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The Needs Analysis on Student Module Development Based on Project-based learning Integrated with Scientific Literacy to Improve Critical Thinking Skill and Learning Independence

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Abstract: Industry 4.0 plays a vital role in the development of the world economy. The development of the world economy requires new skills, such as critical thinking skills and independent learning. Module development Project-based learning Integrated scientific literacy is needed to meet the demands of education in the 4.0 era. The purpose of this research was to analyses the students' needs of the module development project-based learning to be integrated with scientific literacy. This type of research is survey research using quantitative descriptive research methods. The population in this study were all class VIII students at MTs N 1 Wonogiri and MTs N 2 Wonogiri, with a research sample of 62 students. The research was conducted in May 2024. The data collection technique used a questionnaire with a modified Likert scale with four answer choices: strongly agree, agree, disagree, and strongly disagree. The research results showed that the statements submitted to respondents obtained a percentage of 11% -40%, which fell into the categories of strongly disagree and disagree. From these results, students need a science module Project-based learning integrated scientific literacy to improve students' critical thinking skills and learning independence.

Keywords: modules, project-based learning, scientific literacy, critical thinking skills, independence

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1. Introduction

industrial development that has implemented Smart Factories, digital-based mechanization, and adaptation to human needs (Lasi et al., 2014). Industry in this era has used Robotics, the Internet of Things (IoT), Virtual Reality (VR) and Augmented Reality (AR), Big Data Systems, Artificial Intelligence (AI), and Cloud-based computers (Maier, 2017, p.28) to increasing industrial efficiency and productivity (Thames & Schaefer, 2016). Industry 4.0 is essential for developing the world economy (Cugno et al., 2021, p.34). The development of the world economy requires new skills such as creativity, problem-solving, decision-making and analytical skills, research skills (Mourtzis, 2018), and critical thinking skills (The Partnership for 21st Century Skills, 2009, p.11). Children are the owners of the future (Sajidan., 2017, p.2); this means that students are the workforce of the future, so they need to master competencies in the Industry 4.0 era, one of which is critical thinking skills (Kriel, 2013, p.11).

The research results show that students' critical thinking skills are low, namely 85.19 in the sufficient category, 11.11% in the poor category, so improvement is needed (Lapuz & Fulgencio, 2020), amounting to 17.6% (high category), 82.4% (low and medium categories) (Sugandi, 2021). The results of the PISA report were based on scientific ability. In 2012, Indonesia ranked 64th out of 65 countries; in 2015, it ranked 62nd out of 69 countries. Furthermore, in 2018, Indonesia ranked 74th out of 79 countries (Hewi & Shaleh, 2020). This shows that Indonesia has low critical thinking skills compared to other countries.

Jumaisyaroh Hasratuddin (2016) stated that critical thinking skills are related to a person's learning independence. Low critical thinking skills are also accompanied by low learning independence of students (Asmar & Delyana, 2020; Prasetyowati, 2016). This can be seen when students still need to study independently in class or at home. Most students want to study when there will be daily tests or semester exams. This is in line with research by Gusnita et al. (2021) that, on average, students prefer teachers to explain the material, and students only study when they have homework, but only 30% of students do it at home. Most students do their homework at school by copying their friends' homework that they have completed, confirmed by de Bruin & van Merriënboer (2017), that students experience difficulty in effectively monitoring their learning and making decision-making strategies regarding their learning.

Project-based Learning models can empower critical thinking skills and independent learning (Sasson et al., 2018; Bell, 2010; Grant & Maribe Branch, 2005). Project-based learning is a systematic learning model involving students learning knowledge and skills through a structured inquiry process around complex, authentic, or real-life questions (Mary & Anastasia, 2020) and trying to create a specific project to solve the problem (Umar, 2017).

Activity Project-based learning, which is able to empower students' critical thinking skills and independent learning, can be integrated into teaching materials (Dumitrescu et al., 2014). According to Erlinda (2017), success in learning depends on using learning resources or media used during the learning process. A module is one

of the teaching materials that is appropriate and suitable for independent learning. The existing modules in schools must train students' critical thinking and independence and be more interactive (Herawati & Muhtadi, 2018; Nurlaili, 2018; Sidiq & Najuah, 2020).

