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**IMPLEMENTATION OF QUANTUM TEACHING IN MATHEMATICS LEARNING
TO IMPROVE STUDENT'S INTEREST AND LEARNING OUTCOME
IN ELEMENTARY SCHOOL**

Marisan, Aunurrahman, Agung Hartoyo

Universitas Tanjungpura, Pontianak, Indonesia

E-mail: marisan.suryo@gmail.com

Abstract

This study aims to describe the planning, implementation, evaluation and learning barriers of quantum teaching-based mathematics in developing student's interest and learning outcome in elementary school. Data was obtained by observation, in-depth interviews, field records, document data analysis, and teaching and learning process documentation. Research data was checked for its validity by triangulation to obtain accurate and legitimate data. Data analysis was done through data reduction, data display, verification and conclusion. The results of the research were: (1) The quantum teaching-based mathematics lesson plan (RPP) designed by the teacher was generally qualified in the development of RPP; (2) The study of mathematics based on quantum teaching was implemented according to the program that has been drafted to foster the learning interest of learners, although sometimes it should adapt to the situation and condition that occurred suddenly; (3) The evaluation was not monotonous, evaluation of learning using several assessment instruments to make the teacher understand how to foster learning interest and ability of learners (4) Learning mathematics based on quantum teaching requires supporting means of both multi-media learning, multi learning resources and so on.

Keywords: *Mathematics Learning, Quantum Teaching, Learning Interest, Learning Outcomes*

Introduction

Education has a crucial role in improving the quality of human resources to realize the ideals of the Indonesian nation in realizing general welfare and educating the nation's life. Therefore education must be owned by every individual. The purpose of education in improving the quality of education in Indonesia is stated in Law Number 20 of 2003 Chapter II Article 3 concerning the National Education System, namely:

"National education functions to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the nation's life, aiming at developing the potential of students to become human beings who believe, fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent and become a democratic and responsible citizen."

Elementary school is the first level that students must pass to continue to a higher level of education. The role of elementary school teachers will determine whether Indonesian children can continue their education to a higher level. For most Indonesians, Elementary School is the first level of schooling they experience. Elementary school teachers play an essential role for Indonesian children. Therefore, teachers must instil awareness of the learning

importance to students by paying attention to the differences in each student because each individual has different abilities, interests and talents.

Learning is a process or series of interactions between teachers and students in educational situations to achieve specific goals, both academic and non-academic, carried out inside or outside the classroom, curricular and non-curricular activities. The learning process ideally makes students active in a way that is varied, fun and not monotonous. Good learning can make students think that learning is a need that must be met. They should feel homesick to study wherever they are and whenever they have free time. Learning should be a communication process that is not only one-way. Learning should help students find the best way to understand the material where students who have difficulty find ways to solve the problem. In this case, the teacher serves as a guide for students to find a way to solve the problem.

The success of the learning process is the main goal expected in the implementation of education in schools. Mathematics learning aims to equip students to fulfil the ability to think logically, analytically, systematically, critically, and creatively. Therefore, Mathematics has been taught since elementary education. Mathematics as one of the basic sciences today has grown rapidly, both in material and in use. Mathematics has a strategic role in development, but mathematics is still challenging, uninteresting, and boring.

Based on the interviews conducted with the fifth-grade Mathematics teacher on September 3, 2019, students of SDN 19 North Pontianak did not like mathematics and caused their learning outcomes to be low or could be said to be below the KKM determined by the school. Students also find mathematics difficult and the boring learning atmosphere. If this situation continues to occur, students will consider mathematics an unpleasant and scary subject throughout the education period. At the same time, mathematics is a fun subject, with many benefits and needed in the survival of students.

Quantum teaching is an effective way to develop student's skills in applying mathematical concepts. According to Bobby (DePorter, 2010), "Quantum teaching is a learning model that emphasizes students' activity, creativity and productivity in the learning process". Quantum teaching relies on the concept of "Bring their world to our world and deliver our world to theirs". It can be interpreted that we are reminded of the importance of entering the world of students by associating what we teach with an event, thought or feeling obtained from the home or community environment. Bobby (DePorter, 2010) revealed that "quantum teaching show teacher how to orchestrate their students' success by taking into account everything in the classroom along with the environment, the design of the curriculum, and how it's presented" (quantum teaching shows the teachers that to determine the success of students they must consider everything in the classroom environment, curriculum design and presentation of material). Quantum teaching does not only offer material that students must learn. But far from that, students are also taught to create a good emotional connection when learning. The quantum teaching model is a fun learning model for students. Fun learning can develop students' potential correctly because the success or failure of educational goals depends on the learning process experienced by students. In this case, the teacher must optimize planning and make mathematics learning with the quantum teaching model to show good results.

