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QuizWhizzer -Assisted Educational Game Design to Improve Students' Conceptual Understanding Skills

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ABSTRACT
Conceptual understanding is an understanding that is built from factual knowledge or examples to understand the relationship between concepts. However, after studying mathematics there are still many students who are less able and mistaken in understanding concepts so that mathematics is considered difficult. For this reason, an educational and interesting learning evaluation media is needed so that students can be accommodated to understand mathematical concepts. The purpose of this study was to analyze the needs of learning evaluation to improve students' conceptual understanding skills. This research is research and development in the first stage, namely analysis. Sources of data in this study were class VIII SMP Negeri 8 Yogyakarta, material expert validators, and media expert validators. The instruments used in this study were interview guidelines, observations, questionnaires, concept understanding ability test questions, material expert validation instruments, and media expert validation instruments. The data analysis technique includes the stages of data reduction, displaying data, and conclusions. The results showed that (1) students' ability to understand mathematical concepts tended to be low, so educational games were developed; (2) QuizWhizzer-assisted educational game creation; (3) fitur educational games that contain explanation menus with writing, pictures, and videos, practice questions, games, rankings in one class or class; (4) the results of the validation of material experts and media experts indicate that the product is valid to use with an average category is good. The research will continue at the implementation and evaluation stages.

Keywords: *learning media, games, concept understanding*

INTRODUCTION

Understanding is an important competency to be taught in learning mathematics. Understanding is a person's ability after remembering and knowing something so that he can understand or understand something. Meanwhile, understanding the concept means explaining the relationship between concepts and applying concepts flexibly, accurately, efficiently, and precisely in a problem. Thus, concept understanding is an understanding that is built from factual knowledge or examples to understand the relationship between concepts (principles and generalizations). Concept understanding is the ability to understand concepts, operations, and relations in mathematics. Therefore, understanding the concept of mathematics learning material is very necessary, because in mathematics learning all the materials are related to each other. The acquisition of learning outcomes becomes a benchmark in understanding concepts, so that the learning process can run smoothly. Understanding the concept can also help students to understand and distinguish between symbols, words, and signs in mathematics.

A student who already understands mathematical concepts has several indicators, including being able to re-explain ideas, share material that has been studied. appropriate, able to use ideas in a structured manner, able to provide examples, able to present ideas in the form of mathematical interpretation, able to connect various concepts, and able to expand the concept. However, students' ability to understand concepts is still very low, especially in Indonesia. This is supported by the results of the survey *Program for International Students Assessment* 2015 (PISA) in a numeracy test, where one aspect that is assessed is concept understanding and the results show that students' conceptual understanding in Indonesia ranks 63 out of 69 countries participating in PISA 2015. After studying mathematics there are still many

students who are not able to understand the material even on simple material because the concepts that are understood are still wrong and wrong so that mathematics is considered difficult. The materials taught to students are not only memorised, but more emphasis on understanding so that students can better understand the concept of the subject matter itself the materials taught to students are not only memorised, but more emphasis on understanding so that students can better understand the concept of the subject matter itself.

Learning media is everything both technical and physical in the learning process that can make it easier for teachers to deliver subject matter to students. The use of media as a companion in the learning process is needed to overcome problems that arise in the learning process. *games* Educational Are one of the learning media that are expected to increase students' understanding quickly because it is supported by *games* interesting. *Games* Educationalmake students have a better understanding and make student learning more fun. Based on research conducted regarding the use of *games* as learning media which can increase mathematics learning outcomes by 10.86% and increase student interest in mathematics by 20.57%.

QuizWhizzer is suitable for use in learning mathematics because it makes learning not boring and there are many games. Many features are provided by this application to make questions that are packaged into a game. *QuizWhizzer* can also be played during Distance Learning (PJJ) or directly in the classroom. *QuizWhizzer* is also one of the interactive learning media to assist teachers in presenting lessons to be more interesting and not boring. In this *QuizWhizzer* user can give questions to students in the form of a competition by following a certain path that has been prepared, resembling a snake and ladder game system. Users can also set and customize the question type, the score for each question, the rules for player movement and their position on the game board, and the quiz maker can run more than one game at a time.

METHOD

This type of research is research and *development using* the ADDIE development model. ADDIE has five stages of development, namely *Analysis*, *Design*, *Development*, *Implementation* and *Evaluation*. In this study, only the analysis stage has been carried out, so that other stages will still be continued for the sustainability of this research. The subjects in the study were class VIII students at State Junior High School 8 Yogyakarta which consisted of 32 students from class VIII-G as the control class, 31 students from class VIII-H as the experimental class, and 32 students from class VIII-I as the product trial class. The instruments used in this research are interview guides, observations, test questions for understanding mathematical concepts, and student response questionnaires related to learning and learning evaluation media that will be developed. In accordance with this type of research, the researchers used an interactive model from Miles and Huberman (2014) to analyze the research data, namely data reduction, data presentation, and conclusions, drawings, or verification.