Module Project Based Learning can be integrated with Scientific Literacy to empower critical thinking skills and independent learning. As Chiapetta (in Rusilowati et al. 2015) suggests that the characteristics of scientific literacy are characterised by four categories, namely: 1) science as the body knowledge; 2) science as the investigation of nature; 3) science as a way of thinking; 3) interaction of science, environment, technology, and society.

Unfortunately, science learning in junior high schools does not use good learning modules, learning modules only contain subject matter and there are still minimal activities that require active students in learning. The existing modules in schools did not train students' critical thinking and independence and are less interactive (Herawati & Muhtadi, 2018; Nurlaili, 2018; Sidiq & Najuah, 2020). Then in their research, Malina et al., (2021) stated that 93.2% of students need other learning resources that can be understood independently, 68.2% of students have never used a module, 95.5% of students want to know and try learn using modules. Based on research, as many as 77% of students said there were no instructions to invite students to collect data or process data in the modules provided by the school. The modules they use are also incomplete and difficult to understand, do not provide an overview of the concepts involved in science learning (Zulkarnain et al., 2015).

Based on the presented issues, the researcher will develop a Student Module based on integrated project-based learning in scientific literacy, with its novelty lying in integrating the research results from previous studies. Several studies conducted by the researcher related to Student Module based on integrated project-based learning in scientific literacy include (Maslihatin, 2024; Zendrato et al, 2014; Kasman, 2020; Komalasari et al, 2024; Runasih et al, 2023). which can be integrated into the analytical course. The goal is for students to directly understand the application of the course, and this is also an effort to reduce environmental pollution. Providing up-to-date learning resources related to the environment can shape attitudes and concern for the environment and responsiveness to environmental problem-solving. The module designed based on research results creates more meaningful learning because the content presented in the module is more contextual and engaging. It is not only theoretical but also based on scientifically tested facts through research results (Sari et al., 2023) Furthermore, the development and implementation of a research-based curriculum can strengthen the learning process and enhance the understanding of learners (Fitriyati et al., 2015).

The research that has been carried out focuses on developing learning tools based on project based learning integrated with scientific literacy, but the development of learning modules has not been implemented. Meanwhile, the aim of developing the module is to empower critical thinking skills and independent learning simultaneously that be the novelty of this research. Based on the description above, researchers feel it is necessary to develop a Student-Based Module Project-Based-

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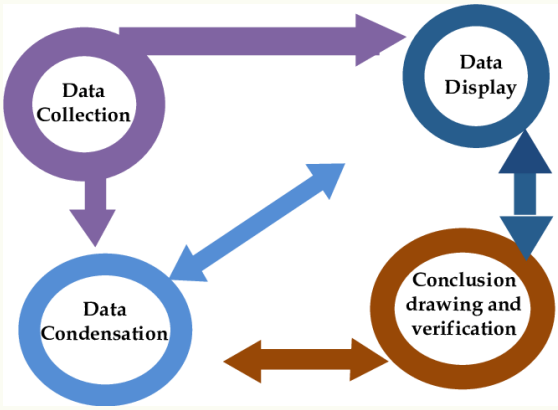
Based Learning integrated scientific literacy to Empower Students' Critical Thinking Skills and Independence.

2. Method

The qualitative method is used in this research. This study used a descriptive qualitative method. This research aims to describe the need for student-based module development Project-based learning integrated scientific literacy. The time of this research was May 2024. The subjects in this research were six teachers of Class VIII MTs N 1 Wonogiri and MTs N 2 Wonogiri, 64 teachers and students of Class VIII MTs N 1 Wonogiri and MTs N 2 Wonogiri, with 30 sons. and 34 daughters. The data in this research was collected using interview techniques, observation, and student needs questionnaires. This research conducted interviews with Class VIII teachers to determine the learning model used and the availability of teaching materials in class. Researchers observed the learning process, the curriculum used, and a needs questionnaire distributed to 64 people to determine the development of student-based modules. Project-based learning integrated scientific literacy. The data analysis technique used in this research is qualitative analysis. The data analysis stages in this research include data collection, data reduction, data presentation, and conclusion, thus forming the Miles and Huberman analysis model. Miles and Huberman's analysis steps can be reviewed in Figure 1.



