

An Investigation of Elementary Students' Motivation in Learning Two-dimensional Shapes through Game

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Abstract: The purpose of this study is to investigate elementary students' motivation in learning two-dimensional shapes through a game. The study was conducted in 4th grade students in an Islamic Elementary School. Data were gathered from a classroom observation, a questionnaire, and some interview. Data were analyzed using three steps, namely reducing data, displaying data, and drawing a conclusion. The result of the analysis data indicated that the elementary students' motivation was very high in learning of two-dimensional shapes using game. Therefore, teachers can use this game to encourage elementary students' motivation in learning two-dimensional shapes.

1 INTRODUCTION

Some elementary school students consider the two-dimensional shapes to study geometry as a difficult material. Several studies identified students' difficulties in learning geometry, among them painting pictures and understanding the characteristics of images (Ayan and Bostan, 2018; DeJarnette and Gonzalez, 2017; Dindyal, 2015; Leavy et al., 2018; Papageorgiou and Xenofontos, 2018). Furthermore, Dindyal said that images can help students understand the concept of geometry, but images also have limitations depending on the learning model used by the teacher.

Piaget identifies the age of 4th grade elementary school children corresponding to concrete operational development stages characterized by the ability to organize knowledge into logical categories that still involve real experience (Gears and Berch, 2016). This means they need a concrete example of the learning experience to build their knowledge. Thus, the geometry learning media needs to be designed with attention to concrete examples. Even so, knowledge organizations with the provision of concrete examples for this two dimensional shapes still have weaknesses. The conceptual weakness of two dimensional shapes like a circle is only a concept that has no example in the real world. In this case, the researchers believe that the provision of concrete examples is the right medium to teach two-

dimensional shapes at the elementary school level. Thus, the use of geometry learning media becomes very important in order to optimize student learning.

Geometry learning for elementary students must be well prepared and implemented because good geometry learning will be a means that can deliver students' success in learning mathematics. Dindyal (2015) advocates collaboration between students and students and collaborates with students in learning geometry so that learning involves various approaches, social interaction, and even play. Game learning ensures social interaction between students and students.

Bandura (2012) defines the mechanism of human learning as a series of repeated interactions between a person's character, environment, and behavior. Student learning becomes very effective when they have good self-regulation, that is when students are able to understand, monitor, and control motivation and behavior towards the expected learning goals (Bandura, 2012; Glynn et al., 2011).

Teachers can use game learning media to increase students' desire/motivation. In this study, the game media used was Snake and Ladder. Unlike the typical Snake and Ladder game, this media contains two dimensional shapes. The advantages of this media can improve students' social interaction and memory. Learning media is played at least by two people who competed first reached the last position.

In fact, knowing the motivation of students in learning mathematics is not an easy matter. Glynn et

al.(2011) suggests that in knowing the motivation to learn mathematics, it needs to be seen why students try to learn mathematics, how they feel when trying to learn mathematics, how intense their efforts are, and how long their works.

2 METHOD

The purpose of this study is to investigate students' motivation of elementary school in two dimensional learning through learning game. The subjects of this research were three 4th grade students of Madrasah Ibtidaiyah Al Hidayah Blitar, Indonesia. The study used descriptive-qualitative research. The descriptive research aims to describe phenomena that are little known or to identify a new phenomena (Dulock, 1993). Creswell (2012) states that qualitative research is aimed to understand the phenomena which contains behavior, perception, action. Supporting instruments in this study consisted of motivation questionnaires, observation sheets, and interviews.

Subjects in this study were drawn from students with different mathematical abilities (low, moderate, and high) who had an equal level of motivation. The level of motivation is divided into 3 criteria, namely low ($0 < m \leq 2$), moderate ($2 < m \leq 3$), and high ($3 < m \leq 4$). Student's mathematical ability is shown by the value of the third grade raport. Subsequently, 3 students were selected as subjects, i.e. S1 (high mathematical ability), S2 (moderate mathematical ability), and S3 (low mathematical ability).

Researchers used six motivational factors used to design a motivational questionnaire. Questionnaire motivation was adapted from Tuan et al. (2005) which includes self efficacy, active learning strategies, mathematics learning value, performance goals, achievement goals, learning environment stimulation. Researchers also used motivation scale by Vallerand et al. (1992) which involves intrinsic, extrinsic, and amotivation. The students' motivation questionnaire is presented in Table 1.

Table 1: Students' motivation questionnaire.