RESULT AND DISCUSSION

Result

- **Define Phase**

Student's first Development educational game decisive. The problem analysis stage has been carried out and shows that (1) students' ability to understand mathematical concepts tended to be low, so educational games were developed; (2) QuizWhizzer-assisted educational game creation; (3) fitur educational games that contain explanation menus with writing, pictures, and videos, practice questions, games, rankings in one class or class; (4) the results of the validation of material experts and media experts indicate that the product is valid to use with an average category is good. The research will continue at the implementation and evaluation stages.

- **Design Phase**

After the analysis is done, the next stage is the design stage. The product in this research is QuizWhizzer to improve students' understanding of mathematical concepts. The application features a main menu, board games, quizzes, explanations of questions in the form of text, images, videos, and sounds, ranking menus, and competencies that must be achieved. Practice questions and discussions are made by paying attention to aspects of understanding the concept.

- **Home page/the start**

Page contains a login menu that students must fill out before entering the *QuizWhizzer*. The start page is shown in Figure 3.

Figure 1. Home page

- **The Main Menu/Game Board**

Serves to provide information related to the game to be passed, and see where the player's position is, and can see the opponent's movements, each number contains a question which must be answered by the player, and when the answer is correct it will continue to the next point, and if the answer is wrong it will remain in that number. Figure 3 shows a board game

Figure 2. Board Game

- **Question Menu**

Contains questions that will be answered by students, when students send their answers it will be corrected directly whether the answer is right or wrong, and there is an explanation for each question. Figure 4 shows the questions and Figure 5 shows the answers and explanations for the questions in.

Figure 4. Questions

Figure 5. Answers and explanations of questions

Final Page/Leader Board

When you have answered all the questions, the results and scores of the answers obtained by players will appear. Players can also see the ratings of other players and will be sorted by rank. Figure 6 shows the player ratings, Figure 7 shows the scores and results of players' answers, and Figure 8 shows the leader boards of all players.

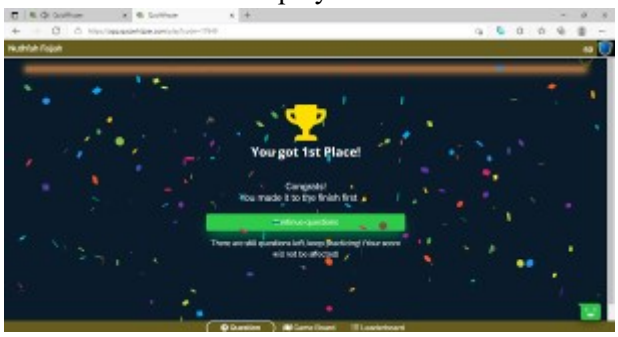

Figure 6. Shows the player ratings

Figure 7. Scores and results of players' answers

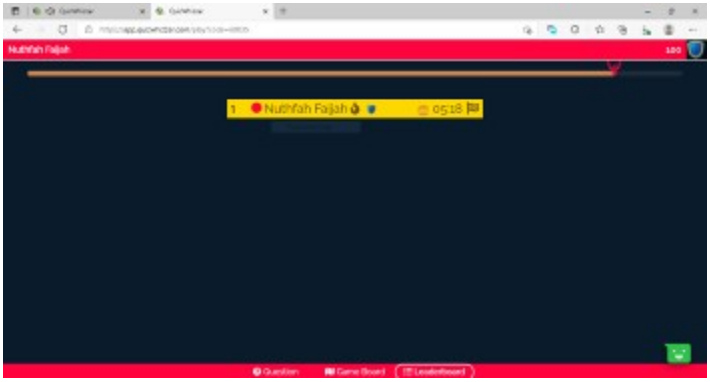

Figure 8. Shows the leader boards of all players

- **Development Phase**

The designs that have been developed by researchers are then validated by material experts and media experts. The instrument used has also been validated by the instrument validator. In this study, the validators of media experts and material experts are two experts. The total score of the validators of media experts and material experts is then interpreted with the classification of validity according to Widoyoko (2012) in Table 1.