Based on the interviews conducted with the fifth-grade Mathematics teacher on September 3, 2019, students at public elementary school (SDN) 19 North Pontianak did not like mathematics and their learning outcomes below the Minimum Passing Score (KKM) determined by the school. Students found mathematics difficult and the boring learning atmosphere. If this situation continues to occur, students will consider mathematics an unpleasant subject throughout the education period. At the same time, mathematics is a fun subject with many benefits for students.

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The quantum teaching-learning design is TANDUR. TANDUR is an acronym for Grow, Experience, Name, Demonstrate, Repeat and Celebrate. In a learning process, it is important to have an interest that must be grown from within the students, and this will motivate students to be active in the learning process. For learning to be meaningful and inspiring for students, learning must be designed to bring experiences to students. Students must have their concepts about the material presented, and this is important because students will easily remember the material with concepts they created themselves. Students also need to be allowed to demonstrate what they know to know that knowledge is valuable. If the material is already known, it will be mastered by students. In this study, researchers chose the quantum teaching model, a learning place lively in all its atmosphere (DePorter, 2010). This learning is student-centred, with a fun learning method. Various aids such as different bench arrangements and creating a pleasant learning atmosphere attract students' interest to continue learning. The Quantum Teaching model was chosen because of its superiority with the TANDUR syntax (DePorter, 2010). The reality found in the field is that the fifth-grade teacher of SDN 19 North Pontianak has implemented mathematics learning by applying the quantum teaching model, but it was not optimal. Based on the data obtained in the field, researchers are interested in investigating the implementation of the quantum teaching model in mathematics learning at elementary schools.

Based on the background described, the problems of this research was "How is the implementation of the quantum teaching model in Mathematics Learning in Elementary Schools?" The formulation of the problem is divided into sub-problems. The sub-problems are:

1. How is the planning for implementing quantum teaching in mathematics learning to foster interest and learning outcomes in elementary school students?
2. How is the implementation of quantum teaching in mathematics learning foster interest and learning outcomes in elementary school students?
3. How is the student's interest in learning mathematics in the fifth grade of Elementary School?
4. How is the acquisition of students' mathematics learning outcome after learning using the quantum teaching model?

Research Method

The approach used in this research was a qualitative approach with the type of research was descriptive. Denzin and Lincoln (in Lexy J. Moleong (2012) stated that "qualitative research is research that uses a natural setting, to interpret phenomena that occur and is carried out by involving existing methods." Meanwhile, according to Strauss and Corbin (in Wiratna Sujarweni, 2014), "qualitative research is a type of research that produces findings that cannot be achieved using statistical procedures or other methods of quantification (measurement)." In line with the three opinions above, Bogdan and Taylor (in Suwardi Endraswara 2006) stated that "a qualitative study is a research procedure that produces descriptive data in the form of written or spoken words from people and observable behaviour."

Bogdan & Biklen (1982), as quoted by Satori and Komariah (2010), revealed five characteristics of qualitative research, namely:

1. Qualitative researchers have the natural setting as the direct source of data, and the researchers are the key instruments.
2. Qualitative researchers are descriptive.
3. Qualitative researchers are concerned with process rather than simply with outcomes or products.
4. Qualitative researchers then analyze their data inductively.
5. "meaning" is of essentials concern to the qualitative approach.

In this study, researchers as research instruments are directly involved in activities that occur in the field. In detail, they can find out the problems that occur in the field and ensure that the solutions provided have been realized as they should be. Apart from being a research instrument, the researcher is also a planner, implementer, data collector, analyzer and data reporter. Researchers as planners are tasked with planning actions to be taken in the data collection stage. The researcher, as the executor, is in charge of carrying out what has been planned. Apart from being the executor, the researcher is also a data collector to be analyzed and then reported. The research location was SDN 19 North Pontianak because this school is an elementary school in the North Pontianak sub-district which is accredited A and has implemented the 2013 curriculum.

