Implementation of Interactive Electronic Books Based on Project Based Learning for Class XI High School Even Semester on Student Motivation and Learning Outcomes

1st Diana Fitri[1], 2nd Saronom Silaban[2], 3rd Ayi Darmana[3]

{ dianafitri866@gmail.com[1],saronomsilaban@unimed.ac.id[2], darmana@yahoo.com[3] }

The Education Chemistry Study Program of Postgraduate School of Universitas Negeri Medan, Indonesia, 20221[1,2,3]

Abstract. The use of interactive electronic books based on project based learning is expected to be able to increase motivation and student learning outcomes in learning chemistry. This study aims to look at student learning outcomes and student motivation by using interactive electronic books based on project based learning. This research was a quasi-experimental or quasi-experimental study (Pre-Experimental Design) with a sample of XI MIPA 1 SMA Negeri 2 Siabu as many as 23 students who were selected using a purposive sampling technique. The instruments used were in the form of 15 multiple choice questions and a student learning motivation questionnaire. Students' chemistry learning outcomes after being taught using interactive electronic books based on project-based learning were higher than Minimum Completeness Criteria with a sig. < α (0,001 < 0,05) and $t_{count} > t_{table}$ (7,074 > 1,714). The level of student learning motivation using interactive electronic books based on project-based learning is 85,2%, with very motivated criteria.

Keywords: Implementation, interactive electronic books, project-based learning, learning outcomes, learning motivation.

1 Introduction

New innovations are urgently needed to be able to improve skills, make students more active, creative and innovative, especially in the fields of science and mathematics as a demand for 21st century learning [1]. 21st century skills are high-level skills that must be possessed by humans to be able to work in the real world and be able to face these challenges. Skills that can be applied in the world of education in the 21st century are 4C (Critical, Collaborative, Communicative, and Creative Thinking) and Integration of HOTS questions [2].

One of the factors that causes students' chemistry learning outcomes to be less than optimal is the lack of interest in the learning media used, so that students become too lazy to learn. [3].

AISTEEL 2023, September 19, Medan, Indonesia

DOI 10.4108/eai.19-9-2023.2340419

Then the learning method used is still the lecture method where the center of the learning process is only carried out by the teacher, students only listen when the teacher explains [4]. The teacher's creativity in determining the learning model is still not suitable and less effective as a result, learning is not fun and students are able to express their creativity [5]. The textbooks used still emphasize content dimensions so that students learn by rote and only show concepts, sets of formulas, and practice questions [6].

Books are the main learning resource that students usually use to learn. However, along with the development of Information and Communication Technology (ICT), books that were originally printed are now widely available in electronic form. Electronic books have the convenience of being used anywhere and anytime, plus if there are interactive features in books it can make students study independently [7]. There are still many educational units that do not take advantage of scientific and technological developments in the development of teaching materials, they consider teaching materials to be in the form of a handout or book, but teaching materials can be in the form of images, audio, animation, video, and web learning [8].

Interactive information technology-based learning media makes learning more interesting and can visualize or describe abstract material using animated media according to the situation in the field [9]. Interactive electronic books can contain content in the form of audio, video, animation and interesting links and can be used in online learning [3]. The use of electronic books shows significant student achievement, provides new tricks in learning and motivates students to learn, creates a more interesting learning environment, increases their attention to instruction, is more efficient, and increases their interest in class [10].

One of the developments in the display of electronic books is in the form of flipbooks [11]. Flipbook allows e-books to be presented in interactive media [8]. Flip PDF Professional is a software or application that is used to create teaching materials in the form of flipbooks and is equipped with multimedia such as audio, animation and video [12]. Another advantage of the Flip PDF Professional application can be saved in several formats such as exe, html, zip, and others. In addition, the menu display and its features are very easy to use [13].

