Journal of Biology Education

http://journal.unnes.ac.id/sju/index.php/ujbe

Interactive Multimedia Effectiveness in Improving Cell Concept Mastery

Saiman Rosamsi[1]✉, Mieke Miarsyah[1], Rizhal Hendi Ristanto[2]

Master of Biology Education Progam, FMIPA, State Univesity of Jakarta

Info articles	Abstract
	The learning process has been carried out in the conventional way, this is caused by the teacher's understanding of using multimedia is still not optimal, so the learning method used is still limited. This phenomenon makes the researchers interested in doing this research. The purpose of the study to determine the effectiveness of multimedia use in improving mastery of cell concepts. this study uses a quantitative approach with a quasi-experimental method. This study uses a quantitative approach with a quasi-experimental method. Based on the results of the study, it was found that the use of interactive multimedia provides a good value of effectiveness in mastering the concept of students cells, compared with learning using conventional media. This is evidenced by the t-test on SPSS obtained value t = 0.00. Based on these results the average value of the gain experimental class is greater, which is 41, compared to the average value of the gain control class, which is 32. The results of this study is indicate there are differences in learning by using interactive multimedia and learning with conventional media. The success of this research can be used by educators in supporting the learning process, especially in biology.

✉ Correspondence:
  Jl. Rawamangun, Pulo Gadung, Jakarta Timur
  E-mail: aimanrosamsi21@gmail.com

INTRODUCTION

Education is a process, developing a personality that is universal for the dimensions of education in the learning process. (Sungkawan & Motlan, 2013). The learning process is one of a form of interaction between educators and students in achieving the learning objectives which take place in the world of education (Syaodih et al, 2014). When the learning process is carried out the educators often have difficulty in conveying an abstract concept, this is because the learning is still used Conventional, so, in the learning process technology is needed to facilitate the delivery of abstract concepts (Mahnun, 2012). Technology is very helpful for students to understand better the concepts conveyed by educators in order to achieve learning goals, such as telephone, computer, internet, e-mail and so on, in this case using interactive multimedia that can be used in computers.

Research said that the use of multimedia could improve mastery of concepts has been carried out by several experts especially in the fields of science including Husein et al, (2015)., Rahmatiah, (2013)., Wiyono, (2012)., Widayat et al, (2014)., Sobarna et al, (2014)., Sumarni et al (2013) states that use multimedia can improve mastery of concepts, it can be stated that interactive multimedia is very helpful in conveying information in the learning process.

Just like what was stated by Hajar & Aini (2010), Computer-based learning (Multimedia) can guide students in improving mastery of concepts. Because of this, the role of multimedia in learning is to help the abstract process become concrete (Sobarna, 2014).

In line with what was said by Angeli & Valanides (2009) who said that the application of technology can change abstract content to be easy for students to understand. Good mastery of concepts will be able to solve problems, both conceptual and systematic (Sukma, 2016). Interactive multimedia that is used is equipped with a controller that can be operated by the user, so that the user can choose for himself which parts he wants to access, this makes the educators a facilitator in using interactive multimedia (Fatima et.al, 2014).

The learning process can be done face to face or without having to deal with accessing it yourself. This is what underlies the implementation of this research to optimize technology in the world of education in the 21st century.

Cells it-self are said to be abstract because relatively of the are small size. This situation made this cell concept abstract and difficult to explain and understand only using conventional learning methods so that learning objectives cannot be achieved.

One of the learning objectives that must be achieved by the students is that students can explain the chemical components that made up cells, structures, functions and processes that take place in cells. but in reality the learning objectives are not easy to achieve by students, this is because the optimal availability of educators in using technology as an effort to facilitate the delivery of information.

This phenomenon allows it to be overcome in various ways, one of it is by using interactive multimedia. Therefore it is necessary to know the effectiveness of the use of interactive multimedia, and research need to be done on the effectiveness of the use of interactive multimedia in improving the mastery of cell concepts.

