TECHNOLOGY-BASED MEDIA AND STRATEGIES IN LEARNING CHEMISTRY TO SUPPORT STUDENTS' LITERACY INTERESTS

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Abstract. Students' interest in literacy in Indonesia is still relatively low, ranking 70th out of 78 countries, so there is a need for innovation in education to increase student literacy. One of the innovations in the field of education is the combination of literacy and technology. This review aims to find out effective learning models in order to increase students' learning interest in literacy and technology. In the review using inquiry learning models, problem based learning (PBL), project based learning (PJBL), and discovery. In this review, the method that really supports student learning interest is in the form of Project Based Learning (PJBL). The Project Based Learning (PJBL) criteria include centrality, focusing on questions or problems (driving questions), constructive investigation (constructive investigation) or design, student autonomy (autonomy), and realism (realism). The method used in this systematic review is based on PRISMA (Preferred Reporting Item for Systematic). From this review it was found that using technology in scientific literacy can increase student learning interest by 80% and those who are very interested 13.3%. It can be concluded that the use of technology-based learning media can foster students' interest and scientific literacy.

Keywords: scientific literacy, technology, interest, chemistry lesson strategy.

INTRODUCTION

Developments in the world of education have now come to the learning model using technological units in its implementation. In the millennial generation, the character of students who always want to be fast both in the learning process such as learning information, assignments, materials, and so on. So that making a learning model inevitably has to use technology as a means in the learning process. Technology is very influential on the era in the world of education today(Kartini, Ketut Sepdyana., Putra, 2020).

Chemistry is a science that studies the structure, matter, and changes experienced by a material both in natural processes and in planned experiments. When studying chemistry, students are able to get to know the composition (composition) of substances and the use of chemicals, both natural and artificial, as well as get to know important processes in living objects, including our own body. Chemistry is a science that studies natural phenomena that without us realizing are close to everyday life (Nirwana & Yenti, 2021).

Chemistry is one of the materials that is quite difficult to understand (Ajani, 2019) (Fauzan et al., 2020) by many students at the high school level that cause a negative mindset that can affect the cognitive, affective, psychomotor and scientific processes (Wahyuni et al., 2018). One aspect that is influenced by this mindset is the interest in learning students, even though interest in learning is a very important aspect in learning chemistry (Harefa et al., 2020). Chemical material is one of the materials that is quite complex in terms of understanding which is not only based on material, but this learning must be studied with three aspects, namely, macroscopic, microscopic, and symbolic(Harianto et al., 2019) (Ering et al., 2018). In learning chemistry, the relationship

between these three aspects is very important. As stated by Chemistry (2012) that understanding chemistry requires the ability to relate three aspects of chemical studies, namely macroscopic, microscopic, and symbolic. In the microscopic and symbolic aspects are two aspects that illustrate that the things studied in chemistry are abstract(Apriani et al., 2021) (Ewais et al., 2021) So that learners cannot experience directly and real. This is what causes students to have difficulty in learning chemistry so that it can affect student interest and learning outcomes.

The results of the research analysis of several journals in the past five years, that the use of technology in the form of androids can display microscopic, macroscopic and symbolic aspects. These aspects are contained in the form of animation media, virtual laboratories, BSE (Electronic School Book) (Astuti et al., 2021) , and virtual related to difficult subject matter to be displayed live through printed textbooks. The media can be used flexibly and repeatedly, making it easier for students in the learning process.(Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021) (Izzaty et al., 2017) (Saputra & Kurniawati, 2021). Learning media is something that can convey or channel messages from a source in a planned manner, so that there is a conducive learning environment where students can carry out the learning process efficiently and effectively (Fauzan et al., 2020).

The use of media in the learning process can increase science literacy. Science literacy can also be said to be the capacity to use scientific knowledge, identify questions and draw conclusions based on facts and data to understand the universe and make decisions from changes that have occurred due to human activities (Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021). However, Indonesia still has relatively low science literacy skills. This is concluded based on research that has been carried out by the Internationale for Students Assessment (PISA) programme every three years (Horohiung, 2017).

