The development of digital comic on ecosystem for thematic learning in elementary schools

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Abstract. This research aims to generate digital comic on ecosystem for thematic learning in elementary school. Research and development was used as method of the study. This study was conducted with five-grade students in five Public Elementary Schools, two Private Elementary Schools and two Integrated Islamic Primary Schools. The instruments of data collection used in this study were questionnaire and interview. The students questionnaire responses was analysed qualitatively and quantitatively for each item. The validity test of the developed digital comic on ecosystem is good validity categories. This finding also suggests that the developed digital comic can increase students' motivation and interest in thematic learning. The development of digital comic learning media on thematic learning in elementary schools can motivate students in the learning process worthy of being used in learning. The feasibility of comic media is shown by the assessment of material experts by 3.51 (good), media expert’s assessment of 4.01 (good), teacher’s assessment as an education practitioner by 3.9 (good) and student questionnaire assessment by 3.93 (good).

1. Introduction

Thematic learning is a model of integration between subjects. Thematic learning emphasizes the activity of students in learning both physically, mentally, intellectually and emotionally in order to achieve optimal learning outcomes [1,2]. Learning in the context of the industrial revolution era 4.0 requires a combination of active learning with IT-based media in its implementation. Digital comics is one of two-dimensional media with a type of graphic media that supports thematic learning in elementary schools [3,4].

In line with the implementation of the RI era thematic learning 4.0, the selection of digital comic media was based on the reason that the purpose of teaching in class was not only to transform knowledge, but to foster the active role of students and the 21st Century Learning Skills they must possess. So that digital comic media can not only be created as entertainment, but digital comics can also be a medium in learning by uniting teaching materials or materials into images that are able to represent students' thoughts clearly. Research on comic development has been carried out by several researchers. Previous researchers have carried out research on the Effects of Using Digital Comics to Improve ESL Writing to enable them to learn language to write in English [5].

Then the Development of Thematic Learning Media Based on Pandawa Comics For Improving Skills
in Writing Descriptions of Stories of Class II Students at SDN Panggungrejo Tulungagung, the results given by students after using modules can support a very high level of module effectiveness. In addition there are also Thematic Comic Modules Based on Multiple Intelligence for Class V Students of Elementary School. As a result, thematic MI based comic modules are appropriate to be used as teaching materials to help students and teachers in the learning process [6].

There is also the Development of Thematic Learning Media Based on Punakawan Comics for Improving Skills in Writing Descriptions of Story Characters in Class II Poncowarno Elementary School Students, the media of Punakawan comic thematic learning produced and used in the learning process has a greater effectiveness than picture print books with acquisition the value of the effect size (effect size) in the high category is equal to 1.03 [7]. Then Development of Media Comics To Increase Moral Development of Early Childhood In Bandar Lampung PAUD, the comic media that was created by researchers received a very good and worthy assessment. And finally about the Effectiveness of Thematic Comic Modules Based on Multiple Intelligence (MI) For Elementary School Students in Elementary School, Thematic Comic Modules Based on Elementary School MI Class V are effective for use in learning [8].

From a number of studies that have been conducted we find that most comic media created are modules and prioritize measurement on one aspect of learning, namely language and writing skills [9-12]. This makes the teacher and students fixated on one thing only, namely following and completing the existing module [13-14]. Therefore we took the initiative to develop a digital comic application to help teachers and students get the learning outcomes expected by the government and education in this era of industrial revolution 4.0 through thematic learning with ecosystem themes.

2. Method
Research used in this study is an exploration method with research and development [15-17]. This development research refers to the development model and Borg & Gall which is limited to the information collection stage, planning stage, product development stage, validation and testing phases. This research was conducted to develop learning media products in the form of comics for the theme of thematic learning in the fifth grade of elementary school. This research was conducted on five-grade elementary school students in several regions in West Java, namely SDN 077 Sejahtera, SDN Ibun 1, SDIT Nurul Fikri and SDN Kedungwaringin 01 for extensive testing. While limited tests were conducted at SDN Nagreg 04, SD IT Matahati and SDN Nusa Indah 01. The technical data used in this study were questionnaire or questionnaire techniques, interviews, and documentary studies. Data analysis in this study was conducted with qualitative analysis techniques and quantitative analysis.

