



Development of Interactive Multimedia for Human Reproduction System in Junior High School

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Abstract

The study was aim to find out the effectiveness of the multimedia interactive for human reproduction system learning. The research was done at Junior High School 5 Pemalang with the design of research is Research and Development (R&D). The small scale trial of the product was done in 23 students with proportionate stratified random sampling method. The larger scale trial of the product was done in IX A class with Purposive Sampling Method and One Group Pre-test Post-test Experimental Design. The assessment from the experts to the multimedia interactive for system human reproduction learning obtains a high score as much as 89.58% for course assessment and 97.22% for media assessment. The results from the teacher and students response questionnaire in small scale trial obtain the average percentage as much as 100 % and 81.55 % respectively, which was high qualified. The effectiveness of Multimedia Interactive in learning could be seen in pretest and post test results with calculating N-gain and obtain N-gain 0.54, which was categorized as middle. Beside N-gain, the completeness of understanding the concepts become another effectiveness of multimedia interactive obtain 88% in classical completeness. The results of the study shows that the multimedia interactive was qualified and effective to enhance the students' learning outcome in the course of system human reproduction.

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INTRODUCTION

The learning in the 2013 curriculum is held interactively, fun, motivating students to actively participate so that students can had space to develop themselves (Permendikbud, 2016). The low material comprehension of Nature Science Biology in SMP/MTs (middle school level) National Exam in 2014/2015 in Pematang Regency was material about the human organ system with percentage at 43.48. Nationally, the human organ system in natural science of class IX junior high school students that receives low grades, one of which is the reproductive system. This line with of the 2015 PISA evaluation and survey, the material mastery of Indonesian students was still in the low category (PISA, 2015).

The result of the initial observation shows the media used in SMP N 5 Pematang were images and power point slides. The media was already good but can be further refined if added with interactive multimedia that was able to make learning in class take place in two directions. The results of interviews with the teacher, the media used still could not involve students to be active during learning. The selection of the right media in learning needs to be considered by the teacher. The use of appropriate media would increase students' interest and motivation for learning so as to improve student learning outcomes (Arsyad, 2013).

The learning resources used when teaching and learning Biology were students' activity sheet and textbooks. The results of interviews with several students, the textbooks used were lacked visualization. This causes students are less interested in studying the book. This line with Mushlich (2010), which forward that the weakness of a textbook is the material in a textbook, outlined very technically, sometimes incompatible with the mindset of students. Therefore, it was necessary to develop interesting media such as interactive multimedia which was used as a source of learning. The use of multimedia in learning had the benefit of clarifying the demonstration of messages and compacting information so that students' understanding can increase (Chasnah *et al.*, 2015). This line with the result of research that learning outcomes could be increased by using interactive multimedia (Syahdiani *et al.*, 2015).

The potential of the facilities and infrastructure such as LCD projectors and laptops in each teacher could be used to make variations of learning using interactive multimedia. The school's large potential and good interactive multimedia were expected to improve student learning outcomes. Based on this background, it was necessary to conduct research on "Development of Interactive Multimedia for the Learning of Reproduction Systems in Junior High Schools." This interactive multimedia development research was expected to increase motivation and learning outcomes for students, increase the variety of sources and learning science media in school

RESEARCH METHOD

Research Desain

This research was the Research and Development wich has been modified from Sugiyono (2015). The developed product in this study was interactive multimedia for the learning of the human reproduction system. The procedure was used that potential and problems, product design, design validation, the small-scale product trial, and the large-scale product trial.

Potential and Problems

Potential and problems were carried out with observation and interview by analyzing media needs that were in accordance with the school's potential and student characteristics. The instrument was used observation sheet, teacher interview sheet, and students interview sheet. The data were taken media needs, complaints about learning media, notes the strengths and weaknesses of learning, student grades, IPA syllabus, teaching materials, and materials for making interactive multimedia. The analysis was used by percentages descriptive.