Source: (Sugiyono, 2019: 322)

Figure 1. Miles and Huberman Analysis Stages

Based on Figure 1, the following is an explanation of the data analysis components in this research: (1) Data collection: Researchers collected data by interviewing Class VIII teachers, observing the learning process in class, and distributing needs questionnaires to 64 Class VIII students at MTs N 1 Wonogiri and MTs N 2 Wonogiri; (2) Data condensation: The researcher summarises and sorts the core information, focusing on the essential aspects according to the research objectives; (3) The data is then displayed by the researcher in the form of a collection of information in the form of a questionnaire results table. tables are designed to combine information that is arranged in one a unified form so you can see what is

happening and determine conclusions; (4) Drawing conclusions and verification are researchers' activities to search for meaning, significance and explanation of data that has been analyzed by looking for important things.

3. Result and Discussion

Needs analysis in this research was carried out by observing the learning process, interviewing teachers, and distributing needs questionnaires to students.

Observing the learning process shows that the teacher needs to apply the project-based learning model and often gives assignments or homework to students. Learning in class is carried out using the lecture method; the material taught is only science content. Teachers also only use teaching materials from school, namely textbooks and worksheets made by MGMP. The teacher gives assignments to work on the questions on the LKS, which are discussed together after completing the tasks. The existence of textbooks is only an addition to independent learning.

The results of interviews with class VIII science teachers were that the implementation of learning had referred to the independent curriculum. The teaching materials used in classroom learning are textbooks and worksheets provided by the school. Often used Learning methods include lectures, discussions, and questions and answers. Implementation of learning in class utilises an LCD projector as a learning tool. The teacher has never used the learning module Project-based learning integrated scientific literacy.

Table 1. Results of filling out questionnaires by respondents regarding student modules

No.	Statement	Percentage	Information
1.	I can study independently just by using the science module	29 %	Disagree
2.	I use a science module where the material is presented very clearly	21%	Disagree
3.	I use IPA modules with good sequence and structure	11,3 %	Disagree
4.	I use the IPA module with a good language	1,6 %	Disagree
5.	I use the IPA module with good graphics	4, 8 %	Strongly Disagree

The results of the first questionnaire relate to the characteristics of the teaching materials that students have used shown in Table 1. The statements given determine the quality of the teaching materials used by students. The results of distributing a questionnaire regarding student needs regarding the student module requirements in the statement that students can learn independently just by using science teaching materials show that 29% of students still need to learn independently. This is in line with research by Santrock (2005), which states that the characteristics of adolescents based on Piaget's stages of cognitive development are in the formal operational stage, where adolescents are able to test their reasoning based on intelligence and experience. They are also able to test hypotheses and process information with clear

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thinking. Logical, as well as projecting oneself into the future and making plans to achieve it. Bartle (1988 in Fleming, 2006) states that there are differences in independence between early adolescents (11-15 years) and late adolescents (16-20 years). Late adolescents have more independence in physical activities managing finances, choosing friends, and interacting with the environment (Greenberg, 1984; Steinberg and Silverberg, 1987 in Fleming, 2006). Expert statements show that junior high school students can carry out learning activities such as reasoning and processing information independently. As students get older, their learning independence will increase. This can be proven by the fact that 29% of students still need to learn independently. The module development that will be carried out in this regard is to provide activity-based Project Learning in the module and then use more detailed instructions and commands.

The results of filling out a questionnaire regarding the presentation of material in teaching materials showed that 21% of students disagreed with the clarity of the presentation of science teaching materials used by students. This is in line with research by Kurniasari, Rusilowati, & Subekti (2014) that the material in several science books is difficult to understand because the illustrations or pictures are displayed in black and white, and the use of grammar is difficult for students to understand. Besides the availability of images, the order in which the material is discussed and the language used in teaching materials are significant so that students can understand it when studying. Setyawan & Wijayanti (2020) stated that science material is difficult due to the lack of image media to assist in the students' understanding process. Abshor's research (2023) states that students need help understanding learning material and concepts. Presenting material in existing teaching material is acceptable for students if they are given good illustration media.