3. Results and discussion
Research and development that have been conducted by researcher used the development procedure of Borg and Gall [18-19]. The steps include (1) Preliminary study and collecting the information; (2) planning; (3) designing the product; (4) conducting the experiment; (5) final revision and completing the product. Below are the result of these research and development.

- Preliminary study and collecting the information. This step aimed to identified and explore the need of additional learning media for students. Data where gathered by distributing students questionnaire, teachers interview, and thematic text book analysis. Questionnaires where distributed to grade V students at SDN Nagreg 04, SD IT Matahati, SDN Nusa Indah 01, SDN 077 Sejahtera, SDN Ibun 1, SDIT Nurul Fikri and SDN Kedungwaringin 01 to determine students initial knowledge and perception about the used text book and students need for additional learning media. Teachers interview aims to know the students learning experience and teacher perception about the used thematic text book.

- Planning. After getting data from the first step, researcher planned the creation of digital comic media with expert help. These step included choose the learning objective, creative and appropriate content, material, arrangement and evaluation [20].

- Designing the product. These step was development of product or application.
• Conducting the experiment. These product was implemented to some students to find the strength and weakness of this product [21].
• Final revision and completing the product. After getting the result of implementation and expert judgement, then this product was revised to get the best one as can be used by the students easily and well [22].

This study aims to develop digital comic learning media that are suitable for thematic learning about Ecosystem fifth graders, to produce output from digital comic products and teaching materials. Exploration research methods with Research and Development are used. To find out the impact of digital comic learning media, the application (Comic Creator) is given validation from expert judgment, as well as the final test conducted after the application of comic applications in elementary school [23,24].

3.1. Validation of expert content and language

| No | Aspect       | Total   | Stage I Percentage | Average | Stage II Percentage | Average | Enhancement Percentage | Average |
|----|--------------|---------|--------------------|---------|--------------------|---------|------------------------|---------|
| 1. | Learning Content/ Content | 39,0    | 65,0               | 3,3     | 45,0               | 75,0    | 10,0                   | 0,5     |
| 2. | Language     | 23,0    | 65,7               | 3,3     | 27,0               | 77,0    | 11,3                   | 0,6     |
| 3. | Display      | 26,0    | 65,0               | 3,3     | 31,0               | 77,5    | 12,5                   | 0,6     |
| 4. | Wear (Used)  | 21,0    | 60,0               | 3,0     | 26,0               | 74,0    | 14,0                   | 0,7     |
|    | Total        | 109,0   | 255,7              | 12,8    | 129,0              | 303,5   | 47,8                   | 2,4     |
|    | Average      | 27,3    | 63,9               | 3,2     | 32,3               | 75,9    | 12,0                   | 0,6     |

The results of the material expert validation based on the two tables above indicate an increase from stage I to stage II. So that it can be said that digital comic media is interpreted in the "Good" category. Thus the material on digital comic learning media is considered feasible to be developed.

3.2. Results of media expert validation

| No | Aspect       | Total   | Stage I Percentage | Average | Stage II Percentage | Average | Enhancement Percentage | Average |
|----|--------------|---------|--------------------|---------|--------------------|---------|------------------------|---------|
| 1. | Learning Content/ Content | 40      | 66,7 %            | 3,30    | 81,7 %            | 4,10    | 15,0 %                 | 0,80    |
| 2. | Language     | 22      | 62,9 %            | 3,28    | 80,0 %            | 4,00    | 17,1 %                 | 0,72    |
| 3. | Display      | 24      | 60,0 %            | 3,00    | 75,0 %            | 3,75    | 15,0 %                 | 0,75    |
| 4. | Wear (Used)  | 24      | 68,6 %            | 3,42    | 85,7 %            | 4,20    | 17,1 %                 | 0,78    |
|    | Total        | 109,0   | 110               | 13      | 137               | 322,4 % | 27                     | 64,2 %  |
|    | Average      | 27,3    | 27,5              | 3,25    | 34,25              | 80,6 %  | 6,75                   | 16,1 %  |

