JPPIPA (Jurnal Penelitian Pendidikan IPA)

Vol.8 No.2 2023

http://journal.unesa.ac.id/index.php/jppipa

STUDENT RESPONSE TO THE E-MODULE ACID BASE SOLUTION BASED ON CHEMICAL LITERACY

Fajar Naqsyahbandi[1], *Syamsidar*[2], *Munnal Hani'ah*[3]
[1,2,3]Department of Chemistry Education, FMIPA, Yogyakarta State University, Indonesia

Abstract

Paradigm changes in the world of education demand innovation in classroom learning, including in chemistry subjects. This study aims to see students' responses to the product development of acid-based solution e-module based on chemical literacy. The type of research used is descriptive quantitative research. The research sampling technique used random sampling with the number of research subjects as many as 36 people who were students of the 11th grade in one of public Senior High School in Gowa Regency, South Sulawesi. The data obtained were processed quantitatively with the results of the study showing that the students' response to the acid-base e-module based on chemical literacy was 98.6% of students gave a good response, so this module was good for use in learning chemistry on acid-base material. Suggestions for further research are expected to proceed to the e-module effectiveness test stage.

Keywords: E-Module, Chemistry Literation, Student Response

Article History: Received: October 24, 2023. Revised: November 25, 2023. Published: December 28, 2023

[1]**Correspondence Address:**
Department of Chemistry Education, FMIPA, Yogyakarta State University, Indonesia
E-mail: fajarnaqsyahbandi.2023@student.uny.ac.id

p-ISSN: 2527-7537
e-ISSN: 2549-2209

INTRODUCTION

The COVID-19 pandemic has had an impact on education systems around the world which has led to a total closure of close education in schools, universities and other colleges (Dietrich et al., 2020; Miltiadous et al., 2020; Simon et al., 2020). Causing changes in the learning system, namely from face-to-face learning to online learning. Therefore, teachers are required to be creative and innovate with changes that occur by striving for learning that is in accordance with student conditions. Based on the results of the interview, chemistry teachers at Public Senior High School 8 Gowa experienced problems in explaining the material in detail, especially those related to chemical calculations and reactions. In addition, incomplete laboratory facilities cause practicum only through youtube videos. In addition to teachers, students also experience obstacles in online learning, for example constrained by the internet network so that student activity in class decreases.

Unlike the case with online learning, student activity in offline learning is quite high. In addition, learning resources in the form of books, modules, and LKPD are also available at Public Senior High School 8 Gowa. However, it does not allow students to bring to their homes because of the limited number. So, in online learning students must actively look for learning resources from the internet. Reflecting on these conditions with all its limitations, it is necessary to develop teaching materials that can be used in online learning and are able to assist teachers in explaining the material in detail and increasing student activity in online learning, namely in the form of chemical literacy-based e-modules.

E-module is one of the interactive media that provides experience in the form of direct interaction and being active to users, such as paying attention to images, paying attention to writing that varies in color or moving, sound, animation and even videos and quizzes in one media (Suryati et al., 2022). The results of previous studies have shown that the use of e-modules in chemistry learning is effective in improving science literacy and student learning outcomes (Rusmansyah et al., 2022), and is able to improve students' higher-order thinking skills (Panggabean et al., 2022). Therefore, e-modules are appropriate to be used in the learning process and understanding of student chemistry.

Chemical literacy refers to a person's ability to understand and apply chemical knowledge in everyday life in terms of understanding three main aspects, namely knowledge of concepts, using chemical understanding in problem solving, and applying chemistry in everyday life appropriately and effectively (Ad'hiya &; Laksono, 2018; Thummathong & Thathong, 2016). Someone who has chemical literacy must understand the basic concepts of chemistry and be able to use their knowledge in everyday life (Ad'hiya &; Laksono, 2018). A good understanding of chemistry can be seen from students' ability to explain chemical concepts both textually and visually (Dori, et al., 2018).

