
Developing Elementary School Student's Learning Independence by using Android-Based Gravity e-comic

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Abstract. Student learning independence is currently low, this is indicated by the lack of a variety of learning media used by teachers. The problem to be raised is that students are not independent in exploring their knowledge, including in science subjects (results from interviews with teachers at SDN 80 Kota Tengah). To overcome these problems, the purpose of this study is to develop an android-based gravity e-comic to increase student learning independence. The method used in this research is the R & D (research & development) method, the development model used to produce android-based gravity e-comics is four d, with steps namely define, design, development, disseminate. The data collection procedure is to describe the validity, practicality and effectiveness of the e-comics that are made. Data analysis uses analysis of validity, practicality, and effectiveness. The results showed that the gravity e-comic developed was valid, received positive responses from students and was very good for training the learning independence of elementary school students, so it was feasible to use in the science learning process in elementary school. The conclusion of this study is that android-based gravity e-comics are valid, practical to use in the learning process, and effective in increasing student learning independence at the elementary school level.

Keywords: e-comic, gravity, independence.

Introduction

The learning process is a transferring information sourced from the provider to the receiver (Huda, 2013). Therefore, the use of learning media occupies an important position as one of the components in the learning process (Putri & Ariyanti, 2015). Learning media can be used to convey messages and stimulate a meaning full learning process, because learning media is broader than teaching aids, teaching aids, and audio-visual media (Zainal, 2013; Astutietal,2019).

The selection of learning media that is interesting for students can optimize the learning process, where one of the learning media that is interesting for students is comics. According to Nurgiyantoro (2013) comics are stories displayed through

pictures in panels accompanied by balloons containing written text. The use of interesting images by presenting events chronologically is the uniqueness of comics as learning media, the same thing was stated by Awiegerova & Navratilova (2017) who revealed that the use of comics that link a scene with students daily lives and the use of simple language can help students to learn the material students can.

The uniqueness of this comic can be an opportunity for teachers, especially for teaching science material for elementary school children, where elementary school children really like pictures, in other hand, learning science comics can be used to explain abstract concepts (Akcanca, 2020; Ilhan & Oruc, 2019). The results showed that comics are feasible to use in the learning process because they can improve student learning outcomes (Yulianti, et al., 2018; Yulinda, et.al., 2019). In addition, comics are very useful to use as a learning medium that motivates students to learn through the images and text presented (Koutnikova, 2015), where by reading comics students are more relaxed in thinking, increasing students' imagination in finding their own ideas (Wang, 2022). This is in line with the opinion of Nurohim et al. (2012), which states that comics can increase student learning motivation through visualization of abstract science material, and can be printed according to student needs. Compared to using textbooks, the use of comics as learning media can improve students cognitive abilities (Avrillianti et al., 2013; Casumpang & Enteria, 2019).

The development of science and technology, the utilization of android-based learning media is one of the solutions to current educational problems. Nazar, et al. (2020) explain that android-based learning application scan be used as media in learning, by utilizing technology in the learning process can make students more interested in learning topics (Papadakis, 2020) and students also respond positively to the use of technology in the learning process (Lisnani & Emmanuel, 2020). Therefore, android-based comics is a challenge in their own development, several researchers have developed android-based comic media or commonly called e-comics. According to Buchori & Setyawati (2015), e-comic is a reading that allows students to use online media on the internet, intranet, or other computer network media. The use of e-comics can improve the quality of learning and student learning outcomes (Riwanto & Budiarti, 2020; Wicaksono et al., 2021; Damopolii et al., 2021).

The learning process should not only improve students' cognitive learning outcomes, but also pay attention to affective aspects. In this case, the character of students, including the character of independence, where independence is important in a learning process because being independent in the learning process will affect student achievement (Rahmayani, 2019).

