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Profile of Interactive Learning Media Based Digital Literacy Needs on Elemental Chemistry Concepts

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Abstract

Interactive learning media integrated with technology are needed to facilitate the explanation of abstract material, including elemental chemistry. The study aims to analyze the profile of interactive learning media-based digital literacy needs on elemental chemistry concepts in high school students. The research uses a descriptive qualitative research method. The subjects of this study consisted of chemistry teachers and high school students from four sub-districts in Trenggalek Regency. Based on perspective of teachers and students, they need learning media that can help explain abstract material to be more communicative and interactive to increase learning effectiveness. The results of questionnaire answers show the application of interactive digital learning media based digital literacy from the teachers and students are 39% and 37%, respectively. The percentage shows that digital literacy-based learning media is still lacking. Furthermore, interactive learning media based on digital literacy could be developed to fulfill a need using specific criteria.

Keywords: digital literacy, elemental chemistry, interactive, multimedia

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1. Introduction

Improving the quality of education is vital in preparing human resources for the development and improvement of the community's standard of living. One step to developing the quality of education is to improve the effectiveness of the teaching and learning process (Yumini & Rakhmawati, 2015). Besides, the teaching system integration is needed to compensate for the dynamics of modernization and follow the era (Rianto, 2020). A computer-based interactive multimedia utilization step is needed to answer evolutionary and implementation learning challenges. Interactive multimedia is the combination of two or more media in one program. It can respond or give feedback (reciprocity) to its users to carry out learning activities (Rafmana et al., 2018). The existence of an interactive learning atmosphere has the opportunity to increase students' understanding of the material being taught.

Chemistry is one branch of natural sciences that is a compulsory subject for secondary education. The purpose of learning chemistry is to provide an understanding of students' ability to think systematically, critically, logically, and creatively toward the theory and practice of chemical material (Nuraini & Fitriani, 2018). By paying attention to this, chemistry subjects should be mastered by students. However, in reality, some material is often considered difficult to understand, affecting student learning achievements (Supardi, 2017). For some students, chemistry subjects are boring lessons because they study material that is considered abstract, such as atoms (small particles). It means that it cannot be seen in plain view, and reactions can only be seen from the symptoms. Therefore,

students are interested in something other than learning chemistry furthermore (Sunyono, 2017). In addition, some materials are explicitly needed delivery methods to increase students' understanding, including the chemical material elements.

Furthermore, students in 12th grade odd semester obtain the average element chemical material. This material generally consists of two crucial sub-materials, which are the leading group and chemical elements of the transition. This material has abstract concepts by learning related to the properties of elements in the periodic system of elements, both from the physical and chemical properties that exist in each element, including the electronegativity, mass number, atomic number, and the tendency of the atomic radius. In this case, 12th grade students need a good understanding of studying the chemical material for a smooth understanding of the subsequent material (Salsabila & Nurjayadi, 2019). According to Wahyuni & Yerimadesi (2021), the middle school still teaches chemical material for elements using only printed book material in the school in the form of an assignment of reading and work on exercise questions without other supporting references. The printed book or package book certainly has shortcomings, including the absence of content that contains video aids, animations, and supporting audio so that it is less interactive and still uses a memorization system. Studying the chemical material of elements is not only by memorizing related to understanding a concept but also by the law of analysis and the process of thinking in understanding it (Arham & Dwiningsih, 2016). Therefore, increasing students' understanding requires tools in the form of learning media.

On the other hand, good learning media could improve students' learning processes and outcomes. Besides, it can facilitate educators in conveying more exciting information (messages and content) and increase students' understanding of data interpretation, compaction of information, and data presentation (Ahyanuardi et al., 2018). These criteria will be more easily achieved when the learning media can cause action reactions with students to create an interaction (Kirschner, A., Karpinski, 2010). These needs follow the principles of interactive learning media integrated with computers and the internet. The types of interactive learning media utilize interactions between media and students to help explain abstract learning materials (concrete) (Yanto, 2019). According to Istiqlal (2017), computer-based learning media for teaching is better than using films, tutors, videos, and other traditional methods. The latest computer-based learning media utilizes multimedia, including graphics, video, and audio, that are packaged interactively in computers (Khuzaini & Santosa, 2016). The learning system uses this interactive multimedia following one of the 21st-century competency values: using various media and technology and assessing its impact.

