

PAPER • OPEN ACCESS

Multimedia learning to overcome anxiety and mathematics difficulty

To cite this article: H M D Soewardini *et al* 2018 *IOP Conf. Ser.: Mater. Sci. Eng.* **434** 012002

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the [collection](#) - download the first chapter of every title for free.

Multimedia learning to overcome anxiety and mathematics difficulty

H M D Soewardini*, M Meilantifa and H Sukrisno

Department of Mathematics Education, Universitas Wijaya Kusuma Surabaya, Jalan Dukuh Kupang XXV/54 Surabaya 60225, Indonesia

*herfa.soewardini@gmail.com

Abstract. This article presents the benefits of multimedia learning to overcome the anxiety and mathematical difficulties experienced by seventh-grade students on the material of the lines in triangles. In previous research, it knows that students have a problem in determining the characteristic of line in the triangle by using a picture. They begin to be anxious to explain because there is an imbalance in their thought processes regarding assimilation and accommodation. In learning using multimedia, students are interested in being shown by student learning activities that fall into the very active category. Also from the results of mathematical anxiety, instruments show that students fall into the category of low numerical stress and from the results of the interview states that students feel no mathematical difficulty regarding describing the height lines, the dividing lines, and the weight lines in a triangle.

1. Introduction

Anxiety in learning mathematics on numeracy and geometry was related to mathematical achievement [1]. Students who have difficulty with numbers as well as drawing wakes in geometry indicate excessive anxiety. Mathematical learning anxiety is considered as an intervention of learning difficulties in mathematics [2]. This can be detrimental to students because they will also have difficulty in understanding the mathematical concepts that will result in learning outcomes.

Soewardini (2013) states that the speed of students in thinking using Piaget's adaptation theory varies depending on the intellectual intelligence and cognitive abilities. Students who are both at the formal operational stage but have high and low capabilities have different speeds in assimilation and accommodation processes. Other findings show that they take a long time because of anxiety in completing the task. It says that mathematical anxiety comes from genes, culture, sex, and age [3].

The result of the interview stated that the students find it difficult to understand because the teacher only explains in words. They hope there is also a picture to clarify the material already delivered. It is also appropriate for people to deeply understand the content if there are words and pictures, not words alone [4].

Based on the previous findings and the results of preliminary studies, then the use of multimedia learning that can overcome the anxiety and difficulty of students in learning mathematics. It is corresponding with the opinion that in multimedia learning involves cognitive and affective processes[5].

With this research, it will be useful for students to eliminate anxiety and difficulties in mathematics. As for the teacher is an alternative approach to learning that can be done to overcome the weaknesses of students in learning



2. Methods

This research is qualitative research [6] that describes the effort to overcome anxiety and difficulties of math by using multimedia learning. Data collection using the methods of observation, questionnaire, and job-based interviews. Observation methods using student activity observation sheets during multimedia learning take place because students are involved in demonstrations using the multimedia. The questionnaire method uses an anxiety questionnaire and a mathematical difficulty that contains a list of statements that reflect the feelings of students in learning math using multimedia. This questionnaire is filled out by the students after the lesson has implemented. While the interview method using extensive interview guides [7] equipped with mathematical tasks with the material line in a triangle that is the height lines, the dividing lines, and the weight lines in a triangle. Questionnaire data were analyzed using low, medium, and high category.

Table 1. Category of anxiety and mathematics difficulty.

No	Score	Category
1	0 – 30	Low
2	31 – 60	Medium
3	61 - 100	High

Student activity observation data has analyzed by calculating the percentage of many activities that often appear divided by the total observed activity, then categorized according to the following table 2.

Table 2. Category of activity.

No	Score	Category
1	0 – 25	Less active
2	26 – 50	Fairly active
3	51 - 75	Active
4	76 - 100	Very active

Interview data were analyzed using interactive analysis of Miles and Huberman model, i.e., data collection, data reduction, data presentation, and verification. Interviews were used to match data with observation and questionnaire results because conversations could explore in depth about students' anxiety and difficulty during tasks.