Data is defined as facts and information obtained from the subject under study. In qualitative research, there are three main elements of research, namely researchers as implementers, research activities in the field and research sites. The data obtained will then be separated into primary and secondary data. The primary data in this study was data obtained from the main source, namely the teacher in the form of lesson plans, syllabus, media, and student scores after using quantum teaching. At the same time, secondary data is data obtained from the results of learning documentation documented by researchers and partners. The secondary data in this study were interviews, the results of photo observations, and videos of the learning process.

The research implementation plan to be carried out in this research is as follows: (1) Preparation, (2) Implementation, and (3) Reporting. According to Burhan Bungin (2007:107-124), five methods collect data in qualitative research: observation, interviews, documentation studies, visual and audio-visual materials, and online data searches. The researcher used observation, interviews, documentation studies and graphic and audiovisual materials to collect data. In qualitative research, data analysis is carried out during and after data collection with techniques, namely data reduction, data presentation, drawing and testing conclusions.

The technique used to track credibility in this study was the triangulation technique. Triangulation is the best way to eliminate differences in the construction of reality in the context of a study when collecting data about various events and relationships from various perspectives (Moleong, 2015: 332).

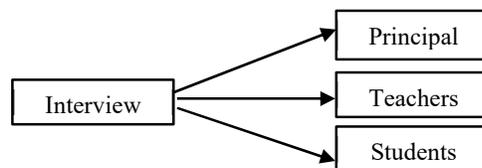


Fig 1. Triangulation Process With Data Source

Result and Discussion

Result

SDN 19 North Pontianak is located on Selat Panjang St. North Pontianak. This elementary school with NSS number 101136001019 is one of the leading public elementary schools in the North Pontianak sub-district. It is because this school has several achievements both in academic, non-academic, and environmental fields. These advantages are well documented so that when facing the school accreditation process, this elementary school received an A predicate on the school's accreditation status.

The location of SDN 19 North Pontianak is very supportive of implementing a comfortable, educational process. It is because the location of the building is not on the side of the main road, which is a crossing route between districts so that students at school do not feel

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the noise of passing vehicles. The school's position, which is in an alley, is approximately 300 meters from the main road makes the learning situation undisturbed. Teachers can focus on delivering learning materials.

There were 26 personnel of SDN 19 North Pontianak, consisting of the Principal, sixteen class teachers, five subject teachers including two Physical Education and Health teachers, two Islamic religion teachers, one a Catholic religion teacher, as well as education staff, namely an administrative employee and two school attendants.

The number of students studying at SDN 19 North Pontianak was 448 students divided into sixteen study groups/classes. The study group consisted of three classes that accommodated 84 students in first grade, two classes accommodated 70 students in second grade, three classes accommodated 86 students in third grade, three classes accommodated 84 students in fourth grade, two classes accommodated 54 students in fifth grade, and three classes accommodated 70 students of sixth grade.

Vision, mission, and goals are the first things that must be formulated and determined when the school will carry out the educational process in schools, especially in this elementary school. Vision is a picture of future targets expected to be achieved through the education and learning process carried out in schools. While the mission is a strategic step developed from the school's vision, the expected goals can be maximally achieved. Concerning the realization of the vision, mission, and objectives of SDN 19 North Pontianak, it is known that there is a need for a short-, medium- and long-term program that is mutually sustainable, both contained in intracurricular and extracurricular activities.

The programs conducted at SDN 19 North Pontianak consisted of the principal's program, the teacher's program, and the extracurricular program. This program is intended to increase their cognitive abilities while attending SDN 19 North Pontianak and develop skills in their learning, especially on students' interests.

The programs referred to above are annual, monthly programs, weekly programs and daily programs. The annual program is related to the division of teaching tasks carried out by consensus. In this case, the principal, even though he has the prerogative right to determine the teacher council's teaching position. Still, with the wisdom and example of the principal, the division of teaching tasks is carried out in meetings so that teachers feel comfortable. In carrying out its duties and obligations, it is based on a high sense of responsibility for the mandate it carries.

The existing annual program is not only limited to teaching task distribution meetings but also other matters. Based on the minutes of the meeting, it was known that the meeting also discussed the needs of teachers related to the succession of learning activities for the next year, starting from the need for learning tools and media, learning facilities in the classroom and other supporting facilities and infrastructure such as religious lesson rooms. Furthermore, the teacher council's strategic plan would also be discussed for the following year.

The monthly program is a routine activity carried out by the principal as the person in charge of the continuity of activities at the school. As the person in charge, the principal constantly supervises, checks student attendance, makes monthly reports in school personnel attendance, and overcomes problems in school environment activities and outside the school environment that impact school teaching and learning process.