RESEARCH METHODS

The method used in this study is a quasi-experimental method with a type of approach, namely a quantitative approach. This method is used to determine the effectiveness of

multimedia use in improving mastery of cell concepts. The research was conducted at 10 Bandung Senior High Schools in the odd semester of the 2018-2019 academic year in the eleventh grade of the Science High School.

The type of instrument used is a multiple choice to measure the mastery of the cell concept of 30 students consisting of C1-C6 congressional levels with 5 choice answers (a, b, c, d, e). The indicators used to find out the mastery of the cell concepts of students are. Understanding and characteristics of cells, inventors and constituent components of cells, cell organelles, structure and function of cell organelles, and transport of substances. Before being tested on the sample, an instrument trial was conducted to determine the feasibility of the instrument used.

The instrument was tested on students both in the experimental class and in the control class 2 times during the pre-test and post-test. The population of this study was 224 divided into experimental classes as many as 112 students and control classes as many as 112 students.

Students are given a pre-test before being given treatment to measure mastery of the initial concept data, then post-test is given to determine the effectiveness of multimedia use in the learning process. Students are given a pre-test before being given treatment, then post-test is given. The treatment is used to find out the mastery of students' initial and final concepts.

The data from the pre-test and post-test were analyzed using help of the SPSS software version 25, which was previously carried out a prerequisite test, namely the normality test and homogeneity test. The test was continued by looking at the gain. The gain value is obtained from the difference from the value of the pre-test and post-test obtained.

RESULTS AND DISCUSSION

The results obtained in this study are summarized in the following table as a result of mastering the concepts of students:

Table 1 Result of mastering the concepts of students

No	class	Value treatment	
		Pre Test	*Post Test*
1	Experiment	33	74
2	Control	33	65

The results of the research that have been done obtained the value of the results for the experimental class the highest value for the pre-test of 57, and the lowest value of 17, while the post- test the highest value of 93, and the lowest value of 53. The highest gain difference is 76 and the lowest is 16. Whereas for the highest grade control class for the pre-test is 53 and the smallest value is 10, while the post-test the highest value is 80, and the lowest value is 43. The highest gain difference is 70 and the lowest is 4.

The findings in the study obtained data that the average value of the experimental class pre-test and control class is equal to 33. This proves that students' initial knowledge is generally considered the same. Unlike the case with the post-test average value obtained by the experimental class and the control class, has a fairly large margin of 9.00. The average breakdown of the experimental class value is 74 while the control class has an average value of 65. The value data is tested by the t-test obtained by the value sig. = 0.00. This value means

that there are differences in the level of mastery of the concepts of students, between the experimental class using interactive multimedia treatment with the control class using conventional media.

These results are in accordance with the opinions of (Surya, 2004) said that learning is a process carried out by someone to obtain a new behavior change. This opinion is in line with the results obtained in this study that, there is a change in the value of mastery of students' concepts after being treated during the teaching and learning process.

The using of interactive multimedia has a positive effect on the conceptualization of students in the teaching and learning process on the subject of cells. This can be proven by the average gain value. The average yield of the gain shows that learning using interactive multimedia increase of 41%, and learning using conventional media only 32%. The data shows differences in the average yield increase in the experimental class, who use interactive multimedia with learning that uses conventional media.

The results obtained in general can be explained that in the learning process using interactive multimedia will be more effective if compared to use conventional learning media. It is possible that in the implementation of the multimedia learning process it can integrate media objects such as text, video, images, animation and sound in representing educators to convey abstract information to achieve learning goals (Crihton & Kopp, 2006). The existence of images, animations and videos can help students understand the material presented. In line with this, Mayer, (2003) suggests that students will learn more by using images and text, compared to just using text. Moreno & Duran (2004) add that knowledge will be processed greater if there are more than 2 five senses involved compared to only one of the five senses involved.

The five senses involved will be linked to the central nervous system (brain) through the nervous system, so the information obtained will be forwarded to the brain through nerve cell apes, neural circuits and neurotransmitters (Wathon, 2016). Information received by the brain in order to last long memory is done by repetition of learning material, this occurs because nerve cells become connected and mineralized to facilitate remembering information (Saputro, 2017). Similar to those opinions in the research process students can repeat the learning material wherever, whenever and with anyone. Those can affect in changes result in the mastery of students' concepts because by using interactive multimedia, students can repeat material without limits. The workings of the brain in processing information become durable based on the work of the brain according to their respective functions in the human brain system.