Several e-modules on chemicals have been developed in previous studies, such as acid-base materials (Ashari el al., 2023), chemical equilibrium (Lubis et al., 2022), colloids (Rusmansyah et al., 2021), protein metabolism (Susanti et al., 2020), and salt hydrolysis (Mazidah et al., 2020). While the novelty of this research is the development of an acid-base solution e-module based on chemical literacy.

The e-module in this study consists of three parts, namely introduction, content, and closing. The introduction section contains the identity of the module, basic competencies, a brief description of the material, instructions for using the module, and learning materials. At the beginning, before the introduction, this e-module contains a glossary and concept map. Meanwhile, the content of this e-module explains the theory of acids and bases, ion equilibrium in acid and base solutions, acidity degrees, and acid-base indicators. All material is delivered in four learning activities. Each learning activity contains learning objectives, material description, summary, practice questions, and self-assessment. Meanwhile, in the closing section, this e-module contains an evaluation and bibliography.

METHOD

Research Design

The development of acid-base solution e-modules based on chemical literacy in this study is a type *of Research and development research* whose procedures are adapted from the 4-D development model of Thiagarajan (1974) which includes four stages, namely: *Define, Design, Develop*, and *Disseminate*. The writing of this article is one part of development research, namely the Develop stage to see how students respond to the developed product. This stage is the realization of the initial product design. This stage includes validation by the assessment team, namely *expert judgment.* One validation by *expert judgment* is done by students. The results of the validation carried out by students are then used as a reference for improvement so that *the e-module* is good for dissemination. By using a descriptive quantative research design, this study wants to describe variables descriptively as they are supported by data in the form of numbers generated from the

results of data collection in the field (Creswell, 2016).

Research Objectives

The research subjects for the product response test were students at the 11th grade in one of public Senior High School in Gowa totaling 36 people who were participating in learning acid-base material in accordance with KI-KD in the revised 2013 curriculum. Sampling is done by *random sampling* method. The time of the study was conducted in May 2021.

Data Collection Techniques

The data collection of this study used response questionnaires distributed online with the Zoho application. The questionnaire is in the form of a Likert scale with four answer choices, namely "Strongly Agree (SS)", "Agree (S)", "Disagree (TS)", "Strongly Disagree (STS)" (Azwar, 2019). Primary data is obtained from the results of student response questionnaires given after students see and study the products that have been developed to determine the feasibility of the appearance aspect, the presentation aspect of the material and the benefit aspect. The questionnaire items used were 16 items with details of 6 items for the display aspect, 6 items for the material presentation aspect, and 4 items for the benefit aspect. The data obtained were then analyzed with percentages to determine the magnitude of the response of students related to the use of chemical literacy-based acid-base solution e-modules. The following formula is used to calculate the percentage of student response (Midroro et al., 2021):

$$\text{Percentage} = \frac{\text{Total Score Obtained}}{\text{Maximum Score}} \times 100\% \qquad (1)$$

RESULTS AND DISCUSSION

The results of filling out the student response questionnaire were carried out on a limited basis using Zoho's online form, to 36 students of the 11th grade in one of public Senior High School in Gowa Regency, South Sulawesi. The test of student response to the use of acid base solution e-module based on chemical literacy on the aspects of appearance, presentation of material and benefits is presented in Table 1, Table 2 and Table 3 below.