The Mathematics Lesson Plan (RPP) with quantum teaching designed by the teacher contained the minimum standard for the 2013 Curriculum RPP, which includes: inclusion of Core Competencies, Basic Competencies, Indicators, Learning Objectives, Accompaniment Impacts, Subject Concept Networks, Main Materials, Learning Tools and Media, Learning Methods, Learning Activities including Time Allocation, Learning Evaluation and Learning Assessment.

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Core Competencies (KI) consist of 4 components of core competencies that become the basis and reference in developing the minimum qualifications of students. These four core competencies describe the ability of religious attitudes, mastery of social attitudes, knowledge, and skills expected to be achieved by students each semester.

Basic Competence (KD) is a number of abilities that students must possess in specific subjects to compile indicators of achievement of the teaching and learning process. The Basic Competencies set by the Ministry of Education and Culture apply nationally. They can be used as a benchmark for uniformity in the achievement of educational competencies at each level. The basic competencies that have been determined will be the starting point for the preparation of indicators.

Indicators are markers of achievement of Basic Competencies marked by measurable changes in behaviour that include attitudes, knowledge, and skills. Indicators are developed according to the characteristics of students, subjects, educational units, regional potential and are formulated in measurable operational verbs (KKO) and observable. Teachers used indicators as guidelines in developing learning materials, designing learning activities, developing teaching materials, and designing evaluations and assessments of learning outcomes.

In formulating the objectives of learning mathematics with quantum teaching as the RPP document that the researcher analyzed, it is known that the class teacher formulates it by considering the ideal criteria for a learning goal, namely: the existence of Audience, Behavior, Condition and Degree or more commonly known as the ABCD formula. The learning objectives are made to accommodate students' abilities, using operational verbs such as: mentioning, explaining, showing, concluding, creating reports and so on. So that it can be measured, considering the conditions that support and influence the success of students in achieving the ultimate goal of learning done correctly and appropriately.

Teachers' learning activities consist of three main components: initial activities, core activities, and final learning activities. The initial learning activities planned by the teacher are greetings, student attendance, delivery of apperception in the form of questions related to the learning theme on that day, learning objectives, and activities to be carried out during the learning process.

After designing the initial activities, the teacher continued the RPP design by compiling a plan for the core learning activities. The core activities are in the form of learning scenarios and the stages of the learning process that will be carried out during the learning process. Learning scenarios are also structured using sentences that are easy to implement, orderly, and systematic and prioritize the active process of students, not teachers.

After the teacher arranged the core activities, the teacher continued preparing the scenario for the final learning activity, which included providing opportunities for students to ask questions or express opinions about mathematics learning with quantum teaching. The students were making conclusions from the learning that has been done, asking students to write summaries, and providing an evaluation of results and feedback on concepts that students have understood.

The evaluation of mathematics RPP with quantum teaching that teachers have made can be grouped into process evaluation and result evaluation. Process evaluation activities occur during the learning process and are more likely to measure students' affective and psychomotor aspects. At the same time, the evaluation of learning outcomes is more to measure the ability to master the knowledge of students.

Learning is carried out based on basic competencies and uses a scientific approach in learning. Five scientific/scientific activities were carried out randomly according to the lesson plan designed by the teacher. The material presented was based on basic competencies covering several subjects and a learner-centred learning approach. In delivering the material,

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the teacher has attracted the attention of students by displaying interesting learning videos. The teacher has implemented mathematics learning with quantum teaching, namely the TANDUR system consisting of Grow, Experience, Name, Demonstrate, Repeat and Celebrate. The following is a brief description of its implementation.

1. Grow

In this stage, the teacher played an essential role in a growing interest in learning. Later, they fostered curiosity from students to increase interest in learning from these students. The growth of students' interest in learning was done by creating a pleasant learning atmosphere, namely by conditioning the class atmosphere to be more relaxed but serious. It can be done by rolling the seats at each meeting, pasting pictures.

2. Experience

In this step, the teacher allowed students to tell their experiences related to the material to be taught so that there was motivation from those who have known the material to develop further their experiences and those who have never known it to be more interested challenged to learn it. In addition, the teacher provided independent assignments to students about the material to be studied in the hope that students have experience before taking lessons.

3. Name

In this activity, the teacher conveyed the material to be studied thoroughly after telling their experiences. In naming students, they had the provision and mastery of the material more optimally. To avoid boredom and explore students' abilities, the teacher presents the material acts as a facilitator.

