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Infographic Development through Instagram to Reduce Mathematics Anxiety and Increase Student Learning Outcomes

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ABSTRACT

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Research is a descriptive research that aims to describe the product development process in the form of infographic learning media in algebra material through Instagram that is appropriate for students to use for independent learning activities. This research focuses on creating infographic media in algebra material through Instagram to reduce mathematics anxiety and improve learning outcomes. The method used in this research is development research using the Sadiman's model. The stages in this development model are preliminary stage, prototyping stage, and final stage, which from three stages contain of nine steps, namely identification of needs, formulation of objectives, formulation of materials, formulation of success measurement tools, writing of media scripts, production, tests/trials, revisions and the final product. There were 34 students of seventh graders of junior high school participating in this study. Data was collected through interviews, observations, tests, and questionnaires. Data were analyzed quantitatively and qualitatively. The results of the validation test by experts show that 93% of infographics through Instagram as strengthening students' understanding are included in the valid category and are suitable for use in the learning process. In addition, as many as 88% of students experienced an increase in learning outcomes after learning to use infographics through Instagram which indicated that the level of student anxiety in learning mathematics had decreased.



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A. INTRODUCTION

Mathematics is a compulsory subject from elementary school to the university level. However, in reality, the importance of mathematics needs to follow the conditions in the field. The reason is that several problems occur during the mathematics learning process, such as mathematical ability problems in solving math problems and up to psychological problems that can be experienced by students in the mathematics learning process (Santoso, 2021). Jayantika (2020) states that one of the psychological problems often experienced by students in the learning process is anxiety. The anxiety experienced by students in mathematics is referred to as mathematical anxiety (Anita, 2014). Dowker et al. (2016) explain that mathematical anxiety is a feeling of tension and anxiety that interferes with solving mathematical problems in everyday life and academics. This is in line with Suren & Kandemir (2020) state that

mathematical anxiety is a feeling of panic, helplessness, inability to act, and unable to control the mentality that occurs to a person when asked to solve mathematical problems. Fear and worry are psychological symptoms usually caused by a person's inability and powerlessness to deal with problems (Supriatna & Zulkarnaen, 2019; Ulya & Rahayu, 2017).

Some research results show that mathematical anxiety has an important role and has a significant relationship to mathematical abilities and student learning outcomes (Auliya, 2016). Research conducted by Diana et al. (2020) states that there is a difference between students' conceptual understanding abilities based on anxiety levels. The ability to understand mathematical concepts of students with low anxiety is higher than those with moderate and high anxiety levels. Based on the explanation that has been described, mathematical anxiety is a psychological aspect that has an important role and needs more attention for mathematics teachers because some research results show that mathematical anxiety influences mathematical abilities and student learning outcomes. Mathematical anxiety in students can negatively impact the learning process because when students experience mathematical anxiety, they will have difficulty digesting or understanding lessons well (Fista et al., 2019; Dowker et al., 2016).

Therefore, it is important for teachers to know the efforts that can be made to overcome and reduce mathematical anxiety in students so that the learning process can run well. One of the efforts that can be done to overcome and reduce mathematical anxiety in students is to use technology. This is because the sophistication of this technology can support success in innovating learning strategies (Alfawareh & Jusoh, 2017). The success of a learning process is determined from various aspects, one of which is learning media. With the help of technology, it is expected to increase the innovation of a learning media which can later improve the quality of education. An interesting media innovation that is currently popular is visual-based learning media. Visual learning media has a very important role in the learning process, this is because visual media will really help students understand the concept of the material being studied (Suyatna et al., 2017).

One way to spread visual learning media is through social media networks. Indonesia has a large enough number of social media users so that it becomes a target for social media to channel various information (Insani et al., 2019). One of the most popular social media is Instagram. In 2022 as many as 173.59 million Indonesians use Instagram as the most frequently used social media, this information can be used to provide learning experiences to students by spreading visual learning media through Instagram (TGS, 2023). This is in line with the results of interviews with teachers, where students and teachers already use Android-based smartphones and have several social media accounts, one of which is Instagram. According to Sari & Siswono (2020) Instagram is a social media application that presents content in the form of photos and videos, features owned by Instagram also allow users to easily interact such as captions, comments, messages` etc. The ease of access to the Instagram application that can be used on smartphone devices plus several interesting features make this social media quite popular with the public. Not only that, the presence of Instagram can also provide benefits for several fields, one of which is the field of education. Instagram is a form of technological sophistication that can make it easier for teachers to deliver learning materials that are more interesting, effective and efficient (Rokhmawati & Mastuti, 2018).