OECD (Organisation for Economic Coperation and Development) report through test results (PISA) in 2015 the science literacy of learners was in the order of 62 out of 70 countries (SILABAN et al., 2019), in 2018 it showed in order of 70 out of 78 participating countries with a score of 396 (Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021). This score is still far below the average science proficiency score of the OECD country set by PISA, which is 489. Indonesia's average score is still relatively low, which reflects that most students in Indonesia have not been able to analyze and apply a problem. Based on the interviews conducted, it was found that students do not yet understand the application of science and technology in everyday life. Efforts are needed to empower students' science literacy skills, through a forum for science learning. One of the efforts to improve the science literacy of students is by learning chemistry. In chemistry learning, students are expected to understand the concept of chemistry to solve a problem by building their individual knowledge. Chemical literacy can be improved through learning that involves students actively and makes the student discover for himself the concepts of chemistry learned so that the learning becomes meaningful. Teachers must be good at using media in supporting the learning process, of course, in accordance with the material to be taught (Darwis et al., 2019).

The factor that causes the low interest in student literacy, especially in chemistry learning, is that students do not fully understand the concept of macroscopic, microscopic, and abstract material. So that students often experience misconceptions in understanding the material. Low use of learning media for teachers in explaining and visualizing microscopic and abstract concepts (Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021).

One of the efforts to increase interest in science literacy can be built with a learning model that supports the teaching and learning process. A learning model is a form of learning that is drawn from beginning to end that is presented characteristically by the teacher to achieve learning objectives optimally. It is necessary to choose a suitable or effective learning model to increase students' interest in learning. So that later it is hoped that it will have a positive impact on the learning process (Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021).

Interest in learning is a relatively changeable aspect (Harefa et al., 2020) and is a key factor in the field of education (Akram et al., 2017). Students may experience changes in interest in a subject matter caused by many factors, such as internal and external factors. The internal factor is that initial ability can affect students' interest in learning, students who have good initial abilities

tend to have a high interest in the subject matter, besides that good emotional intelligence tends to have a high interest in learning.

Another internal factor that can affect interest in learning is student perception. Students tend to have a perception or develop their perception of a learning material. Such perceptions turn out to affect students' interest in learning, students who have a good perception of a learning material tend to have a high curiosity which will affect their interest in learning the material (Harefa et al., 2020).

In addition to internal factors in the student, the attention of parents can influence the interest in learning of a student. Parents who tend to be ignorant of the learning process at school or the learning process of a material that has been taught can reduce children's interest in learning. In addition to parent and student factors, the presence of teachers can influence students' interest in learning. Internal factors such as initial ability can affect a student's interest in learning, students who have good initial ability tend to have a high interest in the learning material (Harefa et al., 2020)

External factors are very difficult to control in an effort to increase student interest in learning. The environment is the dominant external factor that can affect students' interest in learning, both the school environment and the community environment. Slum and child-unfriendly environments contribute significantly to students' low interest in learning. Generally, students' interest in learning scientific materials such as mathematics is in the moderate category.(Harefa et al., 2020).

RESEARCH METHOD

The literature that the author discusses is literature that reviews literacy and technology-based chemistry learning strategies in supporting students' interest in learning. For literature the author uses the SINTA (Science and Technology Index) accredited journal literature type. The author limits the topic of literature that reviews predictions, not for making certain applications (Nirwana & Yenti, 2021).

Literature references were taken from literature search engines, namely Google Scholar, DOAJ (Directory of Open Access Journals), Pro Quest, and ScienceDirect. The author does not limit certain publishers (Faizah & Widyastuti, 2022). The author only uses literature published from 2017 until now in order to get the most up-to-date literature.

References from the search process will undergo several stages of filtering. In the first screening the authors eliminated journals that discussed literacy and technology-based chemistry learning strategies. Then a title screening was carried out to eliminate some of the same literature.

