Digital Literacy on the Use of E-Module Towards Students' Self-Directed Learning on Learning Process and Outcomes Evaluation Cources

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ABSTRAK

Konteks pembelajaran di era revolusi 4.0 saat ini menjadi tantangan terutama dalam dunia pendidikan di tingkat universitas. Proses pembelajaran yang kreatif perlu dikembangkan sehingga pola pembelajaran perlu diperbarui dengan menempatkan siswa sebagai subjek pembelajaran dan menerapkan media pembelajaran yang lebih fleksibel. Penelitian ini bertujuan untuk menganalisis tingkat keeratan hubungan dan melihat ada tidaknya pengaruh simultan (bersama-sama) dan parsial antara literasi digital dengan self-directed learning siswa. Penelitian ini mengarah pada penelitian kuantitatif. Instrumen penelitian yang digunakan adalah angket terbuka dan tertutup. Kuesioner yang digunakan dalam penelitian ini adalah kuesioner terbuka dan tertutup. Sampel dalam penelitian ini adalah 33 mahasiswa dengan menggunakan teknik purposive sampling. Teknik yang digunakan untuk menganalisis data yaitu analisis deskriptif kualitatif, kuantitatif dan statistik inferensial. Hasil penelitian menunjukkan bahwa terdapat korelasi memiliki pengaruh simultan. Dapat disimpulkan bahwa terdapat tingkat korelasi yang kuat dan memiliki pengaruh secara simultan dan parsial antara literasi digital dan self-directed learning siswa terhadap penggunaan e-modul pada evaluasi proses dan hasil pembelajaran mata kuliah. Penggunaan e-module dapat memudahkan siswa dalam belajar dapat dapat meningkatkan Belajar mandiri pada siswa.

ABSTRACT

The context of learning in the 4.0 revolution era is currently a challenge, especially in education at the university level. Creative learning processes need to be developed so that learning patterns need to be updated by placing students as learning subjects and applying more flexible learning media. This study aims to analyze the level of closeness of the relationship and see whether there is a simultaneous (together) and partial effect between digital literacy and students' self-directed learning. This research leads to quantitative research. The research instrument used was an open and closed questionnaire. The questionnaire used in this study was an open and closed questionnaire. The sample in this study was 33 students using the purposive sampling technique. The technique used to analyze the data is descriptive qualitative analysis, quantitative and inferential statistics. The results showed that there was a correlation that had a simultaneous effect. It can be concluded that there is a strong correlation level and has a simultaneous and partial influence between digital literacy and students' self-directed learning on the use of e-modules in evaluating the process and learning outcomes of courses. The use of e-modules can make it easier for students to learn and can improve independent learning in students.

1. INTRODUCTION

The context of learning in the 4.0 revolution era is currently a challenge, especially in the world of education at the university level. The creative learning process needs to be developed so that learning patterns need to be updated by placing students as learning subjects (student-centered learning) and applying more flexible learning media in accordance with technological advances in the field of education to develop student abilities (Ana & Achdiani, 2017; Fuadati & Wilujeng, 2019; Hekmah et al., 2019). It is undeniable that the constant development of science and technology has an impact on the development of digital technology, especially in the educational process (Arifin & Sukmawidjaya, 2020; Lin et al., 2019; Saputro & Setyawan, 2020). Today's digital technology is increasingly complex and can even be said to have

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become a primary need. Students in this millennium era can be said to be digital natives where they grow up in the midst of the presence of technology that can access knowledge sources easily and quickly to improve the quality of learning activities (Darmaji, et al., 2019). Therefore, in the industrial era 4.0, reading, writing and arithmetic skills are not enough but need to be supported by digital literacy skills because they are an important part in the development of the learning process in higher education (Saputra & Salim, 2020). Digital literacy ability is the ability to find, identify, and write information through writing and other media on various digital platforms so that it can be used in education (Churchill, 2020; McDougall et al., 2018; Syah et al., 2019).

Students are adult learners who of course are often faced with a number of problems that must be solved independently, so with digital technology literacy skills, solutions can be easily found, but accompanied by a good Self-Directed Learning (SDL) attitude (Sert & Boynueğri, 2017; Turan & Koç, 2018). The self-directed learning process is a self-planned activity that is very important to be embedded in the learning process with the aim of giving each individual autonomy to explore abilities in accordance with self-initiative and independent nature so that they can find out strengths and weaknesses in the process. their independent learning (Irvani, 2019; Khiat, 2017; Stebbins, 2017). This method makes students more active in participating because it considers the uniqueness of learning styles, where students have full responsibility for practicing, organizing activities, diagnosing needs and being able to make decisions (Geng et al., 2019). Setting a learning independence strategy is one of the factors that determine success in achieving success in the process of life. In the process of SDL stages, students are responsible for the construction of meaning from teaching materials so they need the help of teaching media that support learning (Van Woezik et al., 2019). Learning using information technology is an important supplement and the best teaching method in accommodating students' independent learning which allows students to access the content of the material to be taught so that the teacher's ability to teach must follow technological developments (Hanifah et al., 2020; Onojah et al., 2020; Tanti et al., 2021), so as to create effective learning and facilitate students in learning.

The rapid development of information and communication technology is greatly felt in every line of life, including in the world of education which provides various means of creating new ways of learning (Haryanto et al., 2019; Mardiana, 2020; Suma et al., 2020). The use of ICT-based technology is considered very convenient both in learning that can be accessed easily through computers, laptops and mobile phones whose development is very important in the learning pattern in the classroom because it is arranged using platform technology principles so as to expand human capacity, especially in the field of education (Khlifi & El-Sabagh, 2017; Garcia et al., 2020). Learning in the 21st century era, both students and educators as parties involved in the world of education are required to be able to utilize technology to create an interactive, fun learning atmosphere and not only use printed books and lecture methods (Asrial et al., 2019; N. Susanti et al., 2014). Can use learning media to improve teaching and learning packaged in electronic form of digital visual multimedia-based learning, one of which is e-modules in the form of electronic module materials that are run with the help of computers and contribute to supporting self-instruction and training critical thinking concept (Farenta et al., 2016; Holland, 2019; Imansari & Sunaryantiningsih, 2017). The presence of e-modules is expected to be an effective and fun alternative learning resource.

