS TEST OF THE FIFTH GRADE FREE BOARDING AND SCHOLARSHIP EXAMINATION

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ABSTRACT
The purpose of this study is to determine the content of the questions by examining the questions in mathematics test of the fifth grade free boarding and scholarship examination made regularly by The Ministry of National Education in 2006-2012 in terms of visuality. The document examining method that is a qualitative research approach was used in the study. In the analysis of the questions containing the visuals in the free boarding and scholarship exam's mathematics tests; the interactive model of Miles and Huberman, the data belonging the last six years was found by applying coding and note-taking techniques. At the end of the study, it was stated that increasing the number of the questions visual themed, distributing the questions according to the type and content in a balanced way would be useful.
Keywords: visuality, mathematics, free boarding and scholarship examination

INTRODUCTION

The primary curriculum for 1-5th grades have been revised and used since 2005-2006 academic year. With the renewed curricula more importance has been given to student centered applications in education system, it's been tried to construct a thinking system based on how learning happens. It has also been targeted to improve the students' critical and original thinking, communication, problem solving, research, decision making, entrepreneurship and using information technologies skills (Yaşar et al., 2005; Gömleksiz, 2005; Kıroğlu, 2006).

The revised curriculum has bought many changes with it. In recent years, as it is known, in the light of the developments in science and technology, fundamental arrangements in education system have been implemented. With these arrangements, taking the education system as a whole, it has been targeted improving the quality of education, providing the students to achieve information hardware and competitiveness that they will need in the future in an environment influencing positively their psychological and social developments. At the beginning of these arrangements, the studies of reorganization of educational programs' according to realities of the world with a modern approach, in the light of the innovations and changes occurring in science and technology, and with a constructive approach have been included (Circular, 2008/77). The basic approach of this program has been stated that students in this age group will construct their opinions from their interactions with their peers, concrete objects and the environment besides being active participants in the math education (Pesen, 2005). While adopting learning and teaching model of constructivist theory in new math program, the training concept of behavioral theory was receded. It is important to decide and implement the change in theory in new curricula in terms of education (Kızıltepe, 2004). In addition, it emphasizes learning the rules instead of memorizing these; the acquisition of mathematical concepts, the use of qualifications helping their understanding how it works in life, art, other courses and transition disciplines; and improving spatial skills and aesthetic emotions (Bulut, 2004).

The importance of assessment and evaluation process has increased in the light of the above mentioned information and the information age transforming rapidly. This change in the Primary School Mathematics (1-5) Curriculum requires identification of teaching strategies which the student is active and in the centre and the editing of learning environments in direct proportion to this situation (Gömleksiz and Bulut, 2007). It is seen that the assessment and evaluation approaches differentiate due to these changing targets in the program. Accordingly, alternative assessment and evaluation approaches based on process took the role of those traditional approaches (MNE, 2004; MNE, 2006; EARGED, 2006).

Ministry of National Education carries out the Public Boarding and Scholarship Examination every year, whose aim is to contribute financially to the poor and successful students, in accordance with the Scholarship and Social Welfare, Public Boarding in Primary and Secondary Schools of the Ministry of National Education Regulations. Public Boarding in Primary and Secondary Schools of the Ministry, putting the Regulation of Scholarship and Social Assistance into practice; due to the Ministry's inscription dated to 17.4.2008 No.3185, in accordance with the article 14th of the Low dated to 17.6.1982 No.2684, was determined by the Council of Ministry in 26.5.2008 (Regulation, 2008/13763). In the subparagraph of the 2nd paragraph of 5th article entitled as "Application Terms and Place" of the related regulation, these are the requirements asked to the students applied for the "Free Boarding and Scholarship Examination (d); the net quantity per capita of the sum of the annual incomes, belonging to the previous financial year, of the family, the provision being lack of financial means less than at least three times of Ministry of National Education school board fee situated in the (M) marked schedule of Central Government Budget Law of current financial year, is located (Regulation, 2008/13763).

While preparing the new program, it was benefited from multiple intelligence theory. According to this theory, "people with visual-spatial intelligence, are highly sensitive to the issues such as space, time, colour, line, shape, form and pattern and to the relations among these issues. Therefore, people who have strong visual-spatial intelligence learn the assets best by visualizing the events or the facts, or studying with pictures, lines and colours" (Saban, 2005). When the questions of public boarding and scholarship examination have been analyzed, it is seen that visual themes gained more importance with the renewed primary program. "Visuals in education have taken the functions such as concretization, motivation, repetition, decoration, symbolization, editing, annotation and transformation" (Winn, 1993; Heinch, Molenda ve Russel, 1999; transference: Çam, 2006: 17). Visuals helps students in attracting their attention, motivating them, giving them tips and asking questions, giving feedback to them, reconstructing the information as its source in learning (Akpınar, 1999). Visuals used in the training have different functions. "Visuals utilized in education; are useful tools in attracting students' attention, may help in presenting the subjects that are difficult to do and may concretize the information, emotion, complex and abstract concepts which cannot be told verbally" (Kuru, 2008: 40). The main roles of the visuals in education:

- Providing concretization the words and the thoughts,
- Being the tools attracting the students' attention,
- Being used in simplification of the thoughts difficult to understand,
- Providing one more channel,
- Providing alternatives to words and statements,
- In addition, supporting the oral information (URL-1).