Table 1. Results of student response questionnaire about display aspects

No	Statement	Answer			
		SS	S	TS	STS
1	The text or writing on this e-module is easy to read.	36.1%	63.9%	0.0%	0.0%
2	The image presented is clear or not blurry.	41.7%	58.3%	0.0%	0.0%
3	The images presented are appropriate (not too much and not too little)	19.4%	80.6%	0.0%	0.0%
4	There is a caption on each image presented in this e-module.	25.0%	75.0%	0.0%	0.0%
5	The images presented are interesting.	30.6%	66.7%	2.8%	0.0%
6	The presented picture corresponds to the material.	33.3%	66.7%	0.0%	0.0%

The results of the student response test to the display aspect of the chemical literacy-based acid-base solution e-module based on table 1 showed that as many as 15 students (41.7%) strongly agreed and 58.3% of students agreed to the clarity of the images presented on the e-module. The ease with which the text or writing on the e-module can be read was stated to strongly agree with 36.1% of students and 63.9% of students agreed. As for the suitability of the images presented to the material, the attractiveness of the images, and the presence of captions on each image in the e-module were stated to strongly agree with 12 students, 11 students and 9 students and but one (1) student expressed disapproval that the images presented in the acid-base e-module based on chemical literacy were interesting, the rest of the students expressed agreement. A total of 80.6% of 36 students agreed and 19.4% strongly agreed that the images presented in the e-module were appropriate, not too much or not too little.

Table 2. The results of the questionnaire of student responses about aspects of material presentation

No	Statement	Answer			
		SS	S	TS	STS
1	This e-module explains a concept using context related to everyday life.	25.0%	72.2%	2.8%	0.0%

2	This e-module uses easy-to-understand sample questions.	38.9%	58.3%	2.8%	0.0%
3	The presentation of the material in this e-module encourages me to discuss with other friends.	16.7%	83.3%	0.0%	0.0%
4	The material presented in the e-module is coherent.	22.2%	72.2%	5.6%	0.0%
5	I can follow the learning activities step by step easily.	19.4%	80.6%	0.0%	0.0%
6	The sample questions used in this e-module are in accordance with the material.	27.8%	72.2%	0.0%	0.0%

Based on table 2, the results for the test of student response to the presentation of material in the chemical literacy-based acid-base solution e-module showed that as many as 38.9% (14 students) strongly agreed with the use of easy-to-understand sample questions in the e-module, but there was one student who disagreed and the rest agreed. A total of 27.8% also strongly agreed that the sample questions used in the e-module were in accordance with the material and 72.2% agreed. The concepts on the e-module explained using contexts related to everyday life were recognized as strongly agreeing by 9 students (25%), agreeing by 26 students (72.2%) and disagreeing by 1 student (2.8%). The demands of the material presented in the e-module and the ability of students to be able to follow learning activities step by step were easily stated to be strongly agreed by each 22.2% of students and 19.4% of students, the rest expressed agreement except for 2 students who expressed disagreement with the demands of the material presented. The presentation of material in the e-module makes students encouraged to discuss with other friends, expressed strongly by 16.7% of students and agreed by 83.3% of students.

Table 3. Results of questionnaire of student responses about benefits

No	Statement	Answer			
		SS	S	TS	STS
1	I can understand acid-base material using this e-module easily.	16.7%	80.6%	2.8%	0.0%
2	I find it easier to learn by using this e-module.	22.2%	75.0%	2.8%	0.0%
3	I am very interested in using this e-module.	19.4%	77.8%	2.8%	0.0%
4	Having a chemical context at the beginning of each material can provide motivation to study acid-base material	22.2%	77.8%	0.0%	0.0%

The results of the test of student response to the benefits of chemical literacy-based acid-base solution e-module based on table 3 showed that students found it easier to learn when using the e-module which was stated to strongly agree by 22.2% of students and agree by 75.0% of students even though there was 1 student who expressed disapproval. A total of 8 students (22.2%) strongly agreed that they were motivated to learn acid-base material due to the chemical context at the beginning of each material and as many as 28 students (77.8) only agreed. Students who were very interested in using the chemical literacy-based acid base solution e-module were 19.4% (7 students) and those who were not interested as many as 1 person, the rest only stated that they were attracted (77.8%). Students who can understand acid-base material easily using the e-module were recognized as strongly agreeing by 16.7% of students, agreeing by 80.6% of students and another 2.8% disagreeing.