The results of Ariah's research (2015) show that student independence is currently fairly low, this is indicated by the number of students who can not be independent in doing school assignments. This is supported by the results of interviews with teachers at SDN 80 Kota Tengah who said that students are not independent in exploring their knowledge, including for gaya material, this is indicated to be caused by the lack of learning media suitable for elementary school children. This needs attention considering that there is a positive although low relationship between learning independence and learning outcomes (Permata et al., 2022). Although, according to Elistiani (2022) there is no significant relationship between student learning independence and student science test results.

In the learning process, most teachers use textbooks to teach material in class, so it does not support the creation of learning independence for students. This will certainly have an impact on students' daily lives, where students will depend on others to be able to solve their life problems. Independence is defined as a condition of not depending on others in making decisions and having a confident attitude, while learning independence is defined as the ability of children to believe in their

own abilities, the ability to learn independently and not easily depend on others (Wuryandani et al., 2016).

The use of comics as a learning media is one of the solutions to increase students learning independence, where this learning independence can be in still led in students from an early age, through the use of comics as a learning media, as revealed by Wibowo & Koeswanti (2021) that comics can increase student learning independence in elementary schools. The purpose of this research is to produce android-based gravity e-comics that can increase the independence of students in elementary schools.

Methods

The method used in this research is the R & D (research and development) method. According to (Nana, 2016), development research is a study that aims to develop an existing product or produce a new product that can be accounted for. This research produces a new product, namely android-based gravity e-comics for elementary school students. Data collection procedures by describing the validity, practicality and effectiveness of the e-comics that are made. The data collection technique is through instruments in the form of questionnaires and learning achievement tests. Data analysis uses analysis of validity, practicality, and effectiveness. The development model used to produce the android-based gravity is comic four d. The development steps are carried out based on four stages, namely define, design, develop, disseminate. To measure the quality of the android-based gravity e-comic produced, researchers refer to the opinion of Akker (1999) and Nieveen (1999) who suggest that the quality of a product is seen from the level of validity, practicality and effectiveness of the product produced.

The validity of the android-based gravity e-comic is shown by the results of validation through a validation sheet conducted by 4 experts, namely two science learning experts and 2 learning media experts. The practicality of the product is shown by student responses to the use of android-based gravity e-comics and the effectiveness of the product is shown by an increase in student learning independence.

To obtain data on the practicality and effectiveness of android-based Gravity e-comics, this research was conducted at SDN 80 Kota Tengah Gorontalo City in the odd semester of the 2022/2023 academic year. The research subjects for the development stage were 15 students in class VA and 25 students in class VB.

Student response as an indicator of the practicality of the android-based Gravity e-comic is measured using a student response questionnaire, while learning independence as an indicator of the effectiveness of the android-based Gravity e-comic is measured using a learning independence questionnaire.

Data analysis for this study was carried out to analyze data on the validity of practicality in this case student responses and effectiveness in this case student learning independence, as described. The validity analysis was carried out by calculating the average assessment of each expert. Furthermore, to determine the criteria for validation results refer to Table 1.

Table 1. The criteria for validation results

No.	Value Range	Criteria for Validation
1	4.00 – 3.75	Very Valid
2	3.75 – 3.00	Valid
3	3.00 – 2.25	Fairly Valid
4	2.25 – 1.50	Less Valid

(source: Arikunto, 2013)

If the validation results are on valid or very valid criteria, then the android-based Gravitye-comic can be used in the limited trial and implementation stages to determine student response and learning independence.

Data analysis for student responses and student learning independence is carried out with the following steps. The answer options for the response questionnaire and students' learning independence are yes and no. Yes answer options for positive student responses were given a value of 1, while no answer options for negative student responses were given a value of zero.

After the data for all students was collected, this data was then analyzed using the equation: $NP = \frac{R}{SM}$ (1)

NP = presentation score

R= score obtained

SM = Maximum score of the expected aspect (Widoyoko, 2012)

The percentage value is categorized base on

Table 2. Response criteria and student learning independence

No	Response criteria (%)	Category
1	86-100	Very Good
2	75-85	Good
3	66-74	Fair

(source: Arikunto, 2013)

If the results of the analysis of student responses and learning independence are in the good and very good categories, then the android-based gravity e-comic can be used in a more widespread learning process.

