
Need Analysis of Developing Digital Teaching Materials to Improve 21st Century Skills

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Abstract. Needs analysis is the initial study in development research. This analysis is necessary to produce the right product. The aim is to see the need digital teaching material to improve 21st century skills. The survey research method is applied with a quantitative approach. Technical analysis of data is done by processing and analyzing data using a Likert scale. The research object is related to student characteristics, student skills, and the need for using technology. The subjects of this study were 45 high school students in the city of Bukittinggi. They consisted of 13 men and 32 women. The average age ranged from 17 to 18 years. The results of the analysis found that the characteristics of students were in a good category, but the aspect of interest showed the lowest value. This is caused by the lack of learning media that can improve 21st century skills, especially in the component critical thinking and communication. In addition, the lack of technology-based learning media, while the use of technology is needed in learning. Therefore, it is necessary to development of digital teaching materials to improve student skill.

Keywords: Digital teaching material, 21st century skills

Introduction

The era of revolution 4.0 was marked by the development of science and technology. This development causes human life to turn into a need for technology. Where every human activity is carried out involving the use of big data, internet networks, artificial intelligence, smartphones, and 5G technology (Supriyanto, et al., 2021). The advantage is that it makes it easier for humans to carry out activities and seek information (Rahmawati, et al., 2019).

The development of science and technology in the 4.0 era caused very significant changes in the social, economic, and technological fields. The pace of technological development causes changes in the lifestyle of a global society. Changes in the social and economic fields demand the availability of skilled human resources. In addition, the development of science and technology has also brought changes to the fields of politics, culture, and art, and even penetrated the world of education (Khairinal, et al., 2021).

Changes in the world of education are closely related to globalization which causes science to develop rapidly (Amini, et al., 2020). Digital-based teaching materials are

urgently needed to motivate students during the learning process (Budiyono, et al., 2020). In addition, the existence of the Covid-19 pandemic requires online learning, so digital teaching materials are needed to support the learning process (Dewi, et al., 2021). Therefore it is necessary to develop digital teaching materials in order to achieve educational goals in the 4.0 revolution era.

Based on the field studies that have been carried out, several problems were obtained. First, the use of digital teaching materials during the learning process obtains an average of 25%. This shows that there is still a lack of use of digital teaching materials in schools. Second, students' 21st century skills are still relatively low with an average percentage of 56.75 which is in the pretty good category. Third, student learning outcomes are in the low category because there are no teaching materials that can hone critical, creative, communicative, and collaborative thinking skills. These results indicate that there is a gap between the demands of 21st century education and the reality on the ground. Therefore it is necessary to develop digital teaching materials that can improve Aband 21 skills.

Some of the problems above prove that entering a new era, the learning process in schools requires new innovations to support the learning process. One of the innovations is developing digital materials. In order for the development of digital teaching materials to involve students fully in learning science, a needs analysis was carried out for the digital teaching materials being developed. Needs analysis is an initial study to see how big the need is for the use of digital teaching materials. The aim is to see whether digital teaching materials need to be developed to improve 21st century skills. Branch (2009) states that the purpose of development analysis is to identify gaps that occur and find solutions to cover these gaps.

Methods

The method used in this research is descriptive research. In this study, there were three initial data, namely student characteristics, student skills, and the need for using technology in learning. The characteristics of the students studied consisted of several aspects, including aspects of background, interests, motivation, and student learning styles. The assessment of the skills learned is digital literacy skills. These skills are focused on the components of critical thinking, creative, communication, and collaboration. The subjects in this study were 11th grade high school students in the city of Bukittinggi. The number of students involved was 45 students. The students involved consisted of 13 boys and 32 girls. The average age ranges from 17 to 18 years.

Data collection techniques in this preliminary study used several research instruments. The instrument for viewing student characteristics is a questionnaire sheet. The instrument for assessing critical and creative thinking skills is carried out by means of a literacy test. The instrument for assessing communication and collaborative skills is carried out by means of a performance assessment. The need for the use of technology in learning is seen through questionnaires distributed to all research subjects. The instrument used is the adoption of previous instruments which are modified according to research needs

The data analysis technique used in this study is in the form of descriptive statistics. Descriptive statistics serve to describe or provide an overview of the object under study

through samples or populations as they are. Data processing is carried out by processing and categorizing the data obtained. The obtained value data are analyzed using a Likert scale, then categorized based on certain categories. The likert scale used is a scale of four. Scale four consists of a scale of strongly agreeing (score 4), agreeing (score 3), disagreeing (score 2), and strongly disagreeing (score 1). The categories of values obtained are written based on Table 1.

Table 1. Grade categories

Grade	Categories
0-20	Not good
21-40	Not good enough
41-60	Good enough
61-80	Good
81-100	Excellent

(Source: Ridwan, 2009)

Results and Discussion

The research was conducted as a preliminary study of the use of developed e-books. Preliminary studies are carried out by analyzing the needs in learning science related to student characteristics, student skills, and the need for the use of technology in the learning process. The needs analysis involved 2 schools in Bukittinggi city. The focus of the research is 11th-grade high school students for the 2022/2023 school year.