		Motivation by Vallerand et al. (1992)		
		Intrinsic	Extrinsic	Amotivation
Motivation by Tuan et al. (2005)	Self Efficacy	I am sure that I am confident. I am confident to able to understand subject as difficult as possible.	I need to be motivated. I feel that I am able to understand a difficult lesson.	I am not confident. I did not study hard if the lesson was difficult.
	Active Learning Strategies	I always try to understand and write a new lesson. I always connect a new lesson with the previous lesson.	I understand and write lesson if other people ordered me. I study hard if my course was not good.	I feel that understanding and writing a new lesson is not useful.
	Science Learning Value	I feel happy and satisfied because having a knowledge and skill.	I feel this lesson is useful for my life.	I have no a new knowledge and skill from this lesson.
	Performance Goal	I feel happy and satisfied if I could do better one.	I feel happy and satisfied if other people praised me	I feel that my effort was not appreciated.
	Achievement Goal	I feel happy and satisfied if I could solve problem.	I feel happy and satisfied if I gotten reward or punishment which suitable with my effort.	I feel no one care with me and what I did.
	Learning Environment Stimulation	I feel happy and satisfied if I could use well place and source of learning.	I feel happy and satisfied if I could select place and source of learning.	I feel my learning environment was not supporting.

3 RESULTS AND DISCUSSION

Table 2 shows the answers of student's motivational questionnaire.

Table 2: Result of students' motivation questionnaire.

No	Subject	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	S1	2	4	3	4	2	2	3	4	4	4	1	4	4	1	4	3	2	4	4	2	2	4
2	S2	2	3	3	4	2	2	3	3	4	4	1	3	4	1	4	3	1	4	4	1	2	3
3	S3	2	3	3	4	2	2	3	3	4	4	1	3	4	1	4	3	1	3	4	2	2	3

Note:

Intrinsic motivation : 1,4,7,9,15,21

Extrinsic motivation : 5,10,13,16,19

Amotivation : 2,8, 12, 17,18, 20, 22

3.1 Intrinsic Motivation Description in Learning Geometry through Game

All subjects showed high intrinsic motivation in learning two dimensional geometry based on the questionnaires given and interview conducted. Based on questionnaire item Number 12, all subjects feel happy and satisfy because they can show their effort in learning, especially S1. This indicates that snake and ladder game used in learning two dimensional shapes can provide equal opportunities among students in learning two dimensional geometry. Based on questionnaire item number 18, all subjects feel happy and satisfy as they can utilize learning place and learning resources, especially S1. This indicates that there is dependent situation from the whole subject with learning place, learning resource, or learning media. This finding in line with the statement from Cook and Artino Jr. (2016) who state that human learning proses is influenced with interaction among personal, behavioral, and environmental factors. Eventhough learning media is categorized as extrinsic factors, the extrinsic motivation can translated to be intrinsic motivation if that motivation is integrated and internalised (i.e student think that mastering the learning media as a competency).

3.2 Extrinsic Motivation Description in Learning Geometry through Game

All subjects indicated high extrinsic motivation based on questionnaires given and interview conducted. Based on questionnaires item Number 2, all subjects feel confident in understanding two dimensional geometry right after using Snake and Ladder Game. Based on questionnaires item number 8, all the subjects will study hard when they get bad

score. Hence, all the subjects are motivated from the Snake and Ladder Game. This is suitable with Muntean who stated that gamification not only using extrinsic motivation such as level, points, and badge but also can combine intrinsic motivation such as the effort of mastery, autonomy, and sense of belonging (Richter et al., 2015). Based on questionnaires item Number 22, all the subjects is feel assisted by Snake and Ladder Game because this game freed students to communicate, to cooperate, and interact with the other students. Malone stated that competition, social interaction, and cooperation can influence player behaviour (Richter et al., 2015).

3.3 Amotivation Description in Learning Geometry through Game

Based on questionnaires item Number 17 and 20, all subjects feel that they have received enough attention for what they capable of in learning. All the subjects also think that their environment is still optimum to study. This indicates the optimism from all the subjects such that they could avoid amotivation caused by their environment.

4 CONCLUSIONS

The result of this study indicates that the game for two-dimensional geometry could provide high motivation to students. Those high motivation consist of extrinsic motivation, intrinsic motivation, and amotivation. Snake and Ladder Game for two-dimensional geometry facilitates an intense interactions between students to the other students, and interactions between students and teacher. These interactions were an effective. Researchers also admit that, it would be impossible to mention the example of two-dimensional geometric shape in real life. Hence, the problem remained was teaching two-dimensional as an abstract concept which uncovered by this game.

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