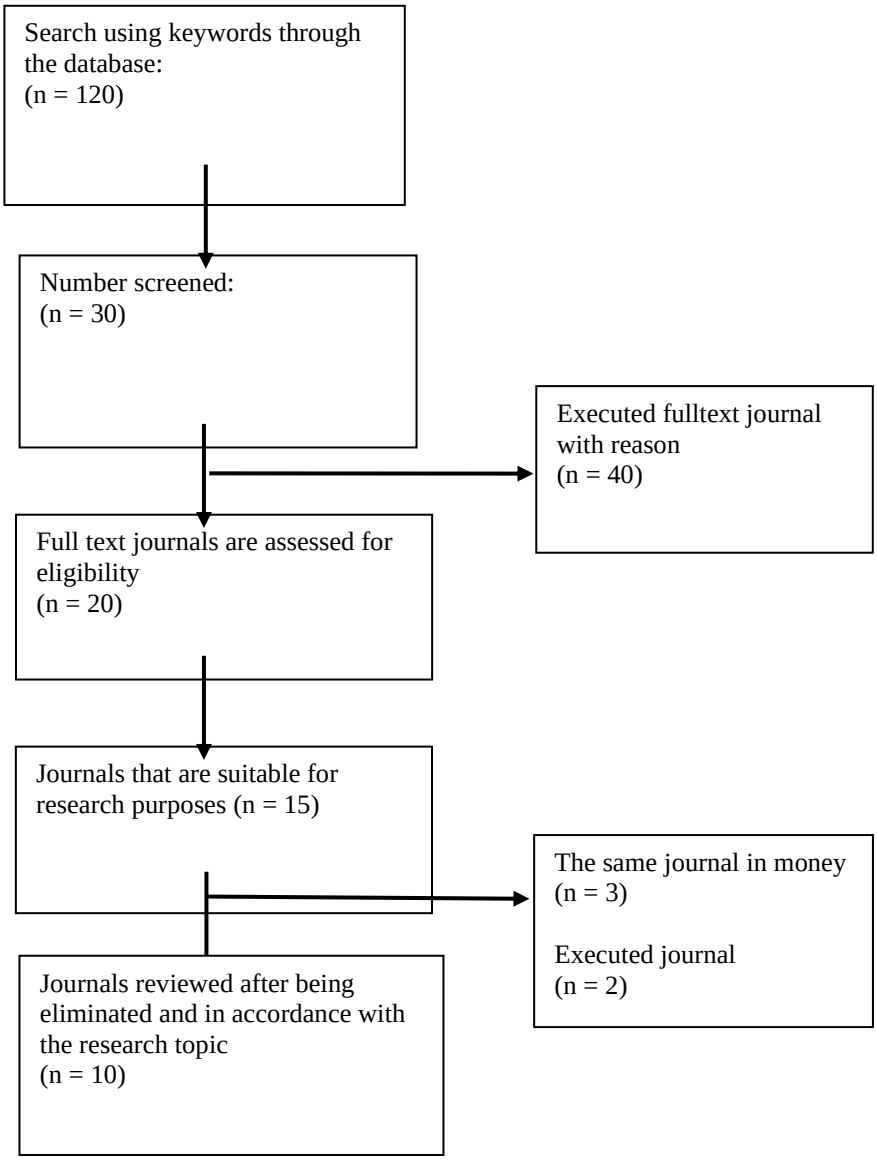
In the next screening, the suitability between the title and the topic reviewed is carried out. Then read the abstract to find out whether the literature is in accordance with the topic discussed. After that, the process of reading the contents of the literature as a whole was carried out. Then choose some literature that really fits the topic to be reviewed (Siti, 2022). After obtaining the appropriate literature, the literature is read in more detail to review the contents of the existing literature.

The results of the review are then made into a summary to facilitate the comparison process. The summary contains:

1) Literacy-based learning strategies to increase student interest
2) Literacy and technology-based learning strategies to increase student interest
3) Supporting media for student interest in learning
4) Predictive results obtained from each literature (Mahfuzah et al., 2018).

The results of these are poured into a table which will be a reference for comparison of the literature used. So as to produce specific data from each literature on the efficiency of using the PRISMA method on Literacy and Technology-Based Chemistry Learning Strategies in Supporting Student Learning Interests.

The PRISMA diagram in SRL's research regarding Literacy and Technology-Based Chemistry Learning Strategies in Supporting Student Learning Interests is as follows:



The possibility of misinterpretation by the author is due to differences in the use of datasets from each literature. Therefore, the main key that is focused in this systematic review is the results obtained from Literacy and Technology-Based Chemistry Learning Strategies in Supporting Student Learning Interests.

