EFFECTIVENESS OF INTERACTIVE E-MODULE BASED ON DIGESTIVE SYSTEM PROBLEMS IN IMPROVING MASTERY OF STUDENT CONCEPTS

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Abstract: This research was conducted to determine the effectiveness of teaching materials in the form of problem-based interactive E-Modules. Prior to conducting this research, a preliminary study was carried out which consisted of literature studies and field studies. This type of research is experimental research. The data collection instruments were in the form of interview sheets to analyze the effectiveness of the teacher's needs and questionnaires to analyze the effectiveness of the E-Module on students as well as concept mastery tests in the form of pretest and posttest which were given to the control class and the experimental class. The interactive e-module used contains text, images and learning videos as an independent learning effort arranged in an experimental class. The subject of this study used 2 classes of students in class XI MIPA SMA YPHB, amounting to 30 people each. The results of the control class research resulted in an N-gain value of 0.37 in the medium category and the experimental class produced an N-Gain value of 0.66 in the moderate category so that it can be concluded that the use of problem-based interactive E-Module has a moderate effect on student mastery of concepts.

Keywords: Interactive E-Module, Problem-based learning, Mastery of Concepts, Digestive System

INTRODUCTION

The definition of education in a broad sense is life. This means that education is all knowledge of learning that occurs throughout life in all places and situations that have a positive influence on the growth of each individual creature (Priwanti et al., 2022). The progress of education is largely determined by the implementation in the hands of educators at school (Chotimah & Nisa, 2019). The teacher must be able to take on his role appropriately so that he remains the person needed in guiding, directing, motivating, and designing learning that takes place in the classroom (Salsabila et al., 2021). Curriculum is an important element in every form and model of education (Wahyuni, 2015). Curriculum and education are two concepts that must be understood before discussing curriculum development. Because, with a clear understanding of these two concepts, it is hoped that education

managers, especially curriculum implementers, will be able to carry out their duties as well as possible (Chanifudin, 2016).

Information and communication technology in the era of the Industrial Revolution 4.0 is growing rapidly so that education has a big role in dealing with advances in technology and information (Sartini & Mulyono, 2022). In the 21st century, education is required to be more advanced and easily accessible to all groups (Fitriah & Mirianda, 2019). Based on Permendikbud Number 81A Appendix IV of 2013 [1] concerning the implementation of the 2013 Curriculum adheres to the basic view that knowledge cannot simply be transferred from educators to students. Learning must be related to the opportunities given to students to construct knowledge in their cognitive processes. In understanding various materials, various scientific approaches are used, so that information can come from anywhere, at any time, and does not depend on educators (Febrianti et al., 2017).

One of the developments occurring in the world of education is the change in the paradigm of teacher-oriented learning (teacher centered learning) to student-oriented learning (student centered learning). This student-oriented learning (student centered learning) no longer positions students as learning objects, but instead students are placed as learning subjects. In other words, student success in learning is strongly influenced by the student's own learning activities (Utami, 2016). The use of teaching materials is an inseparable component in a learning process, which is very necessary for the target of achieving student competencies (Wahyudi, 2022). Teaching materials are a set of subject matter that refers to the curriculum used in order to achieve predetermined competency standards and basic competencies (Nurdyansyah & Mutala'liah, 2015).

Thanks to advances in information technology and the internet today, digital information resources are abundant (Kurnianingsih et al., 2017). Products from technology and information provide alternative learning media that students can use in digital form such as interactive e-modules (Hutahaean et al., 2019). E-module is a learning tool or tool that contains materials, methods, limitations, and ways of evaluating that are designed in a systematic and attractive way to achieve the expected competence according to the level of complexity electronically (Hakim et al., 2020). Unlike the general modules which are usually presented to students in hardcopy form, this e-module is designed to use an electronic format so that it can be used via various devices such as computers, laptops, and smartphones (Wulandari et al., 2021).

Understanding of the concept is very important for everyone. Learning concepts is the main outcome of education (Widia et al., 2020). To solve a problem, a student

must know the relevant rules and these rules are based on the concepts he has acquired (Sugiana et al., 2016).