The results of the material expert validation based on the two tables above indicate an increase from stage I to stage II. So that it can be said that digital comic media is interpreted in the "Good" category. Thus the material on digital comic learning media is considered feasible to be developed too.
3.3. Results of education practitioner's validation

Table 3. Recapitulation of results of teacher assessment / educational practitioners.

| No | Aspect                        | Stage I  | Stage II | Enhancement |
|----|-------------------------------|----------|----------|-------------|
|    | Total                       | Percentage | Total | Percentage | Average | Percentage | Average | Average | Percentage | Average |
| 1  | Learning Content / Content  | 42,0     | 70,0%   | 3,5        | 48,0     | 80,0%   | 4,0      | 6,0     | 10,0%   | 0,5     |
| 2  | Language                     | 25,0     | 62,9%   | 3,6        | 26,0     | 74,3%   | 3,7      | 1,0     | 11,4%   | 0,1     |
| 3  | Display                      | 26,0     | 65,0%   | 3,3        | 31,0     | 77,5%   | 3,8      | 5,0     | 12,5%   | 0,5     |
| 4  | Wear (Used)                  | 22,0     | 62,9%   | 3,1        | 28,0     | 80,0%   | 4,0      | 6,0     | 17,1%   | 0,9     |
|    | Total                        | 109,0    | 115,0    | 260,8%     | 13,5     | 133,0   | 311,8%  | 15,5    | 18,0    | 51,0%   |
|    | Average                      | 27,3     | 28,8     | 65,2%      | 3,4      | 33,3    | 78,0%   | 3,9     | 4,5     | 12,8%   |

The results of the material expert validation based on the two tables above indicate an increase from stage I to stage II. So that it can be said that digital comic media is interpreted in the "Good" category. Thus the material on digital comic learning media is considered feasible to be developed too.

3.4. Student questionnaire results

Table 4. Average student questionnaire results.

| No  | Aspect                        | Average | Enhancement (%) | Category |
|-----|-------------------------------|---------|-----------------|----------|
|     | Total Stage I | Stage II |                |          |
| 1   | Color / picture / presentation / display | 3,25 | 3,9 | 0,65 | Good |
| 3   | Message / information         | 3,3     | 4,0             | 0,70     | Good   |
|     | Average                      | 3,28    | 3,95            | 0,67     | Good   |

There are 25 statements in the student validation sheet. Based on the data, it can be seen that the results of the student questionnaire showed the results of the total score of 107 with a percentage of 80%, and an average score of 3.95 with the category "Good".

The product development stage consists of making story boards, making layouts, writing material, and adding menus to make it easier to install. The initial product of digital comic learning media was then validated by material experts and media experts. Material experts validate twice, this is due to the average score of the material validation results that have not shown a value that matches the feasibility category. The average value for the 1st validation is 3.2 (enough). In the second validation test obtained an average value of 3.79 (good). Media experts validate twice. Validation by media experts in stage II shows the average score of 4.12 (good). Based on these results, digital comic learning media is feasible to be tested. The teacher as a learning practitioner also conducted two validation test which found that the first validation value obtained an average value of 3.38 (sufficient) indicating that it still did not meet the standard for testing, and at the second stage the average value was 3.87 (good) this shows that digital comics meet the standards for testing. Based on interviews with teachers and students, the media was revised again. The results of revision phase II produced the final product of digital comic learning media with ecosystem material for thematic learning in the fifth [25-29].

4. Conclusion

The development of digital comic learning media on thematic learning in elementary schools can motivate students in the learning process worthy of being used in learning. The feasibility of comic media is shown by the assessment of material experts by 3.51 (good), media expert's assessment of 4.01 (good), teacher's assessment as an education practitioner by 3.9 (good) and student questionnaire assessment by 3.93 (good). Media developed can increase students' motivation and interest in thematic
learning, help activate students physically and emotionally, and facilitate student learning. The design of digital comic media begins with needs analysis in elementary schools, analyse curriculum, syllabus and lesson plans [30]. Product development consists of making story boards, making layouts, writing material, and adding menus to make it easier to install [31,32]. After the product development was completed, digital comics learning media were obtained with ecosystem material for thematic learning in the fifth grade of elementary school.

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