The Jambi University Chemistry Education Study Program has various courses, one of which is Evaluation of Chemistry Learning Process and Outcomes which must be followed by all students. This course discusses value/score processing, making and determining appropriate assessment instrumentation both test and non-test, compiling items, analyzing items and interpreting test results. This course is very important to study for all prospective teachers because it is related to the ability or competence in conducting the assessment process. Assessment in education is complex and plays a central role in education because this is where student performance will be assessed (Baird et al., 2017; Schneider & Bodensohn, 2017; Ibarra-Sáiz et al., 2020). The implementation of the lectures is not only theoretical but also practical where students are equipped with the concept of understanding and ability skills in conducting assessments (assessment). Skills in conducting assessments will ensure effectiveness in teaching so as to provide students with a higher quality education (Yüksel & Gündüz, 2017; Harker et al., 2019). To make it easier for students to absorb the material presented, lecturers need to prepare appropriate teaching materials in accordance with the progress of the industrial revolution 4.0 era, namely learning that can be delivered through the concept of e-learning in electronic digital form in the form of e-modules or electronic modules (Liao et al., 2014; Bahreini et al., 2016; Herawati & Muhtadi, 2018).

The emergence of the digitalization era is a challenge as well as an opportunity for lecturers to respond and be creative in utilizing technology in learning such as developing and using innovative electronic learning media products in the form of e-modules to facilitate students in learning and can be used for independent learning that can be practiced anytime and anywhere (Darmaji, Kurniawan, Astalini, & Nasih, 2019; Hermawan, 2020; Kholid, 2020). So it is appropriate that Digital-age Literacy in a higher

education institution can be an agent of change by implementing a learning design in the form of digital media in order to present interesting, contextual and interactive material both audio and visual (Ridha Rizki Novanda, 2019; Setyaningsih et al., 2019). The use of digital media in learning will bring up Self-Directed Learning (SDL) students to learn to solve problems and be able to evaluate thinking and performance against a series of assignments given.

Research on digital literacy conducted by many other researchers focuses on studies on the effect of digital literacy on student learning outcomes. The research examines the effect of digital-based learning on students' motivation and cognitive learning outcomes where digital literacy-based learning affects students' motivation and cognitive learning (Benavides-Varela et al., 2020; Kajin, 2018). Other research examines digital literacy and self-directed learning in thesis students where digital literacy has a significant relationship with self-directed learning (Akbar & Anggraeni, 2017; Suyasa et al., 2021). Based on previous studies, it was found that the studies that had been conducted examined digital literacy with student learning outcomes and digital literacy with self-directed learning. Therefore, the novelty of this research will examine the effect of students' digital literacy on the use of e-modules on self-directed learning. This research expands the scope of research by linking digital literacy and self-directed learning to the use of technology in learning so that it can support the development of learning as science and technology develops. So the purpose of this research is to find out the correlation and simultaneous influence between digital literacy (DL) and self-directed learning (SDL) on the use of e-modules.

2. METHOD

This research is a research that uses a quantitative approach with correlational analysis to determine the level of closeness of the relationship between variables. The variables tested are X: digital literacy and Y: self-directed learning. Quantitative research has a positivism paradigm in an action-based transformative agenda that is used for research on an object in the form of a certain population or sample (Darmaji, et al., 2019; Tavakol & Sandars, 2014; Wright, 2014). Quantitative research emphasizes quantity and numbers and uses data in the form of a Likert scale with a questionnaire as the data collection instrument (Zedko et al., 2017; Indra et al., 2020; Rokhim et al., 2020). Research with a quantitative approach is carried out to measure data in the form of numerical data which is then analyzed to obtain a research result. The research instrument used was an open and closed questionnaire equipped with a Likert scale and additional information related to digital literacy skills and student self-directed learning attitudes. The instrument becomes a useful evaluation tool for data processing, it must go through the validation stage first (Jang & Protacio, 2020). Questionnaire is a written statement that is useful for collecting data or information from respondents. The questionnaire used in this study is an open and closed questionnaire which is arranged on a five-scale Likert scale. Then the results of student questionnaires are grouped into 5 categories, namely: 0,000-0,199 (Very low), 0,20-0,399 (Low), 0,40-0,599 (Medium), 0,60-0,799 (Strong), and 0,80-1,00 (Very strong).

The research was conducted within the Chemistry Education Study Program. The population in this study were students of the Chemistry Education study program who took the Chemistry Study Process and Outcomes Evaluation course. In a study, the population and the sample have a close relationship with each other. The research sample is part of the population that represents the entire population in the study so that it is stated that the number of samples is the total population (Astiti et al., 2017; Seika Ayuni et al., 2017; Zedko et al., 2017). The sample in this study were 33 students who attended the Process Evaluation and Learning Outcomes Chemistry course. The population and samples in the study were taken using certain sampling techniques.

The sampling technique used in this study is a purposive sampling technique. *Purposive sampling was used in this study because the research sample was determined based on the consideration of heterogeneous selection of students' cognitive abilities.* The data obtained will be analyzed by correlation coefficient test using the simple Pearson Product Moment formula, Simultaneous Regression Coefficient Test (F test), and partial regression coefficient test (t test) used to test the significance level of each independent variable coefficient individually. to the dependent variable (Riduwan & Akdon, 2015; Sugiyono, 2017). While the inferential statistics used are hypothesis testing (t-test) with the test criteria is H_0 is accepted if $t_{count} < t_{table}$ and H_0 is rejected if if $t_{count} > t_{table}$, at a significance level of 5% (Dewi et al., 2019).