In the teaching-learning process if students are able to solve these problems it means that these students can think critically (Mardhiyah et al., 2021). This can also be identified from the competencies contained in the 2013 curriculum for the senior high school level starting with C3 to C6 levels. The purpose of knowledge assessment is to measure the level of mastery of students' competencies in the knowledge aspect (Mustafa et al., 2019). From the knowledge assessment, it has a cognitive level based on the Revised Bloom's Taxonomy, namely as follows: (1) remember (C1), (2) understand (C2), (3) apply (C3), (4) analyze (C4), (5) evaluates (C5), and (6) creates (C6) (Syarifah et al., 2020).

From several analyzes that researchers have carried out starting from current education, the relationship between education and the current curriculum, the results of analysis of international journals. The results of a literature study of 15 international journals regarding teaching materials concluded that interactive teaching materials can improve student learning outcomes significantly. Biology subjects in the current era of digitalization provide research opportunities to develop teaching materials or digital-based learning media in the form of interactive E-Modules. Thus, this interactive E-Module can be used as the best alternative to improve students' critical thinking skills and mastery of concepts. This e-module can be designed using the Articulate Storyline 3 application. Articulate storyline 3 is a learning media maker application supported by text, image, audio, and video content that can be adjusted to learning objectives. The resulting media is also supported by interesting quiz content, so that students can immediately actively interact in learning activities (Husain & Ibrahim, 2021). The use of innovative learning media based on information technology has great potential to improve the quality of learning, because it is an effective and efficient way of conveying information (Hutahaean et al., 2019).

METHOD

The research approach used is a quantitative approach using experimental research with the pretest-posttest control group design. Researchers can control all external variables that affect the course of the experiment, thus internal validity or the quality of the implementation of the research design can be relied upon (Sugiyono on Sukmadinata, 2017). In this study, research subjects will be given a pre-test before being given treatment, then the subject is given treatment or treatment. After being given treatment, a post test or final test is given to find out the results of the treatment (Nuryanti, 2019). An overview of the one group pretest-posttest design is shown in Figure 1.

Figure 1. Desain one group pretest-posttest

Information:
O1 : Analysis of the experimental group before being given an experiment using the E-Module
O2 : Analysis of the experimental group after being given an experiment using the E-Module
O3: Analysis of the control group before learning using conventional methods
O4 : Analysis of the control group after being given learning using conventional methods
 X : Providing treatment using interactive E-Module
-   : Providing conventional learning

The research was conducted at YPH B High School, Bogor City, Jl. Pajajaran No. 234A Bogor. The research subjects were students of class XI IPA 1 as the control class and class XI IPA 5 as the experimental class. The instrument item questions to be used are multiple choice questions of 15 questions which are questions at levels C2 to C5. The data analysis used is the gain value to determine the level of increase in the level of students' mastery of the concept.
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RESULTS AND DISCUSSION

This research is an experimental research that aims to see the effectiveness of the problem-based interactive E-Module on students' mastery of concepts in the Digestive System material. The E-Module used is an E-Module created using the Articulate Storyline application. This e-module is a development of previous modules and is made electronically with the aim that paperless can also be used without being limited by space and time. Problem-based learning starts from authentic/everyday problems from life real and meaningful. The main goal of PBM is to increase the application of knowledge, problem solving, and learning skills independent students who require them to actively articulate, understand, and solve the problem (Susilo, 2012). From the research that has been done, data on students' mastery of the concept was obtained from the test scores given at the end of the lesson in both the control class and the experimental class. The results of student tests in both the control class and the experimental class can be seen in the table. 1

Table. 1. Control and Experiment Class Students' Concept Mastery Value

No.	Class	The number of student	Average value	Average N-Gain
1	Control	30	61,33	0,37
2	Experiment	30	81,78	0,66

Concept mastery is students' ability to understand meaning scientifically both in theory and application in everyday life (Rachman et al., 2018). In learning the value of concept mastery is a measure of the success of the teacher in carrying out a teaching. With a high level of mastery of concepts students can improve their intellectual skills and assist in solving the problems they have and lead to more meaningful learning, otherwise you can provide opportunities for students to explore collect and analyze data for solve problems, so students are able to think critically, analytically, systematically and logically find alternative solutions to problems (Gayatri, 2013).

