Practicality of 21st Century Skill-Based Interactive E-Modules in Science Learning Courses for Early Childhood

Peny Husna Handayani[1], Gita Noveri Eza[2], Winda Widya Sari[3]

{peny@unimed.ac.id[1], gitanoverieza@unimed.ac.id[2], widyasari.winda21@gmail.com[3]}

Early Childhood Education Teacher Program, Faculty of Education, Universitas Negeri Medan
Medan, North Sumatera, Indonesia[1,2,3]

Abstract. This research aims to measure the practicality of interactive e-Modules based on 21st century skills in Science Learning Courses for Early Childhood which have been developed by researchers through development research using the ADDIE model. The practicality of interactive e-modules was carried out through limited testing on 40 respondents who were PG PAUD students taking Science Learning courses for Early Childhood. A practicality questionnaire is the tool utilized to evaluate the benefits and convinience of use of this interactive e-module based on 21st century abilities. The practicality test's outcmes demonstrate this 21st century skills-based interactive e-Module is very practical with a percentage of 94.1%. according to the respondents, this dynamic e-module was uncomplicated to use, fostered critical thinking skills, encouraged creativity, and gave them chances to interact and work together on early childhood science learning issues with their group members.

Keywords: Practicality, Skill-Based Interactive, Modules.

1 Introduction

21st century society is a society that lives in a global world with various advances and problems, both social and environmental problems. Science and technology are developing so rapidly that this century is also called the knowledge age and industrial age [1], [2]. Digital transformation has permeated every facet of life and profession. Multicultural, multimedia, multitasking colors life in the moderen era. Life in the twenty-first ceentury certainly has an impact on learning in this era where learning today should not only provide knowledge, but also skills and empower students' potential in order to create superior human beings who are able to compete according to demands era [3]–[5].

The 21st century learning orientation leads to a learning process with a focus on the student center to train thinking skills including critical thinking, problem solving, metacognition, creativity and innovation, information literacy, collaboration, communication and

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technological literacy. The national education asssociation refers to the 4Cs-critical thinking, creativity, communication, and collaboration-as 21st century competencies [6]. The 4C skills (Critical thinking, Creativity, Communication Skill, and Collaboratively) are very important for pupils, students, teachers and educational staff to have in facing competition in the industrial transformation of the present A 4.0[7], [8]. These skills will increase work ability, marketability, and readiness to become good citizens [6].

All levels of education, including higher education, are responsible for preparing graduates with in the twenty-first ceentury competencies, that is critical thinking abilities, creative abilities, partnership and communication [4], [9]. Several programs in universities with the Independent Learning Campus policy, such as Teaching Campuses, student exchanges, have shown effectiveness in developing students' 21st century skills [4]. 21st century skills can also be developed through learning models with a scientific approach, such as project-based, problem-based and design based learning [6]. It is important for teachers and lecturers to find the right models, strategies, approaches and methods to be able to develop 21st century knowledge and skills [10]. Apart from that, developing 21st century skills also requires support from appropriate and adequate media and learning resources according to students' needs and current developments.

Previous researchers have conducted research analyzing students' 21st century skills, there were findings that there was still a lack of critical reasoning abilities and creativity since there aren’t enough suitabke learning materials and resources in developing students' 21st century skills. Current media and teaching materials are no longer relevant to the current development of the learning environment and technology. As a result, it is essential to foster inovative and critical thinking abilities during the stages of learning. One way to train critical thinking skills and creativity is through appropriate, interesting and flexible learning media [11].

E-modules or electronic modules are digital media that are self-instructional which contain learning material so that students can understand and solve problems related to lecture activities [12]. E-modules are designed systematically, attractively, and utilize technology [13]. the modules have an advantege over printed ones in that theu are interactive capable of displaying visuals, music, video and animation and provide formatice assessent with instantaneous feedback[14].

Science learning for early childhood is one of the study program's mandatory courses which contains material on scientific concepts and practices that are appropriate to the characteristics of early childhood. So far, learning in these courses has used printed books as supporting learning resources which are not interactive, not related to technology and do not train 21st century skills. Researchers have developed interactive digital modules oriented on 21st century skills in science learning training for early childhood and carried out practicalyti test. The usefullness of a product is measureable from the ease and presentation of a product by users [15]. This practicality test was carried out to ensure ease of use and usefulness of the dynamic electronic module during construction.