Questionnaire distribution → Questionnaire analysis → Result → Conclusion

Figure 1. The Flowchart of Data Collection Procedure

3. RESULT AND DISCUSSION

Result

Digital literacy skills are an urgent need that needs to be possessed in the modern era like today in order to be able to compete globally. The use of e-modules that utilize technology such as digital media will have an impact on students' digital literacy. Digital literacy using e-modules will have an impact on students' self-directed learning because it is related to students' ability to take the initiative to be responsible for learning. There have not been many studies on digital literacy on the use of e-modules related to its effect on self-directed learning. Therefore, the novelty of this study is to examine students' digital literacy on the use of e-modules for self-directed learning which the researchers reviewed in the course of evaluating learning processes and outcomes. The output of this research test includes observations of students' digital literacy, students' independence, the level of correlation, and the effect of both partially and simultaneously between variables, where the calculation process uses the help of SPSS V.17 software. The results of observations of student digital literacy are presented in Table1.

Table 1. Results of Observation of Students' Digital Literacy

No	Digital Competence	Indicator	Aspects Observed	Score 1 2 3 4	Score	Category
1.	Technical Skills	Limited	a. Using only textbooks in learning activities (1)	√ (3)	2,8	Good
		Fluent	b. Utilizing digital media such as educational games and digital books as learning media (2)	√ (3)	3,1	Good
		active	c. Can use several types of digital media (3)	√ (3)	3	Good
			Total		**3**	**Good**
2.	Critical Under-Standing	Understand	a. Digital media can help me understand the subject matter Rate of Reaction (6)	√ (3)	2,8	Good
		Analyze	b. Students prefer to use printed books instead of using digital media (5)	√ (3)	3	Good
		Evaluate	c. Using digital media, can increase my interest in learning (8)	√ (3)	3,3	Very Good
			Total		**3,1**	**Good**
3.	Commu-Nicative Abilities	Cooperation	a. Through digital media, students can exchange ideas with friends about the Reaction Rate material (7)	√ (3)	3,2	Good
		Caution	b. Digital media makes it difficult for students to complete assignments (10)	√ (3)	2,65	Good
		Active participation	c. Students use digital media to discuss (9)	√ (3)	3,1	Good
			Total			**Good**

Based on Table 1, it is known that the digital technical skills competency with limited indicators and the observed aspect is that only using textbooks in learning activities has a score of 2.8 and is in the good category. In the fluent indicator, the observed aspect is the use of digital media such as educational games and digital books as learning media, which has a score of 3.1 and is in the good category. Then, the active indicator with the observed aspect is being able to use several types of digital media has a score of 3 and is in the good category. So that the total score on digital technical skills competence is 3 which is categorized as good.

In the digital critical understanding competence with understanding indicators and the observed aspect is that digital media can help me in understanding the subject matter of the reaction rate has a score of 2.8 and is in the good category. In the indicators of analyzing the observed aspects, students prefer to use

printed books rather than using digital media, having a score of 3 which is in the good category. Then, on the evaluation indicator, the assessed aspect is that using digital media can increase interest in learning. I have a score of 3.3 and are in the very good category. So that the total score on digital critical understading competence is 3.1 which is in the good category.

In the digital communicative abilities competency with cooperation indicators and the observed aspect is through digital media, students can exchange ideas with friends about the reaction rate material which has a score of 3.2 and is in the good category. In the precautionary indicator, the observed aspect is that digital media makes it difficult for students to complete assignments and has a score of 2.65 and is categorized as good. Then, on the indicator of active participation with the observed aspect, students using digital media to discuss have a score of 3.1 and are in the good category. So the total score on digital communicative abilities is 3 which is in the good category. Furthermore, the results of the student independence questionnaire are shown in Table 2.

Table 2. Student Independence Questionnaire Results

No	Indicator	Aspects Observed	Score	Category
1.	Independence from others	Choosing the optimal learning strategy	3.1	Good
		Completing lecture assignments according to their own abilities	3	Good
		Dare to express a different opinion	2.8	Good
2.	Have confidence	Have confidence can achieve learning goals	3	Good
		Have confidence in being able to overcome problems or obstacles in learning	3.1	Good
3.	Behave discipline	Completing assignments on time	3	Good
		Optimizing time in doing tasks	2.8	Good
		Making plans for learning activities	3	Good
4.	Have a sense of responsibility	Encourage yourself to keep on learning	3.3	Very Good
		Focus on learning activities	3,3	Very Good
5.	Behave on your own initiative	Take the initiative to ask the lecturer if something is not understood	3	Good
		Acting consciously of one's own will	3.3	Very Good
		Doing practice questions even though it's not a lecture assignment	2.65	Good
6.	Optimal use of learning resources	Utilize the virtual lab as a learning resource	3.2	Good
		Use the internet to find additional references	3.3	Very Good
		Read source books	3	Good
7.	Evaluating the learning experience	Experience the benefits of learning to use the module	3.3	Very Good
		Observing the increase and decrease in learning outcomes	2.8	Good
		Trying to study hard again when the grades don't match expectations	3	Good

Based on Table 2, it can be seen that the indicators of independence from others with the observed aspects are choosing the optimal learning strategy, completing lecture assignments according to their own abilities, having scores of 3.1 and 3 respectively, all of which are in the good category. The indicators of having self-confidence with the observed aspects are daring to express different opinions, having confidence that they can achieve learning goals, having confidence in being able to overcome problems or obstacles in learning have a score of 2.8; 3; and 3.1, all of which are in the good category. In the indicators of disciplined behavior with the observed aspects, namely completing assignments on time, optimizing time in doing assignments, making plans for learning activities successively has a score of 3; 2.8; and 3 which are all good category. The indicator of having a sense of responsibility with the assessed aspect, namely spurring oneself to continue to be passionate about learning and focusing attention in lecture activities has a score of 3.3 and 3.3, both of which are in the very good category. In the indicators of behavior on their own initiative, the observed aspects are taking the initiative to ask the lecturer if there is something that is not understood, acting consciously of their own will, and doing practice questions even though they are not college assignments, having a score of 3 in a row; 3.3; and 2.65 which are categorized as good, very good,

and good. In the indicators of optimally utilizing learning resources with the observed aspects, namely utilizing virtual labs as learning resources, utilizing the internet to find additional references, and reading source books, the score is 3.2; 3.3; and 3 which are in the good, very good, and good categories. The indicators for evaluating the learning experience with the observed aspects are feeling the benefits of learning to use modules, observing the increase and decrease in learning outcomes, and trying to study harder when getting a score that is not as expected has a score of 3.3; 2.8; and 3 with categories in a row are very good, good, and good. Then the results of the correlation and determination of digital literacy on self-directed learning.

