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Deciding on the most suitable teaching method in the mathematics classroom

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Abstract

In this research conducted with 35 mathematics teachers selected by stratified co-probative sampling method, the use of teaching methods/approaches and techniques that mathematics teachers used in their lectures were examined and tried to determine their opinions about the application in mathematics teaching. As a result, most of the mathematics teachers who participated in the research do not use games, case studies and problem-solving. In conclusion, the work of observing and rearranging the curriculum should be based on the mental and physically active participation of the students in the mathematics learning process.

Keywords: Teaching, mathematics, teachers, methods, techniques.

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Decidir cuál es el método de enseñanza más adecuado en el aula de matemáticas

Resumen

En esta investigación realizada con 35 maestros de matemáticas seleccionados mediante el método de muestreo co-probativo estratificado, se examinó el uso de métodos / enfoques de enseñanza y las técnicas que los maestros de matemáticas usaron en sus conferencias y trataron de determinar sus opiniones sobre la aplicación en la enseñanza de las matemáticas. Como resultado, la mayoría de los maestros de matemáticas que participaron en la investigación no usan juegos, estudios de casos y resolución de problemas. En conclusión, el trabajo de observar y reorganizar el currículo debe basarse en la participación mental y físicamente activa de los estudiantes en el proceso de aprendizaje de las matemáticas.

Palabras clave: enseñanza, matemáticas, profesores, métodos, técnicas.

1. INTRODUCTION

There have been significant developments in recent years about what mathematics is and how it should be taught. Psychologists, educators and researchers have been discussing the definition of the learners. The contemporary education concept has left the teachers against the obligation and responsibility to choose and implement teaching approaches that will be realized at the maximum level of

learning. Knowing what kind of learning difficulties students have in relation to what they are teaching for all teachers will help to choose these teaching approaches. It is difficult for a student who has difficulties in learning in a particular subject in mathematics to learn the next subjects (Carter and Norwood, 1997).

Although the mathematical language consists of a set of rules that need to be learned the ability of the students to express needs to be improved. In addition, it is clear that the functions of schools need to change in our age when information is multiplying exponentially and the information base is constantly changing. The methods and techniques applied by the teachers in the lessons and the approaches to the students influence the attitudes of the students towards the lessons. Mathematics teachers, strategies, teaching methods and techniques applied in the lessons are very effective factors on students' learning of mathematics.

The method of working with the group should include rich activities such as associating mathematics with itself and other fields and group work. It is a learning approach in which the students create small mixed groups in the classroom environment and they help each other in the direction of a common goal and the group achievement is rewarded. In classroom applications, there is a competition between groups rather than between students. These practices improve the sense of trust among students.

In the technique of simulation, it is essential that students in the class handle educational events as if they were real events. Significant

dimensions of real situations are either shown on a model or are described in pictures and symbolic ways. When applying the simulation technique, the teachers should pay attention; to check the students' preliminary knowledge, to prepare all the documents before the application, and to ensure that the subject is easier than the simulated one, and that the subject is given in an objective manner (Akınsola and Anımasahun, 2007).

By linking virtual reality materials with education and technology in mathematics lesson with virtual reality method similar to simulation technique, they have both possibilities of three-dimensional teaching and also develop their ability to learn mathematics and geometry. The virtual environment will allow students to experience every aspect of the mathematical application in the learning phase. The problem-solving method is about determining the state of the problem. The problem-solving method uses the highest cognitive functions such as analyzing, generalizing and synthesizing of the mind.

Drama is a teaching technique that allows students to express their own feelings and thoughts in a different identity. An idea, situation, problem or event is dramatized in front of a group. Instead of only listening or discussing the members of the group. Role-playing is a technique that has long been used for teaching purposes. Through role-playing, students try to figure out how they think, feel and behave by pretending to be someone else. If the work of the body

organs such as the hand-arm-face is added to the brain, the meaning and significance of the above can be understood better.

Discussion method requires active learning. It means that all students exchange information, ideas and attitudes in line with their goals. The objectives to be achieved must be well controlled and the necessary guidance must be made by the teacher. Otherwise, it becomes difficult to reach the aim of the course. Discussion Method is based on the principle that students should talk together on a problem and search for possible solutions. In order for the issue to be discussed as it is needed, it is necessary to have knowledge about the problem. Particularly suitable for small classes with a small number of students. The teacher makes sure that the discussion is at a certain level and ensures that the course reaches its goal.

