INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 12, Issue 4, (2023) E-ISSN: 2226-6348

Research And Development Of Self-Regulated Learning (SRL)-Based E-Module On Student Independence In History Learning

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To Link this Article: http://dx.doi.org/10.6007/IJARPED/v12-i4/19811 DOI:10.6007/IJARPED/v12-i4/19811

Published Online: 29 November 2023

Abstract

Educational systems in the 21st century is required to deal with student needs through technology in the classroom. Teachers must adapt their teaching methods, including when teaching history, to improve student's independence learning. However, earlier studies found that the use of learning tools to aid history learning still faces some issues. According to the performance analysis of educators, worksheets and textbooks are still used as learning tools along with printed teaching materials. This developmental research aimed to ascertain whether student independence had increased both before and after utilizing the SRL-based e-module in history learning. According to earlier studies, the model significantly increased students' independence across all educational levels. Research and Development (R&D) is the term used to describe this kind of study. It employed the 4D paradigm which has four stages: define, design, develop, and disseminate. The subjects of this study were 102 11th-grade students in Jember. After the data were collected and analyzed, it was found that there was an increase in effectiveness of 97% in the small groups with the Large Effect criteria and 91%

in large groups with the Large Effect criteria. Thus, the SRL e-module is recommended as a history learning resource that promotes learning independence.
Keywords: 4D models; History Learning; Independent Learning; SRL E-Module

Introduction

The educational system has undergone significant modifications throughout the Fourth Industrial Revolution. Puriwat and Tripopsakul (2020) state that the fundamental goal of the system in this era is to balance the needs of students in using technology. The educational system of the 21st-century must reflect the requirements and character of Generation Z, capable of mastering science and technology (Basuki, 2020). Generation Z students refer to students in 21st century learning. Technology has transformed Generation Z, and when used in their educational process, digital resources are preferred (Hussin, 2018). Furthermore, technology alters how teachers deliver classes in this era (Setyaningsih et al., 2020). It is hoped that education will help students develop their critical thinking, creative thinking, communication, and collaboration (4C) (Umamah et al., 2020). Thus, it is necessary to use integrated technology in the learning environment for Generation Z to increase their academic competence.

Success in lifelong learning depends on competence (European Parliament & Council of the European Union, 2006). Awareness of learning demands and an evaluation of learning outcomes that refer to self-direction in the learning process are the first two abilities needed to manage the learning process (Sumuer, 2018). Such competence and independence go hand in hand. According to Steinberg (2017), independence refers to a student's capacity to regulate their behavior when making decisions independently. Student independence and activeness support the learning process, including when history learning.

In three schools in Jember, MAN 1, MAN 2, and MAN 3, educator performance analysis and learner analysis results were used to identify issues with history learning and the lack of technology-integrated teaching resources. Because teachers still use worksheets and textbooks as learning resources, research on educator performance analysis suggests that the utilization of teaching materials (e-modules) is only 33.3%. The students were also found not utilizing these educational resources, which causes various issues in history learning. Moreover, according to student performance assessments, 77.45% of history classes are monotonous and not very fun. This is in line with earlier research (Ma'unah et al., 2018; Rosita et al., 2018) which found that the use of printed instructional materials makes the learning process less engaging, less interactive, and unable to convey historical messages through three-dimensional visuals, videos, and animations. To make learning more relevant for students, educators must come up with innovations to aid students' needs (Umamah et al. 2020), particularly in the study of history.

In response to the issues, it is essential to create electronic teaching resources (e-module) for history learning. The term "e-module" refers to a presentation of independent teaching materials systematically organized into learning units, then presented in an electronic format where learning activities are linked as navigation to make students more active (Kemendikbud, 2017). This teaching material contains video tutorials, animations, and audio to facilitate students' learning experiences. The use of e-modules in history learning itself significantly improves learning outcomes (Azizha, 2020) and is employed in history learning successfully (Ma'rifatullah, et al., 2021). Past studies have shown that using an e-module to teach history might positively influence students' independence and help students become more competent (Hapsari et al. 2016, Sopacua et al. 2020). Additionally, learner analysis

revealed that the material created in the e-module is intended for history as a specialization subject, specifically the material "Indonesian Revolution". Students' mastery of this material is relatively low, as shown by their comprehension with which students could only provide brief answers. This is in line with the findings of historical educators' interviews, which revealed that the Indonesian Revolution material includes a wide range of topics and requires a deeper level of study.