Based on the analysis of the summary model, the correlation value (R) of the relationship between digital literacy ability using the e-module function and self-directed learning has a positive correlation of 0.705, which means it has a strong relationship while the percentage value of the coefficient of determination (R^2) is 49%. The significance of this value implies that the variable digital literacy ability only has a 49% effect on students' self-directed learning attitudes.

The Anova table shows the magnitude of the F value which aims to determine whether or not there is a simultaneous (together) effect given by each variable. For the effect of digital literacy ability using the e-module function on self-directed learning is 0.000 < 0.005 with a value of F_{count} (31.708) > F_{table} (3.32), so it can be concluded that digital literacy skills simultaneously together have an influence on independent learning attitudes (self-directed learning). The coefficient table above describes the partial effect significant test (t test). Based on the table, the coefficient value of digital literacy ability using the e-module function on self-directed learning is 0.760 with t_{count} = 5.631 > t_{table} = 1.69092 and the significance value is 0.000 < 0.05, it can be concluded that there is a significant influence between digital literacy ability on self-directed learning attitude.

Discussion

The description of the research results show that there is a strong correlation and simultaneous and partial influence of digital literacy skills with self-directed learning attitudes. Along with the rapid and massive development of the times, in independent learning, students are currently facilitated by the availability of technology. So in the current era, digital literacy is an important provision in student self-study (Latifah, 2018; Park et al., 2020). The technique of combining independent learning with the use of ICT is an important factor in helping to improve learning efficiency in the digital era (Haji et al., 2015; Naz & Muhammad Athar Hussain, 2020). To make it easier for students to absorb material, lecturers need to prepare appropriate teaching materials that can be delivered through the concept of e-learning in the form of e-modules that have several advantages, namely learning becomes more active and interactive, stimulates interest, challenges, raises the concept of independent learning and is more flexible because it can be accessed anywhere and anytime (Pitaloka et al., 2020; Sanova, 2018).

Students stated that the use of e-modules can help them understand the course material and can operate all types of instructions contained in the e-modules smoothly and according to instructions, so that students can solve a problem with or without the help of others. E-module can help students in learning (Ilmi et al., 2021; Purnamasari et al., 2020). If they encounter obstacles or difficulties, students have the confidence to be able to solve them by thinking of solutive ways to solve these problems, either by discussing forums, seeking information either from the internet or other relevant reference sources.

In the context of education, digital literacy needs to be developed to train the ability to understand, pay close attention to analyze, organize, assess, evaluate information wisely and correctly which indirectly digital literacy plays a role in developing knowledge, creativity, curiosity, selecting information, critical thinking, collaborating and communicating (Nani Pratiwi & Nola Pritanova, 2017). Thus enabling each individual to manage the learning process in the form of his own initiative, able to diagnose needs, set strategies, self-exploration and freedom of learning to achieve optimal learning outcomes with the right learning resources. Digital literacy which refers to a set of competencies related to the use of digital media and information technology, along with technological developments with the existence of laptops or cellphones, making digital literacy very important in the education provided to students in learning (Jayanti et al., 2017; McDougall et al., 2018; Leaning, 2019). Digital literacy is related to the individual's ability to live, study, and work in a digital society, in the education sector as well as universities began to incorporate digital literacy into the curriculum because students are required to express their ideas in digital media (Chan et al., 2017; Spante et al., 2018; Tejedor et al., 2020).

Digital literacy is widely used as a topic in research so that many researchers associate digital literacy with students' abilities. Previous research on digital literacy can be associated with electronic media such as websites (Rahayu et al., 2019). Then another study found that digital literacy can be associated with student achievement as an indicator of success in learning (Giovanni & Komariah, 2019). Another study found that participants did not understand the wise attitude in using digital literacy on social media (Susanti

et al., 2020). Digital literacy in this study is associated with self-directed learning which is an important ability in learning.

Self-directed learning is a learning process that arises as a result of self-initiative so that it is closely related to independence in learning. Research on independence has been widely carried out by researchers who study efforts to increase the learning independence of fifth grade students (Mina et al., 2017). Then another study analyzed student learning independence in social studies subjects for class VIII MTSN 1 Kotim with the results that students tended to be quite good at each indicator of social studies learning independence (Winartiningsih et al., 2018). Furthermore, other research states that students' learning independence in mathematics is classified as moderate so it needs to be improved (Suleang et al., 2020). This shows that research on learning independence that has been carried out by researchers is more focused on the analysis of learning independence itself and the relationship/influence of learning independence on student learning outcomes.

Based on previous studies, digital literacy is widely studied by relating it to learning outcomes or student motivation. So the novelty in this research is to examine digital literacy which is associated with self-directed learning on the use of e-modules. The influence of digital literacy on the use of e-modules is a result of the use of information technology in learning. The use of e-modules will bring up digital literacy for students who use them which will result in students' self-directed learning. Therefore, this study examines a more varied aspect, namely digital literacy in the use of e-modules on students' self-directed learning in learning process and outcomes evaluation courses. So a study on digital literacy which is associated with self-directed learning, especially on the effective use of e-modules, must be carried out. This research can be developed by linking literacy with other students' abilities so as to support the learning process. The limitation of this study is only to examine the correlation and influence of digital literacy with self-directed learning. In addition, this study only examines the correlation and influence of digital literacy with self-directed learning on the use of e-modules on learning processes and outcomes evaluation courses. This research can be further developed by linking digital literacy with other learning models or other courses so that it can support the learning process.