Various ways that teachers can do to improve students' mastery of concepts in the current era of modernization are by using more modern jar materials. The financial ability of students in this all-digital era makes teachers innovate in their learning, one of which is using teaching materials in the form of problem-based interactive E-Modules. The problem-based interactive e-Module developed is an innovation that is used to improve students' mastery of concepts with a variety of attractive displays in the form of attractive learning activities with a variety of questions that make students accustomed to critical thinking, all questions using the G-Form, materials and exercises questions that are all digital. Based on the data generated from the research that the researchers conducted on 2 classes XI, the control class and the experimental class, the calculations were obtained in 2 ways, namely:

a. Through N-Gain

Based on the results of calculations using excel, the average N-Gain value for the control class is 0.37 while the N-Gain for the experimental class is 0.66. good because it is in the range 0.3 > N-Gain > 0.7 and for the experimental class it shows the number 0.66 is also in the good category, although in terms of numbers it is higher than the control class. This means that the problem-based interactive E-Module has a better level of effectiveness than the control class.

b. Testing the average difference (t test)

Statistical calculations using SPSS, obtained a t value of 0.573 which is greater than 0.05 with a significance level of 5%, control and experimental variants showed the same results. After the average t test is carried out, it is assumed that Ho = the average value of the control group is the same as the average of the

experimental group, H1 = the average value of the control group is not the same as the average of the experimental group.

Based on the test, it was found that the t value was 0.000 <0.05, so the decision that can be made is Ho, it can be interpreted with a significance of 5%, the average of the control group is not the same as the average of the experimental group where the value of the experimental group is higher than that of the control group with a calculated t value marked with a value of -6.221.

Referring to the two calculations using N-Gain which are then tested statistically, it can be interpreted that the effectiveness of using problem-based interactive E-Modules is more effective in the experimental group, this is because the E-Modules are designed in such a way that are more attractive and increase students' curiosity in learning, they are also more interested because the existence of the paperless E-Module also learns without the limits of space and time which is very suitable for learning in today's 21st century students. Several previous researchers have developed modules that aim to improve student learning outcomes, among others by Setyoko (2014) showing that module excellence can increase student knowledge both individually and in groups, not be boring, improve learning achievement, and student understanding. Meanwhile, the results of research conducted by Gamaliel (2014) show that modules can provide new colors so that students can carry them out easily in the learning process, besides that students can carry out real learning activities and develop them to the fullest according to the creativity of each student. So it is very clear that the effectiveness of using the E-Module plays a very good role in increasing students' mastery of concepts, as also in the research by Permatasari et. al, 2017 which states that in the learning process of the E-Module students are trained to learn more independently, but does not replace the role of the teacher as a guide during the learning process so that it is in accordance with current learning which leads to 21st century teaching. In line with research from(Wicaksono, et al., 2015) which mentions that the use of research-based modules significant effect on understanding student concept.

CONCLUSION

Based on the results and discussion it can be concluded that the effectiveness of the use of problem-based interactive E-Modules can improve students' mastery of concepts, this can be seen from the average N-gain value in the experimental class which is greater than the control class even though both are included in the good category . And based on statistical calculations using SPSS, the t-count value is -6.221, which means that there are differences in the ability to master concepts between the experimental class and the control class, so it can be concluded that the problem-based interactive E-Module is effectively used in improving students' concept mastery abilities.

REFERENCE

Chanifudin. (2016). Pendekatan Interdisipliner : Tata Kelola Pendidikan Islam Di Tengah Kompleksitas. *Edukasi Islami Jurnal Pendidikan Islam*, *05*, 1277–1294. http://jurnal.staialhidayahbogor.ac.id/index.php/ei/article/view/90

Chotimah, C., & Nisa, K. (2019). Peran Manajemen Sumber Daya Manusia Dalam Meningkatkan Mutu Pendidikan di MA Bertaraf Internasional Amanatul Ummah Pacet. *Prosiding Seminar Nasional Multidisiplin*, 125–128.

Febrianti, K. V., Bakri, F., & Nasbey, H. (2017). Pengembangan Modul Digital Fisika Berbasis Discovery Learning Pada Pokok Bahasan Kinematika Gerak Lurus. *WaPFi (Wahana Pendidikan Fisika)*, *2*(2), 18–26. https://doi.org/10.17509/wapfi.v2i2.8273

Fitriah, D., & Mirianda, M. U. (2019). Kesiapan Guru Dalam Menghadapi Tantangan Pendidikan Berbasis Teknologi. *Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas Pgri*, 148–153.