Meanwhile, the Merdeka Belajar Curriculum that applies currently provides autonomy for educational institutions, teachers and students to innovate, be creative, and be independent in learning as needed. This condition is an opportunity and a challenge to develop good interactive learning media following learning needs and improving learning performance (Sherly et al., 2020). In its application, interactive learning must also increase student literacy, especially digital literacy. Digital literacy is an effort to know, search, understand, analyze, and use digital technology. In principle, digital literacy includes the competencies in interactive learning. In addition, digital literacy also plays a role in streamlining interaction and communication during the learning process. For example, the ability to use the camera and microphone features on the device to be able to be present and connected virtually.

Furthermore, the ability to use software to present text and supporting images (graphics and illustrations) plays a role in optimizing collaboration and communication. The creation of learning media is expected to increase students' understanding of the material provided. Therefore, this research aims to determine the application of

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interactive learning media based on digital literacy in chemical material elements. Also, This research is intended to obtain information about things that need to be used as a reference in developing interactive learning media based on digital literacy to increase the effectiveness, usefulness, and success of delivering learning materials.

2. Research Method

This study uses a qualitative descriptive research method by analyzing teachers' and students' questionnaire answers. The subjects in this study consisted of 10 chemical teachers and 80 high school students from four sub-districts in Trenggalek Regency. Besides, selecting the subject uses the simple random sampling method, where each element is chosen free from other elements (Arieska & Herdiani, 2018). The research procedure was conducted by searching for data information through a questionnaire link shared by students and teachers using the Google Form platform. The types of questionnaires used are open questionnaires and closed questionnaires. This questionnaire has three indicators, as outlined in 10 items for students and 12 for teachers. The instruments used have two types of questions: multiple-choice questions Beskala Guttman and questions with answers to descriptions/explanations. Data from the teacher and student questionnaires' results were analyzed descriptively and statistically to describe the need for interactive learning media based on digital literacy. Meanwhile, exposure to the analysis results through frequency distribution with a percentage and qualitative explanation. The data are interpreted with the conversion of the achievement level with a scale of five, contained in Table 1.

Table 1. Conversion of Achievement Levels with a Scale of 5

No.	Percentage	Category
1.	81 - 100	Very good
2.	61 - 80	Good
3.	41 - 60	Enough
4.	21 - 40	Not good
5.	< 20	Poor

3. Result and Discussion

The purpose of developing interactive learning media based on digital literacy in the chemical material elements is to facilitate the delivery of material, especially the chemistry of elements, more interactively through multimedia to create outputs following learning targets. The test analysis test is a preliminary step in developing interactive learning media based on digital literacy. This way is supported by research (Damopolii et al., 2020).

Based on questions from the questionnaire by the teacher and students, data obtained from answers regarding the need to develop interactive learning media based on digital literacy using three indicators of achievement are as follows.

3.1. The Implementation of Learning Chemical Materials Elements with Interactive Learning Media Based on Digital Literacy

Information about the implementation of learning chemical learning material with interactive learning media based on digital literacy was obtained from three closed questionnaire questions and one open questionnaire question, with the results displayed in Table 2 and Table 3.