2 Method

This research is R&D using the ADDIE formulation research approach, which consists of five steps in developing interactive e-modules based on 21st century skills in the Science Learning for Early Childhood course. The choices performed are (1) analysis, (2) design, (3) development, (4) implementation, (5) evaluation. At the phase of development, a practicality test was conducted to determine how well users could use this dynamic digital module.

This practicality test involved 45 respondents who were PG PAUD FIP UNIMED students who had taken science learning courses for early childhood. Data collection was carried out using a questionnaire consisting of 16 positive statements filled in on a 1-4 Likert scale, ranging from strongly disagree (1) to strongly agree (4). This practicality questionnaire includes aspects for simplicity of use and advantages achieved. To calculate the practical value, use a modified formula from [16] as follows:

$$\mathrm{p} = \frac{score\ obtained}{\text{total score}}\ x\ 100\%$$

The practicality criteria used consist of four interval classes modified from [17] as follows:

Table 1. Categories of Practicality Percentage Results

Percentage (%)	Category
81.26% - 100%	Highly Practical
62.51% - 81.25%	Practical
43.76% - 62.50%	Quite Practical
25.00% - 43.75%	Not Practical

3 Result and Discussion

This research began by developing an dynamic digital-module based on 21st century skills in science learning courses for early childhood. The construct of this electronic module was finished through the stages of analysis, design, then development. The following interactive e-module was developed.

Fig. 1. Developed Interactive Electronic Module

The dynamic electornic module that was developed contains material in text, material in video, examples of science activities for early childhood, challenges that hone critical thinking skills and student creativity, as well as discussion forums that are directly connected to the LMS so that students can discuss and hone collaboration. as well as their communication. Practical tests are carried out to determine ease of use and benefits obtained by users. Media and teaching materials need to pay attention to their practicality so that they competencet to used to achieve the expected learning goals. Apart from that, this practicality needs to be considered in order to facilitate the delivery of learning materials [17], [18].

Forty-five PG PAUD candidtes of teacher took praticality test who had taken the Science Learning for Early Childhood course. The following is documentation of limited trial activities for students in using this 21st Century Skills-Based Interactive E-Module.

Fig. 2. Practicality Test on students

Students as users of this interactive electronic-module gave favorable reactions when the trial was carried out. Researchers provided a questionnaire on the practicality of using this interactive e-module, following the recapitulation of the practicality test of the interactive digital modul based on 21st century skills according to users:

Tabel 2. Recapitulation of 21st Century Skills-Based Interactive E-Module Practicality Tests

The Practicality Aspect	Indicator	Percentage	Category	Average	Category
Ease of Use	Ease of accessing interactive e-modules	95.31%	Highly Practical	94.7 %	Highly Practical
	Ease of accessing videos in interactive e-modules	96%	Highly Practical		
	Ease of accessing material via links in interactive e-modules	93.75%	Highly Practical		
	The language in interactive e-modules is easy to understand	92.97%	Highly Practical		
	The explanation of the material in the interactive digital module is easy to understand	95.31%	Highly Practical		
Benefit Obtained	Helps understand science learning concepts for early childhood	96 %	Highly Practical	93.5 %	Highly Practical
	The challenges/exercises in this e-module help to think critically	92%	Highly Practical		

The Practicality Aspect	Indicator	Percentage	Category	Average	Category
	The challenges/exercises in this e-module help to develop creativity	92%	Highly Practical		
	This e-Module provides an opportunity to discuss with group friends	94.5%	Highly Practical		
	This e-module provides the opportunity to work together in groups	92%	Highly Practical		
	E-Modules make learning more efficient	95%	Highly Practical		
Average Practicality of 21st Century Skills Based Interactive E-Modules				**94.1 %**	Highly Practical

Considering the above table, it can be seen that overall, the dinamic electronic module developed is very practical with an average practicality test result of 94.1%. Of the two aspects of practicality tested, the ease of use aspect showed a higher average than the benefits aspect. The ease of use aspect has an average of 94.7%, while the benefits aspect shows an average of 93.5%. The following is a graph of the average for each aspect in this practicality test.