Product Design

Interactive multimedia was contain by images and videos of the structure and function of reproductive organs, ovulation images and videos, fertilization, and menstruation, fetal development videos, and abnormalities. This interactive multimedia also was contain by practice questions in the form of interactive quizzes. This interactive multimedia was an interactive based media that displays related material in the form of animation or video, character images, interactive questions, the use of scrolls that can combine material in one image, making it easier for readers to read the material of the human reproductive system. Interactive multimedia in the research was made using various software, including Adobe Flash CS 6 as a software for creating animations and presentations dynamically with the help of Action Script 2.0. The video format was result FLV format. Interactive multimedia could be opened using the gom player.

Deisgn Validation

The design was validated by media experts and material experts to find out the feasibility of interactive multimedia. Media expert was lecturer from the Department of Biology, Semarang State University, who was experts in the field of learning media. Meanwhile, material experts was lecturer from the Department of Biology, Semarang State University, who was experts in the field of reproductive systems. The instrument was used a media validation sheet by media experts and material experts along with the rubric. The data was taken the feasibility of interactive multimedia by the validator. Data were analyzed by percentages descriptive.

The Small-Scale Product Trial

The small-scale product trial was carried out on a sample of 23 grade IX students at SMP Negeri 5 Pemalang with proportionate stratified random sampling technique. The instrument was used a questionnaire for responses. The data was taken student responses regarding the feasibility of interactive multimedia. The analysis was used descriptive percentages.

The Large-Scale Product Trial

The large-scale trial was carried out on sample 1 class IX A Pemalang N 5 Middle School with 33 students. The Sampling used purposive sampling technique. The experimental design was used by Pre Experimental Design with the type One Group Pre-test Post-test Design. The instruments used were the questions of the pretest and posttest questions, the student questionnaire responses sheet, and the teacher's questionnaire responses sheet. Data was taken includes cognitive learning outcomes, student responses and teacher responses. The analysis used was the N-gain test and the percentage of classical completeness to measure cognitive

learning outcomes, descriptive percentages for analyzing student responses and teacher responses.

The indicators of success in this study are, (a) the results of the measurement of the display validity by media and material experts reach $\geq 80\%$, (b) students' learning outcomes classically show $\geq 75\%$ of total students get a score of 76, (c) an analysis of the assessment of teacher and student responses to the feasibility of interactive multimedia getting a minimum score achieving good criteria.

RESULT AND DISCUSSION

The interactive multimedia on the learning of the human reproduction system used various media that are interactive (fun). Interactive multimedia was developed using Macromedia Flash as the main software. This interactive multimedia contained pictures and videos/animations that were adapted to junior high school students. The completed multimedia design then was validated by the validator. The assessment of the feasibility of interactive multimedia was carried out by material and media validators. The interactive multimedia assessment sheet refers to the 2013 BSNP regulation regarding interactive multimedia assessment instruments for the learning of the human reproduction system.

The assessment of the material presentation aspect was done by material experts and media experts from Universitas Negeri Semarang. The interactive multimedia had a percentage of 89.58 and 97,22 with a very feasible category. Very feasible was given by material experts because of the completeness of the material in accordance with indicators derived from KI and KD. In addition, the material of presentation in interactive multimedia was presented in accordance with empirical facts and coherent. The observed assessment shows that the developed interactive multimedia was a media that is easy to use and simple in operation, creative in ideas, and clear audio and backsound does not disturb students' concentration. The repair for interactive multimedia betterment was gotten based on the feasibility assessment of the interactive multimedia by media specialists and subject material experts. The results of the validator assessment got a percentage score of $\geq 80\%$ with very decent criteria.

In general, interactive multimedia had become a good media where the elements of interactive multimedia layout have a harmonious color composition, clarity and contrast. An attractive display with clear and colorful images could focus students on learning to understand concepts. This was in line with the opinion that the use of color was the most important thing in making visual design products (Hasibuan & Kartono, 2013).