Based on the results of student responses to the use of chemical literacy-based acid-base solution e-modules that have been developed, it shows that 98.6% of students respond well to aspects of appearance, aspects of material presentation and aspects of benefits. In the benefit aspect, 97.9% of students responded well, which was directly proportional to the display aspect, as many as 99.5% of students responded well and in the presentation aspect, 98.1% of students responded well (Gola et al., 2022).

The results of the study found that students are interested in using e-modules and are motivated to learn e-module material influenced by the appearance of modules and the presentation of modules, students argue that the e-modules developed by researchers are very interesting because they are equipped with supporting images and presentation of material that is easy to understand, in line with the results of Sitepu's research (2005) which states that student motivation and learning outcomes can be influenced by aspects of graphics and usage proper presentation language. Nuraini and Supriadi (2018) also explained in the results of their research that there is relevance of interest in obtaining the highest response because the multimedia developed is able to attract students' learning interest. Therefore, teachers must also understand by providing subject matter in accordance with the

number and type in accordance with the interests of their students.

The students' response to the use of chemical literacy-based acid-base solution e-module shown based on the results of this study was very high. The e-module response indicates that it can motivate students to learn so that they get optimal learning outcomes (Diantari et al., 2018). The results of the research of Muhsam et al. (2021) also explained that student response is one of the factors that affect student learning motivation. This is inversely proportional to the previous online learning process, students have a low level of learning motivation as evidenced by the lack of student learning activity in the classroom. So that e-modules developed from research are well used in learning, especially online learning which is able to help teachers explain acid-base material well and can increase student motivation in online learning.

CONCLUSIONS AND SUGGESTIONS

Conclusions

The students' response to the acid-base e-module based on chemical literacy was 98.6% of students responded well, so this module is good for use in learning chemistry on acid-base material.

Suggestions

Limited time in research so that this development research is only able to see how students respond to the products developed. Suggestions for further research can be continued until the product effectiveness test or even to the product dissemination stage, so that more research benefits are generated.

REFERENCES

Ad'hiya, Eka., & Laksono, E. W. (2018). Development and validation of an integrated assessment instrument to assess students' analytical thinking skills in chemical literacy. *International Journal of Instruction,* 11(4), 241-256. https://doi.org/10.12973/iji.2018.11416a

Ashari, V. R., Fatirul, A. N., & Walujo, D. A. (2023). Pengembangan E-Modul Kimia Materi Asam Basa Berbasis Flip PDF Professional untuk Peserta Didik Kelas XI SMA Negeri 1 Menganti. *EDUKASIA: Jurnal Pendidikan dan Pembelajaran, 4*(2), 1391-1398.

Azwar, S. (2019). *Penyusunan Skala Psikologi* (Edisi 2). Pustaka Belajar.

Creswell, J. W. (2016). *Research Design: Pendekatan Metode Kualitatif, Kuantitatif, dan Campuran* (A. Fawaid & R. K. Pancasari (trans.); Edisi 4). Pustaka Belajar.

Diantari, L. P. E., Damayanthi, L. P. E., Sugihartini, N. S., & Wirawan, I. M. A. (2018). Pengembangan E-Modul Berbasis Mastery Learning Untuk Mata Pelajaran KKPI Kelas XI. *Jurnal Nasional Pendidikan Teknik Informatika (JANAPATI), 7*(1), 33.