An SRL-based e-module is created using the SRL model's syntax adapted from Philips (2006, pp. 13–14), and includes the following steps: (1) Analyze; (2) Plan; (3) Implement; (4) Comprehend; (5) Problem-Solving; (6) Evaluate; and (7) Modify. According to Zimmerman and Schunk (1989), the SRL model considers students' thoughts, feelings, strategies, actions, and behavior to achieve learning objectives. This model has been successfully applied as a learning solution and it has been shown that the SRL approach helps students become more independent. Previous studies have shown that the SRL model can be effectively applied to learning at the college and middle school levels, increasing student independence (Ana & Achdiani, 2015), which has a positive relationship with SRL (Sari, 2018). The use of SRL to promote learning independence at the elementary school level has also been found successful (Sukowati et al., 2020). In addition, past research has shown that SRL significantly increases learning independence across all educational levels.

Based on the background above, this research aimed to create an SRL-based e-module validated by experts and users to promote 11th-grade students' independence in history classes using the 4D model.

Methodology

Research Design

This research employed the research and development (R&D). Meanwhile, the 4D development model adaption of Thiagarajan et al. (1974) was used to construct the SRL-based E-Module development, which consisted of the following steps: (1) Define; (2) Design; (3) Develop; and (4) Disseminate.

Sample and Data Collection

Three researchers and 102 students from class XI IPS from MAN 1 Jember, MAN 2 Jember, and MAN 3 Jember during the odd semester of the 2022–2023 academic year served as the research subjects, questionnaires, observation were utilized as data collection methods.

Analyzing of Data

The data analysis included both qualitative and quantitative data analysis methods. The qualitative data was analyzed through observation, comments, suggestions from experts, as well as documentation. Meanwhile, the quantitative data were used to assess the quality of the SRL-based e-module created according to user trials, expert validation suggestions, and expert comments. The results of the user trials and expert validation questionnaire were calculated using the following formula:

$$P = \frac{\sum x}{\sum xi} \times 100\%$$

Description:

P: Percentage

∑x: The total number of respondents' answers

∑xi: The total number of ideal values in 1 item

100%: Constanta (Cohen et al, 2018).

The percentage results from the questionnaire calculation were analyzed with the product eligibility criteria as shown in Table 1.

Table 1. Product Eligibility Criteria

Rating	Description	Interpretation
1,0 ≤ SV > 1,5	Very Poor	Not usable
1,6 ≤ SV > 2,5	Poor	Can be used with major revisions
2,6 ≤ SV > 3,5	Well	Can be used with minor revision
3,6 ≤ SV > 4	Very good	Can be used without revisions

Source: Gronlund (1977)

The next step was to perform a normality test required to test other variables under the presumption that the residuals followed a normal distribution. A paired sample T-test of this sort was used to analyze the product effectiveness once the normality test was completed and the data were declared normal. The results of the paired sample T-test were used to determine whether there was a difference between the pre-questionnaire and post-questionnaire averages of students when testing small and large groups by implementing the SRL-based e-module as a reference for measuring the increase in independence after and before using e-module. The indicators of independence in this study were adapted from Steinberg (2017, pp. 238-249), namely: emotional autonomy, behavioral autonomy, and cognitive autonomy. The formula for determining effectiveness was as follows:

$$Eta\ squared = \frac{t^2}{t^2 + (N-1)}$$

Description:
t: t-value
N: Number of individuals (Cohen, Manion, & Morrison, 2018).
Furthermore, the results of the relative effectiveness analysis were interpreted based on the following criteria:

Table 2.
Relative Effectiveness Test Criteria

Score	Criteria
0,80	Large Effect
0,50	Moderate Effect
0,20	Small Effect

Source: (Cohen, Manion, & Morrison. 2018).