Rokhmawati & Mastuti (2018) also revealed that Instagram supports the active role of students in the learning process, this is because they often use social media in their daily lives. One of the visual learning media through Instagram that can be used as a tool to overcome and reduce anxiety is infographics. The use of infographics as learning media can affect student achievement in the cognitive domain (Umami et al., 2016). According to Alrwele (2017) infographics come from the words information and graphics, Infographics are variety of visuals presented by combining text, images, and illustrations can also help students understand the material presented. Infographics present complex visual information clearly so that it will be easier to understand (Hutauruk, 2020). Infographics are not something new, now infographics are one of the trends in delivering information that we often encounter in everyday life. Infographic display is able to attract attention and simplify complex information to be easier to understand (Arigia et al., 2017). Infographics have been widely used in several fields, one of which is in the field of education, namely as a learning media. Dunlap & Lowenthal (2016) reveal that infographics have considerable potential as an efficient, clear, and precise way to convey complex, abstract, and difficult-to-understand information, thus supporting patterns of learning activities.

According to Kominfo (2018), there are several criteria for compiling infographics which have been adjusted to the learning components, namely goal-oriented, coming from valid and factual sources, relevant to the needs of readers, superior visual aspects, straightforward and easy to understand, and easy to spread. Infographics as a learning media can be one way that can increase students' learning motivation (Mansur & Rafiudin, 2020; Wulandari et al., 2019). This infographic media can be used both for independent study and learning together with other students. Infographics can increase students' reading interest, because of the provision of colour on the background, as well as providing relevant and interesting images (Arimbawa & Sanyadiputra, 2018; Miftah et al., 2016). The advantages of infographic media are, first, infographic media contains interesting pictures and sentences. Second, infographic media can be displayed on social media platforms such as Instagram. Third, infographic media can be accessed by anyone, including students. Fourth, infographic media can make it easier for teachers to deliver learning materials. Fifth, infographic media can increase the imagination of students.

Infographic media can also help educators to train students' abilities and students' habits of learning independently. Infographic media plays a role in simplifying information so that it becomes easier and faster to understand (Dewi et al., 2021; Nasution & Diansyah, 2020). The ability to process infographics will create an attractive learning atmosphere for students, so that learning materials are conveyed well to students. Infographic media is one of the information media that is easy to convey and can be understood well (Hakim & Ramadhan, 2020; Muthiadin et al., 2020). This is in accordance with research which says that learning media makes it easier for students to learn (Aldila et al, 2019; Puspitorini et al., 2014). Other research findings show that students who use learning media using augmented reality technology show higher learning motivation than students who do not use augmented reality. In addition, students who used augmented reality showed lower math anxiety compared to the group that did not use augmented reality (Hidayat & Asmalah, 2022).

Suren & Kandemir (2020) stated that the relationship between the high achievement of students' mathematics learning outcomes and mathematics anxiety is that the higher the achievement of students' mathematics learning, the level of students' mathematics anxiety is at a low or moderate level. On the other hand, students who have a high level of math anxiety have low mathematics learning outcomes. This is what the researchers considered in this study to develop learning media through Instagram, as the largest social media used by Indonesians. Instagram can use for student learning platforms with infographics as the visual-based media used. This is something new that has never been studied before, this development was carried out by combining Instagram social media with infographics in mathematics learning material for class VII algebra. This study aims to infographic development through Instagram to reduce mathematics anxiety and increase student learning outcomes. It is hoped that with the application of this media, mathematics anxiety in students can be overcome, making it easier for students to understand the learning material and can provide a separate learning experience for students to access learning materials both inside and outside the classroom, and also students can use social media for learning activities so that they can have a more positive impact of using social media.

B. METHODS

This research is a descriptive research to describe the process of media development in the form of infographics on algebra material. The method used in this research is development research using the Sadiman development model (Sadiman, 2008) with the development flow as shown in Figure 1.