Dietrich, N., Kentheswaran, K., Ahmadi, A., Teychene, J., Bessiere, Y., Alfenore, S., Laborie, S., Bastoul, D., Loubiere, K., Guigui, C., Sperandio, M., Barna, L., Paul, E., Cabassud, C., Line, A., & Hebrard, G. (2020). Attempts, successes, and failures of distance learning in the time of covid-19. *Journal of Chemical Education*, *97*(9), 2448–2457. https://doi.org/10.1021/acs.jchemed.0c00717

Dori, Y. J., Avargil, S., Kohen, Z., & Saar, L. (2018). Context-based learning and metacognitive prompts for enhancing scientific text comprehension. *International Journal of Science Education,* 40(10), 1198-1220. https://doi.org/10.1080/09500693.2018.1470351

Gola, N., Subiki, S., & Nuraini, L. (2022). Profil Respon Siswa Penggunaan E-Modul Fisika Berbasis Android (Andromo). *Jurnal Pembelajaran Fisika*, *11*(2), 53-58.

Lubis, A. P., Ellizar, E., & Zainul, R. (2023, September). Preliminary Study of Development of Chemical Equilibrium E-Module Integrated Virtual Laboratory for High School Students. In *Journal of Physics: Conference Series* (Vol. 2582, No. 1, p. 012063). IOP Publishing.

Mazidah, Erna, M., & Anwar, L. (2020, October). Developing an Interactive Chemistry E-Module for Salt Hydrolysis Material to Face the Covid-19 Pandemic. In *Journal of Physics: Conference Series* (Vol. 1655, No. 1, p. 012051). IOP Publishing.

Midroro, J. N. A., Prastowo, S. H. B., & Nuraini, L. (2021). Analisis respon siswa sma plus al-azhar jember terhadap modul fisika digital berbasis articulate storyline 3 pokok bahasan hukum newton tentang gravitasi. *Jurnal pembelajaran fisika*, *10*(1), 8-14.

Miltiadous, A., Callahan, D. L., & Schultz, M. (2020). Exploring engagement as a predictor of success in the transition to online learning in first year chemistry. *Journal of Chemical Education*, *97*(9), 2494–2501. https://doi.org/10.1021/acs.jchemed.0c00794

Muhsam, J., Widiastuti, I., & Cakranegara, P. A. (2021). Hubungan Antara Respon Siswa Dalam Pembelajaran Atas Motivasi Belajar Kelas IV Sekolah Dasar. *Aksara: Jurnal Ilmu Pendidikan Nonformal*, *7*(2), 263-272.

Nuraini, L., & Supriadi, B. (2018). Analisis Pemanfataan Multimedia Terhadap Penguasaan Konsep Reaksi Nuklir Mahasiswa Pada Mata Kuliah Fisika Inti. *Saintifika*, *20*(2), 22–31.

Panggabean, F. T. M., Silitonga, P. M., & Sinaga, M. (2022, November). Development of e-modules to improve students' high order thinking skills. In *AIP Conference Proceedings* (Vol. 2659, No. 1). AIP Publishing.

Rusmansyah, Anjaini, N., & Kusasi, M. (2021, November). Development of e-modules coloid materials based on PjBL-STEM to improve scientific literature and student learning outcomes of wetlands context. In *Journal of Physics: Conference Series* (Vol. 2104, No. 1, p. 012026). IOP Publishing.

Simon, L. E., Genova, L. E., Kloepper, M. L. O., & Kloepper, K. D. (2020). Learning postdisruption: Lessons from students in a fully online nonmajors laboratory course. *Journal of Chemical Education*, *97*(9), 2430–2438. https://doi.org/10.1021/acs.jchemed.0c00778

Sitepu. (2005). Memilih buku pelajaran. *Jurnal Pendidikan Penabur*. 4(4), 113-126.

Susanti, T., Kurniadewi, F., & Nurjayadi, M. (2021, April). Development of protein metabolism electronic module by flip PDF professional application. In *Journal of Physics: Conference Series* (Vol. 1869, No. 1, p. 012025). IOP Publishing.

Thummathong, R., & Thathong, K. (2016). Construction of a chemical literacy test for engineering students. *Turkish Science Education.*13(3), 185-198. http://tused.org/index.php/tused/article/view/649

Thiagarajan, S. (1974). Instructional development for training teachers of exceptional children: A sourcebook.