According to Steinberg (2014), independence is part of achieving self-autonomy in adolescents which involves three aspects:

a. Emotional independence (emotional autonomy) refers to independence related to changes in individual relationships, especially with parents. Individuals can let go of their dependence on their parents and fulfill their emotional needs without any involvement from their parents.
b. Behavioural independence (behavioural autonomy) refers to the capacity to decide for oneself and implement that decision. People with such independence can carry out daily life according to their own unique behaviours.
c. Independent values, namely having a set of principles that define what is right and wrong, as well as what is important and unimportant. Individuals can do things according to their stance and according to their assessment of that behaviour.

Findings/Results

The development model used was the 4D development model and Table 3 below explains how the steps were carried out:

Table 3.
4D Development Steps

Development Steps	Development Activities
Define	At this stage, teaching materials to facilitate learning were analyzed. The researcher analyzed problems faced at school. The first steps taken were conducting observations, distributing educator and student performance questionnaires, and front-end analysis instruments at the front-end analysis stage. This aimed to determine the main problems in history learning activities. It was discovered that there was a lack of technology-integrated teaching resources in history learning. Identification of student characteristics, including attitude, language, and tool skills, was done during the learner analysis step. The subject at this stage was history as a specialization subject material for 11th grade about the Indonesian Revolution, which was arranged systematically through Concept Analysis, Task analysis, and Specifying Instructional Objectives.
Design	At this stage, the prototype design of the SRL-based e-module was completed. At the Criterion Test Construction stage, questions were prepared in the form of a pre-test to determine the level of initial ability and independence of each student before being taught with the SRL-based e-module. During the media selection stage, the fliphtml5 flipbook application was chosen as the media, while at the Format Selection stage, the module preparation was adjusted to the SRL syntax. The last stage was the Initial Design by designing the entire e-module, which was done before it reached the validation stage.
Develop	This stage resulted in draft 1, the SRL-based learning e-module draft, as the finished product. The objective of the Expert Appraisal step was to obtain feedback and suggestions from the validators who assessed e-module products according to the SRL. Experts in the field of study who are knowledgeable about the subject matter, linguists, and designers all participated in the validation process. The development testing step was the next; it was used to gather feedback and suggestions from instructors, pupils, and observers acting as module users. User trials, small group trials, and field testing were all types of development trials.
Disseminate	At this validation stage, the finished product was distributed and installed as the SRL-based e-module used in history learning activities for 11th-grade students. The final steps in this stage were Packaging, Diffusion, and Adaptation, which created the final SRL-based e-module product designed to be beneficial for its users, after which was only distributed to MAN 2 Jember. The modules were distributed as CDs and utilized in history as a specialization subject classroom.

Source: S. Thiagarajan et.al. (1974)

Expert Validation of SRL-based E-module

This SRL-based historical learning e-module has undergone several stages of validation by linguists, media or design professionals, and content experts in the field of study. The table below explains the outcomes of each validation:

Table 4.
Results of Expert Validation on SRL

	N	N	$\sum_X$	$\sum_X 1$	Min	Max	Mean	Std. Dev
Ahli Bidang Studi	1	16	80	69	3	5	4.3	0.79
Ahli Media	1	10	50	40	4	5	4.7	0.48
Ahli Bahasa	1	10	50	47	3	5	4	0.81
Rata-rata Validasi Ahli							**4.3**	**0.69**

The results of expert validation of self-regulated learning e-module products after consulting the criteria table show that they are suitable for use in the learning process, in the "very good" category can be used without revisions.