4. Demonstrate

Demonstrations were carried out by providing opportunities for students to present the results of independent assignments that have been given by the previous teacher, both to their group friends and to all students. In this way, it is hoped that students' self-confidence will increase because they were allowed to show their "work."

5. Repeat

Repetition was done by providing opportunities for students to re-express the material conveyed by the teacher, how to tell stories to their group friends, and all students. Thus, students who ignore the teacher when teaching can be avoided. After the teacher provided the material, the teacher would appoint one student to re-explain the material provided with explanations and practice directly.

6. Celebrate

Celebrations were one form of motivation carried out by teachers by praising students who succeed and those who fail to answer questions and did not directly blame students' answers that were not appropriate. Besides that, celebrations were carried out by clapping together when the class ended. This condition is expected to foster enthusiasm and interest in learning. Likewise, if some fail, they are also given praise for their efforts not to get discouraged and practice even more.

Quantum teaching is a learning activity with a pleasant atmosphere and is one of the teachings that demands freedom, relaxation, amazing, fun and excitement so that a pleasant atmosphere arises. It can lead to a positive attitude, the emergence of interest and enthusiasm in the environment of students in learning. Learning activity and, in the end, can improve student learning outcomes.

Observations conducted in the classroom on May 5 and May 14, 2020. We found that the evaluation carried out by the classroom teacher included an assessment of attitudes, knowledge and skills. During the learning process, in explaining the learning material and during student learning activities, both in groups and individually, the teacher always evaluated and observed students. The teacher wrote the results of the knowledge through the

results of the student assessment. The results of the knowledge assessment as found by researchers at the first meeting are presented in Table 1 below:

Table 1. Implementation of Tandur Quantum Teaching in Creative Dance Movement Skills

Meeting	Aspects					
	T	A	N	D	U	R
I	20 (100%)	20 (100%)	20 (100%)	20 (100%)	20 (100%)	20 (100%)
II	20 (100%)	20 (100%)	20 (100%)	20 (100%)	20 (100%)	20 (100%)

Based on the table above, it can be explained that the application of TANDUR quantum teaching can be implemented well at SDN 19 North Pontianak. Learners could follow all series of learning using TANDUR learning steps well. The number 20 shows the total number of students in fifth-grade students at SDN 19 North Pontianak, and it means that students as a whole can follow the TANDUR learning stages that the teacher has planned.

Conclusion and Suggestion

Conclusion

Based on the results of the study and discussion presented, it can be concluded that TANDUR quantum teaching in mathematics learning can foster the enthusiasm and interest of students in elementary schools. In particular, some conclusions can be described as follows: (1) By carrying out the stages in the Tandur Quantum Teaching approach and by looking at the results of observations, the success of learning mathematics is strongly influenced by how far the learning activities are planned and packaged according to the conditions of students and in preparation of the lesson plans, (2) the implementation of the quantum teaching approach in learning mathematics is carried out well according to the plans made previously. From the beginning of learning to the end of learning, it can be generalized that the teacher has a central role in fostering student interest and learning outcomes. The teacher's learning has variations adapted to the mathematics learning material, (3) By using the image and video media and the environment around, the students begin to learn more about the material. The media used must attract and foster students' curiosity about mathematics, learning using the quantum teaching approach in mathematics learning can be carried out well and in accordance with the learning objectives, (4) Evaluation of the quantum teaching approach in mathematics learning is carried out by evaluating the process and results. Analyzing and interpreting the process and learning outcomes of students carried out systematically and continuously will obtain data regarding the level of achievement of the specified success. Using these two evaluation stages, learning using the quantum teaching model can be appropriately realised according to the plan and learning objectives.

Suggestion

Based on the results of the data obtained during the study, the following things can be considered before using the quantum teaching model in learning mathematics: (1) At the planning stage, first analyze the basic competencies of the related subjects so that in delivering the material it can be sustainable, (2) At the planning stage, the implementation involves students in the learning by making small groups, naming groups and making small yells for each group as encouragement. (3) The use of learning media should involve the active participation of students so that learning becomes meaningful for students and the material presented can be easily accepted by students. For learning to be meaningful, the media used should be attractive, harmless, and safe for students, (4) In carrying out process observations,

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you should ask partners for help to assess the learning process of students so that the process carried out by students can be assessed as a whole without being missed.

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