Journal of Innovative Physics Teaching
Volume 1, Issue 1 June 2-23, 50 – 61
ISSN 3021-8551
https:// https://jipt.ppj.unp.ac.id/index,php/jipt
Doi: https://doi.org/10.24036/jipt/vol1-iss1/4

Preliminary Study on the Development of Global Warming E-Learning Material in Independent Curriculum

Mela Femilia[1], Asrizal[2*]
[1]Study Program of Physics Education, FMIPA, Universitas Negeri Padang, Padang, Indonesia.
[2] Physics Department, FMIPA, Universitas Negeri Padang, Padang, Indonesia.

Article Info

Article history:

Received June 13, 2023
Revised June 30, 2023
Accepted June 30, 2023

Keywords:

Preliminary study
E-Learning material
Global warming
Independent curriculum

ABSTRACT

Twenty first century education promotes the use of communication technology in learning. Electronic teaching materials are the application of communication technology in learning activities. However, the application of electronic teaching materials in the independent curriculum were still limited. The solution that can be done was to do a preliminary study. Preliminary study need to be carried out to analyze learning problems, students, learning objectives, and learning settings. This type of research is descriptive research. Data obtained using instruments in the form of interviews, questionnaires, and documentation. The data analysis technique used is descriptive statistical analysis. Based on data analysis, it can be stated that there are four results of this study. First, the problems experienced by teachers are designing content and variations in thinking skills in the sufficient category, enriching learning experiences using teaching materials in the sufficient category, adequacy and equitable evaluation of learning in the sufficient category. Second, the characteristics of students on global warming material are generally good. Third, the results of the analysis of learning objectives show competence in the appropriate category, content in the appropriate category, variations in the very appropriate category, and operational verb in the sufficient category. Fourth, the results of the analysis of learning settings are in the inappropriate category. Therefore, the results of this study can be used as a basis for developing electronic teaching materials according to the independent curriculum.

This work is licensed under a Creative Commons Attribution 4.0 International License.

***Correspondence:**
Asrizal, Physics Department, Universitas Negeri Padang, Padang, Indonesia.
email : asrizal@fmipa.unp.ac.id, Phone: 08126791903

INTRODUCTION

The twenty-first century or the century of globalization is experiencing rapid development in every aspect of life. One aspect of life that is experiencing development is the aspect of education. In today's digital age, education has entered the age of knowledge, accelerating the astounding acquisition of knowledge. The accelerating growth of knowledge is supported by the use of digital media and technology (Wangi, 2018). Education should create human resources who have the ability in the network and the internet (Yurnetti, et al., 2020). The implementation of education must facilitate students to enter the era of globalization, anticipate the rapid progress of science and technology, and utilize information

Copyright (c) 2023 Mela Femilia, Asrizal

technology in various activities. 21st century education must produce human resources with comprehensive capabilities to face various challenges and opportunities in this era (Asrizal, et al., 2022).

The independent learning program is an example of twenty-first century education in Indonesia. Freedom to learn means freedom in thinking (Mazid, et al., 2021). Before it happens to students, freedom of thought must occur to the teacher first, in teacher competence at any level without a process of translating basic competencies and curriculum, learning will never occur (Prahani, et al., 2020). The free learning policy was launched in the form of episodes. Episode one discusses four points of independent learning policies, namely: National Standard School Exams, National Examinations, Learning Implementation Plans, and Zoning Regulations for Admission of New Students. In addition to the four main policies for independent learning, there are other policies, such as independent campuses, driving teachers, driving school programs and so on (Tohir, 2019). Merdeka Learning is expected to be able to explore the talents and potentials possessed by students at an early age according to their wishes, in this case teachers and schools become effective facilitators (Prakoso, et al., 2020).

One of the fundamental aspects to improve the quality of education is the curriculum. Based on Law No 20 of 2003 concerning the National Education System, the curriculum consists of a set of plans and arrangements regarding the objectives, content and learning materials, as well as the methods used as guidelines for the implementation of learning activities to achieve certain educational goals. One of the government's efforts to improve the quality of education is curriculum development (Poedjiastutie, et al., 2018). The development consists of several main foundations, namely philosophical, juridical, historical, psychological, social and cultural (Hadi, 2022). In 2021, the driving school program will implement the driving school program curriculum. The driving school is a program that aims to improve the ability or competence (literacy and numeracy) and character of students holistically or thoroughly to create a profile of Pancasila students (Permendikbud, 2020).