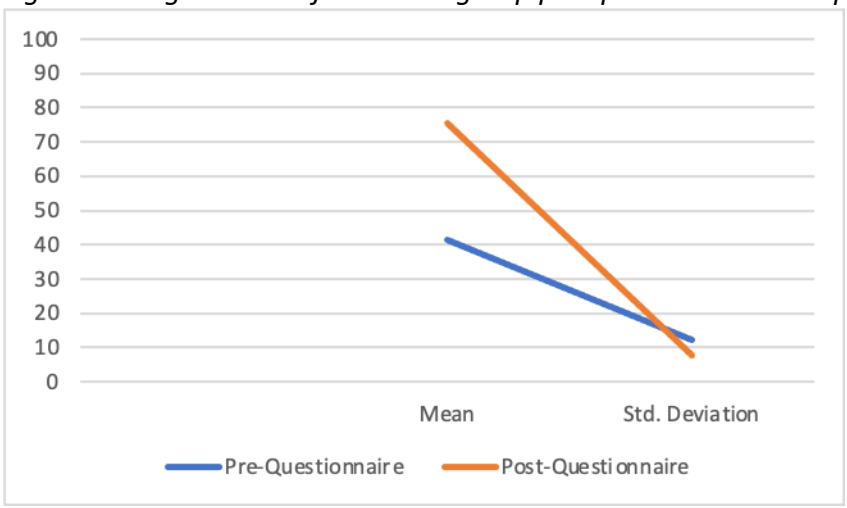
User Trial of the SRL-Based E-Module

Following the validation of three experts, user trials of development products were conducted on e-module users. History teachers who taught the 11th-grade students of the Social Science major at MAN 2 Jember participated in the trials. The trials found that a rate of 100% was obtained based on the assessment by history educators using the SRL-based e-module. The assessment results of the e-module were then adjusted to the product feasibility table, resulting in an e-module that met the "very good" qualification and did not require correction.

Small Group Trial of the SRL-Based E-Module

Nine students from class XI IPS 1 participated in the small-group study conducted at MAN 2 Jember. The teaching-learning process was carried out by developers and students using the SRL-based e-module as a learning resource. The pre- and post-questionnaire results were then summarized to obtain the research findings, which are shown in the diagram below.

Fig.2 - Average results of the small group pre-questionnaire and post-questionnaire



1) Small-Group Trial Data Analysis

The data above show an increase in the effectiveness of history learning after the implementation of the SRL-based e-module. The following tables show the paired statistical data, paired sample t-test, and normality test results based on pretest and post-test scores for the small group.

Table 4 –
Results of Paired Statistical Data

Score	Mean	Std. Deviation
Pre-Questionnaire	41,56	12,105
Post-Questionnaire	75,33	7,842

Based on Table 4, it was found that the average value of the pre-questionnaire was 41.56 with a Std. Deviation of 12.105, and that of the post-questionnaire was 75.33 with a Std. Deviation of 7.842. In conclusion, the independence of students increased after using the SRL-based e-module.

Table 5 –
Paired Sample t-Test Results

t-Value	D*f*	Sig. Value
17,266	8	0,001

Based on Table 5, the t-test value obtained was 17.266 (df=8) with a significance value of 0.001 which was smaller than the confidence threshold value of 5% (0.00 <0.05). Thus, there was a significant difference between the pre-test and post-test scores of the small group.

Table 6 –
Normality Test Results

Shapiro-Wilk			
	Statistic	D*f*	**Sig. Value**
Pre-questionnaire	0,916	9	0,363
Post-Questionnaire	0,877	9	0,146

Based on the normality test, the pre-questionnaire data had a Sig of 0.363, meaning that it was greater than 0.05 and could be declared as "Normal". The post-test data obtained a Sig of 0.146, which was greater than 0.05, so the post-test data were also "Normal". Overall, both pre-test and post-test data from the Normality Test had a "Normal" distribution.