Therefore the human brain consists of six brain systems including the prefrontalis cortex, limbic system, cingulatus gyros, basal ganglia, temporal lobe, and cerebellum, the six brain systems will affect IQ, EQ, and SQ, and will have an impact on mastering the concepts of students (Wathon, 2016). Those six brain systems will influence the change in the concept of students using both interactive multimedia and conventional learning media.

Multimedia that is used is multimedia that attracts attention and combines audio and visual. So that students not only can listen but can optimize the learning process using audio and visuals. Therefore, as stated by Netriwati (2015), in the learning process can be said as "Your writing and use of your spoken language help students to learn". The same thing was stated by Ridwan (2017), who said that increasing the mastery of the concepts of students using multimedia was closely related to the characteristics and characteristics of the multimedia, The multimedia contains audio and visual components so that it can involve interactivity. So that

using interactive multimedia can be a means to transmit or convey information in the learning process to achieve learning goals (Omenge, 2016).

Multimedia used is equipped with the supporting factors, that is buttons to make it easier for students to determine for themselves which part to learn, so that the activity encourages students to learn independently (Munir, 2015). Determination the part of studied will have an impact on repetition of material that has not been understood so that students can repeat it several times. Likewise, multimedia used which is equipped with navigation buttons indirectly can support changes in the mastery of abstract concepts of students (Moraes & Pereira, 2010). This makes retention of the knowledge gained will last a long time.

The same opinion was expressed by Naz (2008), who said that interactive multimedia can help students in getting greater knowledge and making information have longer retention. This can provide a learning experience to be more meaningful and satisfying so that it has an effect on mastering the concepts of students (Ridwan, 2008).

The using of interactive multimedia will affect the mastery of the concepts of students because of the supporting factors, as well as in this study which involves several senses involved, using enlarged image sizes, colors used that attract students' attention to learn it, there is a movement -movement (video animation) in interactive multimedia, the using can be done repeatedly and bring up something new in the learning process. The six factors are contained in the multimedia used so that it is effective in increasing the mastery of the concepts of students. In line with this opinion, Husein (2015) also revealed that the use of multimedia can have more opportunities in improving the mastery of students' concepts because the learning process is carried out repeatedly. In the presentation of multimedia used by educators presents multimedia that does not explain in detail but students can organize their own concepts that are achieved. This activities can help learners work harder and maximize multimedia as an effort to improve mastery of concepts. (Swestiyani, 2016).

The Other effects of learning using interactive multimedia can saving energy and make time effective so it can explain concepts easily even if the material is abstract (Naz, 2008). The more concrete the material presented which is abstract in multimedia, the more learning experience will increase the mastery of students' concepts. (Afriani et al., 2014). The explanation can be said that the use of interactive multimedia can take an important role in an effort to improve the mastery of students' concepts, especially on abstract concepts (Darmawan, 2012).

Another study that is commensurate with this research is (Sutarno, 2011) and (Wiyono, 2012). The results obtained said that the use of interactive multimedia in the experimental class in learning can significantly improve the mastery of students' concepts than the control class using conventional media.

CONCLUSION

The results obtained both in the experimental class and in the control class, both had a change in the increase in mastery of cell concepts. however, if examined further, the results obtained in the experimental class are higher in value until the average score obtained can reach the established KKM. compared to the comparison class, the average value of learning outcomes is still below the established KKM, so it can be concluded that the using of interactive multimedia in improving mastery of cell concepts can be used effectively in learning abstract concepts, in this case, the concepts learned are cell concepts.