The results of filling out a questionnaire regarding the presentation of material in teaching materials showed that 11.3% of students disagreed that existing science teaching materials had a good sequence and structure. According to Tarigan (Tarigan, 1986), there are eleven provisions for determining the quality of a textbook, one of which is that it must have clear concepts and the textbook must be relevant to the curriculum in force at that time. The LKS used only contains material descriptions and practice questions, so students tend to only memorise the science concepts contained in the LKS without finding the meaning of the material they have studied and its relation to students' lives (Artiniasih et al., 2019; Novrianti et al., 2018). Widiastuti et al. (2021) In his research, he stated that some teaching materials available on the market only refer to concepts that students must remember and can train students enough to construct their knowledge and experience to discover for themselves the ideas that must be understood, as well as the interrelationships of the concepts being studied with the real life they experience. The teaching materials used in schools have a good sequence and structure, as shown by the LKS, which only contains material neatly arranged for students to memorize. Teaching modules must be developed with various activities to train students to think critically and independently.

The results of filling out a questionnaire regarding the use of language in teaching materials were that 1.6% of students disagreed with the use of language in existing science teaching materials. This is confirmed by several studies, including Ramadhani & Martinez (2022), in research on the K-13 Curriculum and KTSP Science Textbooks, stating that the language used in textbooks is relatively appropriate. Researchers assume that the language used in this textbook is suitable for the age of middle school children and is easy to understand, but some biological terms need to be explained in more detail. During learning, the existing teaching materials still need to be appropriate to the characteristics and development of students. There are still many languages that need to be understood and need to be more suitable for students' languages. Existing teaching materials do not relate to the conditions in the students' environment. Abshor (2023) added in his research that based on the results of interviews with students, the language used in teaching materials was too complicated, so students had difficulty understanding it. Apart from that, the instructions for working on the questions could be more precise. The module development has a glossary to help students understand difficult words.

The results of filling out a questionnaire regarding graphic teaching materials showed that 4.8% of students strongly disagreed, and 24.2% disagreed with using graphics in existing science teaching materials. This is in line with research by Astiti et al., 2020 which states that illustrations and examples contained in textbooks, which should be able to help students understand complex/dense material, are often found to be less contextual to the conditions in which they live in the environment around students so that it is also difficult for students to understand the material in Integrated Science lessons. It isn't easy to relate it to students' lives. The pictures presented are also black and white, which makes them seem less attractive for students, especially junior high school students, to read. Textbooks are only concerned with the content without paying attention to or considering what the prospective students will see later. Giving a colorful impression will make the textbook more aesthetic and attract students' interest (Cochrane & Devlin, 2000). The questionnaire results stated that as many as 4.8% said they strongly disagreed, and 24.2% said they disagreed. It can be concluded that the science module students use needs better graphics. So, it is necessary to develop a science module with various color combinations, the images provided are not black and white and are appropriate to the conditions in the environment around students.

The results of the following questionnaire are related to process- and Project-based learning, as shown in Table 2. The statements given serve to determine the extent of students' abilities to carry out syntax Project-based learning. The results of filling out a questionnaire regarding the stages of deciding basic questions show that 32.3% of students disagreed, which means they could not determine basic questions. This aligns with research by Ahmadani (2019) and Nisa et al. (2023), which states that the questions asked by students need to show critical questions related to the material being studied. Students do not dare to ask questions because they are afraid and reluctant to ask the teacher. Students still need to be more active in improving their thinking abilities in the learning process, so learning becomes passive and

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impacts low student learning outcomes. Meanwhile, determining basic questions, according to The George Lucas Educational Foundation in Darmayoga (2021), begins with essential questions that can assign students to carry out an activity, take a topic that corresponds to real-world realities, and start with an in-depth investigation. Teachers try to make the issues raised relevant to students. Students on the scale of asking simple questions still need help, especially when asked to determine basic questions. Students still have difficulty asking simple questions, especially determining basic questions, so the module that will be developed contains a guide for making basic questions.

Table 2. Results of filling out questionnaires by respondents regarding the learning process Project-Based Learning

No.	Statement	Percentage	Information
1.	I can already determine the basic questions	32,3 %	Disagree
2.	I often design project plans	8,1% 48,4 %	Strongly Disagree Disagree
3.	I can prepare a project creation schedule	8,1% 51,6 %	Strongly Disagree Disagree
4.	I'm used to checking the progress of a project	9,7% 43,5 %	Strongly Disagree Disagree
5.	I always test project results	6,5% 32,3%	Strongly Disagree Disagree
6.	I am able to evaluate experience in project activities	1,6% 29,0%	Strongly Disagree Disagree

The results of filling out a questionnaire regarding the stages of preparing a project creation schedule showed that 8.1% stated that they strongly disagreed, and 51.6% of students indicated that they did not agree, which means that most students were unable to prepare a project creation schedule. This is reinforced by several studies, including Riak and Hananto (2023), stating that students have yet to be able to monitor the progress of assignments carried out independently; assignments given are also collected beyond the specified time limit. The teaching module developed contains a guidance text for students and a table of assistance compiling a project creation schedule.