Interactive electronic books can be paired with innovative learning models that are believed to improve student learning outcomes [14]. One of the learning models that are suitable for chemistry learning is Project Based Learning (PjBL) [15]. PjBL is a learning model or approach focused on students to creating and applying the results of exploration to solving a problem by organizing the learning material into a project while still emphasizing concepts through contextual learning activities [16]. Project Based Learning is an alternative learning model that can create learning activities and students' creative thinking skills [17]. In 21st century learning, students are expected to be able to develop critical thinking, for example with a project-based learning model [18]. Students feel happier, more motivated and feel more creative when participating in project-based learning [19]. In addition, the advantage of PjBL is that it can increase learning motivation, problem solving skills, students' cognitive and psychomotor [6].

The use of e-books in the learning process has an impact on increasing students' critical thinking skills and an increase in the number of students whose scores are above the KKM [20]. Research provides an overview of interactive e-books that can motivate students to learn science in depth and more contextually with content analysis [21]. Interactive electronic books

are effectively applied as learning resources to improve student learning outcomes and learning activities [22]. Interactive e-books are effective in increasing students' conceptual understanding and strengthening students' character [23]. The use of interactive e-books during online learning can improve student learning outcomes and understanding of concepts [24]. Student learning outcomes and the mastery of student problem-solving skills increased after using the PjBL-based plant anatomy structure E-book [2]. The application of interactive digital books combined with project-based learning can improve student learning outcomes [14].

The interactive electronic book based on project based learning that has been developed has been validated by experts and the result is that the book is very feasible to use. The application of interactive electronic books based on project based learning was carried out at SMA Negeri 2 Siabu. The purpose of this study was to see the application of interactive electronic books based on project based learning on student learning outcomes and student learning motivation.

2 Method

This research was carried out at SMA Negeri 2 Siabu in May of the 2022/2023 academic year. The population in this study was the entire sample in this study, class XI MIPA 1, totaling 23 students. Sample selection was carried out using the purposive sampling technique.

The instruments used in this research were test and non-test instruments. Test instruments in the form of objective tests are used to measure learning outcomes, and non-test instruments in the form of learning motivation questionnaires are used to measure student learning motivation.

The method used in this research is a quasi-experimental method or quasi-experimental. The design of this study is the Pre-Experiment Design with the form of One-Group Pretest-Posttest Design, namely there is a pretest before being given treatment. The results of this design are known to be more accurate because they compare conditions before being given treatment with those after being given treatment [25]. This research design is shown in Figure 1 as follows:

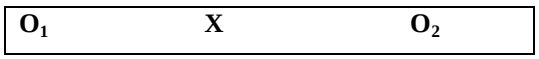

Fig. 1. Research Design for PjBL-Based Interactive Electronic Book Implementation

Information :

O_1 = pretest

O_2 = postest

X = Learning using interactive electronic books based on PjBL on titration material acid base.

Data obtained in descriptive form and processed using SPSS 29 for windows

3 Results and Discussion

Student learning outcomes are taken from pretest and posttest scores obtained before and after carrying out learning activities using interactive electronic books based on project based learning. To find out student learning outcomes are measured using multiple choice questions totaling 15 questions. The implemented material is acid-base titration. Students' pretest and posttest scores can be seen in Figure 2 below.

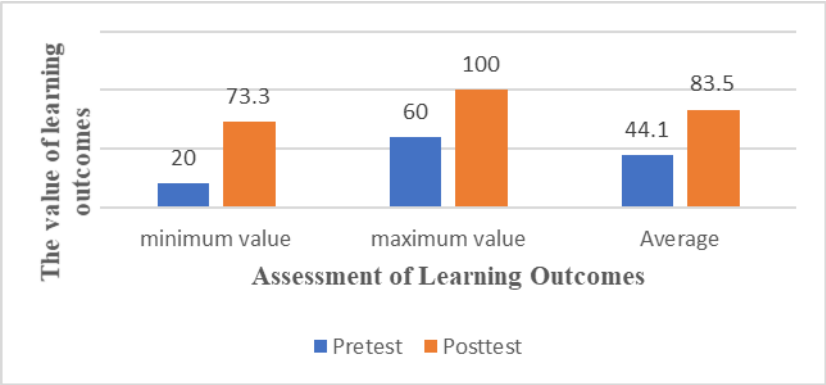

Fig. 2. Graph of Student Learning Outcomes

To test the hypothesis regarding student learning outcomes after using interactive electronic books based on project-based learning, a one-sample T-test was carried out with the help of the IBM SPSS Statistics 29 for Windows program. Prior to testing the hypothesis, prerequisite tests were carried out (pretest data normality test and posttest data normality test), and then the hypothesis was tested (one sample t-test).