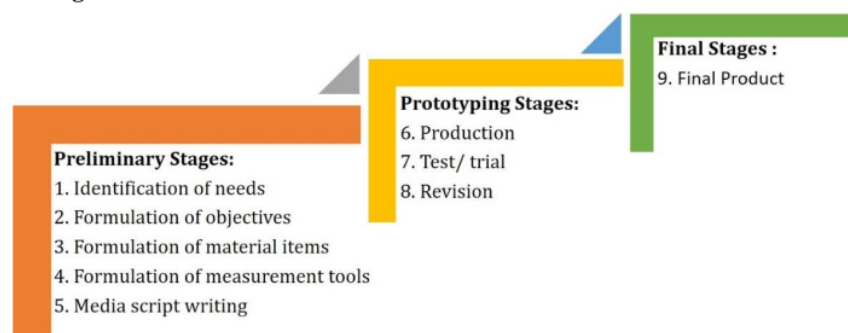


Figure 1. Development model of infographics in algebraic material (Sadiman, 2008)

Figure 1 showed that there are three stages of Sadiman development models, contain of preliminary stages, prototyping stages, and final stages, where each stage has a research steps. The steps in this development model include identification of needs, formulation of objectives, formulation of material items, formulation of success measurement tools, media script writing, production, tests/trials, revisions and final products. The subject in this study are 34 students of seventh grade of Patra Mandiri 1 Junior high school Plaju, Palembang. They participated in prototyping stages in part of test/trial. There are three steps of trials that are applied to the target, namely individual trials, small group trials, and field trials.

Data was collected through interviews, observations, tests, and questionnaires. Interviews, and observation use for gathering information about problems in the learning process obtained

through observation activities. The questionnaire was used to determine the level of students' mathematics anxiety before carrying out learning using infographics and after using infographics. The test is used to measure the achievement of students' mathematics learning. Respondent's questionnaire instrument with a total of 20 items, then for the tests consist of pre-test and post-test questions each 20 items. The data analysis used in this research and development is qualitative and quantitative data analysis. Qualitative data obtained from the responses of experts and students related to the product being developed. Quantitative data were obtained from a feasibility assessment questionnaire from experts and students. Questionnaire and test data were analysed quantitatively using the eligibility criteria according to Arikunto (Arikunto, 2010). Furthermore, the data is presented and described in the research results.

C. RESULT AND DISCUSSION

1. Results

In the preliminary stage there are five steps that must be carried out, namely the first step, identification of needs, in this step researchers were gathering information about problems in the learning process obtained through observation activities at school. The result of this step is that students are still not optimal in achieving learning outcomes in mathematics, besides that the use of ICT in learning is still not optimal. The results of interviews with teachers show that both teachers and students already use Android, and have social media accounts, one of which is Instagram. The second step, the formulation of learning objectives, namely formulating a basis of reference to determine everything in a lesson. In this step, the researcher formulates the learning outcomes that must be obtained by students through curriculum analysis and creates indicators of learning achievement. After this is done, the researcher conducts a study of algebraic material to decide on the material and arranges content to be developed on media, the content developed is in the form of infographic media on algebraic material. The fourth step is the preparation of a measuring instrument for the success of this step to develop an assessment tool for the developed media. The fifth step is writing media scripts to create designs on media that will be developed in this case infographics via Instagram.

Based on the results of the development of an infographic product containing material about algebra which consists of 4 sub-materials that are operated through social media Instagram. By utilizing some of the features found on Instagram, it consists of several parts, namely instructions for use, learning objectives, concept maps, quizzes, and summaries that are displayed in the highlight section, as well as learning materials displayed in the Instagram feed section. The following is a display of the results of developing infographics through social media Instagram showed at Figure 2.



Figure 2. Infographic Display on Instagram Sub Algebra Addition Material

Figure 2 shows the results of the media script writing step, at this step it has also entered the prototyping stage, namely the production step for display on Instagram. Beside that production step is the step where everything that is arranged in the design will be produced or implemented into a media. Before being tested on students for the seventh step, this infographic will be validated first to 1 material expert and 1 media expert to see the feasibility of the infographic being developed as a learning media. Judging from the data from the validation test results by material experts, the percentage of the overall results obtained is 93%. Based on the eligibility criteria that have been determined, it can be said that infographics through Instagram as a strengthening of students' understanding are included in the valid and appropriate category for use in the learning process. The responses from material experts are: improvements to writing errors. Then for the data from the media expert validation test results, the percentage of the overall results obtained is 94%. Based on the eligibility criteria that have been determined, it can be said that infographics through Instagram as a strengthening of students' understanding are included in the valid and appropriate category for use in the learning process. The responses obtained from the media expert validation test are: improvements to writing errors and the addition of a task sub menu in the highlight section.