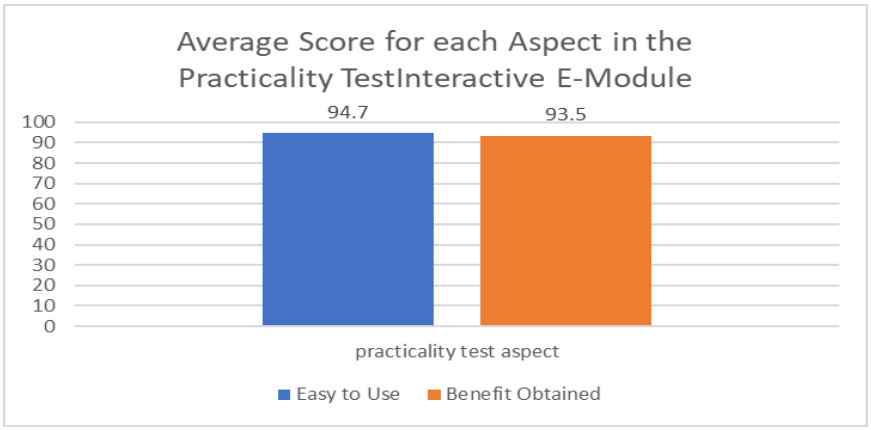

Fig. 3. Chart of Average Score for each Aspect in the Practicality TestInteractive E-Module

This is a finding for researchers that in terms of appearance, ease of access to both videos and other links, explanations of material, and language have been very well developed based on the benefits obtained. Even though these two aspects are both in the very practical category. Convenience for users consists of several assessment indicators. The following graph shows the score for each indicator in the ease of use aspect.

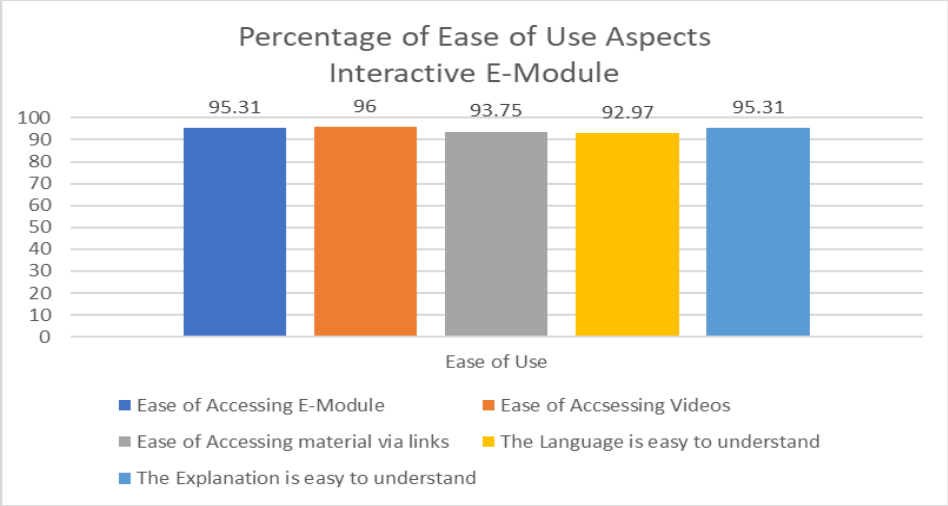

Fig. 4. Chart of Percentage of Ease of Use Aspects Interactive E-Module

The graph above shows that the difference in scores for each indicator in the ease of use aspect is not significantly different. The score for the ease of video access indicator shows the highest value, while the score for language that is easy to understand shows the lowest score in this aspect. This is due to the use of several foreign terms in this e-module, and there are still several typing errors. This becomes input for researchers in making improvements and improvements to this e-module.

The benefit aspect obtained consists of several indicators, namely (1) benefits in understanding scientific concepts (96%), (2) benefits in developing critical thinking skills (92%), (3) benefits in developing creativity (92%), (4) benefits in developing communication (94.5%), (5) benefits in developing collaboration (92%), (6) learning becomes efficient (95%). The following graph shows the score for each indicator in the aspect of benefits obtained.