Results and Discussion

The result of the research is the availability of an android-based gravity e-comic, with the researches ages as described.

Define

The main activity carried out at the define stage is to examine the importance of developing android-based gravity e-comics in science learning. The analyses that have been carried out are: Performance analysis that examines the basic problems in learning science in grade 5 elementary schools, where elementary school students have difficulty learning science concepts, the lack of learning media that is interesting and in accordance with the cognitive level of grade V elementary school children, and the low learning independence of grade 5 elementary school students. Moreover, the characteristics of grade 5 students were analyzed through literature studies and surveys conducted in several elementary schools in Gorontalo City.

The results of the analysis show that the characteristics of elementary school students are that students can learn in a calm position for 30 minutes, so teachers must be creative in choosing appropriate learning methods and media that can motivate students to continue to be active in learning. Students only like to learning groups, so students have difficulty if given independent assignments by the teacher, to overcome this teacher must be creative in choosing media that can train students' learning independence. Where the results of research by Sari et al. (2021) show some things that were analyzed include needs, such as material, characteristics of students and learning media. The curriculum used in SMA Negeri 1 Garoga was the k-13

curriculum. Reaction rate material includes material that was difficult for students to understand, besides this material used a lot of calculations and also has practical activities.

The results of the analysis showed that a media that can lead students to be more active and able to visualize the subject matter was needed. Based on this, the learning media for chemical comics based on android were expected to help students understand the reaction rate more easily and interestingly. The results of this analysis indicate that the use of android-based Gravity e-comics can be used as a solution as a learning media for grade v elementary school students, where the results of research by Wibowo & Koeswanti (2021) show that the use of comics in the learning process can increase student learning independence. Still in the analysis stage, learning objectives are then analyzed to determine the competencies that students need to have after learning by using the android-based gravity e-comic learning media.

Design

The design of the android-based gravity e-comic begins with the preparation of the story narrative then proceeds with making comics. The following is given a view of the gravitice comic the main screen of the android.

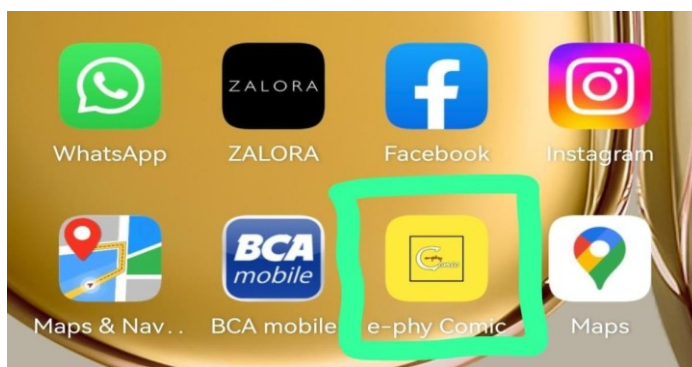


Figure 1. E-comic app display on android main screen

To use the-comics application on the main android screen, students click on the app and the following image will appear on the student's android screen.



Figure 2. Android-based Gravity e-comic start screen

Clicks start, and the following screen will appear on the android screen.



Figure 3. Android-based Gravity e-comichomescreen

Click start, then students can read the entire contents of the comic. Here are some content from the gravity e-comic story.



Figure 4. Content of gravity e-comic on android

The advantage of the application used is that internet data is only needed when students download this application, after that the application can be used without internet data, making it easier to use gravity e-comics in the learning process, because it is not hampered by the network and students who do not have internet can use this gravity e-comic as long as they have downloaded this application. Where the results of research by Panjaitan et al. (2021) show the clarity of pictures displayed was necessarily essential. The clear images with attractive colors can increasingly motivate students to study more.