The results of filling out a questionnaire regarding the stages of checking the progress of a project stated that as many as 9.7% said they strongly disagreed, and 43.5% said they disagreed, meaning that most students are not used to checking the progress of doing projects. Sari et al. (2023), in their research, based on observations in the form of interviews with teachers at school, the teacher said that he had given project-making assignments to students but was only limited to providing projects and had not implemented them using a learning model. The developed teaching module contains a guidance text for students, accompanied by a table of assistance for checking the progress of project creation.

The results of filling out the questionnaire regarding the stages of testing project results stated that as many as 6.5% said they strongly disagreed, and 32.3% said they disagreed, which means that most students are not used to testing project results. Sari et al. (2023), in their research, based on observations in the form of interviews with teachers at school, the teacher said that he had given project assignments to students but was only limited to providing projects and had not implemented them using a learning model. Students must carry out the task of testing the project and need to be given guidance. The teaching module that will be developed contains a guidance text for students and a table of assistance in testing project results.

The results of filling out the questionnaire regarding the stages of evaluating experience in project activities showed that 1.6% said they strongly disagreed, and 29.0% said they disagreed, which means that some students were not used to assessing experience in project activities. Sari et al. (2023), in their research, based on observations in the form of interviews with teachers at school, the teacher said that he had given project assignments to students but was only limited to providing projects and had not implemented them using a learning model. Students are just trying out the task of testing the project and need guidance. The teaching module that will be developed contains a guidance text for students and a table of assistance in evaluating experience in project activities.

Table 3. Results of filling out questionnaires by respondents regarding the scientific literacy learning process

No.	Statement	Percentage	Information
1.	I am used to observing phenomena and problems related to learning materials in the environment where I live	1,6 % 11,3 %	Strongly Disagree Disagree
2.	I often study science concepts and laws	1,6 % 38,7 %	Strongly Disagree Disagree
3.	I familiarize myself with scientific attitudes and processes in my daily life	1,6 % 33,9 %	Strongly Disagree Disagree
4.	I am able to connect science concepts and laws with technology and society	37,1 %	Disagree

The results of the following questionnaire are related to scientific literacy learning, as shown in Table 3. The statements given determine the extent to which students are familiar with scientific literacy. In the statement of the process of observing phenomena and problems related to learning material in the environment around where they live, the results of the questionnaire stated that as many as 1.6% said they strongly disagreed, 11.3% said they disagreed, which means that some students are used to observing phenomena and problems related to learning material in the environment around where you live. The skill of observing phenomena and problems is included in the scientific attitude. This is reinforced by research by Miaturrohmah & Fadly (2020), which states that one of the characteristics of a scientific attitude is always being curious; teenagers aged 13-15 years tend to have the character of high curiosity like to ask questions, strong imagination, intense interest. Many are not afraid of mistakes, dare to take risks, think freely, and like things that

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have never been known (Depdiknas in Jaya, 2004). Students' curiosity encourages them to observe the surrounding environment actively. So, module development also requires more familiarization with observation skills.

In the statement of the process of studying science concepts and laws, the questionnaire results showed that 1.6% of students strongly disagreed and 38.7% disagreed when asked about their activities in learning science concepts and laws. Most students need help to study science concepts and laws. Astiti et al. (2020) in their research stated that students' understanding of material related to science is considered very difficult to understand because physics material involves many formulas and calculations that are considered difficult to solve. Prasetyoningsih et al. (2023), in their research based on initial diagnostic tests, showed that almost all students did not like science learning. Students need help understanding the material because the material is abstract, and students need real experience in understanding science material. The development of teaching modules that can be carried out by completing them with experimental activities to discover concepts for themselves and including video links in the form of barcode scans to help students understand science material, attaching video links when working on calculation questions so that students can learn independently according to their style and style. Learning speed.