Table 2. The Questionnaire Results Indicators of Learning Implementation in Chemical Materials Using Interactive Media Based on Digital Literacy

No	Questions	Average Results	
		Teacher	Student
1.	The level of implementation of the learning of elemental chemistry using multimedia-based learning media.	62%	58%
2.	The level of implementation of the application of interactive learning media based on digital literacy on chemical elements.	39%	37%
3.	The level of implementation of the teacher in suggesting to students to use digital literacy-based learning references.	72%	52%

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Table 3. The Results of the Open Questionnaire Indicators of Learning Implementation on Elemental Chemistry Using Interactive Media Based on Digital Literacy

Questions	Average results	
	Teacher	Student
What kind of interactive learning on elemental chemistry has been applied?	3 out of 10 teachers have made interactive learning media on elemental chemistry by incorporating interactive multimedia components into teaching materials such as animations, graphics, illustrations, videos, and audio that students can access.	Most students answered that the teacher provided material and assignments for students to do. Students also answered that some teachers already use the internet in teaching, but most teachers still use printed books/print modules.

From question one in Table 2, information about the level of implementation of elemental chemistry learning using multimedia from the teacher's perspective is 65%, and the student's perspective is 62%. Moreover, the results are included in the good category. Furthermore, in question two in Table 2, information is obtained that the application of interactive learning media based on digital literacy from the teacher's perspective is 39% and from the perspective of students is 37%. This percentage shows that digital literacy-based learning media is still very lacking. This outcome is in line with Kaniawati (2017), which states that the use of learning media currently needs to be more varied. Additionally, in one semester, the average teacher only uses teaching aids for learning media only two to three times. In addition, Puspitasari (2019) states that the learning media widely used among students is the print module which tends to have simple pictures and informative literature and contains only practice questions. Therefore, for some students who have yet to be able to study independently, it will be challenging to learn. In addition, Salsabila & Nurjayadi's research (2019) clarifies that more than 70% of students considered the chemical printed books used to be challenging to understand and less attractive. In addition, the more interesting the learning media used by the teacher, the higher the learning motivation of students; this is due to the varied forms of media that can prevent students' boredom in the learning process (Sri et al., 2021). In addition, the application of interactive learning media in schools still needs to be improved. This consequence is evidenced by Agustini et al. (2016), which state that the average teacher in schools has yet to properly utilize technology as an interactive learning medium, and many teachers still use conventional methods to convey the theory. However, the teacher once advised students to learn to use digital literacy. It can be seen from the results of the questionnaire in question three Table 2, where the results of the survey on the level of implementation based on the perspective of students are 52% (enough category) and teachers are 72% (good category).

Based on the questions in Table 3, three out of 10 teacher respondents stated that the application of making interactive learning media on elemental chemistry was made by incorporating interactive multimedia components into teaching materials, such as animation, video, and audio students could access. This condition made the teachers increase the student's enthusiasm for learning. Besides, adding audio and visual media to learning can increase students' understanding of the material being taught and facilitate the transfer of knowledge between teachers and students in a more communicative manner (Manurung, 2021). In addition, based on the questions in Table 3 regarding interactive learning of elemental chemistry, the student's perspective stated that learning chemistry on elemental material could have been more effective due to the average being only glued to print books or modules. On the other hand, students stated that the teacher only gave material with the lecture method and then gave assignments related to the material that had been delivered. Hence, students tended to be passive in learning. However, some respondent students also stated that teachers

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had started using the internet literature integrated learning media. The difference in the application of learning media is possible due to IT (Information and Technology) capabilities and school facilities, so some teachers have yet to be able to apply interactive multimedia-based learning media based on digital literacy on elemental chemistry. The results of research by (Arham & Dwiningsih, 2016), interactive multimedia was declared feasible as a learning medium in introductory chemistry in terms of instructional quality, this quality and purpose, and technical quality. It means that interactive multimedia can help explain abstract elemental chemistry.

3.2. The Implementation of Interactive Learning Media for Elemental Chemistry Using Electronic and Computer Media

Information related to the implementation of interactive learning of elemental chemistry using electronic media was obtained from two closed questionnaire questions and one open questionnaire, each of which results are shown in Table 4 and Table 5.