RESULT AND ANALYSIS

Based on data from the literature review that has been carried out, it is found that 5 research and development journals are relevant, namely by using the *Project Based Learning* (PJBL) research model, the Inquiry model, the *Problem-Based Learning* (PBL) model, and the Discovery model:

Table 1. Literacy and Technology-Based Student Interest Analysis

Research Model	Theory	Media	Results	Journal
PJBL	Chemical physical changes	Virtual lab	Well	(Widyasari, 2019)
Inquiry	Collogative nature	Virtual lab	Well	(Tanto et al., 2022)
PJBL	Electrolyte and non-electrolyte solutions	Animation	Well	(Wahyuni et al., 2018)
PBL	Science and science learning outcomes	Electronic school books (BSE) and student worksheets (LKS)	Well	(Wijanarko et al., 2017)
Inquiry	Science and chemistry	Virtual	Well	(Mellyzar et al., 2022)
TGT	Buffer Solution	Animation	Well	(Amni et al., 2021)
Inquiry	Chemical bonds	Studens worksheets	Well	(Pesak, 2022)
Inquiry	Basic laws of chemistry	Electronic school books	Well	(Umar & Limatahu, 2021)
Discovery	Salt Hydrolysis	Animatioan	Well	(S. Wulandari et al., 2018)

Discovery	Electrolyte and Non Electrolyte Solutions	Virtual lab	Good	(Ott et al., 2018)
Discovery	Periodic System of Elements	Elektronik base book	Good	(Azzajjad et al., 2020)
PBL	Acid base	Virtual lab	Good	(Murtihapsari et al., 2022)
Inquiry	Redox reaction	Elektronik base books	Well	(Listiyani, 2018)
PBL	Redox Reactian	Elektronik base books	Good	(Fadillah, Siti dan Surya, 2018)
Discovery	Mole concept	Animation	Well	(Hamidah et al., 2018)
PJBL	Buffer solution	Virtual lab	Good	(A. S. Wulandari, 2022)
PJBL	Analytical chemistry	Animation	Good	(Engin, 2002)
PJBL	Reaction Rate	Animation and Virtual lab	Good	(Dwi et al., 2022)
PJBL	Acid base	Virtual lab	Good	(Ahmad Fauzi Syahputra Yani & Oktaviani, 2022)
PJBL	Electrolyte and non-electrolyte	Electronic school books (BSE) and student worksheets	Good	(Panjaitan, 2022)

Based on table 1, it shows that the literacy level of students is still at a low level, so there is a need for improvement in learning, one of which is through learning media. From the results of the review of the journals that we have analyzed, there is a relative and significant relationship

between technology-based learning and literacy. Along with the development of learning models, there have also been many developments, both discovery learning models, *problem based learning* (PBL), *project based learning* (PJBL) models, and inquiry models. The learning model is a conceptual framework that describes procedures systematically in achieving learning goals and serves as a guide for teachers in planning teaching and learning activities. In learning models, especially innovative learning models, students are actively involved and not used as objects. Learning is no longer centered on the teacher but on students. So a teacher must be able to use learning models so that students can be more active, creative and motivate students in learning. Students who lack motivation will tend to lack concentration when participating in learning activities because in these students there is a lack of encouragement to carry out learning activities(Wulandari, D.T., & Sayekti, 2022). The advantages of the learning model can support the learning process and students are encouraged to learn new material and concepts when solving problems, foster student learning interest, and provide opportunities for students to learn for life, while the drawback is that teachers have the opportunity to experience obstacles in changing teaching styles, and Students likely need more time to solve problems when they are first raised in class(Zainal, 2022).

Interest is a focus of attention that contains elements of feelings, pleasure, an involuntary desire that is active in nature to receive something from the outside (environment). Interest has the benefit of being a strong driving force in achieving achievement. By having an interest in learning, students further strengthen their memories of the lessons given by the educator. With a strong memory, students succeed in understanding the subject matter provided by the educator. So, it is not difficult for students to work on questions or questions from students. This results in good grades and improves teacher performance. Interest in learning to create and lead to concentration in learning. Students will have good concentration if they have an interest in learning what they want to know. This concentration is formed, which makes it easier for students to understand the material being studied (Rahmi & Alfurqan, 2021).