3. Result and discussion

The results showed the average total score of anxiety and learning difficulties that were filled by students with the collective knowledge and students with low expertise after the learning took place was 22. This score included in the small category (according to table 1), obtained from the questionnaire results which is filled by students with low knowledge and knowledge. The score of an observation result of student activity is 82 which shows that the students are very active in learning. First, shows that students are very enthusiastic in education (in listening to teacher explanation). Second, the interaction between student and teacher (question and answer). Third, the interaction between student and student discussing with peers). Fourth, group collaboration in completing tasks. Fifth, active in group discussions. Sixth, engaged in learning, skilled in using drawing tools (using bows and drawing compass), and participating in concluding material (explaining concepts with their sentences based on problem-solving that had done).

From the interview based-task of the line in the triangle shows that the student with knowledge is claiming that he can do the task without any difficulty and anxiety because he understands the concept of multimedia learning beforehand and he also tries to use the arc and the term in depicting the line in the triangle. As for students with the in-depth knowledge, initially, he still seemed anxious after reading the matter and see the existing picture. But with the help of a researcher who reminded him of the

previously demonstrated image demonstrations using multimedia, his anxiety began to diminish by starting drawing sequentially utilizing the arc and the run and did not take a long time to think. The experience gained in using arcs and runs during peer discussions, and demonstrations during the lessons remind him to draw according to the characteristics of the high line, line dividing, and triangular outline. He also stated that there is not much difficulty because it has been reminded through multimedia learning by teachers.

The overall results of the research are by relevant theories and studies on overcoming mathematical abilities in the classroom (Finlayson, 2014). It is also essential to consider mathematical anxiety with student learning experiences (Mutodi & Ngirande, 2014). Based on the results of research with activity observation data, questionnaire data, and interview data states that anxiety can be related to adaptation process based on Piaget (Karmiloff-Smith, 2017) that is the process of assimilation and accommodation to equilibrium. The constructivist theory applies to all cognitive domains, especially language and numbers in children. Students with different intellectual maturity also have different mathematical anxieties and difficulties. It can be due to those who already have new knowledge in the scheme so that they are more comfortable in their thought processes to associate with a unique experience, this is what can be called adaptation. As for students who do not have the first knowledge, he tends to be anxious and difficult because disequilibrium (imbalance) occurs in his thinking process so that he is also difficult to understand new knowledge. With multimedia learning that is visual audiences will be able to overcome their anxieties and difficulties, the incidence of interest in them because most students are more dominant in the optical ability than the ability to listen.

4. Conclusion

From the results of research and discussion, it could conclude that with multimedia learning that displays object visualization along with words with additional audio can overcome anxiety and difficulty learning math. The low math anxiety and pain in the line material in the triangle makes it easier for students to understand the concept. Suggestions for further research is how to know the mathematical achievements of decreasing levels of anxiety and mathematical difficulties.

Acknowledgment

We would like to express our appreciation to Kemenristekdikti, math teachers and seventh graders at SMPN 14, SMPN 20, and SMPN 26 Surabaya, along with students who assist in the collection of data.

References

- [1] R K Vukovic, M J Kieffer, S P Bailey and R R Harari 2013 Mathematics anxiety in young children: Concurrent and longitudinal associations with mathematical performance *Contemp. Educ. Psychol* **38**(1) pp. 1–10
- [2] Y Lai, X Zhu, Y Chen and Y Li 2015 Effects of mathematics anxiety and mathematical metacognition on word problem solving in children with and without mathematical learning difficulties *PLoS One* **10**(6)
- [3] A Dowker, A Sarkar and C Y Looi Mathematics anxiety: What have we learned in 60 years? *Frontiers in Psychology* **7** no. APR
- [4] R E Mayer 2014 *Introduction to multimedia learning* The Cambridge Handbook of Multimedia Learning Second Edition 2014 pp. 1–24.
- [5] B Park, J L Plass and R Brünken 2014 Cognitive and affective processes in multimedia learning *Learning and Instruction* **29** pp. 125–127
- [6] J W Creswell 2013 *Five Qualitative Approaches to Inquiry in Qualitative Inquiry & Research Design: Choosing Among Five Approaches* pp. 69–110
- [7] K Peters and E Halcomb 2015 Interviews in qualitative research *Nurse Researcher* **22**(4) pp. 6–7