Table 4. The Results of Closed Questionnaire Indicators of the Implementation of Interactive Learning Media for Elemental Chemistry Using Electronic Media

No	Questions	Average results	
		Teacher	Student
1.	The level of use of electronic-based media in the learning process	91%	72.5%
2.	The level of use of computer-based media in the learning process	75.5%	82.6%

Table 5. The Results of the Open Questionnaire Indicators of the Implementation of Interactive Learning Media for Elemental Chemistry Using Electronic Media

Questions	Average results	
	Teacher	Student
What media are commonly used in the learning process of elemental chemistry?	PowerPoint, Charta, printed book, video, smartboard, teams office 365, google form, dan google meet	Modules, worksheets, Youtube, Telegram, WhatsApp, google classroom, social media.

Based on question one in Table 4 regarding using electronic-based media in the learning process, the survey results from the teacher's perspective were 91% (very good), and the student's perspective was 72.5% (good). In addition, based on the open questionnaire questions in Table 5, information is obtained that the learning media commonly used in the learning process for elemental chemistry include PowerPoint, charts, printed books, videos, smartboards, teams office 365, google forms, and google meet. This phenomenon shows that teachers have widely used electronic media to help deliver material in class. According to the research of Daud et al. (2019), teachers need to master certain digital media to maintain students' interest in learning through internet media. Teachers are also highly recommended to master the method or method for creating exciting content, conveying information either through pictures, verbally, or using audio that has been developed as teaching material. Effective learning is when the teacher can convey information accurately, precisely, and easily understood by students. As an integral part of the inclusion of technology components, it can affect other components, including changes in the role of teachers in school education units. In this case, the teacher is no longer the center or the only source of learning. However, it has the primary role of a facilitator, designer of the learning process, and motivator for students in the learning process. The use of technology can also support the concretization of abstract concepts in learning and allow students to interact with the environment outside the classroom without mobilization (Nurvitasari, 2018). In question two, Table 4, regarding the level of computer-based media use, the survey results from the teacher's perspective are 75.5% (good), and the student's perspective is 82.6% (very good). Students have used

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computers to prepare and deliver the material. In (Priyanto, 2019), computer multimedia makes learning more interactive, effective, efficient, and interesting. This condition is supported by Suryadi's research (2019), which states that using technology improves the quality of effective learning.

3.3. The Need for Development of Digital Literacy-Based Interactive Learning Media on Elemental Chemistry

Information about the need for developing interactive learning media based on digital literacy on elemental chemistry was obtained from one open questionnaire and five closed questionnaire questions, shown in Tables 6 and 7, respectively.

Table 6. The Results of the Closed Questionnaire Need Development of Interactive Learning Media Based on Digital Literacy on Elemental Chemistry

No	Questions	Average Results	
		Teacher	Student
1.	Level of need for the use of electronic-based media in the learning process	98%	92.5%
2.	The level of need for the use of computer-based learning media in the elemental chemistry learning process	100%	92.6%
3.	The level of attractiveness of digital literacy-based interactive learning media on elemental chemistry	100%	98%
4.	The level of confidence in the use of electronic-based learning media (such as computers) in explaining the subject matter	100%	97%
5.	The level of confidence in the use of interactive multimedia in making digital literacy-based learning media that contains chemical elements	100%	96.5%

Table 7. The Results of the Open Questionnaire on The Need for the Development of Interactive Learning Media Based on Digital Literacy on Elemental Chemistry

Question	Average Results
	Teacher
How are digital literacy-based learning media needed to support the learning process for elemental chemistry?	Interactive media that has expertise in making explanations related to the material logically and accurately with technical abilities, information management, and artistic abilities, making these abilities collaborative that attracting students' learning interest.

Based on question one in Table 6 regarding the need for electronic-based media in the learning process, the survey results were obtained from the teacher's perspective of 98% and the student's perspective of 92.5%. This result is included in the very good category. It means that electronic-based media is needed to support the implementation of learning. Meanwhile, in question two in Table 6 regarding the need for using computer-based learning media in the learning process of elemental chemistry, the survey results are almost the same as in question number six. It was included in the very good category, where from the teacher's perspective, it is 100%, and students are 92.6%. In other words, computer-based media is indispensable in supporting learning elemental chemistry. This condition is in line with Cahdriyana & Richardo (2016), which stated that one of the environmental changes that significantly affect the world of education is the presence of information technology. Besides, technology serves as a material and a tool for learning. In this case, technology is interpreted as a learning material and a tool to master a computer-assisted competency. In this case, the computer has been programmed to foster students in stages by using the principles of complete learning to master the competencies. In this case, the position of technology is like a teacher who functions as a facilitator, motivator, transmitter, and evaluator.