In the statement about getting used to scientific attitudes and processes in everyday life, the questionnaire results showed that 1.6% of students strongly disagreed and 33.9% disagreed when asked about their activities in getting used to scientific attitudes and processes. It can cause students to need to become more familiar with the scientific landscape and process. Astiti et al. (2020) stated that books in the field only emphasize conveying knowledge with lots of theories, which makes students often feel bored, so students still need help to have a helpful or meaningful learning experience, as expected in the integrated learning concept. Putra et al. (2019) in their research stated that in learning, teachers rarely provide opportunities for students to carry out experimental activities or experiments. Hence, students' science process skills need to be developed. As stated by Dahar (1985: 11), science process skills are students' ability to understand, create, and discover science by applying scientific methods. Through science process skills, students can learn about science using scientific methods such as observation, classification, experiments, etc. During learning, students are only exposed to the concepts in books without any scientific process to discover and understand these concepts. The module development will be carried out by adding a "tips" section containing a leaflet about the scientific attitude that students must have and experimental activities on wave vibrations and sound to train students' scientific attitudes and processes.

In the statement of connecting science concepts and laws with technology and society, the questionnaire results showed that 23% of students disagreed when asked about connecting science concepts and laws with technology and society. Most students needed help linking ideas and laws, science law with technology and society. According to Yulita and Inelda (2017), science teaching materials or textbooks still contain few phenomena related to science, technology, and everyday life. The book's contents should display a scale of aspects of scientific literacy that are simple enough

to be understood by middle school students. The module development will be done by adding a "did you know?" which reviews the relationship between science, technology, and society.

The results of the following questionnaire are related to the profile of students' critical thinking skills, shown in Table 4. The statements given determine the extent of students' critical thinking skills. In the statement of skills in observing and grouping natural phenomena, the questionnaire results showed that 24.2% of students disagreed when asked about their activities in making observations and grouping natural phenomena. It can be concluded that some students still need to become skilled at observing and grouping natural phenomena. In their research, Nuryanti et al. (2018) stated that junior high school students have relatively low critical thinking skills. This is in line with research conducted by Prihartiningsih et al. (2016), Martawijaya (2015, and Normaya (2015), who stated that junior high school students' critical thinking abilities still need to be developed or are low. They make observations and groups, including critical thinking skills in the interpretation aspect. Interpretation, according to statements by national experts (Facione. 2015: 5), is understanding the meaning or significance of various kinds of experiences, situations, data, events, judgments, habits, beliefs, rules, procedures, or criteria. Interpretation includes categorization, solving significance, and clarifying meaning. Based on the questionnaire and expert opinions, the developed module contains activities for observing and classifying natural phenomena related to vibrations, waves, and sound.

Table 4. Results of filling out questionnaires by respondents regarding critical thinking skills

No.	Statement	Percentage	Information
1.	I am used to observing phenomena and problems related to learning materials in the environment where I live	24,2 %	Disagree
2.	I am able to conclude the results of the experiment by drawing meaning from the results/interpretations according to the initial problem	1,6 % 50 %	Strongly Disagree Disagree
3.	I am able to interpret graphic shapes to obtain relationships between quantities during experiments	6,5 % 43,5 %	Strongly Disagree Disagree
4.	I am able to find and check experimental ideas for identified problems	32,3 %	No Agree
5.	I am able to present arguments that underlie the correctness of procedures and experimental results	1,6 % 38,6 %	Strongly Disagree Disagree
6.	I am able to use the right strategy to solve the problem formulation completely and correctly linked to the results of the analysis	37,1 %	No Agree

In the statement of the need to become more skilled in concluding experimental results by drawing meaning from the results/interpretations according to the initial problem, the questionnaire results show that 1.6% of

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students strongly disagree and 50% disagree. Most students cannot conclude experimental results by drawing meaning from the results/interpretations according to the initial problem. This ability is included in the Analysis aspect, where, according to experts, analysis is to identify actual intentions and conclusions related to statements, questions, concepts, descriptions, or forms of representation to express beliefs, judgments, experiences, reasons, information, or opinions. The analysis includes examining ideas, obtaining opinions, and analyzing views as part of the analysis (Facione. 2015: 5). Setiawaty et al., (2022), in his research, concluded that the analysis aspect of students is still low, so it is necessary to develop modules to improve the analysis aspect. Module development provides examples of how to conclude from the experimental results obtained, accompanied by a bar code containing an explanatory video link.