Gamaliel S. A. 2014. Pengembangan Modul Pembelajaran Berbasis Home Science Process Skill Dipadu dengan Blended Learning untuk Meningkatkan Keterampilan Proses Sains Siswa Kelas XI IPA SMA Kristen Petra Malang. Tesis tidak diterbitkan. Malang: Pascasarjana Universitas Negeri Malang.

Gayatri, I. G. A. S., Jekti, D. S. D., & Jufri, A. W. (2013). Efektifitas pembelajaran berbasis masalah (PBM) dan strategi kooperatif terhadap kemampuan menyelesaikan masalah dan hasil belajar kognitif biologi ditinjau dari kemampuan akademik awal siswa kelas X SMA Negeri 3 Mataram. *Jurnal Pijar Mipa, 8(2).*

Hakim, L. N., Wedi, A., & Praherdhiono, H. (2020). Electronic Module (E-Module) Untuk Memfasilitasi Siswa Belajar Materi Cahaya dan Alat Optik Di Rumah. *Jurnal Kajian Teknologi Pendidikan*, *3*(3), 239–250. https://doi.org/10.17977/um038v3i32020p239

Hutahaean, L. A., Siswandari, & Harini. (2019). Pemanfaatan E-Module Interaktif Sebagai Media Pembelajaran di Era Digital. *Prosiding Seminar Nasional Teknologi Pendidikan Pascasarjana UNIMED*, *1*(2018), 298–305. http://digilib.unimed.ac.id/id/eprint/38744

Kurnianingsih, I., Rosini, & Ismayati, N. (2017). Upaya Peningkatan Kemampuan Literasi Digital Bagi Tenaga Perpustakaan Sekolah dan Guru di Wilayah Jakarta Pusat Melalui Pelatihan Literasi Informasi. *Jurnal Pengabdian Kepada Masyarakat (Indonesian Journal of Community Engagement)*, *3*(1), 61–76. https://doi.org/10.22146/jpkm.25370

Mardhiyah, R. H., Aldriani, S. N. F., Chitta, F., & Zulfikar, M. R. (2021). Pentingnya Keterampilan Belajar di Abad 21 sebagai Tuntutan dalam Pengembangan Sumber Daya Manusia. *Lectura: Jurnal Pendiidkan*, *12*(1),

29–38.

Mustafa, P. S., Winarno, M. E., & Supriyadi. (2019). Penilaian Pendidikan Jasmani, Olahraga, dan Kesehatan pada Sekolah Menengah Pertama Negeri Kota Malang. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *4*(10), 1364–1379. https://doi.org/10.17977/jptpp.v4i10.12845

Nurdyansyah, & Mutala'liah, N. (2015). Pengembangan Bahan Ajar Modul Ilmu Pengetahuan Alambagi Siswa Kelas IV Sekolah Dasar. *Esprints*, *41*(20), 1–10.

Nuryanti, R. (2019). Penggunaan Model Pembelajaran Kooperatif dengan Strategi Team Games Tournament (TGT) untuk Meningkatkan Hasil Belajar Matematika pada Materi Bilangan Romawi bagi Siswa Tunarungu Kelas IV SDLB. *JASSI_anakku*, *20*(1), 40–51. https://ejournal.undiksha.ac.id/index.php/JET/article/view/21734

Permatasari, El. A., Mudakir, I., & Fikri, K. (2017). PENGEMBANGAN EMODUL BERBASIS ADOBE FLASH PADA POKOK PEMBAHASAN SISTEM REPRODUKSI UNTUK KELAS IX MIPA SMA. *Jurnal Saintifika*, *19*(1), 57–65.

Pristiwanti, D., Badariah, B., Hidayat, S., & Dewi, R. S. (2022). Pengertian Pendidikan. *Jurnal Pendidikan Dan Konseling (JPDK)*, *4*(6), 1707–1715.

Rachman, K. A., Prastowo, S. H. B., & Lesmono, A. D. (2018). Analisis Penguasaan Konsep Teori Kinetik Gas Menggunakan Taksonomi Solo Pada Siswa Sman 1 Jember. *Seminar Nasional Pendidikan Fisika 2018*, *3*, 140–143.