After entering the production period and going through expert validation, the next step is to carry out the test/trial steps, with three steps namely, individual trials which are attended by three children who have heterogeneous abilities. The results of the analysis of individual trial data, the overall percentage obtained is 85%. Based on the eligibility criteria that have been determined, it can be said that infographics through Instagram as a strengthening of students' understanding are included in the valid and appropriate category for use in the learning process.. After going through individual trials, the next step is small group trials which are tested on six students with various abilities who study in small groups. The results of the small group trial data analysis, the overall percentage obtained was 89%. Based on the

eligibility criteria that have been determined, it can be said that infographics through Instagram as a strengthening of students' understanding are included in the valid and appropriate category for use in the learning process.

Furthermore, field trials were carried out with 25 students with heterogeneous abilities participating. The results of field trial data analysis, the overall percentage obtained is 90%. Based on the eligibility criteria that have been determined, it can be said that infographics through Instagram as a strengthening of students' understanding are included in the valid and appropriate category for use in the learning process. The following Figure 3. Is the picture of the learning process when students used the Instagram Sub Algebra Addition Material.



Figure 3. The Learning Process of The Students using Instagram Sub Algebra Addition Material

The responses obtained from the field trials are: the media presented is interesting and not boring, but some students also give suggestions to apply infographics into some learning materials. Furthermore, it can be seen from the data of learning outcomes through pre-test and post-test activities conducted on 25 students. There is 1, namely 4% of students who have not experienced an increase in value, while 24 or 96% of students have increased in value.

When viewed from the results of the analysis of the success of the learning test (Arikunto 2010) it shows that as many as 23 students easily use infographics through Instagram in learning activities, while two students still find it difficult to use infographics through Instagram in learning activities. Judging from the results of the description, it can be concluded that infographic media through Instagram is appropriate for students to use as individual learning media. For the level of students' math anxiety obtained from the results of the questionnaire can be seen in the following (Table 1). Students mathematics anxiety in learning algebra through Instagram, as shown in Table 1.

Table 1. Result of students' mathematics anxiety in learning algebra through Instagram

Interval	Percentage	Categories of math anxiety
86-100	0	Very high
70-85	12	High
60-69	44	Moderate
50-59	36	Low
< 50	8	Very Low

Based on Table 1 above the results of the students' mathematics anxiety level, as many as 12% or 3 students have a high level of mathematics anxiety, as many as 44% or 11 students have a moderate level of mathematics anxiety, as much as 36% or 9 students have a low mathematics anxiety level and as many as 8% of students have a very low level of mathematics

anxiety. After the results of students' math anxiety were obtained, they were analyzed and discussed.

The eighth step, namely revision, is the stage of perfecting the media. At this stage the media is perfected by looking at the overall process and results of tests/trials on students, including individual trials, small group trials and field trials. To see as a whole if there are still errors in the infographic media used. Next is the final stage, namely the Final product stage, where at this stage the resulting product is final, declared valid and practical to use so that this product is suitable for distribution to schools or disseminated to the community as a medium for learning mathematics algebra material.

2. Discussion

In this study, the media developed was infographic media. Ozdamli et al. (2016) suggest that effective infographics present complex information in a simpler and easier way for readers to understand. In the field of education, infographics can be adopted as a tool that can help in the learning process. Some of the reasons why infographics were chosen as learning media are because they can improve students' ability to think about complex information and also increase students' understanding of the information conveyed (Bicen and Beheshti, 2017). Nowadays, infographics can be presented on any media, one of which is using a digital device, namely a smartphone. Now this smartphone has become a common part in people's lives. Ozdamli & Ozdal (2018) say smartphones make a big contribution in terms of presenting infographics in the digital era. One of them is by using social media. In Indonesia, social media is at the first level as the most accessed internet content, which is 173.59 million people. This is the reason for the trend of delivering infographic information through social media. However, utilization in education is still not optimal. In this development, namely by presenting learning material content in the form of infographics by utilizing Instagram social media.