One of the learning tools that support the learning process is teaching materials. Teaching materials are important tools to achieve learning objectives, can help teachers prepare learning activities, and guide students in learning (Kusuma, et al., 2018). Teachers are expected to be able to apply or integrate technology for the development of their teaching materials (Fakhruddin, 2019). Electronic teaching materials are a set of materials that are systematically arranged that show the competencies that are expected to be mastered by students which are poured into interactive multimedia (Misbah, et al., 2021). The application of multimedia in learning is important in the current era of information and communication technology (Sedjiru, 2017).

However, in fact, after conducting interviews with teachers using an instrument in the form of interview sheets, it was found that the use of teaching materials that implemented the curriculum of the driving school program was still limited. In addition to teaching materials in printed form, teaching materials in electronic form are also still limited in number. This is because the independent curriculum will be implemented in the 2021/2022 school year. The only books that apply the curriculum of the driving school program are teaching materials published by the Ministry of Education, Culture, Research and Technology which consist of student books and teacher books.

Science subjects in class X are a combination of biology, chemistry, and physics, this is in accordance with the opinions of Afrizal (2018), Sukarnasih (2015) and Rahmania (2017). One of the materials studied in class X in the independent curriculum is global warming material. Global warming material in the 2013 curriculum is studied in class XI while in the school program this material is studied in class X. Global Warming class XI MIPA is almost never taught in class, students are only asked to study the theory in the book, this results in students

not know how to deal with global warming concretely (Putri, et al., 2020). The understanding of students about the causes and effects of global warming is still low (Damayanti, et al., 2017). The concepts presented in the book tend to be only aspects of knowledge, a combination of science, technology, environment, and society material is still slightly associated with global warming material (Indah, et al., 2020).

One way that can be done to overcome this problem is to develop electronic teaching materials. The use of electronic teaching materials provides opportunities for students to learn individually whenever and wherever, the use of multimedia construction makes the learning process more active, interesting and fun, this is in accordance with the opinions of Nurhikmah (2021), Arkorful (2014) and Anori (2020). Improve students' ability to understand subjects and topics. The teaching-learning process becomes easy (Hafeez, 2021). So it is necessary to conduct a preliminary study before developing teaching materials that apply the curriculum of the driving school program as initial information.

Based on the background that has been described, it is necessary to conduct a preliminary study to develop electronic science teaching materials for class X on Global Warming material. This study aims to investigate the problems of learning activities, investigate the characteristics of students, investigate the results of the analysis of learning objectives, and investigate the results of the analysis of learning settings that apply the independent curriculum.

METHODS

This kind of studies is descriptive study. Descriptive research is research aimed at producing systematic, fact-based, and accurate descriptions, illustrations, or pictures of the facts, characteristics, and relationships among the phenomena under study. This research is a preliminary study that refers to the Preliminary Research in the Plomp development model.
In general, the study describes four dates. First, data on learning problems experienced by teachers. Second, the data on the characteristics of students in participating in global warming material learning in terms of motivation, learning styles, interests, and attitudes. Third, the data on the suitability of the learning objectives designed by the teacher with the expected ideal conditions. Fourth, the data on the suitability of the learning setting designed by the teacher with the expected ideal conditions.

The object of this research is the physics teacher of class X, class X participants, and the global warming teaching module designed by the teacher. There are four teachers from two schools implementing this curriculum in 50 Kota Districts. The number of students involved in this data collection was 60 people in both schools.

Data collection techniques used in this study are: interviews, questionnaires, and documentation. Information related to learning problems was obtained from a questionnaire given to the teacher. Information related to the characteristics of students was obtained from a questionnaire given to students. Teaching modules are used as documentation to analyze learning objectives and settings.

Data analysis is an activity that is carried out after data from all data sources is collected. The data analysis technique in this study uses descriptive statistical analysis. Presentation of data can be done in several ways. The way of presenting data is in the form of numbers, tables, and graphs. Data in the form of numbers is still lacking for analysis purposes. Lack of information from numbers can be overcome by presenting data in the form of tables or graphs.

RESULTS AND DISCUSSION

Analysis of Learning Problems

Analysis of learning problems is based on several components. The components of learning problems consist of learning objectives, learning methods, learning materials, teaching materials and learning evaluations. The first component of learning problem analysis is learning objectives. The learning objectives consist of four indicators. The three indicators are competence (CM), content (CN), variation (V), and operational verb (OV). The results of the analysis of the indicator components of learning objectives can be explained in Figure 1.