When the literature reviewed, there are very few similar samples of the study. However, at the end of Tabak's (2012) study titled as analyzing the questions containing the visuals in SBS Turkish Test, these recommendations were found. Due to the reflection of visualization on every aspect of daily life and giving place to visuals in SBS as an indication of this reflection, in the 6-8th grade Turkish Teaching Program, the necessity of including those to the visual reading and visual presentation area as a different learning field and the distribution of the questions' supported with visuals being balanced according to the variety and the content was stated. In addition, it should be provided the teachers to

use the image interpretation scale with the visual reading and presentation from in order to follow the students' level and development of visual reading and presentation skills (Kuru, 2008).

Method

In this study, document analysis method giving information about the facts and event with a qualitative research approach, including the analysis of written materials has been used. Document analysis contains the analysis of written materials including information about the facts and events which was targeted to research (Yıldırım and Simsek, 2008). In relation with the research problem, examining written and visual documents, is very important due to providing a richer and more extensive inference (Akturan, 2008).

The aim of the study

The purpose of this study is to determine the content of the questions in math test in fifth grade public boarding and scholarship exam by examining those in terms of visuality. In addition, this was needed because of the limited studies' made in this field and shedding light on future studies.

Data gathering and analysis

In the study which document analysis method one of the qualitative research approaches has been used, firstly question booklets of Public Boarding and Scholarship Examination applied in 2006-2012 composing the research material of the study have been found from the web site belonging to the Ministry of National Education Innovation and Education Technologies General Directorate. The question booklets including the last six years period has been recorded on the computer in portable document format (URL-2). As data, 83 math questions were gathered from these booklets and Miles and Huberman's (1994) interactive model was used in data analysis. Besides this, coding and note taking were applied.

Totally 150 math questions, from the last six years exams which 25 questions was placed each year, were classified as containing and not containing visuals examining one by one. 83 of 150 math questions supported by visuals were determined. According to Punch (2005: 193), "two basic processes that move analysis are coding and note taking". During analysis, the questions supported by visuals were classified by applying coding and note taking in terms of variety and content. The questions supported visually, were classified as shapes, symbols, pictures, graphs and table form in terms of diversity; and geometrical shapes, fractions, math in our life, area and volume measurement, the world of numbers and multiply and divide operations in terms of content. In the following table, basic concepts, classified according to the qualification of the questions, where the content took place in detail according to the teacher's guide book with the decision dated 18.12.2009 No. 297 of the Ministry of National Education the Council of Training and Discipline are involved (URL-3).

Table 1. The basic concepts of contents

Contents	Basic concepts
Geometrical Shapes	Data Editing, Polygons and Finery, Quadrangles, Symmetry and Circles
Fractions	Fractions, Length Measurements
Mathematics in our Life	Operations with Fractions, Rate-Way-Measurement
Area and Volume measurements	The Areas of Geometrical Shapes, Geometric Objects
The World of Numbers	Numbers in Our Lives, Mind Operations and Results Prediction
Multiply and Divide Operations	Multiply and Divide Operations, Mind Operations and Results Prediction

Content analyses is interpretation by bringing together the data similar to each other in a particular framework of contents and themes and understandably streamlining them (Yıldırım and Şimşek, 2005). Coding is the first and fundamental process for the analysis of discovering the contents of data in qualitative resolving (Punch, 2005: 193). In addition, data should be revised many times in a good analysis (Punch, 2005). In content analysis, the studies were carried out according to the following process steps. First of all, significant findings, taken from math tests and numbered beginning from the first, were processed to the table where the findings had been written one by one. Then, data processed to the tables were subjected to content analysis. In the analysis, the coding and decoding were carried out based on respectively the data and the coding. In the final stage of the analysis, the validity and reliability were performed by making inferences, descriptions, comments and discussions from given codes and reached themes . In qualitative researches, it's been applied for a field expert for expertise and consistency analysis with the aim of ensuring the credibility and consistency which is one of the various strategies used to ensure the validity and reliability (Yıldırım and Şimşek, 2008). As a result of the expert's opinion and suggestion, the study has been finalized.

Findings

The findings gathered from the questions, supported visually in math tests of State Boarding and Scholarship Examination in accordance with rates of each year, variety and the content are shown in the following tables.

Table 2. The rate of the questions presented with visuals according to each year

The Rate of Visual Themed Questions/Years of the Exams	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total Number of Math Questions	25	25	25	25	25	25
Visual Themed Questions	10	17	16	12	14	14
The Percentage of the Visual Themed Questions in Math Test	% 40	% 68	% 64	% 48	% 56	% 56

When examined table 2 including the rate of the questions presented visually each year; 10 in 2007, 17 in 2008, 16 in 2009, 12 in 2010, 14 in 2011, and 14 questions in 2012 consist of visual themes. In the last 6 years, the most visual contented questions were in 2008 with 17 visual themed questions. In 2007, the minimum number of visual themed questions which was 10 were asked.