REFERENCES

Abdullah, R. 2012. Pembelajaran Berbasis Pemanfaatan Sumber Belajar. *Jurnal DIDAKTIKA.* 12 (2): 216-231

Arsyad, A. 2014. Media Pembelajaran. Jakara: Raja Grafindo Persada

Crook S. J., Sharma, M. D., & Wilson, R.. 2015. An Evaluation of the Impact of 1:1 Laptops on Student Attainment in Senior High School Sciences. *International Journal of Science Education*. 2(37): 272-293

Departemen Pendidikan Nasional. 2003. Kamus Besar Bahasa Indonesia edisi ketiga. Jakarta: Balai Pustaka

Educational Ministry of Education (Kemendikbud). 2013. Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia Nomor 65 Tahun 2013 Tentang Standar Proses Pendidikan Dasar Dan Menengah. Jakarta: Kementerian Pendidikan dan Kebudayaan.Entrrprise, J. 2017. Otodidak Visual Basic. Jakarta: Elex Media Komputindo

Hastuti A. A., Mustikaningtyas, D. & Widiyatmoko, A.. 2014. Pengembangan Lks Berbasis Education Game Pada Tema Rokok Dan Kesehatan. *Unnes Science Education Journal.* 3 (3): 579-586

Herdiyeni, Y. E., Zuhud, A.M. & Heryanto, R.. 2014. Pembangunan Database Mangrove untuk Biodiversity Informatics Biofarmaka IPB. Jurnal Ilmu Pertanian Indonesia (JIPI). 19 (3): 197-203.

Indonesian Ministry of Environment (KemenLHK). 2013. Peraturan Menteri Lingkungan Hidup Republik Indonesia Tentang Pedoman Pelaksanaan Program Adiwiyata. Jakarta: Kementerian Lingkungan Hidup dan Kehutanan.

Istialina. 2016. Pemanfaatan Lingkungan sebagai Sumber Belajar Subtema Hewan dan Tumbuhan Dilingkungan Rumahku Kelas IV SD Negeri 3 Jeumpa Kabupaten Biruen. *Jurnal ilmiah mahasiswa prodi PGSD.* 1(1): 59-68

Jatmika, H. M. 2005. Pemanfaatan Media Visual dalam Menunjang Pembelajaran Pendidikan Jasmani di Sekolah Dasar. *Jurnal Pendidikan Jasmani Indonesia*. 3 (1): 89-99

Kanedi, I., Jauhari & Wulandari, A. 2013. Tata Kelola Perpustakaan Menggunakan Bahasa Pemrograman Visual Basic 6.0. *Jurnal Media Infotama*, 9 (1): 46-66

Koch. M.A, D. A. German, M. Kiefer, & A. Franzke. 2018. Database Taxonomics as Key to Modern Plant Biology. *Trends in Plants Science*. 23 (1): 4-9.

Kurniawan, R. 2015. Analisis Strategi Pengembangan Sistem Informasi pada PT Gunanusa Eramandiri dengan Metode Enterprise Architecture. *Jurnal ComTech.* 6 (1): 133-142

Landriany, E. 2014. Implementasi Kebijakan Adiwiyata Dalam Upaya Mewujudkan Pendidikan Lingkungan Hidup di SMA Kota Malang. *Jurnal Kebijakan dan Pengembangan Pendidikan*. 1(2): 82-88

Nurdiana, DN. 2013. Inventarisasi tumbuhan air di Kebun Raya Cibodas. *Jurnal UPT Balai Konservasi Tumbuhan Kebun Raya Cibodas LIPI.* 2(1): 6-9

Rasyid. M, A.A. Azis & A.R. Saleh. Pengembangan Media Pembelajaran Berbasis Multimedia dalam Konsep Sistem Indera pada Siswa Kelas Xi SMA. Jurnal Pendidikan Biologi. 7 (2) : 69-80

Sobri, K.M., F. Hanum, H. Zulnaedi, A. R. Ahmad & Alfitri. 2017. A comparative study of school environment for students' skills development in Malaysia and Indonesia. *Kasetsart Journal of Sosial Science.* xxx:1-6

Sugiyono. 2015. Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta

Sydara, K., M. Xayvue, O. Souliya, B. G. Elkington& D. D. Soejarto. 2014. Inventory of Medical Plants of the Lao People's Democratic Republic: A Mini Review. *Journal of Medicinal Plant Research.* 8 (43):1262-1274