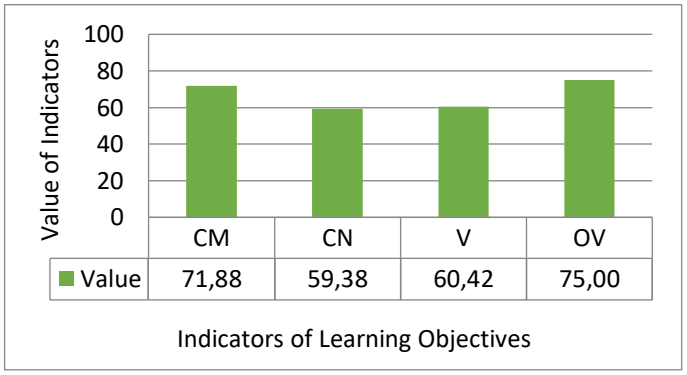

Figure 1. Indicators of Learning Objectives

Based on Figure 1, the average competition indicator is 71.88. The average content indicator is 59.38. The average variation indicator is 60.42. The average OV indicator is 75.00. The average value of the content and variety indicators is in the sufficient category. while the category of competence and OV are in the strong category. This result means that the content and variation in the learning objectives need to be further improved, so that the learning objectives and learning outcomes can be met. This result is in line with Giantara (2020) teachers have not fully paid attention to the quality of the material content delivered in the learning process. The second problem is found in the variation indicators where the teacher experiences quite a few problems in formulating higher-order thinking skills in learning objectives. Learning activities that are able to develop higher-order thinking skills must begin with a teacher's ability to solve a problem in the learning process itself Mahariyanti (2021).

The second component is the learning method. The indicators of the learning method are the goals achieved (GA), the state of the students (SS), teaching materials (TM), teaching and learning situations (LS), available facilities (AF), and teacher abilities (TA). The results of the analysis of learning methods can be explained in Figure 2.

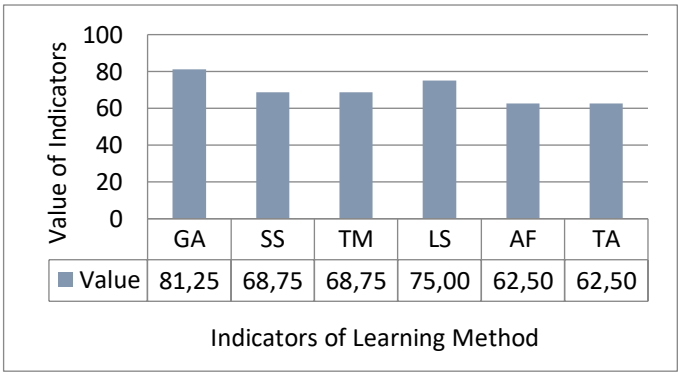

Figure 2. Indicators of Learning Method

Based on Figure 2, the average goal indicator to be achieved is 81.25. The average indicator of the condition of students is 68.75. The average indicator of teaching materials is 68.75. The average indicator of teaching and learning situation is 75.00. The average indicator of available facilities is 62.50. The average teacher ability indicator is 62.50. Overall, the components of the learning method are in the strong category. These results indicate that teachers do not experience problems in using learning methods on global warming material.

The third component is learning material. The learning material consists of four indicators. These indicators are: material suitability (MS), material depth (MD), presentation (P), and active learning opportunities (ALO). The results of the indicator analysis of the components of the learning method are described in Figure 3.

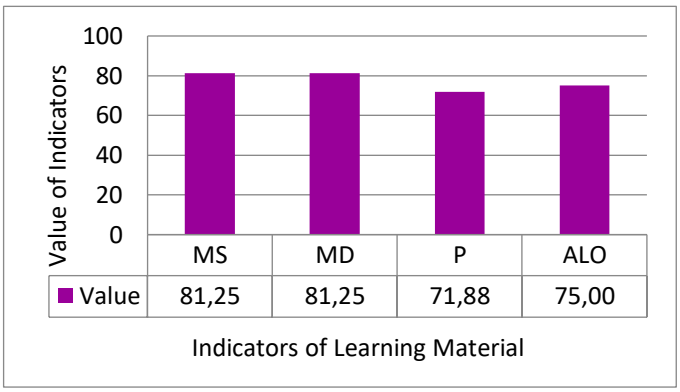

Figure 3. Indicators of Learning Material

Based on Figure 3, the average material suitability indicator is 81.25. The average material depth indicator is 81.25. The average presentation indicator is 71.88. The average indicator of active learning opportunities for students is 75.00. This result means that the average value of the material suitability indicator and the material depth are in the very appropriate category. The average value of the indicator for the presentation of opportunities for active learning students is in the appropriate category. These results indicate that teachers do not experience problems when teaching global warming material. Mastery of learning material is one of the competencies that must be possessed by a teacher, namely professional competence. Professional competence, namely the ability of teachers to master material broadly and in depth which allows teachers to guide students to meet national education standards (Firmansyah, 2017). Professional competence is a competency that must be possessed by a teacher to carry out his main duties as a teacher (Idris, 2019).