4. CONCLUSION

The students' digital literacy skills on the use of e-modules are positively correlated with self-directed learning on learning processes and outcomes evaluation courses. Then, students' digital literacy skills on the use of e-modules also have a simultaneous and significant influence on self-directed learning on learning processes and outcomes evaluation courses.

5. ACKNOWLEDGEMENT

6. REFERENCES

Akbar, M. F., & Anggraeni, F. D. (2017). Teknologi dalam Pendidikan : Literasi Digital dan Self-Directed Learning pada Mahasiswa Skripsi. *Indigenous: Jurnal Ilmiah Psikologi*, *2*(1), 28–38. https://doi.org/10.23917/indigenous.v1i1.4458.

Ana, A., & Achdiani, Y. (2017). Penerapan Self Regulated Learning Berbasis Internet Untuk Meningkatkan Kemandirian Belajar Mahasiswa. *Innovation of Vocational Technology Education*, *11*(1), 15–22. https://doi.org/10.17509/invotec.v11i1.4835.

Arifin, S., & Sukmawidjaya, M. (2020). Technology Transformation and Its Impact on Lecturer's Performance. *JPI (Jurnal Pendidikan Indonesia)*, *9*(1), 153–162. https://doi.org/10.23887/jpi-undiksha.v9i1.24372.

Asrial, Syahrial, Kurniawan, D. A., Chan, F., Septianingsih, R., & Perdana, R. (2019). Multimedia innovation 4.0 in education: E-modul ethnoconstructivism. *Universal Journal of Educational Research*, *7*(10), 2098–2107. https://doi.org/10.13189/ujer.2019.071007.

Astiti, N. P. M., Ardana, I. K., & Wiarta, I. W. (2017). Pengaruh Model Pembelajaran Children Learning in Science Berbasis Budaya Penyelidikan Terhadap Kompetensi Pengetahuan IPA. *Journal of*

Education Technology, *1*(2), 86–93. https://doi.org/10.23887/jet.v1i2.11744.

Bahreini, K., Nadolski, R., & Westera, W. (2016). Towards Multimodal Emotion Recognition in E-learning Environments. *Interactive Learning Environments*, *24*(3), 590–605. https://doi.org/10.1080/10494820.2014.908927.

Baird, J. A., Andrich, D., Hopfenbeck, T. N., & Stobart, G. (2017). Assessment and Learning: Fields Apart? *Assessment in Education: Principles, Policy and Practice*, *24*(3), 317–350. https://doi.org/10.1080/0969594X.2017.1319337.

Benavides-Varela, S., Callegher, C. Z., Fagiolini, B., Leo, I., Altoè, G., & Lucangeli, D. (2020). Effectiveness of digital-based interventions for children with mathematical learning difficulties: A meta-analysis. *Computers & Education*, *157*. https://doi.org/10.1016/j.compedu.2020.103953.

Chan, B. S. K., Churchill, D., & Chiu, T. K. F. (2017). Digital Literacy Learning in Higher Education through Digital Storytelling Approach. *Journal of International Education Research (JIER)*, *13*(1), 1–16. https://doi.org/10.19030/jier.v13i1.9907.

Churchill, N. (2020). Development of Students' Digital Literacy Skills through Digital Storytelling with Mobile Devices. *Educational Media International*, *57*(3), 271–284. https://doi.org/10.1080/09523987.2020.1833680.

Darmaji, Kurniawan, D. A., Astalini, Lumbantoruan, A., & Samosir, S. C. (2019). Mobile learning in higher education for the industrial revolution 4.0: Perception and response of physics practicum. In *International Journal of Interactive Mobile Technologies* (Vol. 13, Issue 9). https://doi.org/10.3991/ijim.v13i09.10948.

Darmaji, Kurniawan, D. A., Astalini, & Nasih, N. R. (2019). Persepsi Mahasiswa pada Penuntun Praktikum Fisika 1059 Dasar II Berbasis Mobile Learning. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *4*(4), 516–523. https://doi.org/10.17977/jptpp.v4i4.12345.

Dewi, N. N. K., Kristiantari, M. . R., & Ganing, N. N. (2019). Pengaruh Model Pembelajaran Picture And Picture Berbantuan Media Visual Terhadap Keterampilan Menulis Bahasa Indonesia. *Journal of Education Technology*, *3*(4). https://doi.org/10.23887/jet.v3i4.22364.

Farenta, A. S., Sulton, & Setyosari, P. (2016). Pengembangan E-Module Berbasis Problem Based Learning Mata Pelajaran Kimia Untuk Siswa Kelas X Sma Negeri 8 Malang. *Jurnal Pendidikan - Teori, Penelitian, Dan Pengembangan*, *1*(6), 1159–1168. https://doi.org/10.17977/jp.v1i6.6460.

Fuadati, M., & Wilujeng, I. (2019). Web-Lembar Kerja Peserta Didik IPA Terintegrasi Potensi Lokal Pabrik Gula untuk Meningkatkan Rasa Ingin Tahu Peserta Didik. *Jurnal Inovasi Pendidikan IPA*, *5*(1), 98–108. https://doi.org/10.21831/jipi.v5i1.24543.

Garcia, A., Kelly, M. R., & Stamatis, K. (2020). When Technology Goes Unnoticed: Teacher Beliefs and Assumptions about Technology Use in Three 9th Grade English Classrooms. *Pedagogies*, 1–22. https://doi.org/10.1080/1554480X.2020.1781638.