2) Effectiveness Test on the Small Group

The average value analyzed from the test above was used to measure the increase in independence in history learning using the following formula:

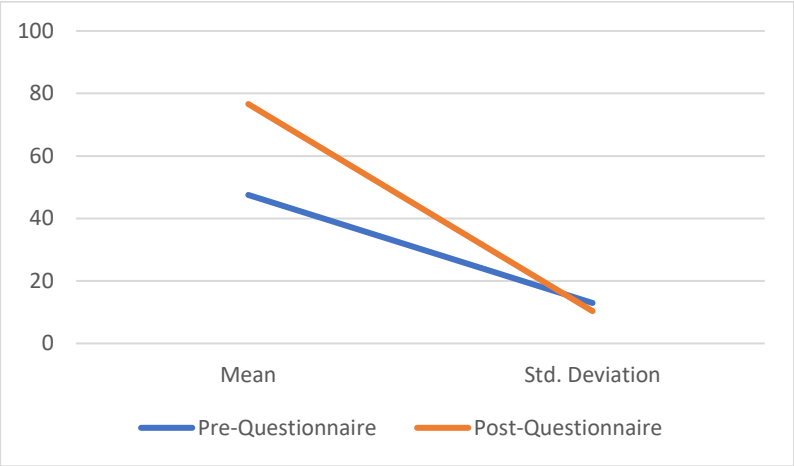
$$Eta\ squared = \frac{295{,}8}{295{,}8\ \ +\ (9-1)} = 0.97$$

The results of the relative effectiveness value of using the SRL-based e-module obtained a value of 0.97 or 97% in the "Large Effect" criteria with high effectiveness.

Effectiveness of the SRL-Based E-module on Student Independence Enhancement Trial in the Large Group

The research conducted on the large group involved 33 students of class XI IPS 1 at MAN 2 Jember. In its implementation, developers and students carried out the teaching and learning activities using the SRL-based e-module as resources. The results were obtained by calculating the pre-questionnaire and post-questionnaire results presented in the following diagram:

Fig. 3 - Average of pre-questionnaire and post-questionnaire data for the small group



1) Large Group Trial Data Analysis

The diagram above shows an increase in the effectiveness of history learning after the implementation of the SRL-based e-module. The following tables show the paired statistical data, paired sample t-test, and normality test results based on the pretest and posttest scores for the large group.

Table 7 –
Results of Paired Statistical Data

Score	Mean	Std. Deviation
Pre-Questionnaire	47,52	12,940
Post-Questionnaire	76,61	10,335

The average value of the pre-questionnaire was 47.52 with a Std. Deviation of 12.940 and 76.61 in the post-questionnaire with a Std. Deviation of 10.335. Thus, students' learning independence increased after using the SRL-based e-module.

Table 8 –
Paired Sample t-Test Results

t-Score	*Df*	Sig. Value
18,608	32	0,000

The t-test value was 18.608 with a *Df* of 32 and a Sig. Value of 0.00. The Sig. Value was smaller than the 5% of the confidence threshold value (0.00 <0.05). Thus, there was a significant difference between the pre-test and post-test scores for the large group.

Table 9 –
Normality Test Results

Shapiro-Wilk			
	Statistic	**D*f***	**Sig. Value**
Pre-Questionnaire	0,938	33	0,058
Post-Questionnaire	0,977	33	0,699

Based on the normality test results for the large group, the pre-question data obtained a Sig. Value of 0.058, while the post-test data obtained a Sig. Value of 0.699. Both were greater than 0.05, so they were determined to have a "Normal" distribution.

2) Effectiveness Test on the Large Group

Following the analysis of the average value obtained from the small group test, the increase in students' learning independence in history classroom was calculated using the following formula:

$$Eta\ squared = \frac{345{,}9}{345{,}9 + (33 - 1)} = 0.91$$

The results of the relative effectiveness value of using the SRL-based e-module obtained a value of 0.91 or 91% and fell into the "Large effect" criteria with high effectiveness.

Discussion

In this study, researchers carried out history-learning activities using the SRL-based e-module. The e-module was developed according to the learner analysis results on learning materials and the results of interviews with educators and Core Competence 3.4 for the history as a specialization subject for 11th-grade students in Social Studies major regarding the Indonesian Revolution. Before the e-module was used in learning, it must first meet several criteria to be determined suitable for use in learning. Based on the validation of experts in the field of study, linguists, as well as media and design specialists, the e-module can be used to effectively teach history as a specialization subject.