The fourth component is teaching materials. The indicators of teaching materials are: meaningful learning experiences (ML), facilitating interaction (FI), enriching learning experiences (EL), and learning atmosphere (LA). The results of the analysis of the indicator components of teaching materials are described in Figure 4.

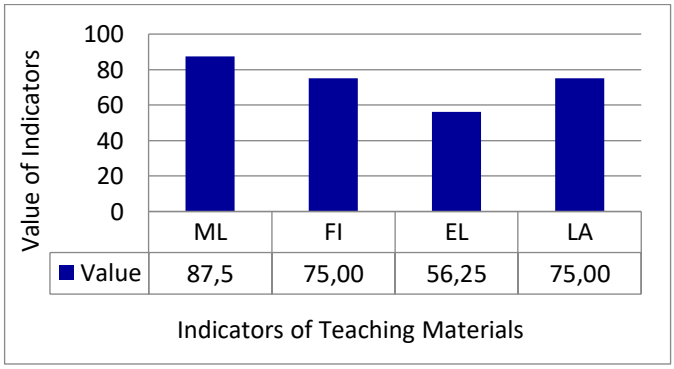

Figure 4. Indicators of Teaching Materials

Based on Figure 4, the average value of the meaningful learning experience indicator is 87.50. The average value of the indicator facilitating interaction is 75.00. The average value of the indicator of enriching the learning experience is 56.25. The average value of the learning atmosphere indicator is 75.00. This result means that the average value of the meaningful learning experience indicator is in the very appropriate category. The average value of the indicator facilitating interaction and learning atmosphere is in the appropriate category. The average value of the indicator enriching the learning experience of students is in the sufficient category. These results mean that teachers have problems in enriching students' learning experiences by using teaching materials. This is because the teacher only uses one type of teaching material and has not been applied in electronic form. Electronic teaching materials such as ebooks, e-modules, and so on can be used as an alternative learning media to deal with less-than-optimal learning time in class (Ariani, 2020).

The last component of learning problem analysis is learning evaluation. Learning evaluation has several indicators. Learning evaluation indicators are: effectiveness (EE), efficiency (EI), adequacy (AD), flattening (F), responsiveness (R), and accuracy (AC). The results of the analysis of the indicators of the learning evaluation component are described in Figure 5.

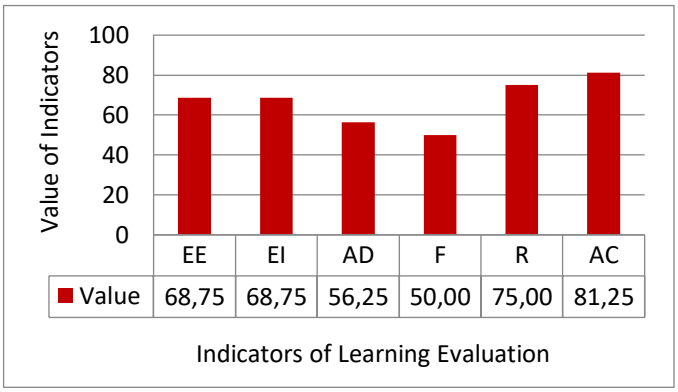

Figure 5. Indicators of Learning Evaluations

Based on Figure 5, the average value of the effectiveness indicator is 68.75. The average value of the efficiency indicator is 68.75. The average value of the adequacy indicator is 56.25. The average value of the smoothing indicator is 50.00. The average value of the responsiveness indicator is 75.00. The average value of the accuracy indicator is 81.25. This result means that the average value of the indicators of effectiveness, efficiency, and responsiveness is in the strong category. The average value of the adequacy and smoothing indicators is in the sufficient category. The average value of the accuracy indicator is in the very appropriate category. These results indicate that teachers have problems in designing learning evaluations that have adequate and even distribution.

Analysis of Student Characteristics

Analysis of student characteristics is based on several components. The components of student analysis are learning motivation (M), learning style (LS), interests (I) and attitude (A). Data analysis of student characteristics was obtained from two schools, namely SMAN 1 akabiluru, and SMAN 1 Suliki. The results of the analysis of student characteristics are described in Figure 6.