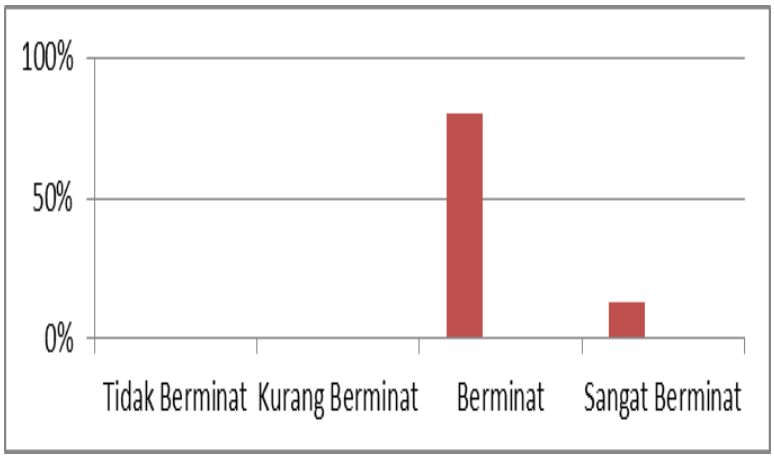


Figure 1. Comparison of Student Learning Interests
(Apriani et al., 2021)

Based on Figure 1, it can be seen that students' interest in learning is in the interested category by 80%, very interested by 13.33%. Based on the data above, the use of multimedia on students' learning interest is very influential. In the learning process, interest is an important aspect, especially in chemistry learning. Interest in learning can also affect other aspects such as learning motivation and learning achievement (Harefa et al., 2020).

The relationship between literacy and technology can make a significant contribution to learning achievement. Students who have a strong interest in learning will show a strong interest in learning various things, participate actively in every learning activity, and have a spirit of achievement. Likewise, low interest in learning will also have an impact on low interest in

learning. With the existence of technology can increase students' strong interest in learning so that student learning outcomes can increase significantly(Rahmi & Alfurqan, 2021).

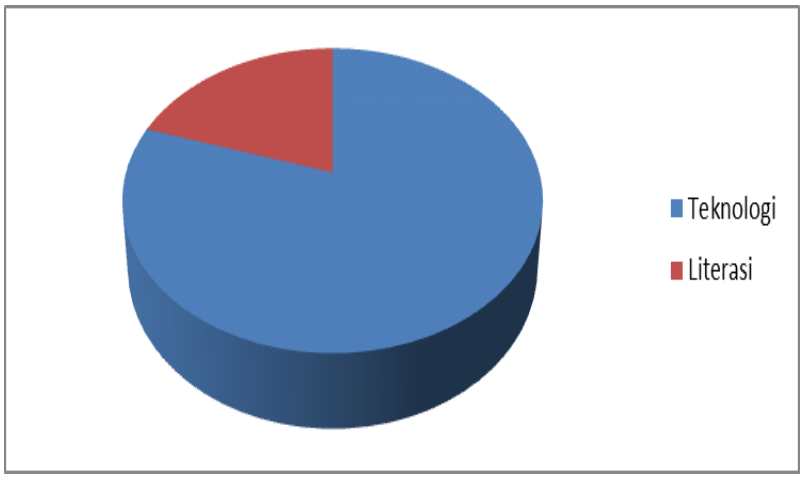


Figure 2. Comparison of Literacy and Technology in Student Learning Interests
(Kartini, Ketut Sepdyana., Putra, 2020)

Science literacy coupled with technology tends to be more effective than relying solely on print media(Muhammad Shohibul Ihsan & Siti Wardatul Jannah, 2021). With the help of animation in the learning process it can make it easier for students to understand and focus when the teacher explains learning material. Factors causing the low scientific literacy of students because students tend to learn and understand rote material. So that students are less able and apply the material in everyday life. Meanwhile, teachers are required to have good scientific literacy skills in order to support their students to develop scientific literacy skills.