In addition, this is in accordance with the views of Nazar *et al.* (2020) that a learning media will provide fun elements so that it can foster interest and attractiveness of students to learn a concept that is complicated or boring. In addition, this is in accordance with the views of Lisnani & Gunadi (2020) that Educational games in the classroom tend to minimize distractions, thereby increasing the quality of teaching and learning beyond what is provided in conventional classrooms.

Development

At this stage, after the android-based gravity e-comic is finished in the form of a finished product, validation is carried out by science learning material experts and learning media experts. This validation process is carried out with the aim of getting suggestions and input from experts to improve the quality of android-based gravity

e-comics. The following data is the results of expert validation of android-based gravity e-comics that have been designed at the previous stage.

Table 3. Science learning expert validation results

No.	Validator Assessment Aspect	Average Score	Assessment Category
1	Self Instruction	3.85	Very Valid
2	Self Contained	3.75	Very Valid
3	Stand Alone	3.50	Valid
4	Adaptive	3.75	Very valid
5	User Friendly	3.75	Very Valid

Based on the results of the validation of science learning experts, it can be seen that the gravitational science e-comic material is in a very valid and valid category. The self instruction aspect is in a very good category where the learning objectives contained in the gravity science e-comic are in accordance with the required competencies, the material exposure is in accordance with the required competencies, the material is presented coherently, easy to understand, the illustrations presented are in accordance with the material content, and the language used is easy for students to understand. Self contained aspect, the material in the science e-comic is in accordance with the required competencies and the competencies of the material presented contain the required competency units. In terms of stand alone, adaptive, and user friendly aspects, material in the science e-comic can be learned without the help of other media assistance, in accordance with the development of science and technology, can be learned any time and anywhere.

The results of the learning media expert validation are shown in Table 4

Table 4. Results of the learning media expert

No	Assessment Aspect	Average Score	Assessment Category
1	Attractive e-comic display	4	Very Valid
2	Appropriateness off on shape And size	3.5	Very Valid
3	Readability of text	4	Valid
4	Image quality	4	Very valid
5	Generates student interest	4	Very Valid

Based on Table 4, it can be seen that the android-based gravity e-comics are in the valid and very valid categories. This validator assessment was given after the researchers made revisions to the suggestions given by the experts, so that the resulting android-based gravity e-comic is valid and can be used in the learning process. This finding is in line with previous findings which state that comics are valid for use in the learning process (Lesmonoet et al., 2018; Zuhrowatiet et al., 2018; Sari et al., 2021; Adnyani & Wibawa, 2021).

After the android-based gravity e-comic was proven valid and could be used in the learning process, the research continued with a limited trial with 15 students in class VA SDN 80Kota Tengah. The results of the limited trial provided data on student responses and student learning independence as follows.