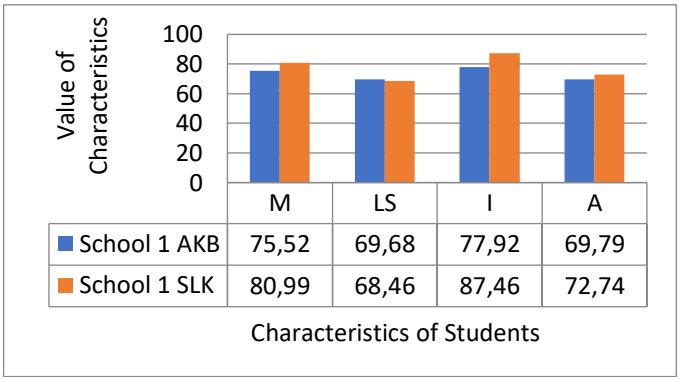

Figure 6. Charateristics of Students

Based on Figure 6, the average value of the motivation component is 75,52 for SMAN 1 Akabiluru and 80,99 for SMAN 1 Suliki. The average value of the learning style component is 69,68 for SMAN 1 Akabiluru and 68,46 for SMAN 1 Suliki. The average value of the interest component is 77,92 for SMAN 1 Akabiluru and 87,46 for SMAN 1 Suliki. The average value of the attitude component is 69,79 for SMAN 1 Akabiluru and 72,74 for SMAN 1 Suliki. The average value of the motivation component of the two schools is 78,26 with a strong category. The average value of the learning style component for the two schools is 69,07 with a strong category. The average value of the interest component for the two schools is 82,69 with a strong category. The average value of the attitude component for the two schools is 71,27 with a strong category. This means that students already have good characteristics in learning activities on global warming material.

Analysis of Learning Objectives

The learning objectives consist of three components. These components are competence, content, variety, and operational verbs. Each component has its own indicators. The first component is competence. Competence has several indicators. These indicators are: knowledge (K), skills (S), attitude (AT), and student profile of Pancasila (SPP). The second component is content. The content consists of three indicators. The three indicators are: truth (T), accuracy (AC), and detail (D). The third component of learning objectives is variation. Variation consists of three indicators. These indicators are: critical thinking skills (CI), creative thinking skills (CE), and higher order thinking skills (HO). The last component of learning objectives is operational verb. Operational verb consists of three indicators. Operational verb indicators are cognitive domain (CD), affective domain (AD), and psychomotor domain (PD).The results of the learning objectives component indicator analysis are described in Figure 7.

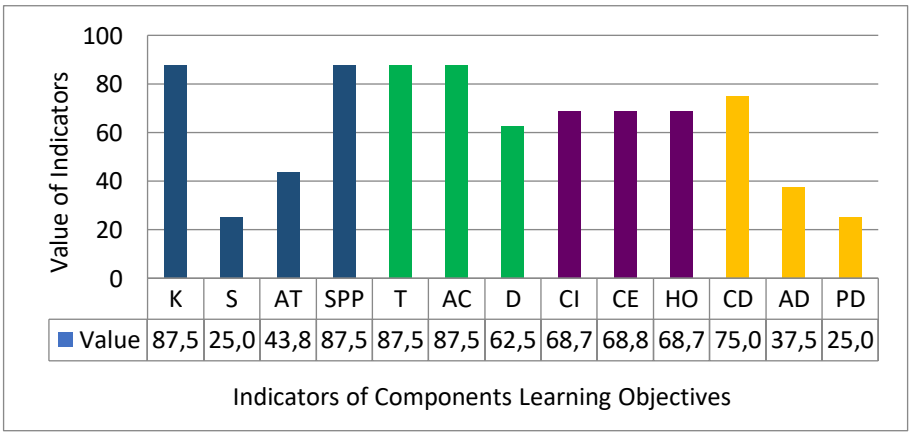

Figure 7. Indicators of Components Learning Objectives

Based on Figure 7, the mean of knowledge indicator is 87.50. The mean of skill indicator is 25.00. The mean of attitude indicator is 43.75. The mean of student indicator is 87.50. This result means that the skill indicator is in the inappropriate category. Attitude indicators are in the sufficient category. While the indicators of knowledge and students in the category are very appropriate. These results indicate that the competencies in the learning objectives designed by the teacher are in accordance with the expected ideal conditions. While the attitude indicators are quite in accordance with ideal conditions.

The mean of truth indicator is 87.50. The mean of accuracy indicator is 87.50. The mean of detail indicator is 62.50. This result means that the mean of truth and accuracy indicators is in the very appropriate category. While the mean of detail indicator is in the appropriate category. These results indicate that the content in the learning objectives designed by the teacher is in accordance with the expected ideal conditions.