The results of the normality test used were the Shapiro-Wilk test because the number of samples was less than 50 students. The Shapiro-Wilk test is generally used for small samples (less than 50 data points). The data is normally distributed if the significance value is greater than 0,05 [26]. The significance value of the students' pretest was 0,200; which means that the sig value (0,200) > α value was 0.05, so it can be concluded that the students' pretest data were normally distributed. The significance value of the students' posttest was 0,063; which means that the sig value (0,063) > α value was 0,05; so it can be concluded that the students' posttest data were normally distributed.

After the posttest data is normally distributed, the hypothesis can be tested using the SPSS one sample t-test. The results of the one sample t-test are in Table 1.

Table 1. Results of Student Learning Outcomes Hypothesis Testing

One-Sample Test							
	Test Value = 73						
			Significance			95% Confidence Interval of the Difference	
	t	Df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper

Learning outcomes	7,074	22	,001	,001	12,21304	8,6325	15,7936

Based on data testing with the help of the IBM SPSS Statistics 29 for Windows program, if the sig. < 0,05 then Ha is accepted. From the test results in Table 2, the significance value is 0,001 and t calculate is 7,074. This means that the result value is sig. < α (0,001 < 0,05) and tcount > ttable (7,074> 1,714) then Ha is accepted, so it can be concluded that student learning outcomes after using interactive electronic books based on project based learning developed are higher than the Minimum Completeness Criteria.

The increase in student learning outcomes is calculated using the N-gain formula based on the pretest and posttest scores of each student. The N-gain value can be seen in Table 3 below:

Table 2. Student's N-gain Value

The number of students	Average value		*N-gain*	Category
	Pretest	Posttest		
23	44,1	83,5	0,72	High

Based on Table 3 it can be concluded that the increase in student learning outcomes after using interactive electronic books based on project based learning is 0,72 in the high category.

Student learning motivation was obtained from a learning motivation questionnaire filled in by students after completing learning using interactive electronic books based on the developed Project Based Learning. The purpose of collecting this data is to determine the level of students' motivation to study chemistry after using interactive electronic books based on project based learning. Data on the percentage of students' motivation levels can be seen in Table 3.

Table 3. Percentage Results of Student Learning Motivation Levels

No.	Indicator	Statement item	Average	Criteria
1	Attention	13,14,15,	87,3%	Highly Motivated
2	Confidence	10,18,19	82,6%	Motivated
3	Satisfaction	9,11,12,16,17,20	82%	Motivated
4	Challenge	1,3,5,8	87,9%	Highly Motivated
5	Curiosity	2,6,	87,4%	Highly Motivated
6	Engage	4,7	83,9%	Motivated
	Average		**85,2%**	Highly Motivated

The percentage value of students' learning motivation when using interactive electronic books based on project based learning was 85,2%, so it was concluded that students' learning motivation was in the category of highly motivated to study chemistry when using interactive electronic books based on project based learning.

Based on the results of the analysis, it was found that student learning outcomes were higher than Minimum Completeness Criteria and there was an increase in student learning outcomes after using interactive electronic books. The results of research on improving student learning

outcomes after using interactive electronic books are supported by research that states that interactive e-books are effectively used as learning resources to improve student learning outcomes and learning activities [22]. The use of interactive e-books during online learning activities can improve student learning outcomes and understanding of concepts [24]. The application of interactive digital books combined with project-based learning can improve student learning outcomes [14]. Chemistry learning outcomes and students' learning interest increased after being taught with the PjBL model assisted by Digital Flipbook media [27].

4 Conclusion

Students' chemistry learning outcomes are higher than the Minimum Completeness Criteria determined by the school after being taught using interactive electronic books based on project based learning. The increase in student learning outcomes after using interactive electronic books based on project-based learning was 0,72 in the high category. The level of student learning motivation using interactive electronic books based on project-based learning is 85,2%; with very motivated criteria.