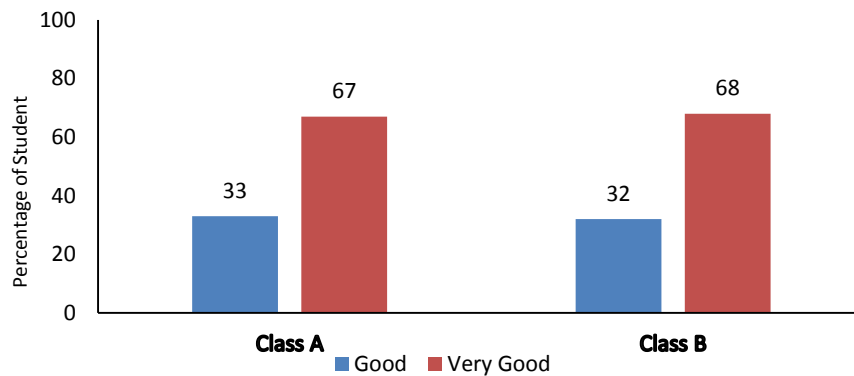


Figure 5. Percentage of student for each responses assesment

Figure 5 provides information that 33% of 15 people in class VA gave a good response to the use of android-based gravity e-comics, while 67% percent gave a very good response, while in class VB 32% of 25 students gave a good response and 68% gave a very good response. According to Rafikayuni, et al. (2017), response is a change in attitude caused by stimulation during the learning process. Furthermore, according to Amir & Arsyad (2015) the response consists of three main dimensions, namely the cognitive dimension, affective dimension and conative dimension. The cognitive component is indicated by the level of knowledge, views, or beliefs of students after using the media used (Darmawati & Thalib, 2017). It is further explained that the cognitive response is a response related to the view of an object, where the individual's mindset can be identified from the expression of beliefs, both which tend to be negative and positive. Affective response is an attitude object that is either positive expressed with pleasure or negative expressed with displeasure (Paranita, 2014). While the conative response is related to the tendency to act or behave towards an object (Hakim, 2016). In processing research data to determine student learning independence, it is calculated in the form of a percentage by dividing the total score obtained by the maximum total score then multiplied by 100% (Elistiani, et al., 2022).

Based on this, the researcher grouped student responses based on these dimensions, where the results were obtained as shown in Figure 6.

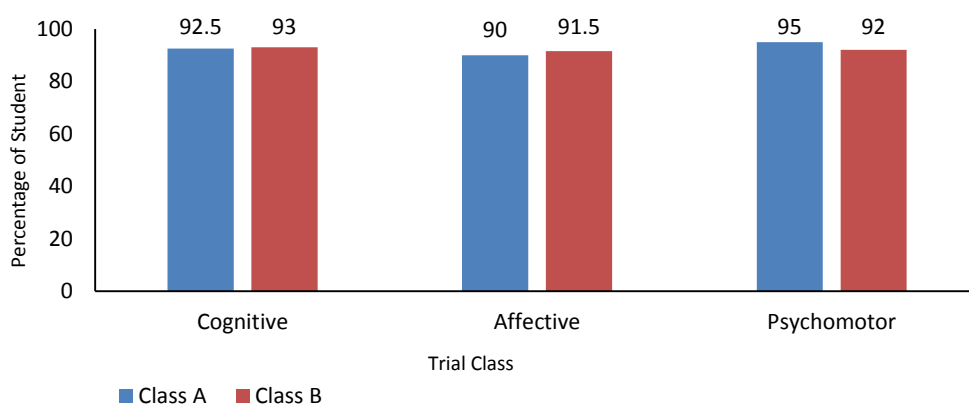


Figure 6. The response of class students in the cognitive dimension

Figure 6 shows that the response of VA class students in the cognitive dimension is 92.5%, the affective dimension is 90% and the conative dimension is 95%. These results indicate that for these three dimensions, student responses are in the very good category. For class VB students' response to the use of android-based gravity e-comics, it was found that the cognitive dimension was 93%, the affective dimension was 91.5% and the conative dimension was 92%. Similar results were presented by Topkaya & Yakup (2020) who suggested that students have a positive response to educational comics from both cognitive and affective aspects.

The findings for students' responses to this android-based gravity e-comic show that android-based e-comics are practical to use in the learning process. The same thing was revealed by Lova et al. (2013) who suggested that comics are very practical to use in the learning process, because in comics the material is presented in the form of clear and easy-to-read images. When viewed from the contents of comics with clear and attractive images and colors, comics can attract interest and motivate students to study hard (Sari et al., 2014; Panjaitan et al., 2021). Moreover, comics can also familiarize students to read, especially for students who lack interest in reading (Topkaya & Yilar, 2015).

Similar results were presented by Permata et al. (2022) Students with higher learning outcomes are found to have higher learning independence, students can identify their own learning needs, can use different learning methods and strategies, can manage their learning process independently, plan their time effectively, and evaluate learning outcomes to correct their deficiencies in learning. Furthermore, for the effectiveness of the android-based Gravity e-comic which is indicated by student learning independence, this study provides limited trial results in classes VA and VB in the form of classical student independence, as well as student independence in terms of learning independence indicators as described below.