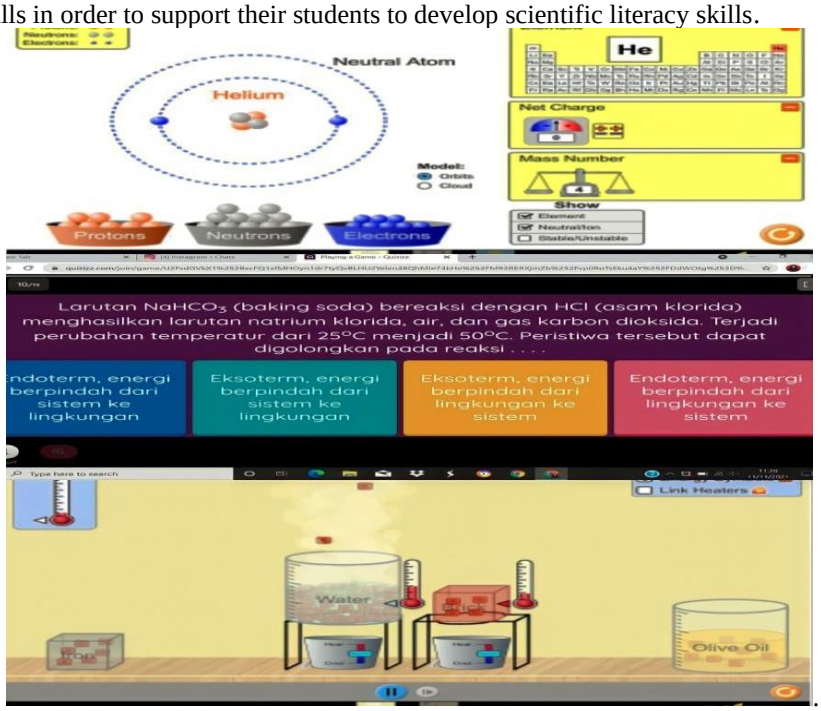


Figure 3. Use of Learning Multimedia Applications
(Khaldun et al., 2020)

Based on Figure 3, it can be said that Android-based chemistry learning media can grow student literacy which is used to support student activities. The use of Android-based chemistry learning media can provide opportunities for students to learn independently based on the practicality of media that is used repeatedly, anytime and anywhere. Providing opportunities to students aims to train thinking skills to act scientifically, learn independently and be able to make connections between knowledge and its application in everyday life. Aspects of scientific literacy that are used in android assistance include aspects of context, aspects of knowledge, aspects of competency, and aspects of attitude. The context aspect consists of several individual and local understandings of science and technology contained in the developed Android-based chemistry learning media. The knowledge aspect refers to the key concepts of science needed to understand natural phenomena and changes made to nature through human activities. Furthermore, competency aspects include explaining phenomena scientifically, evaluating and designing scientific investigations and interpreting scientific data and evidence. Meanwhile, aspects of attitudes toward science relate to interest in science. However, due to time constraints, the attitude aspect of scientific literacy was not measured. The knowledge aspect refers to the key concepts of science needed to understand natural phenomena and changes made to nature through human activities. Furthermore, competency aspects include explaining phenomena scientifically, evaluating and designing scientific investigations and interpreting scientific data and evidence. Meanwhile, aspects of attitudes toward science relate to interest in science. However, due to time constraints, the attitude aspect of scientific literacy was not measured. The knowledge aspect refers to the key concepts of science needed to understand natural phenomena and changes made to nature through human activities. Furthermore, competency aspects include explaining phenomena scientifically, evaluating and designing scientific investigations and interpreting scientific data and evidence. Meanwhile, aspects of attitudes toward science relate to interest in science. However, due to time constraints, the attitude aspect of scientific literacy was not measured.

CONCLUSION

Based on the results of the journal review, it was found that the use of technology-based media can foster students' scientific literacy, because flexible technological media can be used repeatedly with the readiness and willingness of students. So that with the help of technology it is hoped that it can increase student interest in learning so that in the future it can change student literacy which is lacking at the moment, and can create millennial generations who like to read. Of the 15 journals it says that scientific literacy associated with technology can foster students' interest in learning with an average of 80% and students who are very interested reach an average of 13.3%.

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