The question-answer method is a method of teaching based on the students' verbal responses to the questions the teacher has formulated. If the student is taught to search for answers in a rational and scientific way, he/ she will be able to solve the problem with an appropriate method. It is a way of creating ideas, finding the information to be taught. It enables the actor to actively participate in the lesson. Throughout the history of education, it was benefited from the mind has stimulating, seedling, fermenting, and giving birth-giving power of the mind. The questions prompted both students to think and disciplined teaching.

The method of straightforward teaching is a Traditional method that the teacher transfers knowledge in an autocratic manner. This

method is about the teacher teaching the subject in an orderly way. The teacher will tell, the students will listen; so the teacher is active and the students are passive. The straightforward method is advantageous in the short term of transferring overloaded subjects (large curriculum). In addition, this method is easy and economical to implement. But this method should be used by teachers as little as possible, when they use it. According to Erden (1997), the expression is a teaching method that provides an accurate flow of information to the students.

Project method and project-based learning is a learning method that aims to solve the problem by using this information as researching, examining, reaching information and acquiring knowledge (Bruner, 1991; Altun, 2001).

Computer-aided training (CAT) claims that the computer is at the forefront of the important technologies that students can use in their lessons. The findings of many studies made around the world Çekbaş et al. (2003) suggest that CAT has an influence on academic achievement positively. In his definition of computer-assisted education, Baki (2002) states that learners must recognize their deficiencies and performance through mutual interaction, take feedback and control their own learning; with the help of graphics, sounds, animations and forms, to be more relevant to the lesson (Veridun & Clark, 1994).

2. RESEARCH METHODOLOGY

Within the scope of this study, 35 mathematics teachers selected by stratified random sampling from the schools in Erbil province were investigated to use the teaching methods/approaches and techniques they used in their lectures and the qualitative and quantitative methods were applied to determine the opinions about the application in mathematics teaching. For the ethical concerns, the names of the teachers who participated in the research were not used anywhere. Teachers-based on the order of interview and course observation-were numbered and these numbers were used until the end of the study. Within the scope of this research, semi-structured interviews with mathematics teachers were carried out with a voice recorder for about 25 minutes, and observation of their classes was carried out and a copy of two hours long mathematics lesson plan photocopies was obtained.

3. DATA ANALYSIS

Since the interview technique is used as the main method in the research, qualitative methods which are analyzed by using a more interpretational approach in the analysis of data are used. During the analysis of the interview questions, firstly the interview files were written on the computer and the teacher files were created. In each

question file, the categories that were the same or close to each other from teachers' responses to that question were brought together and categories were produced (Miles and Huberman, 1994). In the category files, after the answers of the teachers were categorized and the number of teachers in each category was calculated by the scoreboard, interesting or revealing answers about the categories were determined.

The use of these category files has led to the writing of findings. The categories are written to the verbal expression taking into account the number and percentage of teachers responding in that category. Interesting or explanatory responses from the teachers are quoted just below the paragraph - by specifying the teacher's number. In the meantime, the categories considered to be of low percentage or insignificant were ignored. Each teacher was assessed in terms of the teaching method they use, by using the notes held during the course observation form. Different forms were filled for each of the 35 mathematics teachers during the course observation. All the materials in the course observation form were filled during the course observation and the materials that could not be filled in during the course were filled in after the observation.

During the analysis, first of all, taking into account all 35 teachers, each of the 32 items in the course observation form on a single form, in terms of frequencies of Yes, Medium, None and at the situations where it cannot be decided Undecided were chosen, and then the highest frequency options/options in each item were

determined. The lesson plans were also used as secondary data collection tool such as course observation form. The lesson plans were examined in order to get a general idea about teaching methods and techniques used in lesson plans and an analysis was made to determine the methods used in the plan.