The average value of each indicator, namely critical thinking ability, creative thinking ability, and higher order thinking ability is 87.50. The three indicators have an average value with a very appropriate category. These results indicate that the variation of learning objectives designed by the teacher is in accordance with the expected ideal conditions.

The mean of cognitive domain indicator is 75.00. The mean of affective domain indicator is 37.50. The mean of psychomotor domain indicator is 25.00. This result means that the mean of cognitive domain indicator is in the appropriate category. The mean of affective domain indicator is in the inappropriate category. The mean of psychomotor domain indicator is in the inappropriate category. Overall the indicators of the affective domain are quite in accordance with the ideal conditions and the indicators of the psychomotor domain are not in accordance with the ideal conditions.

Analysis of Learning Setting

Analysis of learning settings is based on several components. The components are: reading and discussing the increase in the earth's temperature, sea surface temperature, melting of ice and poles, sea level rise, el nino and la nina phenomena (C1), conducting group observations and interviews in the surrounding environment about changes in coastline or seasonal changes over the last few years, about the average annual temperature and average annual rainfall that occurred in the local area (C2), discuss the relationship between observations and information from BMKG from the results of activities (C3), read and discuss the keeling curve and the greenhouse effect (C4), read and discuss human activities that cause environmental change (C5), read and discuss alternative solutions to mitigate the impact of environmental damage (C6), analyze the causes and create solutions for change environment and campaigning for its solution with a media (C7). The results of the analysis of learning settings are described in Figure 8.

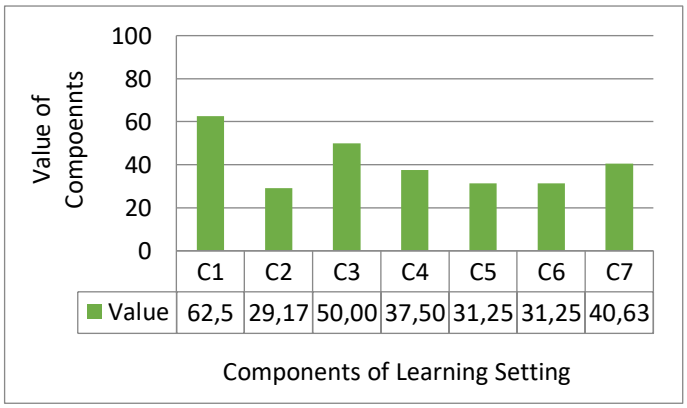

Figure 8. Components of Learning Setting

Based on Figure 8, the mean of the first component is 62.50. The mean of the second component is 29.17. The mean of the third component is 50.00. The mean of the fourth component is 37.50. The mean of the fifth component is 31.25. The mean of the sixth component is 31.25. The mean of the seven components is 40.63. This result means that the average value of the components The average value of the second, fourth, fifth, and sixth components is in the inappropriate category. The mean of the third and seventh components is in the sufficient category. Overall the learning setting is in the inappropriate category. These results indicate that the learning setting designed by the teacher is not in accordance with the expected ideal conditions. These results are in line with Putri (2020) where teachers still have difficulty understanding and preparing learning tools, teachers still have difficulty determining the right learning model, and teachers are still not creative enough. According to Dolong (2016) planning in preparing teaching programs must be in accordance with the concepts of education and teaching that are adhered to in the applicable curriculum.

Discussion

This study addressed the four main aspects indicated by four research purposes. The first was to provide information about difficulties faced by teachers in learning activities. The response from the teacher showed that the teacher had problems in designing content and variations in learning objectives, enriching the learning experience by using teaching materials, adequacy and leveling learning evaluation. Teachers should be open-minded to new teaching approaches. Where support is lacking, they need to find a way to solve problems involving the use of ICT in learning activities (Habibu, 2012). The second was knowing the characteristics of students. Characteristics of students are special abilities that affect the level of success in learning following learning and as a key to interaction between students and students learning that will affect the effectiveness of learning. Therefore, the teacher must recognize and consider the characteristics of students so that learning can be successful well (Dwiwarna, 2018). From student responses, it shows that overall students have good characteristics. The third was knowing the results of the analysis of learning objectives. Objectives interpret the goals and focus and prioritize curricular components. They are narrow and time-bound to achieve a specific task which can be measured. Goals may be intangible while objectives are tangible. Objectives are learner oriented and stated in terms of learner's behavior at the end of an instruction or a course (Khan, 2012).