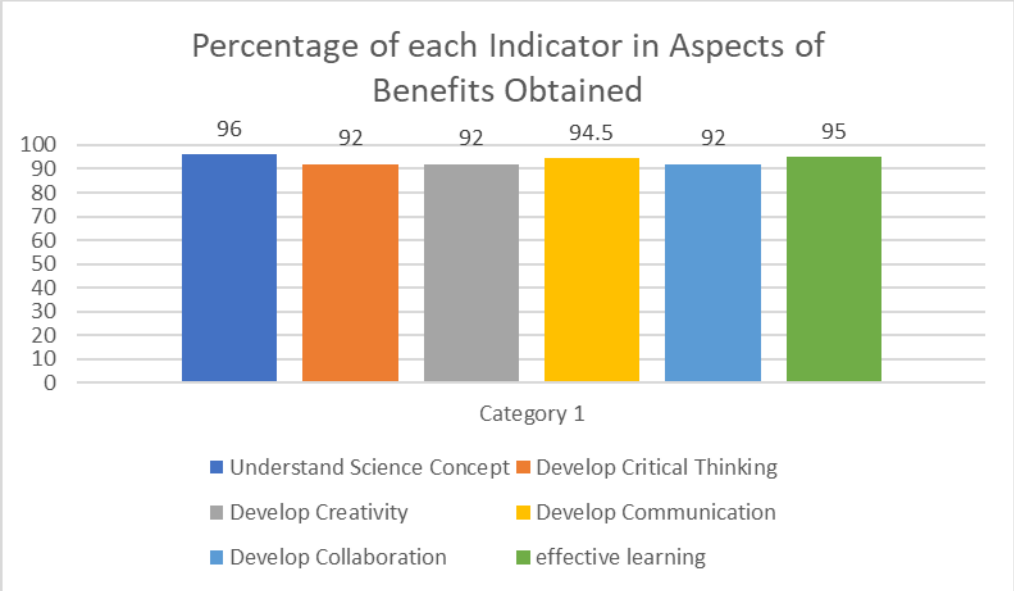

Fig. 5. Chart of Percentage of each Indicator in Aspects of Benefits Obtained

following the graph above, it is noticeable that in this practicality test, the benefits obtained from this interactive e-module in developing critical thinking skills, creativity and collaboration are still relatively low compared to other indicators. Even though all indicators are in the excelent category. The development of critical and creative competence is trained in the "challenges" section of the e-module. This challenge takes the form of assignments to study a case, create a concept map, plan science practice activities for early childhood, and so on. Meanwhile, cooperation skills are trained through invitations in the e-module to discuss cases or other challenges given with the group. The development of critical skills, creativity and collaboration is carried out implicitly in the interactive digtal module that was construction, so this is what causes the score for indicator to be lower than other indicators.

Development of twenty-first century competence (4C); critical thinking, creativity, communication and work, can be done through various learning models, learning methods such as case method and team based projects [19], learning that practices problem solving [20], and providing appropriate media and teaching materials [11].

One of the highlogts of today educational learning is student center learning where students actively participate in their education and teacher becomes the facilitator. Interactive e-modules can help activate students in learning [21].

Electronic-module is a self-instructional media that can help students' independence in learning and improve their learning outcomes [12]dynamic eletronic modules are a learning medium that can help students' creativity and activeness and help make learning more effective [22]. The new era skills-based interactive digital module that has been constructed

has practicality in the very good category oriented the usefulless tests that have been finished. The practicality of teaching materials that are easy to use and provide benefits to users will be able to raise the quality of teaching and learning [23]. A product is said to be suitable for use and can be implemented optimally, if the practical value of a product is in the good and very good category [17], [18], [24]–[31].

4 Conclusion

The twenty first century skills oriented in interactive electronic-module developed has practicality in the very good category with an average score of 94.1%. The digital module was developed contains teaching materials related to science learning for early childhood in the form of text and videos, thereby helping students to understand the essence and basic concepts of science learning for early childhood. Apart from containing teaching material, this e-module also provides challenges to train students to develop critical thinking, creativity, cooperation and communication skills. In terms of ease of use, this e-module has an average score of 94.7%. Meanwhile, in terms of the benefits obtained, this e-module has an average score of 93.5%. Both aspects are in the very practical category. Respondents assessed that this interactive e-Module was easy to use and helped them to think critically, develop creativity, and provided opportunities to communicate and collaborate with their group friends on science learning topics for early childhood. Thus, this 21st century skills-based interactive e-module is feasible and practical for use in science learning courses for early childhood.

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