Regarding skills in interpreting graphic shapes to obtain relationships between quantities during experiments, the questionnaire results show that 6.5% of students strongly disagree and 43.5% disagree. Most students need help interpreting graphic shapes to obtain the relationship between quantities during experiments. This ability is included in the inference aspect. According to experts, conclusions or inferences are to identify and guarantee the basis to draw reasonable conclusions and consider relevant information. (Facione. 2015: 6). Permata et al., (2019) in his research, concluded that the inference aspect of students is still low, so it is necessary to develop modules to improve the inference aspect.

In the statement of skills in finding and examining experimental ideas from identified problems, the questionnaire results show that 32.3% of students disagree. Most students need help finding and examining experimental ideas from issues identified. This ability is included in the Evaluation aspect. Evaluation is defined as an assessment of the trustworthiness (credibility) of a statement or representation from the description of someone who is an expert in perception, experience, judgment, and the interpretation of actual logical abilities (Facione. 2015: 6). Evaluation skills are skills that provide a decision about value that is measured using existing criteria. Permata et al., (2019) , in his research, concluded that the evaluation aspect of students needed to be higher. In the statement of skills in presenting arguments that underlie the correctness of procedures and experimental results. The questionnaire results show that 1.6% of students strongly disagree and 38.7% disagree. Some students need more support for arguments that underlie the correctness of procedures and results. Test. This ability is included in the Explanation aspect. Explanation or Explanation is defined as the current ability to convince reasonable results within a reason. This means that it can give someone a full view of the big picture (Facione. 2015: 6). Permata et al., (2019), in his research, concluded that the explanation aspect of students needed to be higher.

The statement of skills in using the right strategy to solve the problem formulation entirely and correctly is linked to the analysis results. The results of the questionnaire show that 37.1% of students disagree. Most students need help

to use the right strategy to solve the formulation. The problem is completely and correctly linked to the results of the analysis. This ability is included in the aspect of self-regulation. According to experts, self-regulation is self-awareness to monitor one's cognitive activities and the results of development, especially by applying the ability to analyze and evaluate conclusions to assessors with a view to questions, confirmation, validation, or correction of results or reasons (Facione. 2015: 7). Permata et al., (2019) in his research concluded that aspects Self Regulation students are pretty good.

Table 5. Results of filling out questionnaires by respondents regarding learning independence

No.	Statement	Percentage	Information
1.	I am used to observing phenomena and problems related to learning materials in the environment where I live	3,2 % 12,9 %	Strongly Disagree Disagree
2.	I am able to conclude the results of the experiment by drawing meaning from the results/interpretations according to the initial problem	1,6 % 17,7 %	Strongly Disagree Disagree
3.	I am able to interpret graphic shapes to obtain relationships between quantities during experiments	1,6 % 8,1 %	Strongly Disagree Disagree
4.	I am able to exercise self-control	1,6 % 16,1 %	Strongly Disagree Disagree

The results of the following questionnaire are related to the student's independent learning profile, shown in Table 5. The statements given serve to determine the extent of students' learning independence. The questionnaire results show that 3.2% of students strongly disagree and 12.9% disagree. It can be concluded that some students have not tried not to depend on others, do not have self-confidence, do not have a sense of responsibility, and are not yet able to exercise self-control. This is following several studies, including those from Sriyono (2016), Nurhidayanti et al. (2022), and Gusnita et al. (2021), which state that most students do not learn under the control of other people, such as teachers and parents. Students' learning independence is still at medium criteria, so it is necessary to develop modules to increase students' learning independence.

4. Conclusion

Based on the data obtained from the analysis of teacher and student needs, the availability of science modules for students needs to be developed based on Project-based learning. It needs to be accompanied by a guide to help students carry out each stage of Project-based learning. Students' science modules must also be developed by considering graphic aspects, structures, and features that can encourage students to learn independently. Students' science modules also need to be designed with scientific literacy so that students understand scientific content, attitudes and

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processes, and the interaction of science with technology and society. Students' critical thinking skills and learning independence are relatively low, so they need to be empowered with the features of the science module that will be developed.

The author hopes that the data from this needs analysis will become a first step or reference in developing student-based science modules with Project-based learning integrated scientific literacy for material on wave vibrations and sound, where these products can be used in the learning process.

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