Based on question three in Table 6 regarding the level of attractiveness of interactive learning media based on digital literacy, three of the elemental chemistry material to be developed found in the survey showed 100%

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from the teacher's perspective and 98% from the student's perspective. In addition, questions four and five of Table 6 regarding the level of trust in using electronic-based learning media (such as computers) in explaining the subject matter also received as a very good category. With the integrated learning of electronic media, abstract material will be more easily conveyed with multimedia visualization. Thus, learning will be more interactive, effective, and memorable for students. Meanwhile, electronic media was intended to save words and time; students will more easily understand explanations, arouse interest in learning, eliminate misunderstandings, and convey information more consistently.

Based on the questions in Table 7, information is obtained from the teacher's perspective regarding the characteristics of interactive multimedia-based learning media needed to support the learning process for elemental chemistry. These are interactive media with expertise in making explanations related to the material logically and accurately with technical skills, information management, and artistic skills. Therefore, it can make this ability a collaboration that attracts student learning interest. Besides, the survey results follow the character of digital literacy-based learning media. Moreover, according to Kaniawati (2017), digital literacy is the ability to understand and use information in various formats (text, images, audio, video, and animation) and from multiple sources presented through devices; consequently, electronics are more accurate. On the other hand, digital literacy can help explain information with a specific purpose (according to the user's goals). Moreover, the educator can combine digital literacy with audio and visual arts to attract students to understand a concept that previously seemed dull, abstract, and hard to understand. The explanation can also be made historically or have a plot so that students better understand the process presented in the material. Meantime, using computers in digital literacy as an interactive learning medium for elemental chemistry material related to student learning abilities has several advantages. Computers can create an effective learning climate for slow learners and spur learning effectiveness for fast learners. On the other side, there are 12 pillars of characteristics of computer-based interactive learning media: based on instructional objectives; according to student characteristics; maximizing interaction and individualization; maintaining student interest; approaching students individually; providing a variety of feedback; appropriating to the instructional environment; can evaluate performance properly; using computer resources sparingly; based on instructional principles and it has been thoroughly evaluated.

Two essential competencies support the implementation of interactive learning (communication and collaboration), which is the main element of digital literacy. Communication and collaboration have an individual competence component consisting of valuable skills, which are the ability to access and operate media, critical understanding in the form of the ability to analyze and evaluate media content comprehensively, and communicative skills, namely the ability to communicate and participate through media.

Therefore, developing interactive learning media based on digital literacy is expected to become an evolutionary learning strategy, increase students' learning power, and improve classroom learning efficiency. Meanwhile, technology plays an essential role in both learnings and is implemented properly to help make learning more lively, and there are meaningful interactions. Hence, the results of this study are in the form of information about the perspectives of teachers and students regarding the analysis of needs related to interactive learning media based on digital literacy that will be developed. Also, it will later be used as a reference in developing learning media that follow needs and effectively improve the quality of learning.

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4. Conclusion

The development of interactive learning media based on digital literacy in elemental chemistry is determined through closed and open questionnaire analysis. This analysis includes the needs of teachers and students. The data shows that teachers and students at several schools in Trenggalek strongly agree with developing interactive learning media based on digital literacy on elemental chemistry. The results of the study stated that teachers need learning media that can help explain abstract material to be more communicative and interactive so that it is expected to increase students' understanding and interest in the material presented. In addition, learning media is also integrated with computers as interactive multimedia that can harmoniously combine technology and art to be used in developing more memorable learning for students. This research is the initial section on developing interactive learning media based on digital literacy on elemental chemistry, so further research is still needed to develop this learning media.

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