4. FINDINGS

4.1. Teaching Methods/ Approaches Used in Courses

Teachers were asked what methods they used in their lessons, what their approach was, and when they prefer it. It was determined that the most frequently used method was the question-answer technique (56%). Another method they often use is the method of straightforward (44%), which they prefer during their narration. Seven (20%) of the thirty-five teachers mentioned that they used mathematical games, riddles and puzzles from time to time in order to be able to draw attention, while four teachers (12%) said they used the demonstration method. However, according to the observation reports, it was determined that only one teacher (3%) included the method of demonstration, but that teacher is not among the four teachers that were mentioned (Indriastuti, 2019).

Teachers generally do not know approaches as a name, but they explain the way in which they follow, resulting in four teachers (12%) taking the approach of teaching by a presentation. According to the

observation reports, it was determined that seventeen (48%) teachers use the teaching approach by a presentation and ten (28%) of the teachers use it according to the lesson plans. Four of the teachers (12%) said they used the Multiple Intelligence Theory when teaching. Observation reports show that three (9%) of the teachers have included Multiple Intelligences Theory. One of the teachers (3%) stated that after making the sample solutions, the students had to come up with the definitions. Observation reports suggest that six teachers (17%) are trying to include in their lessons the features of the approach to learning by discovery, but it shows that one of these teachers (12th teacher) uses this approach more effectively.

The teaching methods that the teachers say in their lessons; discussion (8%), creative drama technique (8%) and concept map (4%). According to the observation reports, it was observed that thirteen teachers (37%) used the discussion method, three teachers (9%) used the creative drama technique. When it is examined whether these three teaching methods are used in lesson plans, only discussion method (8%) is used. It was also observed that one teacher (3%) used problem-solving in his/her classroom.

Three of the teachers (8%) emphasized learning by doingexperiencing rather than the-self-achieving results in the courses. Six of the teachers (17%) said that the teaching methods in the courses should be prepared according to a method that will enable the student to learn by experience. For the lesson plans that should be done taking into account the different teaching methods in the courses,

three of the teachers (8%) thinks that the plan should be very detailed; seven of them (20%) thinks the student's self-awareness with his own learning path should be realized with different techniques and; three (8%) supports the usage of materials; thirteen (38%) supports the visual usage; one (3%) states that the plan should be a plan to be added to the programs that can be used with computers (See Table 1).

DESIRABLE ASPECT	NUMBER OF TEACHER (Total teacher: 35)	PERCENTAGES OF TEACHERS (%)
Visuals	13	38%
The self-realizing of the learner in recognition of his or her learning path through different methods and techniques	7	20%
Learning through self-experiencing	6	17%
To be very detailed	3	8%
Material Usage	3	8%
To assure permanent learning	2	6%
To be added to the programmes for the computer	1	3%

Table1: the desirable aspect of the lecture plants that should be done according to the different teaching methods

Two teachers (8%) think that the plan will provide long-lasting learning. One of these teachers thinks that the implementation of the plan prepared with these different teaching methods can also facilitate the learning of late learner students. In addition, the fact that the students are informed about what to learn (at the beginning of the lesson); the beauty of the written plan and its order; that is a very different, unfamiliar plan, are what the teachers like about the aspects (see Table 1) (Soo et al., 2019). The aspect that I like is that; it is different. As a result, a classical mathematics course will not work. This can be attractive, the child may be welcome like it. So you can

gain a student who is talented in painting or handmade. It is nice in this respect, in terms of attracting. (3rd Teacher - Interview).

4.2. Disliked Aspects of Lesson Plans Prepared According to Different Teaching Methods

Teachers were asked if there were any dissatisfied aspects of the different teaching methods, 5 (20%) teachers said there is none (see Table 2). Eighteen of the teachers (51%) stated that the lesson plan prepared with different teaching methods was not applicable in the classroom (See Table 2) (Sears, 2018). As a reason for not feasible, eleven teachers (32%) stated that timing is the problem; four (12%) stated that it is because of the intensive teaching program; one (3%) said that it is difficult for students to use materials in lessons because of their economic situation; two (6%) claimed that the students were not interested in the course (Yang et al., 2019).