The first data analysis is about the characteristics of students. Based on the results of data analysis obtained from the instrument characteristics of class XI students, in general, student characteristics are in a good category as shown in Figure 1.

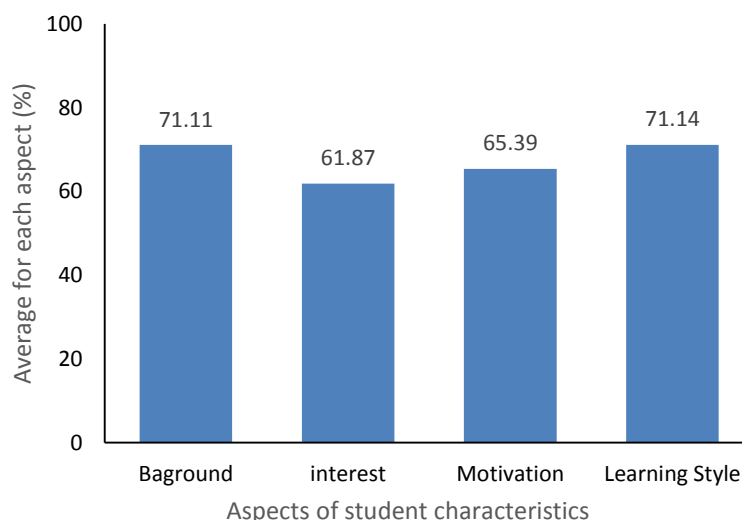


Figure 1. Student characteristics for every aspect

Figure 1 shows that the average percentage overall student characteristics of each aspect are 67.38% and are in a good category. Analysis of student characteristics is also outlined for each aspect so that these good categories are visible. The results of the first analysis of student characteristic data are in the background aspects which can be seen in Table 2.

Table 2. Analysis of student characteristics on the background aspect

No	Indicators	Value characteristics of students on background aspects (%)	Categories
1	Coming from a family capable in the economy	72.22	Good
2	Have good achievements in academics in school	68.89	Good
3	Had good academic performance while in class XI	64.44	Good
4	Getting guidance from parents in learning	71.67	Good
5	Living in an environment that supports me to learn	78.33	Good
Average		71.11	Good

In Table 2, it can be seen that the average percentage value in the background aspect is 71.11% and is in a good category. This category indicates that the student comes from a good background. The highest score is found in the indicators of a conducive student learning environment. While the lowest score is found in the indicator's lack of academic achievement of students in the field of physics. This data shows that it is necessary to develop a digital teaching material in order to improve student academic achievement. Nurdiyanti, et al. (2022) in their research stated that digital modules are very valid and practical to use in learning. Digital teaching materials can help teachers during the learning process and increase student activity (Fatmawati, et al., 2023). Maulidiya, et al. (2023) in the results of his research also stated that digital teaching materials were suitable for use in learning. In addition to the background aspect, characteristics are also seen from the aspect of interest as shown in Table 3.

Table 3. Data analysis of student characteristics of aspects of interest

No	Indicators	Value of student characteristics on aspects of interest (%)	Categories
1	Spirit in learning physics	71.11	Good
2	Having one's consciousness to learn physics without the coercion of others	74.44	Good
3	Serious during the physics learning process	68.33	Good
4	Have a high ability to learn physics	69.44	Good
5	Love to study physics because the teacher is fun	81.11	Excellent
6	Likes to study physics because the material is close to daily life	72.77	Good
7	Trying to find a source to find a solution, when there is a difficult problem	75.55	Good
8	Have the intention to continue studying in the field of Physics	52.77	Good enough

9	Have a high concentration in studying physics materials	63.77	Good
10	Repeating physics lessons that have been taught in school when you have free time	62.22	Good
Average		61.87	Baik

Based on the data in Table 3, it can be seen that the percentage value for the interesting aspect is 61.87 and is in a good category. This shows that students already have an interest in learning. However, for each indicator analyzed, the highest score is seen from the pleasant teacher, while the lowest score, it can be seen from the lack of interest of students to continue their studies in physics. Khairinal, et al. (2021) stated that the interest in learning is seen from the interest of students to learn, enthusiasm, and actively participating during learning. In addition, there is a sense of pleasure so that it is easy to understand the material being studied. Aswad, et al. (2021) also mentioned in their research that using e-books can increase student interest in learning which can be seen from students' interest in studying physics. Setianingrum, et al. (2022) states in his research results that digital teaching materials can attract students' attention in carrying out learning. Characteristics of students analyzed against the motivational aspect. The results of the analysis can be seen in Table 4.

Table 4. Analysis of student characteristic data on the motivational aspect

No	Indicators	Value of student characteristics on aspects of motivation (%)	Categories
1	Have a strong will in studying physics	67.22	Good
2	Following physics learning with enthusiasm and not sleepiness	63.88	Good
3	Do physics assignments first before doing other activities	62.77	Good
4	Collecting tasks on time	71.11	Good
5	Never give up hope doing physics problems even though solving requires extra hard thinking	65.56	Good
6	Frequently do physics tasks for hours	60.00	Good
7	When the teacher asks about the physics material in class, willing to answer willingly	67.22	Good
Average		65.39	Good

Table 4 shows that student motivation results are in a good category with an average score of 65.39. These results illustrate students as motivated in learning physics. This can be seen from the enthusiasm for students' learning, enthusiasm in carrying out physics tasks, and discipline in collecting assignments. In addition, student motivation can also be seen in the students' ability to answer questions related to physics material.