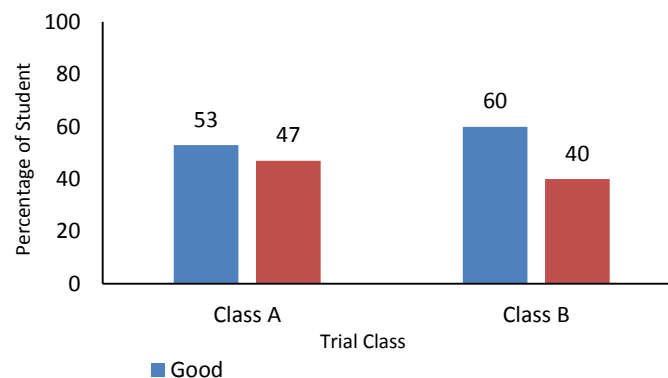


Figure 7. Students' learning independence after using the android-based gravity e-comic category.

Figure 7 provides information that in class VA 53% of 15 students have good learning independence, 47% others have excellent learning independence, while in class VB 60% of 25 students have good learning independence, while 40% others have excellent learning independence after using android-based gravity e-comics in the learning process. Furthermore, students' learning independence after using the android-based gravity e-comic, in terms of independence indicators, provides the following results.

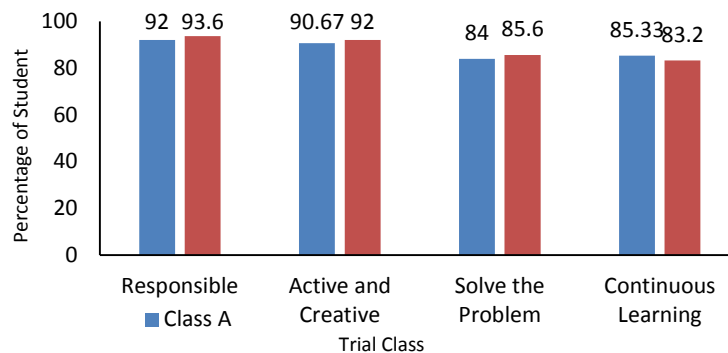


Figure 8. student independence for responsible indicators and active and creative indicators

Based on Figure 8, it can be seen that student independence for responsible indicators and active and creative indicators is in the very good category. For the indicator of solving problems in class VA is in the good category, while in class VB it is in the very good category. Another case for the indicator of continuous learning, both class VA and class VB student learning independence is in the good category. The results of this study indicate that the use of e-comics in science learning can train students' learning independence in elementary schools. This is in line with the results of research by Pramana & Dewi (2014); Linda et al. (2021) which shows that the use of android-based electronic learning media can increase student learning independence. These results are supported by the results of research by Ilhan et al. (2021) which states that the use of e-comics in learning can increase students' positive attitudes, where independence is one of the aspects of student attitudes that need attention.

The level of student independence in this study is shown by the attitude of being responsible, active and creative, solving problems and continuing to learn, the same thing was stated by Fahrädina et al. (2014), where the level of student learning independence can be determined based on how responsible students are for playing an active role in the learning process, while according to Kizilcec et al. (2017), learning independence is characterized by students' ability to achieve learning goals through cognitive, affective, motivational, behavioral and metacognition processes.

Diseminate

At this stage, product packaging is carried out, where the android-based gravity e-comic application and instructions for use are disseminated to users, in this case science teachers in elementary schools, so that they are easily understood and can be used in the learning process more widely. These results are supported by the results of research by Rahmayani (2019) The learning process should not only improve students' cognitive learning outcomes, but also pay attention to affective aspects. In this case, the character of students, including the character of independence, where independence is important in a learning process because being independent in the learning process will affect student achievement.

Conclusion

This research results in an android-based Gravity e-comic that is valid, practical to use in the learning process, where students respond positively to its application, and effective in increasing student learning independence at the elementary

school level. This android-based gravity e-comic is recommended to be used in the learning process at school to increase student learning independence.

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