References

[1] Aulya, R. A., Asyhar, R., & Yusnaidar, Y. "Pengembangan E-Modul Kimia Berbasis PjBL-STEM untuk Pembelajaran Daring Siswa SMA pada Materi Larutan Penyangga." Journal of The Indonesian Society of Integrated Chemistry (On Progress), vol. 13, no. 2, 2021, pp. 84-91.

[2] Muwaffaqoh, D., Kirana, T., & Rachmadiarti, F. "The development of e-book based on project based learning on the plant anatomy structure material. IJORER: International Journal of Recent Educational Research, vol. 2, no. 4, 2021, pp. 416-431.

[3] Puspitasari, H., Wilujeng, I., & Haristy, D. R. "Keefektifan Interactive E-Book Ipa Untuk Meningkatkan Kemampuan Literasi Sains Siswa SMP pada masa pandemi Covid-19". Al-Ulum: Jurnal Sains Dan Teknologi, vol. 6, no.2, 2021, pp.49-55.

[4] Antara, I. P. P. A. "Model Pembelajaran Problem Based Learning Untuk Meningkatkan Hasil Belajar Kimia Pada Pokok Bahasan Termokimia". Journal of Education Action Research, vol. 6, No.1, 2022.

[5] Gultom, E. R., & Muchtar, Z. "Penerapan Model Pembelajaran Berbasis Proyek Pada Pembelajaran E-Learning Materi Kesetimbangan Kimia". Educenter : Jurnal Ilmiah Pendidikan, vol.1, no. 4, 2022, pp.327-334.

[6] Rokhim, D.A., Widarti, H.R., & Fajaroh, F. "Pengembangan Bahan Belajar Flipbook Pada Materi Redoks Dan Elektrokimia Berbasis Pendekatan STEM-PJBL Berbatuan Video Pembelajaran". Jurnal Teknologi Pendidikan, vol. 8, no. 2, 2020, pp. 234-250.

[7] Salamiyah, Z., & Kholiq, A. "Pengembangan Ecthing (E-Book Creative Thinking) Untuk Meningkatkan Keterampilan Berpikir Kreatif Peserta Didik SMK Pada Materi Hukum Ohm". Inovasi Pendidikan Fisika, vol. 9, no. 3, 2020, pp. 342-348.

[8] Fitriasari, P., Fuadiah, N. F., Destiniar, D., Misdalina, M., Rohana, R., & Nopriyanti, T. D. "Pelatihan Pembuatan Buku Elektronik (E-Book) dengan Aplikasi Flipbook Bagi Guru Sekolah Menengah". Community Education Engagement Journal, vol 2, no. 2, 2021, pp. 11-20.

[9] Ayuningtyas, M. D., Suyatna, A., & Suyanto, E. "Development of LCDS-Based Interactive Electronic School Book on Blackbody Radiation as Self-Instructional Materials for Fostering

Student's Critical Thinking". Jurnal Ilmiah Pendidikan Fisika Al-Biruni, vol. 7, no. 2, 2018, pp. 183-193.
[10] Nasrulloh, I., Ibrahim, N., & Bhakti, D. "The Effectiveness of Using Electronic Book (Epub 3.0) with Blended Learning Approach on Science Classroom". In Proceedings of the 1st International Conference on Science and Technology for an Internet of Things. European Alliance for Innovation (EAI) (2018).
[11] Yulisetiani, S., dkk. (2022). Merancang Bahan Ajar Digital Berwawasan Budaya Nusantara Untuk Pembelajaran Bahasa Indonesia Sekolah Dasar. Yogyakarta : Jejak Pustaka.
[12] Nurlatifah, S. C., Hodijah, S. R. N., & Nestiadi, A. "pengembangan modul berbasis multimedia dengan menggunakan Flip PDF Professional pada tema udara yang sehat". PENDIPA Journal of Science Education, vol. 6, no.1, 2022, pp. 226-232.