Geng, S., Law, K. M. Y., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. *International Journal of Educational Technology in Higher Education*, *16*(1), 17. https://doi.org/10.1186/s41239-019-0147-0.

Giovanni, F., & Komariah, N. (2019). Hubungan antara Literasi Digital dengan Prestasi Belajar Siswa SMA Negeri 6 Kota Bogor. *LIBRARIA: Jurnal Perpustakaan*, *7*(1), 147–162. https://doi.org/10.21043/libraria.v7i1.5827.

Haji, A. G., Safriana, & Safitri, R. (2015). The use of problem based learning to increase students' learning independent and to investigate students' concept understanding on rotational dynamic at students of SMA Negeri 4 Banda Aceh. *Jurnal Pendidikan IPA Indonesia*, *4*(1), 67–72. https://doi.org/10.15294/jpii.v4i1.3503.

Hanifah, N. H., Rofiki, I., Sedayu, A., & Hariyadi, M. A. (2020). Mobile Learning Pada Mata Kuliah Strategi Pembelajaran Mi/Sd: Penelitian Pengembangan. *Ta'dib*, *23*(1), 119. https://doi.org/10.31958/jt.v23i1.1704.

Harker, K., O'Toole, E., Keshmiripour, S., McIntosh, M., & Sassen, C. (2019). Mixed-Methods Assessment of a Mentoring Program. *Journal of Library Administration*, 1–30. https://doi.org/10.1080/01930826.2019.1661745.

Hekmah, N., Wilujeng, I., & Suryadarma, I. G. P. (2019). Web-Lembar Kerja Siswa IPA terintegrasi lingkungan untuk meningkatkan literasi lingkungan siswa. *Jurnal Inovasi Pendidikan IPA*. https://doi.org/10.21831/jipi.v5i2.25402.

Herawati, N. S., & Muhtadi, A. (2018). Pengembangan Modul Elektronik (E-Modul) Interaktif Pada Mata Pelajaran Kimia kelas XI SMA. *Jurnal Inovasi Teknologi Pendidikan*, *5*(2), 180–191. https://doi.org/10.21831/jitp.v5i2.15424.

Hermawan, Y. D. (2020). Dampak Pandemi Covid-19 terhadap Eksistensi Pendidik di Era Digital. *Quality*, *8*(2), 303. https://doi.org/10.21043/quality.v8i2.8182.

Holland, E. P. (2019). Making Sense of Module Feedback: Accounting for Individual Behaviours in Student Evaluations of Teaching. *Assessment and Evaluation in Higher Education*, *44*(6), 961–972. https://doi.org/10.1080/02602938.2018.1556777.

Ibarra-Sáiz, M. S., Rodríguez-Gómez, G., & Boud, D. (2020). The Quality of Assessment Tasks as A Determinant of Learning. *Assessment and Evaluation in Higher Education*, *0*(0), 1–13. https://doi.org/10.1080/02602938.2020.1828268.

Ilmi, R., Arnawa, I. M., Yerizon, & Bakar, N. N. (2021). Development of an Android-Based for Math E-Module by using Adobe Flash Professional CS6 for Grade X Students of Senior High School. *Journal of Physics: Conference Series*, *1742*(1). https://doi.org/10.1088/1742-6596/1742/1/012026.

Imansari, N., & Sunaryantiningsih, I. (2017). Pengaruh Penggunaan E-Modul Interaktif Terhadap Hasil Belajar Mahasiswa Pada Materi Kesehatan dan Keselamatan Kerja. *VOLT : Jurnal Ilmiah Pendidikan Teknik Elektro*, *2*(1), 11–16. https://doi.org/10.30870/volt.v2i1.1478.

Indra, P., Saragi, R. E. S., & Aribowo, E. K. (2020). Persepsi Siswa terhadap Pemanfaatan Media Kahoot dalam Pembelajaran Bahasa Indonesia. *Kwangsan: Jurnal Teknologi Pendidikan*, *8*(2), 290–306. https://doi.org/10.31800/jtp.kw.v8n2.p290--306.

Irvani, A. I. (2019). Hubungan Kemampuan Self-Directed Learning Dan Problem Solving Siswa Smp Melalui Pembelajaran Berbasis Masalah. *Journal of Teaching and Learning Physics*, *4*(1), 28–33. https://doi.org/10.15575/jotalp.v4i1.3792.

Jang, B. G., & Protacio, M. S. (2020). Use of Cognitive Interviews to Test the Validity of a Reading Motivation Instrument for English Learners. *Reading Psychology*, 1–21. https://doi.org/10.1080/02702711.2020.1813226.

Jayanti, E. D., Aryana, I., & Gunamantha, I. M. (2017). Pengaruh Model Pembelajaran Sains Teknologi Masyarakat terhadap Hasil Belajar Ipa Ditinjau dari Literasi Digital Siswa Kelas V Sekolah Dasar Gugus VI Kecamatan Mengwi. *PENDASI: Jurnal Pendidikan Dasar Indonesia*, *1*(2), 55–64. https://doi.org/10.23887/jpdi.v1i2.2681.

Kajin, S. (2018). Pengaruh Pembelajaran Berbasis Literasi Digital terhadap Motivasi dan Hasil Belajar Kognitif di MTs N Mojosari dan MTs N Sooko Mojokerto. *Progressa: Journal of Islamic Religious ...*, *2*(1), 133–142.

Khiat, H. (2017). Academic Performance and The Practice of Self-Directed Learning: The Adult Student Perspective. *Journal of Further and Higher Education*, *41*(1), 44–59. https://doi.org/10.1080/0309877X.2015.1062849.

Khlifi, Y., & El-Sabagh, H. A. (2017). A novel authentication scheme for E-assessments based on student behavior over E-learning platform. *International Journal of Emerging Technologies in Learning*, *12*(4), 62–89. https://doi.org/10.3991/ijet.v12i04.6478.