The use of interactive multimedia must also had good contrast, sharpness, and focus. It was based on the statement that the learning media must have a good contrast, focus, and have a natural and realistic color (Arsyad, 2013). The use of right color would be create a beautiful image, increase readability, and increase the user's interest when viewing interactive multimedia.

Interactive multimedia was tested in a limited environment. The trial was conducted to explore the readability of interactive multimedia through teacher and student response questionnaires. The teacher given an assessment of interactive multimedia is very feasible to be used as a learning medium for learning the human reproductive system with no revisions.

Teacher felt interested in using interactive multimedia as a learning medium. Interactive multimedia was developed in accordance with KI (Core Competence), KD, learning goals that were easy to use and systematic. Interactive multimedia also was contained by good and

interesting flash images and animations which were fun interactive quizzes and train students to work together. Learning to use video was also an interesting learning because it was able to visualize processes such as video ovulation, fertilization and fetal development. The teacher also supported the use of interactive multimedia to train students to learn independently. This was supported by research that learning using macromedia flash-based supporting media could improve understanding of Biology concepts (Hutahean *et al.*, 2017).

Students given an assessment of interactive multimedia was developed by filling out the questionnaire. The recapitulation of student questionnaire responses for small-scale trial is presented in Table 1.

Table 1. The Recapitulation of Students Questionnaire (Small Scale)

| No | Statements | Score | % | Criteria |
|---------------------------------------|--|-------|-------|---------------|
| 1. | Attractive multimedia display with clear color contrast | 98 | 85,21 | Very feasible |
| 2. | Clear usage instructions with easy to use buttons | 102 | 88,69 | Very feasible |
| 3. | The material in interactive multimedia is clear and easy to understand | 101 | 87,82 | Very feasible |
| 4. | The language used is clear and easy to understand | 100 | 86,95 | Very feasible |
| 5. | Images presented in interactive multimedia are clear and interesting | 91 | 79,13 | Feasible |
| 6. | Animations/videos presented in interactive multimedia are easily understood and used independently | 87 | 75,65 | Feasible |
| 7. | Readability (selection of letters in interactive multimedia accordingly so easy to read) | 94 | 81,74 | Very feasible |
| 8. | Clear voice with narration according to the text or picture presented | 74 | 64,35 | Feasible |
| 9. | Easy to use interactive quizzes | 97 | 84,35 | Very feasible |
| Obtained average score and percentage | | 844 | 81,55 | Very feasible |

The average score was obtained from the small-scale student questionnaire responses. Most respondents gave a positive response. This showed that criticism and suggestions that was given by media and material experts were followed up with improvements that were in line with what is desired by students. Some students felt interested because they never got learning using video and animation before. Students said that the process of ovulation and fertilization was easier to understand when presented in the form of video. The video used also greatly helps students understand the material better. This was reinforced by Jazilah *et al* (2017) that interactive multimedia could help students better understand the material of the human reproduction system with both video visualizations.

Some students also pointed out that images of abnormalities and diseases made students feel conscious always cleaning themselves. Students were also very stingy because interactive multimedia containing interactive quizzes was fun learning. The use of interactive multimedia in which there were images, animations, and videos can create a pleasant learning atmosphere that makes it easier for students to understand the material (Kholina, 2013). The indicators to see the effectiveness of learning in this study were increased student understanding, and student responses to learning. The result of N-gain data is listed in Table 2.

Table 2. The Recapitulation of N-gain Test Result

| No. | Test Result | Total |
|-----|--------------------------|---------------|
| 1. | Pretest Score Average | 52,88 |
| 2. | Posttest Score Average | 78,33 |
| 3. | Maximal Score | 90 |
| 4. | N-gain Improvement Score | 0,54 (medium) |

The results of pretest and posttest scores are analyzed using the N-gain test. The results of the N-gain calculation analysis are obtained at 0.54 (Table 2). This showed that the average increase in students' knowledge ability was in the medium category. The results of this study were consistent with a research that interactive multimedia influences mastery of concepts where the average N-gain obtained was in the medium category and higher than the control class N-gain average (Husein, 2015).