Table 1. Table of Media Validity Criteria

No	Average Score	Criteria
1	$\bar{x} > \bar{x_i} + 1.8sb_i$	Very Good
2	$\bar{x_i} + 0.6sb_i < \bar{x} \leq \bar{x_i} + 1.8sb_i$	Good
3	$\bar{x_i} - 0.6sb_i < \bar{x} \leq \bar{x_i} + 0.6sb_i$	Enough
4	$\bar{x_i} - 1.8sb_i < \bar{x} \leq \bar{x_i} - 0.6sb_i$	Less
5	$\bar{x} \leq \bar{x_i} - 1.8sb_i$	Very Less

Based on Table 1, the interpretation of the categorization of the validity of media experts is shown in Table 2

Table 2. Results of Calculation of Media Validity Criteria

No	Average Score	Criteria
1	$\bar{X} > 63$	Very Good
2	$51 < \bar{X} \leq 63$	Good
3	$39 < \bar{X} \leq 51$	Enough

No	Average Score	Criteria
4	$27 < \bar{X} \leq 39$	Less
5	$\bar{X} \leq 27$	Very Less

The results of media validity criteria show the educational game design in Table 3 below:

Table 3. The Result of Media Validity Criteria

Assesors	Position	Score	Criteria
Dr. Suharno, S.Pd.,S.,S.Pd.T.,M.Pd	Lecture in Mathematics Education at Mercu Buana University of Yogyakarta	70	Very Good
Bayu Sudarmaji, S.Pd.	Headmaster at SMK Assalafiyyah Sleman & Manager CV ASA Multimedia	56	Good
Average		63	Good

Table 3 shows that it can be concluded that the design *QuizWhizzer* educational game criteria is Good. So that the *QuizWhizzer* educational game design can be declared valid. Based on the results of the definition stage and the design stage, this study shows the need to analyse educational games to improve students' understanding of mathematical concepts. For some reason, designing student learning problems based on the *QuizWhizzer* educational game was created which has the potential to improve students' understanding of mathematical concepts. Educational game design consists of a start page, main menu or game board, question menu, and end page or leader board. *QuizWhizzer* is made with educational game development problems to improve students' understanding of mathematical concepts. So, because the *QuizWhizzer* educational game design is in good criteria, this research can proceed to the development stage and the socialization stage.

The interpretation of the categorization of the validity of media experts is shown in Table 4

Table 4. Results of Calculation of Material Validity Criteria

No	Average Score	Classification
1	$\bar{X} > 54{,}606$	Very Good
2	$44{,}202 < \bar{X} \leq 54{,}606$	Good
3	$33{,}789 < \bar{X} \leq 44{,}202$	Enough
4	$23{,}394 < \bar{X} \leq 33{,}789$	Less
5	$\bar{X} \leq 23{,}394$	Very Less

The results of material validity criteria show the educational game design in Table 5 below:

Table 5. The Result of Media Validity Criteria

Assesors	Position	Score	Criteria
Ageng Triyono, S.Pd	Lecture in STKIP Kusuma Negara & *Curriculum Researcher & Developer* Widya Edutech – PT Widya Kreasi Bangsa	63	Very Good
Adhitya Prasetyaningtyas, M.Pd	Mathematics teacher at SMP Negeri 1 Way Tenong, Lampung	62	Very Good
Average		62,5	Very Good

Table 5 shows that it can be concluded that the material *QuizWhizzer* educational game criteria is

Very Good. So that the *QuizWhizzer* educational game material can be declared valid. *QuizWhizzer* is made with educational game development problems to improve students' understanding of mathematical concepts. So, because the *QuizWhizzer* educational game material is in Very Good criteria, this research

Discussion

The purpose of this study was to develop a QuizWhizzer-assisted educational game which was declared valid to be used by media experts and material experts. At the design stage, researchers consider input from students regarding media that is interesting to students and can improve students' understanding of mathematical concepts. So that the game developed contains questions that are in accordance with the student's problems. At the development stage, the researcher asked for opinions from two material expert validators and two media expert validators. For material experts to provide media input and suggestions, namely; (1) The position of the triangle used in the problem is the same, (2) There are still writing errors in the explanation of the question. From this input, the researcher has corrected and discussed it again with the validator so that the product is declared valid to be used. In addition, two media expert validators provided input and suggestions, namely (1) Instructions for using educational games. This has also been improved and revised by researchers. So, from the validator aspect, the product has been declared valid to be used.

CONCLUSION

Based on the discussion and research results above, it can be concluded that the material for the Pythagorean theorem is material that is considered difficult by students because there are still many students who tend to not understand which side is the sloping side, the upright side, and the base side, so students are also difficult to understand. determine what formula should be used to solve the problem. Then based on the results The results showed that (1) students' ability to understand mathematical concepts tended to be low, so educational games were developed; (2) QuizWhizzer-assisted educational game creation; (3) (4) the results of the validation of material experts and media experts indicate that the product is valid to use with an average category is good. The research will continue at the implementation and evaluation stages. Based on the results of the validation of material experts and media experts, it shows that the product is valid to use with a total score for media experts is 63 meeting the good criteria and the total score for material experts is 62.5 meeting the very good criteria. The research will continue at the implementation and evaluation stages.

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