Technology in the classroom allows students to learn independently and take autonomy in their learning (Rufaidah et al., 2021). Technology adoption and adaptation are required in education for the development of an independent character (Jahari, 2020). Electronic media modules (or "e-modules") are used to incorporate technology into history learning and they can be utilized to teach history.

Through appropriate learning media, educators can make history learning more authentic (Sopacua, et.al, 2020), build motivation, help students understand learning materials optimally (Umamah, 2021), and aid students in achieving learning objectives (Umamah, 2020). The developed e-module was adapted to the SRL model's syntax below in Table 10 which also explains each of the SRL steps conducted in history learning using the E-Module.

Table 10.
SRL-Based E-Module Syntax

Syntax	Description
Analyze	This stage is carried out by analyzing the subject and conveying the learning objectives to educators. Students carry out the subject organization and related concepts in the previous lessons. This process involves students' initial knowledge regarding the material. When introducing the material, educators draw students' attention and motivate them to promote independent learning.
Plan	At this stage, students prepare and design learning activities. Learners set a hypothesis on the material/problems encountered. Students then design learning activities based on the learning objectives and their needs and evaluate learning activities. This activity directs students to independent learning.
Implement	At this stage, students choose and implement their plans during learning. At this stage, students carry out learning activities in groups. The learning process then refers to the teaching materials provided, namely SRL-based e-module
Comprehend	At this stage, students make observations on their understanding of the concepts of the material being studied. Students follow the rules to increase their achievement of competencies.
Problem-Solving	At this stage, students solve problems regarding concepts that they have not understood. When solving problems, students carry out discussions with other students in one group, inter-group discussions, and class discussions, according to the teacher's instructions. The role of educators at this stage is to help discuss unresolved problems.
Evaluate	At this stage, students self-evaluate their learning activities and the suitability of learning objectives with the achieved performance and results. Then, students fix the mistakes found during learning.
Modify	At this stage, students elaborate on the evaluation results by drawing conclusions about the learning materials, while the teacher acts as a facilitator.

Source: (Philips, 2006. p. 13-14).

The success of the SRL-based e-module in increasing students' independence in small-group and large-group trials is visible in the high effectiveness of the "Large effect" criteria. Independence positively affects students' learning process, environment, and life, as it improves (1) learning achievement (Hadi & Farida, 2012); (2) academic competence (Cline, 2017); and (3) students' ability to adapt to the environment, helping them to overcome difficulties, be responsible, emotionally stable, and resilient in facing challenges (Santosa & Marheni, 2013). Independence is closely related to students' attitude toward completing learning tasks without depending on other people and their ability to solve problems related to learning and organizing activities known as self-regulation (Yasdar & Muliyadi, 2018). It is one of the characteristics that students must have, therefore an appropriate learning model to promote it, such as SRL is needed.

The SRL model significantly directs students toward independence as an important component in self-regulated learning. With such quality, students can estimate their own needs, identify resources, analyze material, determine appropriate learning strategies, and evaluate the achieved competencies (Leijen & Saks, 2014). Two special characteristics can be used as a reference for understanding students using the SRL (Surawan et al, 2018), they are:

1) students have full awareness of their inner potential which is then used properly in the regulation process; 2) students have definite goals in their learning.

The SRL model is directly linked to learning independence, such as setting schedules according to needs, setting goals, and autonomously finding required information (Dinata et al., 2016: 140). Students can ask their friends, professors, and parents for assistance if they cannot find what they are looking for when researching for information (Zimmerman, 2008). In line with the research by Olakanmi & Gumbo (2017), independent learners are active learners who can control their learning in a different context.