The value of the final and highest student learning outcomes showed the diversity of student learning styles. This was in line with the statement that there was a significant influence of learning styles on student learning outcomes (Vaishnav, 2013). Various learning styles show that each student had different habits in learning. This was in line with the opinion that there was no choice of an effective learning style but everyone had their own learning style and uniqueness in learning (Gunawan, 2016). The improvement of students' understanding was the analysis of classical student learning completeness listed in Table 3.

Table 3. The Recapitulation of Students' Final Score

| No. | Test Result | Total |
|-----|----------------------------------|-------|
| 1. | Final Score Average | 81,77 |
| 2. | Highest Final Score | 92,67 |
| 3. | Lowest Final Score | 66,00 |
| 4. | Incomplete students | 12% |
| 5. | Completed Students | 88% |
| 6. | Students' Classical Completeness | 88% |

Table 3 showed that learning using interactive multimedia had a positive impact with students' classical completeness of 88% with a KKM score set at 76. The research indicators were successful, because classical student learning completeness results $\geq 75\%$ of students who complete. The KKM was elevated compared to the KKM used in SMP Negeri 5 Pematang by 75. The elevated KKM was aim to find out the effectiveness of interactive multimedia that was developed effectively to improve the classical mastery of student learning. The results of this assessment were in accordance with the Chasnah research (2015) conducted that multimedia developed was said to be completely classical in terms of increasing students' understanding.

Despite an increase in learning outcomes, there were still 4 students who had not completed yet. The results of observations during the study, students who had not completed tend to ignore the tasks given and not serious in learning activities. The less understanding of the material and the value of learning did not reach the KKM. This was in line with the statement that learning outcomes were not only influenced by learning activities, interests, and motivations, but also the characteristics and intelligence (Minarti, 2012). It was proven that if students who did not have good responsibilities and mean to study would affect the results of students.

The effectiveness of interactive multimedia was also assessed by teacher responses to interactive multimedia after being in class during learning. The teacher was interested in using interactive multimedia as a learning media. Clear instructions made it easy for students to use this interactive multimedia. The atmosphere and conditions seen during the learning process were the children looked very happy because according to the teacher learning by using interactive multimedia was new. In general, during teaching and learning activities using interactive multimedia, there were no significant obstacles, only the teacher's questions are still classical. The disadvantage in applying this learning was that there was still a need for computer facilities that were suitable for the number of students. The teacher states that interactive multimedia was very feasible to use as a learning media for the human reproductive system.

This interactive multimedia had shown that the creativity of teacher in utilizing infrastructure had a positive effect on the effectiveness of teaching and learning. This was because learning patterns using computers and interactive multimedia were new to students and contain processes that could facilitate students in learning. This was in line with the statement that student-centered learning requires supporting infrastructure (Kisworo, 2017).

The teacher strives to make the existing infrastructure could be useful well. Computers were learning support tools. This was in accordance with the statement that the computer was used as a learning tool that helps or supports the learning process (Adiwisstra, 2015).

The teacher feels interested in applying the same learning media to other matters. In general, there were no obstacles in teaching and learning using interactive multimedia only the classical teacher's questions. There was no question between individuals that made the teacher know each other's understanding. This was due to the limited time that the teacher had to pursue other material.

The questionnaire was filled in during the large-scale student questionnaire given to 35 students of class IXA SMP Negeri 5 Pematang at the end of the learning of the human reproduction system. The results of the student response questionnaire are presented in Table 7 as follows.