Table 3. The classification of the questions presented with visuals according to their types

The Types of Visual Themes	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Shape	6	10	8	4	7	4
Symbol	1	1	-	1	1	1
Picture	-	2	4	4	5	7
Graph	2	1	1	1	-	-
Table	1	3	3	2	1	2
Total	10	17	16	12	14	14

When the visual themed questions were classified according to their types, the following information was obtained: In 2007, 6 questions consist of shapes, 1 from the table and 2 consist of graph. It is seen that there is no picture contented question. In 2008, 10 questions from shapes, 1 from symbol, 2 from picture, 1 from graph and 3 questions consist of tables. In 2009, while 8 questions from shapes, 4 from pictures, 1 from graph, 3 questions consist of tables, there is no question containing symbol. In 2010, 4 from shapes, 1 from symbol, 4 from pictures, 1 from graph and 2 questions consist of tables. In 2011, while 7 from shapes, 1 from symbol, 5 from pictures, 1 question consists of table, there is no question consisting of graph. In 2012, while 4 from shapes, 1 from symbol, 7 from pictures, 2 questions consist of tables, there is no question consisting of graph.

Table 4. The classification of the questions presented with visuals according to the content

The Content of Visual Themes	2007	2008	2009	2010	2011	2012
Geometrical Shapes	1	5	4	3	4	2
Fractions	2	5	3	3	5	1
Mathematics in our Life	-	2	6	2	2	2
Area and Volume Measurements	4	2	2	2	1	3
The World of Numbers	2	2	1	2	1	3
Multiply and Divide Operations	1	1	-	-	1	3
Total	10	17	16	12	14	14

When the visual themed questions were classified according to the content, the following information was obtained: In 2007, 1 from geometrical shapes, 2 from fractions, 4 from area and volume measurements, 2 from the world of numbers and 1 question consists of multiply and divide operations. In 2008, 5 from geometrical shapes, 5 from fractions, 2 from area and volume, 2 from the world of numbers and 1 question consists of multiply and divide operations. In 2009, 4 from geometrical shapes, 3 from fractions, 6 from the mathematics in our life, 2 from area and volume, and 1 question consists of the world of numbers. In 2010, 3 from geometrical shapes, 3 from fractions, 2 from the mathematics in our life, 2 from area and volume, and 2 questions consist of the world of numbers. In 2011, 4 from geometrical shapes, 5 from fractions, 2 from the mathematics in our life, 1 from area and volume, 1 from the world of numbers, and 1 question consists of multiply and divide operations. In 2012, 2 from geometrical shapes, 1 from fraction, 2 from the mathematics in our life, 3 from area and volume, 3 from the world of numbers, and 3 questions consist of multiply and divide operations.

Discussion and Implications

The reflections of visual themed expressions in education are different. "The teachers' thinking that visuals help the students in expressing their knowledge, emotion and opinions easier may cause them to prefer the visuals often in fill in the blanks questions. The reasons why the teachers often use these questions in true-false and short answer types of questions maybe not taking too much time to prepare those questions and its facilitating assessment compared with the process and product assessment" (Kuru, 2008). In measurement and evaluation process, visual themes have gained more importance in recent years. This forces the students to spend more effort in understanding the questions containing visuals. In fact, Considine (1994) has stated that our children need to learn how to analyze and interpret the visuals they encounter. Visual contented questions are not often used by the teachers due to their taking too much time to prepare and evaluate. Güneş also (2007) determined that classroom teachers' usage rate of alternative assessment tools is in the middle level but not high level in comparison with traditional assessment tools. In addition, Tabak (2007) determined in his study that teachers cannot make an efficient and effective assessment because the measurement and evaluation process takes too much time. However, with the revised curriculum, as well as in the course books visual themes are used frequently in the exams. Because visual contented questions take place in the exams made by the Ministry of National Education, the teachers' using visual themes will be beneficial especially in assessment process. Giving descriptive information about the issue of assessment and evaluation studies related to visual reading and presentation skills will facilitate the teachers' studies on evaluating these skills (Kuru, 2008).

Teachers' using visual themes also in teaching process will facilitate the learning. The students' gaining their knowledge and thought presentation skills with graphs and tables, are quite important in development invisual presentation skills and reading correctly the graphs and tables that they encounter in daily life. For this reason, the teachers should be encouraged to apply more often graph and table creating activity in teacher's guide book in accordance with the text and the theme in each text-handling process with the aim of improving the students' visual presentation skills (Kuru, 2008). According to the research results, the following recommendations are made:

- It is seen that the number of visual themed questions differentiate according to the exam analyzed. Instead of this, the number of questions must be within a certain criteria.
- The number of visual themed questions should be increased and should be distributed in a balanced way depending on the type and content.
- By giving more importance to visual themes in revised curriculum, they should be frequently used in the unit assessment process.
- It is seen that visual themed questions including the whole content has not been asked in some years. Eliminating this situation, equal distribution of the presented questions with visuals should be made according to their contents.

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