Students who use SRL are more active in finding learning opportunities as well as reactive to the learning results attained (Zimmerman, 1989). Self-observation, self-evaluation, and self-improvement are always the first things they undertake (Zimmerman, 1990). They assess their responses to the learning process and how they view their academic progress. They are also self-reliant and completely in charge of their learning processes. They identify potential learning challenges, and after doing so, they thoughtfully consider the best course of action. This is done by applying alternative paths and strategies to correct their mistakes, so they will know their strengths and weaknesses in learning and use them productively and constructively (Latipah, 2010). The more effectively students manage their learning activities, the higher the SRL level they have.

Both within and outside of the classroom, students' daily activities can benefit from SRL (Cetin, 2017). This type of learning is a part of the social cognitive theory (Gafoor & Kurukkan, 2016). Metacognition, which is connected to knowledge, cognitive control, and awareness, is a specialization of the SRL model. In terms of metacognition, the regulation process pertains to how students self-direct, plan, organize, monitor, and self-evaluate. As a result of their sense of experience, students then believe that they can do tasks independently, and behaviorally, they organize their learning environment to maximize learning (Zimmerman, 1989). In SRL, aspects that have a major influence are students' academic motivation, academic environment, and situations (Atmoko & Kuswando, 2021). In addition, the SRL approach is a socio-cognitive approach that consists of forethought, performance, and self-reflection. These three phases greatly assist students in planning, organizing, and independently evaluating their learning activities and results (Putra, 2019).

The results of research related to the increasing independence through the SRL model are relevant to previous studies. Research from Ana & Achdiani (2015) states that the application of the SRL model is proven to be able to increase student learning independence and obtain an increase in the High criteria (0.7) in the aspect of independence, this proves that the SRL model is proven effective in increasing independence. The findings of this research on the increasing independence through the SRL model apply to earlier investigations. According to Ana & Achdiani (2015), the model's application highly increases learning independence with a value of 0.7, proving its effectiveness. In addition, Sukowati, et.al (2020) state that students with the SRL model can motivate themselves to set their learning objectives and develop a sense of responsibility for learning.

Conclusion

According to the expert validation results, the SRL-based e-module obtained very good feasibility results with the following descriptions: (1) the validation from experts in the field of study obtained a percentage value of 86.25% with a "very good" qualification; (2) the validation of media specialists obtained a percentage value of 80% with a "good" qualification; and (3) the validation of language experts obtained a percentage value of 94%

with a "very good" qualification. Based on the assessments, the SRL-based e-module with a 4D development model for history as a specialization subject for 11th-grade students has been carefully validated and acquired good percentage values. Furthermore, the results of the small group trials involving 9 students found that students' independence increased and obtained a percentage value of 97% with "Very High" effectiveness. As for the large group test involving 34 students, "Very High" effectiveness with a percentage value of 91% was achieved. Based on the results, the SRL-based e-module that has undergone assessments can boost 11th-grade students' independence in history learning.

Contribution to the Literature

The research results, theoretically contribute positively to the development of knowledge in the field of pedagogy. The syntax of the SRL model, product of this research and development, can facilitate student's learning autonomy. Through this model, students can decide their own learning environment and carry out self-management activities to achieve good learning outcome. In the context of an information technology-based learning environment, students can study independently anywhere and at any time. Therefore, practically SRL ability is important for student's lifelong learning.

Recommendations

Based on research results and the development of SRL-based e-module products, we suggest that (1) SRL-based e-module for the Indonesian Revolution material in history as a specialization subject for 11th-grade students is used as one of the effective and innovative learning resources integrated with technology, following the demands of the 21st-century learning; (2) SRL-based e-module is used both inside and outside the classroom without assistance with other learning media since it was designed according to Gen-Z students' needs who tend to use technology in their learning; (3) educators create an active and innovative learning environment assisted by SRL-based e-module to increase learning independence. With SRL, students are expected to be able to improve their competencies to achieve the learning objectives.

Acknowledgements

We would like to express our deepest appreciation to LP2M for their invaluable support and contribution in the completion of this research. We also would like to thank the participating teachers and students for their contributions to this study.

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