Table 4. The Recapitulation of Students' Questionnaire Response to Interactive Multimedia (Large-Scale)

| No | Statements | Total Score | % | Criteria |
|----|---|-------------|----|------------|
| 1. | Students feel interested in using interactive multimedia in the learning of the human reproductive system | 151 | 92 | Very Agree |
| 2. | Interactive Multimedia is interesting to learn | 144 | 87 | Very Agree |
| 3. | Instructions for using interactive multimedia are conveyed clearly and easily understood | 139 | 84 | Very Agree |
| 4. | Material in interactive multimedia is easy to understand | 140 | 85 | Very Agree |
| 5. | Interactive multimedia presentation attracts you to study | 147 | 89 | Very Agree |
| 6. | Images in interactive multimedia help you understand material in interactive multimedia | 152 | 92 | Very Agree |
| 7. | Learning activities use fun interactive multimedia | 148 | 90 | Very Agree |

| | | | | |
|---------------------------------------|--|------|-------|------------|
| 8. | Students' insight into the reproductive system increases with interactive multimedia | 145 | 88 | Very Agree |
| 9. | Students become motivated to learn the material in interactive multimedia | 141 | 85 | Very Agree |
| 10. | Overall, interactive multimedia is suitable for use as a learning resource | 142 | 86 | Very Agree |
| Average score and percentage obtained | | 1449 | 87,82 | Very Agree |

The results of the student response questionnaire recapitulation on Table 4 showed that the average value of the percentage obtained is 87.82% with the criteria very agree if the interactive multimedia developed was used as a learning medium. The results of student responses show excellent student responses. Interactive multimedia had an impact on student learning outcomes. Fun learning conditions made students were more motivated to study (Suryorini *et al.*, 2014). This was because interactive multimedia developed was more attractive than ordinary media used by teacher before using interactive multimedia. High motivation could trigger an increase in learning outcomes. Learning motivation and learning outcomes showed a relationship with an influence of 6% (Ristanti, 2013). Learning motivation did not only provide enthusiasm and strength in students' efforts to learn but could be provide clarity of direction and learning objectives. The indicators that have been achieved in this study, it could be interpreted that interactive multimedia was appropriate to be applied in the learning of the human reproductive system because it was able to score above 80%. Interactive multimedia was also effectively used in the learning of the human reproductive system because it could increase learning outcomes.

Besides positive responses, obstacles were also found in learning. These constraints include; (1) student activity at the beginning of learning still tends to be low, (2) the management of classes using computers was quite difficult. The class tends to be crowded because students were very enthusiastic about learning in a computer laboratory. The constraints in the student class management were found that when students begin to be enthusiastic in learning activities, the classroom conditions begin to be difficult to control (Suryani *et al.*, 2014). The obstacles during the research could be overcome in a way; (1) the teacher explained the rules of learning by giving rewards or positive reinforcement so that when learning in the classroom, students would be more conducive and easy to manage, (2) the computers used in learning reproductive systems could be adjusted to a number of students.

CONCLUSION

Interactive multimedia that has been developed was feasible to be used as a learning media human reproduction systems with the results of media validity and material exceeding the results set.

Interactive multimedia for learning human reproduction systems that have been developed was effective as a learning medium, improve cognitive learning outcomes of students and good positive responses from teacher and students.