Kholid. (2020). Pentingnya Literasi Digital bagi Guru Pada Lembaga Pendidikan Tingkat Dasar dan Implikasinya Terhadap Penylenggaraan Kegiatan Belajar Mengajar. *Jurnal Horizon Pendagogia*, 22–27. https://jurnal.untirta.ac.id/index.php/jhp/article/view/10422.

Latifah, K. (2018). Digital Literasi dan Self Directed Learning dalam Pembelajaran Mahasiswa PBI IAIN Surakarta. *Academica*, *2*(1), 159–167. http://ejournal.iainsurakarta.ac.id/index.php/academica/article/view/2247.

Leaning, M. (2019). An approach to digital literacy through the integration of media and information literacy. *Media and Communication*. https://doi.org/10.17645/mac.v7i2.1931.

Liao, J., Wang, M., Ran, W., & Yang, S. J. H. (2014). Collaborative cloud: a new model for e-learning. *Innovations in Education and Teaching International*, *51*(3), 338–351. https://doi.org/10.1080/14703297.2013.791554.

Lin, K. Y., Hsiao, H. S., Williams, P. J., & Chen, Y. H. (2019). Effects of 6E-oriented STEM Practical Activities in Cultivating Middle School Students' Attitudes toward Technology and Technological Inquiry Ability. *Research in Science and Technological Education*, 1–18. https://doi.org/10.1080/02635143.2018.1561432.

Mardiana, H. (2020). Lecturers' Adaptability To Technological Change And Its Impact On The Teaching Process. *JPI*, *9*(2). https://doi.org/10.23887/jpi-undiksha.v9i2.24595.

McDougall, J., Readman, M., & Wilkinson, P. (2018). The Uses of (Digital) Literacy. *Learning, Media and Technology*, *43*(3), 263–279. https://doi.org/10.1080/17439884.2018.1462206.

Mina, W., Israwati, & Victoria, L. (2017). Upaya Meningkatkan Kemandirian Belajar Siswa melalui Lesson Study Di Kelas V SD Negeri Lampageu Aceh Besar. *Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *2*(1), 185–192. http://www.jim.unsyiah.ac.id/pgsd/article/view/2547.

Nani Pratiwi, & Nola Pritanova. (2017). Pengaruh Literasi Digital terhadap Psikologis Anak dan Remaja. *Jurnal Semantik*, *6*(1), 11–24. http://e-journal.stkipsiliwangi.ac.id/index.php/semantik/article/view/250/0.

Naz, S., & Muhammad Athar Hussain. (2020). *Trends in Self Directed Learning : Constraints and Opportunities*. *7*(1), 63–75. https://jesar.su.edu.pk/uploads/journals/Article_52.pdf.

Onojah, A. O., Onojah, A. A., Olumorin, C. O., & Abimbola, I. O. (2020). Study Technology: The Suitable Tenacity to Learning Snags. *JPI (Jurnal Pendidikan Indonesia)*, *9*(3), 497–507. https://doi.org/10.23887/jpi-undiksha.v9i3.25191.

Park, H., Kim, H. S., & Park, H. W. (2020). A Scientometric Study of Digital Literacy, ICT Literacy, Information Literacy, and Media Literacy. *Journal of Data and Information Science*. https://doi.org/10.2478/jdis-2021-0001.

Pitaloka, N. L., Anggraini, H. W., Kurniawan, D., Erlina, E., & Jaya, H. P. (2020). Blended Learning in a Reading Course: Undergraduate EFL Students' Perceptions and Experiences. *IRJE |Indonesian Research Journal in Education|*, *4*(1), 43–57. https://doi.org/10.22437/irje.v4i1.8790.

Purnamasari, N., Siswanto, S., & Malik, S. (2020). E-module as an emergency-innovated learning source during the Covid-19 outbreak. *Psychology, Evaluation, and Technology in Educational Research*, *3*(1), 1–8. https://doi.org/10.33292/petier.v3i1.53.

Rahayu, T., Mayasari, T., & Huriawati, F. (2019). Pengembangan Media Website Hybrid Learning berbasis Kemampuan Literasi Digital dalam Pembelajaran Fisika. *Jurnal Pendidikan Fisika*, *7*(1), 130–142. https://doi.org/10.24127/jpf.v7i1.1567.

Ridha Rizki Novanda. (2019). Hubungan Literasi Digital dengan Self Directed Learning Pada Mahasiswa Di Daerah Miskin Sumatera. *Jurnal Ilmu Informasi, Perpustakaan Dan Kearsipan*, *Vol. 21*(No. 1), 20–24. http://dx.doi.org/10.7454/jipk.v21i1.115.

Riduwan, & Akdon. (2015). *Rumus dan Data Dalam Analisis Statistika* (6th ed.). Alfabeta.

Rokhim, D. A., Widarti, H. R., & Fajaroh, F. (2020). Pengembangan Bahan Belajar Flipbook pada Materi Redoks dan Elektrokimia Berbasis Pendekatan STEM-PjBL Berbantuan Video Pembelajaran. *Kwangsan: Jurnal Teknologi Pendidikan*, *8*(2), 234–250. https://doi.org/10.31800/jtp.kw.v8n2.p234--250.

Sanova, A. (2018). Learning Management System (LMS) Sebagai Aplikasi Pengembangan Materi Interaktif Pada mata Kimia Lingkungan dengan Metode Computer Assisted Instruction. *Jurnal Sains Sosio Humaniora*, *2*(1), 61–68. https://doi.org/10.22437/jssh.v2i1.5282.

Saputra, H. N., & Salim, S. (2020). Potret Sikap Mahasiswa dalam Penggunaan Literasi Digital. *Jurnal Komunikasi Pendidikan*, *4*(2), 94. https://doi.org/10.32585/jkp.v4i2.667.

Saputro, S. D., & Setyawan, A. (2020). The Effectiveness Use of Virtual Reality Media in Physics Education of Solar System Towards Cognitive Learning Outcomes. *JPI (Jurnal Pendidikan Indonesia)*, *9*(3), 389–400. https://doi.org/10.23887/jpi-undiksha.v9i3.23105.