DISLIKED ASPECT	NUMBER OF TEACHER (Total teacher: 35)	PERCENTAGES OF TEACHERS (%)
Cannot be applied	18	51%
Too detailed	6	17%
Hard for some students	4	11%
Hard to get the desirable results in the class	3	9%
Not applicable for crowded classes	2	6%
Not practical	1	3%
Too long	1	3%

Table 2: Dislike Aspects in prepared plan According to different teaching Methods

Six of the teachers (17%) stated that the very detailed plan prepared with different teaching methods is an aspect that they do not like. Four of the teachers (11%) stated that it would be difficult for some students due to reasons such as not having the necessary prior knowledge, not knowing the area calculation, not compiling the numerical expression with letter expressions. Three out of thirty-five mathematics teachers (9%) said that it is difficult to achieve the desired outcome with this plan; two of the teachers (6%) stated that this plan was not suitable for crowded classes. Also, one teacher (3%) stated that the plan would not be practical because students could not remember past information; another teacher (3%) thinks that the plan will be too long.

4.3. Teacher Evaluations for Prepared Curriculum According to Different Teaching Methods

After the opinions of the teachers about the use of teaching approach based on different teaching methods in mathematics lessons and the directions they liked and disliked of the lesson plan prepared according to this approach were asked, they were also asked whether they wanted to correct/change these lesson plans. Six teachers (17%) stated that it would be good to increase the samples in the course; three teachers (9%), claimed whole cube formula can also be included; three of the teachers (9%) stated that starting with the

numbers, then the transition to the letters could be more useful for the students' learning. One teacher (3%) stated that the plan is detailed and added that in order not to have time problems, some places should be kept short and that part should be left to the student. In addition, two of the teachers (6%) suggested that the places where they had difficulty in learning could be noted in the plan in order to give an opinion on the plans to be prepared in the following years.

For example, in such plans, it is said that Students are asked to ask questions that they do not understand. There, one can note down the questions. I think that we will be able to prepare our plan according to these questions, considering that the students will have problems in the next year. (20th Teacher - Interview). Two teachers (6%) thought that a function like this plan was not suitable for 9th grade, maybe it could be applied in some subjects in 7th class; twenty-one of thirtyfive teachers (60%) said that there was no change in their lesson plans that they want to apply.

5. RESULTS

Within the scope of this research, it was examined what the teaching methods/approaches of mathematics teachers used in their lectures, and attempts were made to determine their views on the application of the teaching approach based on learning with techniques in mathematics teaching. The told most used methods and

the used teaching techniques are similar to the mentioned two techniques. When observational reports are examined, it is seen that the most used are question-and-answer technique, presentation, discussion and straightforward methods are used. From there, it is determined that some of the teachers who participated in the research have consistency between what they say about teaching methods and their teaching practices. These results show that the majority of teachers participating in the research use traditional methods in their lessons.

Despite the fact that the course plans prepared according to different teaching methods and techniques and the learning approach are favorable, they are not applied because of the time-consuming application of such approaches, the intensive teaching program, the difficulty of using materials in lessons due to the economic situation of the students, and the students being not interested about the course. The intensity of the curriculum and the time factors that teachers in the research have shown as a reason for this approach to be impractical are consistent with what Bonwell said. In addition, the teachers who participated in the research think that the lesson plans prepared according to different teaching methods and techniques and the learning approach are too detailed, difficult for some students, difficult to get the desired result in class, and are not suitable for crowded classes.

6. SUGGESTIONS

It is necessary for our future teachers to make sure that the education programs applied in the education faculties of the country are sufficient to provide teaching methods and techniques to the prospective teachers. For this purpose, it is necessary to ensure that the faculties of education are qualified in terms of physical and equipment facilities and number and quality of teaching staff. In order to increase the quality of mathematics teaching; teachers' views on mathematics, mathematics learning and teaching and classroom practices; the success of teachers with in-class practices; the studies of the relationships between teachers' beliefs about mathematics, mathematics learning and teaching and their students' beliefs on these issues should be included in the country.

7. CONCLUSION

The majority of teachers complain about the lack of time, the intensity of the curriculum, and view them as obstacles to the use of different teaching approaches in their lessons. In this process, students will be able to research, discover information, solve problems, questioning, and discussing, providing a learning environment in which they can actively participate, and some sample lesson plans can be presented. For mathematics learning to take place, we can talk

about beginning with concrete experiences of teaching; motivating students; efficient use of technology. This study is based on the idea that developing the concept in mathematics is an important but difficult goal but it is an important step in reaching this goal of learning mathematics difficulties and knowing the source of these difficulties and designing a teaching method to get rid of them.

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