Instagram application as a social media that can help teachers to deliver learning materials effectively and efficiently (Zhang 2013). Instagram can be used as an alternative to online learning that can be accessed by students independently because there are interesting pictures and features so it is not boring. As Veygid et al. (2020) said, several features on Instagram such as feeds really support the learning process because they can present information in visual form about the material presented. This study used the subjects of junior high school students with an average age of about 12-15 years. According to Novelyya (2019), junior high school students tend to have high curiosity about learning materials. In this case, an encouragement is needed to make students excited and focused in learning activities. Infographic media through Instagram is not only designed to help students in terms of ease of understanding information on learning materials, but also helps to motivate students to be more enthusiastic and focus on learning. Instagram supports students to play an active role in individual learning because students often use Instagram social media in their daily lives (Rokhmawati & Mastuti, 2018). It is known from the observation that 94% of Patra Mandiri 1 Plaju Junior High School students use social media, especially Instagram in their daily activities. The learning content in this development contains algebraic material in mathematics learning. This material is generally abstract. In its application in learning the teacher often explains the material in an abstract way so that it is difficult for students to understand. Students' understanding of concepts in

mathematics is less effective if its application is only using conventional methods, it would be better if the delivery of material is supported by appropriate supporting media (Firdaus et al., 2015). Infographic media can change the material to be more interesting and easier for students to understand. Hart (2013) said that infographics make it easier for students to understand the material easily and can also build thinking skills. In its development, this infographic media is easy to develop by utilizing several inexpensive means but it also provides many advantages in its application to learning activities. By taking advantage of the ease of access to Instagram, infographic media can be an alternative for learning both in the classroom and outside the classroom. Other studies have determined that infographics can be an alternative to independent learning by utilizing the help of social media so that students can access and learn anytime and anywhere (MacQuarrie 2012).

The learning media in this study was used to overcome problems in mathematics anxiety and decreased learning outcomes. In the study it was stated that the developed infographic media was able to overcome math anxiety so that it could help students to improve learning outcomes. In this study, an infographic media for algebra learning materials was developed, it aims to help students understand the learning material. The material in this study is presented in the form of an infographic which is uploaded in the website Judging from the results of the trial, the material expert gave an assessment of 93% and the test result of the media expert was 96%. There are several expert suggestions, namely the media is very interesting and up to date. As for the improvement of the media, namely the improvement of some word writing errors. Infographic media through Instagram has the advantage that the material is presented on a static infographic so that it looks very attractive than the material presented in printed books. The material presented in the infographic is also very brief and easy to understand. This is because static infographics integrate several graphic elements so that students focus more on the material they are learning. Easy access to material through Instagram makes it easy for students to learn independently. Through individual evaluation activities, the overall analysis results obtained by 85% show that infographic media through Instagram is considered valid and feasible to use in learning. Then the small group evaluation, obtained an overall analysis result of 89% indicating an increase and was considered valid and feasible to be used in learning. The last one is the field evaluation, which involves 25 students. Overall, the analysis results obtained are 90%, seen from the percentage of field evaluations showing that infographic media through Instagram is considered valid and feasible to use in learning.

The use of infographic media through Instagram can make it easier for students to learn, in accordance with the purpose of this media it was developed to facilitate students' independent learning activities. From the results of the evaluation through pre-test and post-test activities, it was shown that there was an increase in student learning outcomes before and after using infographic media through Instagram in learning. Other research reveals that apart from being an alternative learning media, infographics are also able to improve student learning outcomes. Based on the students' comments, they found that infographics through Instagram made learning activities more interesting, easy to understand, and not boring, because the information explained was very concise, clear, and with interesting pictures. Infographic media combined with Instagram can also be an online independent learning media solution so that it can facilitate students to increase students' understanding of the material when outside the

classroom. Students also provide suggestions for applying infographic media through Instagram to other learning materials.

D. CONCLUSION AND SUGGESTIONS

Infographic media through Instagram as a strengthening of understanding of the subject of algebra for class VII students has a position as a supplement (additional), which can be used for learning activities inside and outside the classroom. The development of infographic media through Instagram is expected to help students to improve their understanding of the material of the human digestive system. Based on the development objectives, this infographic media through Instagram social media has met the criteria for being suitable for use as a learning medium. This means that the developed infographic media through Instagram is able to increase students' understanding of the human digestive system material and arouse students' interest in learning. In the other hand, with developed infographic media through Instagram the high level of math anxiety only shows that they reduce mathematics anxiety. Infographics media can be accessed via smartphone devices online so that students can use them independently. In the process of testing the development of infographics media through Instagram, it obtained valid and appropriate results to be used as learning media. Some of the responses obtained from students in the trial activities were that infographics media through Instagram could make it easier for students to understand the material. In addition, by utilizing Instagram media students could access material independently whenever and wherever so as to provide a separate learning experience for students. For further development in the future, it is hoped that the media developed will include more learning materials. The importance of revising media products so that the media developed can be in accordance with what is expected.

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