From the results of the analysis, there are still learning objectives designed by the teacher that are not in accordance with ideal conditions. The last was knowing the result of the analysis of learning setting. Most learning activities in the lesson plans can be traced back to the steps described in the accompanying materials. Participants created several additional learning activities on their own. All learning activities provided educational information and most learning activities also included content and technical information, indicating that trainee teachers had ample opportunities for integration technology with pedagogy and content (Janssen, 2019). From the results of the analysis, the learning setting designed by the teacher is not in accordance with the ideal conditions expected.

CONCLUSION

Conclusions can be drawn from a preliminary study: the problems faced by teachers in learning activities that apply the curriculum of the driving school program, namely designing content and variations in learning objectives are in the sufficient category, enriching the learning experience by using teaching materials are in the sufficient category, adequacy and levelling learning evaluation is in the sufficient category. Characteristics of students after the implementation of the driving school program as a whole is good. The results of the analysis of learning objectives show that competence is in the appropriate category, content in the

appropriate category, variations in the very appropriate category, and operational verb in the sufficient category. Analysis results of learning settings indicate that the learning settings designed by the teacher are in the inappropriate category.

REFERENCES

Anori, S., Putra, A., & Asrizal, A. (2020). Pengaruh Penggunaan Buku ajar Elektronik dalam Model Pembelajaran Langsung Terhadap Hasil Belajar Siswa Kelas X SMAN 1 Lubuk Alung. *Jurnal Pillar of Physics Education 1,* 104-111

Ariani, S., Roza, L. (2020). Hasil Analisis Kebutuhan Pengembangan E-Book Berbasis Multipel Representasi. Prosiding Seminar Nasional Pendidikan Fisika FITK UNSIQ, Wonosobo 4 Juli 2020.

Arkorful, V., Abaidoo, N. (2014).The Role of E-Learning, The Advantages, and Disadvantages of Its Adoption in Higher Education. *International Journal of Education and Research 2*(12), 397-410

Asrizal, A., Ananda, A., & Festiyed, F. (2018). Development of adaptive contextual teaching Model of Integrated Science to Improve Digital Age Literacy on Grade VIII Students'. SEMIRATA-International Conference on Science and Technology 2018. *IOP Conf: Journal of Physics*: Conf. Series 1116 (2018) 032004

Asrizal, A., Yurnetti, Y., & Usman, E.A. (2022). ICT Thematic Science Teaching MaterialWith 5E Learning Cycle Model to Develop Students' 21st-Centur Skill. *Journal Pendidikan IPA Indonesia, 11* (1), 61.

Damayanti, R.S., Suyatna, A., Warsono, W., & Rosidin, U. (2017). Development of Authentic Assessment instruments for Critical Thinking skills in Global Warming with a Scientific Approach. International Conference on Science and Applied Science 2017. *International Journal of Science and Applied Science*: Conference Series

Dolong, J. (2016). Sudut Pandang Perencanaan dalam Pengembangan Pembelajaran. *Jurnal Inspiratif Pendidikan, 5* (1), 65-76.

Dwiwarna, & Rahadian, R. B. (2018). The Most Considered Type of Student Characteristics by Primary School Teachers. *International Journal on Integrating Technology in Education, 7*(3), 29-42.

Fakhruddin, Z., Amzah, A., & Nurchalis, N.F. (2019). Technology-Based Teaching Material Development Training for Pre-Service Teachers to Improve Students' Learning Outcomes. *Nobel Journal of Literature and LanguageTeaching, 10*(1), 87-102.

Hadi, M.Y. (2022). The Foundation of Curriculum Renewal (Reviewing From Philosophical, Juridic, Historical, Psychological, Social and Cultural Aspects). *Journal Pendidikan Indonesia: Teori, Penelitian,dan Inovasi, 2* (2), 27-46.

Giantara, F., Astuti. (2020). Kemampuan Guru Matematika Mempertahankan Substansi Materi Melalui Proses Pembelajaran Online. *Jurnal Cendekia: Jurnal Pendidikan Matematika, 4* (2), 787-796.

Habibu, T., Mamun, M.A, & Clement, C. (2012). Difficulties Faced by Teachers in Using ICT in Teaching-Learning at Technical and Higher Educational Institutions of Uganda. *International Journal of Engineering Research & Technology (IJERT)*, *1* (7), 1-9.

Hafeez, M. (2021).Teaching-Learning Process And ICT Tools- A Review. *Indonesian Journal of Basic Education 4* (1),18-27.

Idris, M. (2019). Standar Kompetensi Guru Profesional. *Ta'dibi : Jurnal Manajemen Pendidikan Islam, 8* (1), 41-54.