Fauziyah, et al. (2020) stated that the use of e-books has a significant influence on student learning motivation. In addition, Adnan, et al. (2019) stated that if students have high learning motivation, then students' knowledge competencies tend to be higher. Students learning motivation can also be improved through the use of e-books which cover four main aspects, namely, attention, relevance, self-confidence, and satisfaction. The next aspect that is analyzed is the aspect of the student's learning style. There are three main indicators to see students' learning styles as shown in Table 5.

Table 5. Analysis of student characteristics on aspects of learning styles

No	Indicators	Value of student characteristics on aspects of learning styles (%)	Categories
1	Visual learning style	74.02	Good
2	Audio learning style	67.63	Good
3	Kinesthetic learning styles	71.77	Good
	Average	71.14	Good

Table 5 shows the percentage of student characteristics on aspects of learning style with a score of 71.14. This value indicates that the student's learning style is in a good category. Learning style is an approach to explain an individual's way of mastering information. Each learning style has a different way of understanding a subject matter (Umrana, et al., 2019). Saefiana, et al. (2022) suggests that when a person has found a learning style that suits himself, it will be easier to understand the subject matter. Learning styles are individuals that distinguish one person from another. In addition, learning styles are also one of the factors that affect student learning outcomes (Adawitah, et al., 2020). Based on the analysis of the data obtained that students have the same learning style as well. The average percentage for the three learning styles does not show a very significant difference.

The second data analysis is the analysis of student skills. Students' skills are limited to aspects of critical, creative, collaborative, and communicative thinking skills. These skills are part of the digital literacy component. More details can be seen in Table 6.

Table 6. Analysis of Student Skills data

No	Skills	Student skills value (%)	Category
1	Critical thinking	51	Good Enough
2	Creative thinking	43	Good Enough
3	Collaborative	68	Good
4	Communication	65	Good
	Average	56.75	Good Enough

Table 6 shows the percentage of students average skills at 56.75. This score shows that students' skills are in the category of quite good. Although students already have digital literacy skills as can be seen from the results of the analysis of communication and collaborative skills indicators are in a good category, there are still shortcomings. This can be seen from the results of the analysis of critical and creative thinking indicators which are still in the fairly good category. Maburoh, et al. (2017) stated that the low critical thinking skills in physics learning are caused by learning too teacher-centered, students are not active in their knowledge, and a lack of stimulating students' reasoning and thinking levels. The lack of percentage obtained indicates that efforts need to be made to improve these skills. Beside that Bahtiar, et al. (2023) result that some of these problems are in

stark contrast to the mental growth of awareness to work better among students and very far from developing 4C competencies (critical thinking, creative and innovative, communication ability, collaboration) that are 21st-century ability. Astutik, et al. (2019) argue that every human being can grow and develop into a creative and critical thinker because, in reality, human thought is related to his self-management. Thinking skills are very important to be applied in learning physics because they can help to analyze and solve problems. Creative thinking is needed to provide new ideas related to the problems faced. The third data analysis relates to the need for the use of technology. There are 3 important indicators that look like in Table 7.

Table 7. Data analysis of technology use needs

No	Indicators	Average value of technology use needs (%)	Categories
1	Digital attitude	80.69	Excellent
2	Digital literacy	84.58	Excellent
3	Data Literacy	78.96	Good
Average		81.41	Excellent

Based on the analysis of data in Table 7, it can be seen that the percentage of technology use needs is 81.41 and is in the excellent category. This category indicates the need for the application of technology in learning. This can be done by developing learning media in the form of digital teaching materials. The use of technology in learning has a positive impact, including more effective learning and more flexible evaluation and assessment because it can be done anywhere. In addition, it is more efficient because it can be seen immediately. The use time is unlimited and more focused on a conducive environment (Aisa, et al., 2020). Digital teaching materials developed with technology can assist teachers in delivering subject matter (Apriani, et al., 2021). Munzil, et al. (2022) say that digital teaching materials is friendly for technology and can be used as self learning for students during online learning. Preliminary research conducted shows that the most significant problems occur in indicators of low 21st-century skills, especially in critical thinking skills and creative thinking. The low value of this skill affects student academic achievement. This happens because of the lack of digital teaching materials that can be used by students to support the learning process. Therefore we need a digital teaching material that can support student academic achievement so that 21st-century skills can be improved.

Conclusion

Based on the preliminary data analysis that has been done, there is a discrepancy between the ideal conditions and the reality faced. The most significant problem occurs in the indicators of 21st century skills. Skills that are in the low category are critical and creative thinking skills. This is because the learning media used has not been able to improve students' skills, especially for creative thinking skills and critical thinking. Another cause is the lack of technology-based learning media. However, the need for the use of technology in learning is needed to support the learning process. So that students are less interested in studying physics subject matter.

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