Schneider, C., & Bodensohn, R. (2017). Student Teachers' Appraisal of The Importance of Assessment in Teacher Education and Self-Reports on The Development of Assessment Competence. *Assessment in Education: Principles, Policy and Practice*, *24*(2), 127–146. https://doi.org/10.1080/0969594X.2017.1293002.

Seika Ayuni, I. G. a. P. A., Kusmariyatni, N., & Japa, I. G. N. (2017). Pengaruh Model Pembelajaran Talking Stick Berbantuan Media Question Box Terhadap Hasil Belajar Ipa Kelas V. *Journal of Education Technology*, *1*(3), 183. https://doi.org/10.23887/jet.v1i3.12503.

Sert, N., & Boynueğri, E. (2017). Digital technology use by the students and english teachers and self-directed language learning. *World Journal on Educational Technology: Current Issues*, *9*(1), 24. https://doi.org/10.18844/wjet.v9i1.993.

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital Competence and Digital Literacy in Higher Education Research: Systematic Review of Concept Use. *Cogent Education*, *5*(1), 1–21. https://doi.org/10.1080/2331186X.2018.1519143.

Stebbins, R. A. (2017). Self-Directed Learning as A Basis for Complex Leisure. *Loisir et Societe*, *40*(3), 377–387. https://doi.org/10.1080/07053436.2017.1378505.

Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Alfabeta.

Suleang, F., Katili, N., & Zakiyah, S. (2020). Analisis Kemandirian Belajar Siswa melalui Pembelajaran Daring pada Mata Pelajaran Matematika. *EULER: Jurnal Ilmiah Matematika, Sains Dan Teknologi*, *8*(1), 29–35. https://doi.org/10.34312/euler.v8i1.10392.

Suma, K., Suwindra, I. N. ., & Sujanem, R. (2020). The Effectiveness of Blended Learning in Increasing Prospective Physics Teacher Students' Learning Motivation and Problem-Solving Ability. *JPI (Jurnal Pendidikan Indonesia)*, *9*(3), 436–445. https://doi.org/10.23887/jpi-undiksha.v9i3.21947.

Susanti, F., Ratnawati, W., & Jazwita, D. I. (2020). Loyalitas Kreativitas Abdi Masyarakat Kreatif Loyalitas Kreativitas Abdi Masyarakat Kreatif. *Jurnal LOKABMAS Kreatif*, *01*(02), 35–40. http://openjournal.unpam.ac.id/index.php/JLKK/article/download/14330/8124.

Susanti, N., Purwaningsih, S., & Jufrida. (2014). The Development Of Instructional Media on The Object

Hydrogen Atoms In The Mechanical A Quantum. *Proceeding 3rd International Seminar on Quality and Affordable Education (ISQAE)*, 65–71.

Suyasa, P. W. A., Divayana, D. G. H., & Kristiantari, M. R. (2021). The effect of digital books based on kvisoft flipbook maker on student learning outcomes. *Journal of Physics: Conference Series*, *1810*(1), 012046. https://doi.org/10.1088/1742-6596/1810/1/012046.

Syah, R., Darmawan, D., & Purnawan, A. (2019). Analisis Faktor yang Mempengaruhi Kemampuan Literasi Digital. *Jurnal Akrab*, *10*(2), 60–69.

Tanti, T., Kurniawan, D. A., Firmansyah, R., & Zain, M. S. (2021). Correlation Between Reading Fondness and Attitude Toward Science at Middle School. *Jurnal Pendidikan Indonesia*, *10*(1), 46–56. https://doi.org/10.23887/jpi-undiksha.v10i1.24701.

Tavakol, M., & Sandars, J. (2014). Quantitative and Qualitative Methods in Medical Education Research: AMEE Guide No 90: Part II. *Medical Teacher*, *36*, 838–848. https://doi.org/10.3109/0142159X.2014.915297.

Tejedor, S., Cervi, L., Pérez-Escoda, A., & Jumbo, F. T. (2020). Digital literacy and higher education during COVID-19 lockdown: Spain, Italy, and Ecuador. *Publications*. https://doi.org/10.3390/publications8040048.

Turan, M. B., & Koç, K. (2018). The impact of self-directed learning readiness on critical thinking and self-efficacy among the students of the school of physical education and sports. *International Journal of Higher Education*, *7*(6), 98–105. https://doi.org/10.5430/ijhe.v7n6p98.

Van Woezik, T., Reuzel, R., Koksma, J., & Serpa, S. (2019). Exploring open space: A self-directed learning approach for higher education. *Cogent Education*, *6*(1), 1–22. https://doi.org/10.1080/2331186X.2019.1615766.

Winartiningsih, W. E., Halimah, S., & Kunci, K. (2018). Analisis Kemandirian Belajar pada Mata Pelajaran IPS Siswa Kelas VIII MTSN 1 Kotim. *Equilibria Pendidikan Jurnal Ilmiah Pendidikan Ekonomi*, *3*(1), 28–35.

Wright, S. (2014). Quantitative Research Performing other Worlds: Lessons from Sustainable Agriculture in The Philippines. *Australian Geographer*, *45*(1), 1–18. https://doi.org/10.1080/00049182.2014.869293.

Yüksel, H. S., & Gündüz, N. (2017). Formative and Summative Assessment in Higher Education: Opinions and Practices of Instructors. *European Journal of Education Studies*, *3*(8), 336–356. https://doi.org/10.5281/zenodo.832999.

Zedko, M., Ali, I., Evaluation, M., Lq, R., Journal, X., Zedko, M., & Sumual, I. (2017). Evaluation of Primary School Teachers' Pedagogical Competence in Implementing Curriculum. *Journal of Education and Learning*, *11*(3), 343–350. https://doi.org/10.11591/edulearn.v11i3.6429.