Indah, D., Yurnetti, Y. (2020). Pembuatan Modul Fisika Berbasis Pendekatan SETS pada Materi Pemanasan Global dengan Konsep Zerowaste Lifestyle (Pola Hidup Minim Sampah) untuk Peserta Didik SMA/MA Kelas XI. *Journal Pillar of Physics Education 13* (1), 113-120.

Janssen, N., Knoef, M., & Lazonder, A. W. (2019). Technological and pedagogical support for pre-service teachers' lesson planning. *Technology, Pedagogy and Education, 28*(1), 115–128.

Khan, T., Hande, S., Bedi, S., Singh, T., & Kumar, V. (2012). Learning objectives. *International Journal of User-Driven Healthcare, 2*(3), 44–62.

Kusuma, H.A., Apriyanto, A. (2018). Strategy on Developing English Learning Material for Specific Purposes. *IJECA International Journal of Education & Curriculum Application, 1* (3), 39-48.

Mahariyanti, E., Irwansah, Murniatun, & MProfesional. (2021). Analisis Kesulitan Guru dalam Mengembangkan Keterampilan Berpikir Tingkat Tinggi Peserta Didik pada Pembelajaran Biologi SMA. *Jurnal Ilmiah Global Education, 2* (1), 96-103.

Mazid, S., Futaqi, S., & Farikah. (2021). The concept of "freedom of learning" in a multicultural education perspective. *Jurnal Ta'dib, 24* (1) 72

Misbah, M., Khairunnisa, Y., Amrita, P.D., Dewantara, D., Mahtari, S., Syahidi, K., Muhammad, N., Prahani, B.K., & Deta, U.A. (2021). The effectiveness of introduction to nuclear physics e-module as a teaching material during covid-19 pandemic. National Seminar of Physics Education. *IOP Publishing Journal of Physics*: Conference Series 1760 (2021) 012052.

Nurhikmah, H., Hakim, A., & Wahid, M.S. (2021). Interactive E-Module Development in Multimedia Learning. *Al-Islah Jurnal Pendidikan, 13* (3), 2293-2300.

Permendikbud No 1117 Tahun 2020 tentang Program Sekolah Penggerak.

Poedjiastutie, D., Akhyar, F., Hidayati, D., & Gasmi, F.N. (2018). Does Curriculum Help Students to Develop Their English Competence? A Case in Indonesia. *Arab World Journal (AWEJ),* (2),175-185.

Prahani, B.K., Deta, U.A., Yasir, M., Astutik, S., Pandiangan, P., Mahtari, S., Mubarok, H. (2020).The Concept of "Kampus Merdeka" in Accordance with Freire's Critical Pedagogy. *Journal Studies in Philosophy of Science and Education, 1* (1), 21-37.

Prakoso, B.H., Ramdani, Z., & Rahmah, B. (2020). Teacher's Perception on Merdeka Belajar Policy. *Indonesian Journal of Educational Assessment, 3* (2), 128-137.

Purwadhi, P. (2019). Curriculum Management in the 21st Century Learning. *Jurnal Pendidikan Sains Sosial dan Kemanusiaan, 12* (2),143-156.

Putri, A., Budiharti, R., & Budiawati, S. (2020). Analisis Kebutuhan Pengembangan Perangkat Pembelajaran Fisika Berbasis Proyek Materi Gejala Pemanasan Global. *Jurnal Materi dan Pembelajaran Fisika, 10* (1), 20-24.

Rahmania, R., Fitriani, A., & Kaniawati, I. (2017). Role of Integrated Sciences Teaching Materials on Pressure Topic to Improve Student's Critical Thinking Skills in Junior. *Asian Journal of Education and e-Learning, 5* (2), 82-85.

Sejdiu, S. (2017). Are Listening Skills Best Enhanced Through the Use of Multimedia Technology. *Digital Education Review,32,* 60-72

Sukarnasih, L. Development of Integrated Natural Science Teaching Materials Webbed Type with Applying Discourse Analysis on Students Grade VIII in Physics Class. International Conference on Theoretical and Applied Physics 2015. *IOP Conf. Series: Journal of Physics:* Conf. Series 846 (2017) 012028.

Tohir, M. (2019). Merdeka Belajar. In Kementrian Pendidikan dan Kebudayaan.

Wangi, N.B., Nahrullah, M.H., & Wajdi, M.B. (2018). Digital Era's Education and Aplication in Higher Education. *Journal of Education and Technology, 1* (2), 119-128.

Yurnetti, Y., Asrizal, A., & Murtiani, M. (2020). Need analysis to develop science learning material based on thematic teaching by integrating the new literacy. International Conference on Research and Learning of Physics 2020. *IOP Conf. Series: Journal of Physics*: Conf. Series 1481 (2020) 012122.