REFERENCES

- Adiwisastro, M. F. 2015. Perancangan Game Kuis Interaktif sebagai Multimedia Pembelajaran Drill and Pratices untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Informatika* 2(1) : 205 -211
- Arsyad, A. 2013. *Media Pembelajaran*. Jakarta : PT Rajagrafindo Persada
- Chasnah, S.N., D. Mustikaningtyas, & Nugrahaningsih W. H.. 2015. Pengembangan Multimedia SMEDIG Materi Sistem Reproduksi Manusia Tingkat SMA. *Unnes Journal of Biology Education*, 4(3) : 275 : 281.
- Gunawan, Harjono, A., Imran. 2016. Pengaruh Multimedia Interaktif dan Gaya Belajar terhadap Penguasaan Konsep Kalor Siswa. *Jurnal Pendidikan Fisika* 12 (2) : 118-125
- Hasibuan, L.K. & Kartono, G. 2013. Analisis Disharmoni Tipografi Dan Warna Pada Iklan Layanan Masyarakat Di Kota Medan Tahun 2012. *Gorga Jurnal Seni Rupa* 1(3) : 22-32
- Husein, S., Herayanti, L., & Gunawan. 2015. Pengaruh Penggunaan Multimedia Interaktif terhadap Penguasaan Konsep dan Keterampilan Berpikir Kritis Siswa pada Materi Suhu dan Kalor. *Jurnal Pendidikan Fisika dan Teknologi* 1 (13) : 221-225.
- Hutahean, R., Mara, B. H., & Derlina. 2017. The Effect Scientific Inquiry Learning Model Using Macromedia Flash on Student's Concept Understanding and Science Process Skills in Senior High School. *Journal of Research & Method in Education*, 7 (4) : 29-37.
- Jazilah, Nur., S. Sukaesih & Nugrahaningsih W. H.. 2017. Pengaruh Model Pembelajaran Numbered Head Together berbantuan Prezi terhadap Hasil Belajar Siswa Materi Saraf. *Unnes Journal of Biology Education* 6 (1) : 110-118
- Kholina, Nina., T.A. Pribadi & S Ridhl. 2013. Penerapan Investigasi Kelompok berbantuan Multimedia Materi Identifikasi Bakteri. *Unnes Journal of Innovative Science Education*. 2 (1) : 179-185
- Kisworo, S. Ngabekti., D. R.Indriyanti. 2017. Faktor Determinan dari Guru dalam Implementasi Pembelajaran Tingkat SMP di Wonosobo. *Journal of Innovative Science Education*. 2 (6) : 179-185
- Minarti, I. B., Sri Mulyani E.S., D. R. Indriyanti. 2012 Perangkat Pembelajaran IPA Terpadu Bervisi SETS Berbasis Edutainment pada Tema Pencernaan. *Journal of Innovative Science*.1 (2) : 105-111
- Muslich, M. 2010. *Text Book Writing*. Jakarta: Ar-Ruzz Media
- [PERMENDIKBUD] Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia No 24. 2016. Kompetensi Inti dan Kompetensi Dasar Pelajaran pada Kurikulum 2013 pada Pendidikan Dasar dan Menengah. Jakarta: Kemendikbud.
- Pisa. 2015. *PISA 2015 Result In Focus*. OECD. www.oecd.org/education/pisa-2015-results-volume-i-9789264266490-en.html
- Ristanti,A., S. Sukaesih., D. R.Indriyanti. 2013. Hubungan Bimbingan Belajar Swasta dengan Hasil Belajar Biologi. *Unnes Journal of Biology Education*. 2 (2) : 197-204.
- Sugiyono. 2015. *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D)*. Bandung: Penerbit Alfabeta.
- Suryani, E. Rudyatmi, & T.A. Pribadi. 2014. Pengaruh Experiential Learning Kolb melalui Kegiatan Praktikum terhadap Hasil Belajar Biologi Siswa. *Unnes Journal of Biology Education* 3 (2).
- Suryorini, AP, A. Marianti & A. Irsadi. 2013. Application of Bioedutainment Strategies in Learning Plant Materials at Weleri 1 Public High School. *Unnes Journal of Biology Education*. 2 (1): 20-25
- Syahdiani, S. Kardi, & I.G.M. Sanjaya. 2015. Pengembangan Multimedia Interaktif berbasis Inkuiri pada Materi Sistem Reproduksi Manusia untuk Meningkatkan Hasil Belajar dan Melatihkan Keterampilan Berpikir Kritis Siswa. *Jurnal Pendidikan Sains Pascasarjana* 5 (1).
- Vaishnav, R. S. 2013. Learning Style and Academic Achievement of Secondary School Students. *Voice of Research*. 1(4), 1-4.