Salsabila, U. H., Ilmi, M. U., Aisyah, S., Nurfadila, & Saputra, R. (2021). Peran Teknologi Pendidikan dalam Meningkatkan Kualitas Pendidikan di Era Disrupsi. *Journal on Education*, *3*(01), 104–112. https://doi.org/10.31004/joe.v3i01.348

Sartini, & Mulyono, R. (2022). Analisis Implementasi Kurikulum Merdeka Belajar Untuk Mempersiapkan Pembelajaran Abad 21. *Didaktik : Jurnal Ilmiah PGSD STKIP FKIP Universitas Mandiri*, *8*(2), 1348–1363. https://doi.org/10.36989/didaktik.v8i2.392

Setyoko. 2014. Struktur Komunitas Makrozoobenthos di Area Mangrove Pantai Bukit Barisan Kabupaten Bengkalis sebagai Modul Ekologi Hewan di Perguruan Tinggi. Malang: Tesis tidak diterbitkan. Pascasarjana Universitas Negeri Malang.

Sugiana, I. N., Harjono, A., Sahidu, H., & Gunawan. (2016). Pengaruh Model Pembelajaran Generatif Berbantuan Media Laboratorium Virtual Terhadap Penguasaan Konsep Fisika Siswa pada Materi Momentum dan Impuls. *Jurnal Pendidikan Fisika Dan Teknologi*, *2*(2), 61–65. https://doi.org/10.29303/jpft.v2i2.290

Suhailah, F., Muttaqin, M., Suhada, I., Jamaluddin, D., & Paujiah, E. (2021).

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Articulate Storyline: Sebuah Pengembangan Media Pembelajaran Interaktif Pada Materi Sel. *Pedagonal : Jurnal Ilmiah Pendidikan*, *5*(1), 19–25. https://doi.org/10.33751/pedagonal.v5i1.3208

Sukmadinata, Nana Syaodih. (2017). Metode Penelitian Pendidikan. Bandung : PT Remaja Rosdakarya.

Susilo, A. B. (2012). Pengembangan model pembelajaran IPA berbasis masalah untuk meningkatkan motivasi belajar dan berpikir kritis siswa SMP. *Journal of Primary Education. 1(1)*

Syarifah, L. L., Yenni, & Dewi, W. K. (2020). Analisis Soal-Soal Pada Buku Ajar Matematika Siswa Kelas XI Ditinjau Dari Aspek Kognitif. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(2), 1259–1272. https://doi.org/10.31004/cendekia.v4i2.335

Utami, I. S. (2016). Implementasi E-Learning untuk Meningkatkan Aktivitas Belajar Siswa. *Jurnal Komputer Terapan*, *2*(2), 169–178. http://jurnal.pcr.ac.id

Wahyudi, A. (2022). Pentingnya Pengembangan Bahan Ajar Dalam Pembelajaran Ips. *JESS: Jurnal Education Social Science*, *2*(1), 51–61.

Wahyuni, F. (2015). Kurikulum dari Masa ke Masa (Telaah Atas Pentahapan Kurikulum Pendidikan di Indonesia). *Al-Adabiya*, *10*(2), 231–242. https://doi.org/10.1023/A:1013199923212

Widia, Sarnita, F., Fathurrahmaniah, & Atmaja, J. P. (2020). Penggunaan Strategi Mind Mapping Untuk Meningkatkan Penguasaan Konsep Siswa. *Jurnal Ilmiah Mandala Education*, *6*(2), 467–473. https://doi.org/10.58258/jime.v6i2.1459

Wicaksono, A. R., Widoretno, S., & Nurmiyati, N. (2015). Pengaruh Penggunaan Modul Berbasis Research pada Pembelajaran Think Pair Share dan Group Investigation terhadap Pemahaman Konsep dan Kemampuan Metakognisi Peserta Didik Kelas X SMA Negeri 1 Boyolali Tahun Ajaran 2013/2014. Bioedukasi: *Jurnal Pendidikan Biologi,* 8(1), 60. https://doi.org/10.20961/bioedukasiuns.v8i1.35

Wulandari, F., Yogica, R., & Darussyamsu, R. (2021). Analisis Manfaat Penggunaan E-Modul Interaktif Sebagai Media Pembelajaran Jarak Jauh Di Masa Pandemi Covid-19. *Khazanah Pendidikan*, *15*(2), 139–144. https://doi.org/10.30595/jkp.v15i2.10809

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