The Urgency of Developing E-Learning Moodle Substance Pressure Topic on Guided Inquiry Learning to Improve Mastery of Scientific Concepts and Communication

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Abstract. Constraints found in science learning in junior high schools lead to low mastery of scientific concepts and communication skills. Therefore, this study aims to describe the early stages of analysis related to urgency as the basis for product development in the form of e-learning moodle in guided inquiry learning to improve mastery of scientific concepts and communication skills on substance pressure material and its application to everyday life. The method used was descriptive research using literature studies, curriculum analysis, needs analysis questionnaires, open interviews with science teachers, and student ability surveys using question instruments. The research subjects comprised 81 students and two junior high school science teachers. Based on the analysis results, it is known that students want a new learning atmosphere that involves several learning media and practicum-based learning. But the reality of learning still uses traditional methods and a single learning resource, namely textbooks. The development of learning media in the form of moodle e-learning with the guided inquiry learning model is expected to assist teachers in facilitating a new, fun learning atmosphere and involving practicum activities to improve students' mastery of concepts and scientific communication skills.

Keywords: e-learning, moodle; guided inquiry; scientific communication skills.

Introduction

Science is learning that has a lot of applications in everyday life. Where when students see directly natural science phenomena, students will form their concepts based on phenomena they have seen or tried now so that they will more easily understand a material (Siahaan et al., 2020). Creating meaningful science learning must be integrated with the support of learning models. The learning model that is considered capable of implementing the experimental process throughout the implementation of one of them is the guided
inquiry learning model. The guided inquiry model's syntax, directs students to conduct experiments before finding a concept. The guided inquiry also invites students to find and use various information sources to increase understanding of the concepts being studied. Not only that, the guided inquiry also focuses learning on students so that the teacher is only a facilitator who guides and provides assistance during the learning process (Gunawan et al., 2019). This student-centered learning involves students discovering a concept from the material being studied. Therefore, initially learning science which had a scary and challenging stigma, would be fun and exciting for students (Inayah, 2020).

Guided inquiry learning is generally carried out in groups where students will form a discussion group before starting learning. At the same time, science learning also requires students to communicate their findings so that this is considered in line with supporting communication skills in students through guided inquiry syntax (Sintiawati et al., 2021). Scientific communication skills are one of the 21st century skills that students, especially in science subjects must possess, this is related to the characteristics of science learning which is not only fixated on listening to the teacher's explanation, but also there are practical activities that require students to communicate either with fellow students or with the teacher to solve a problem they find related to the concept of a material (Ika, 2018). Not only when discussing solving a problem, but communication skills are also honed in the syntax of the guided inquiry learning model when students present their findings after carrying out a series of investigations on a material. The aspects of scientific communication skills include seeking information, reading, listening and observing, writing scientific papers, scientific representations, and presentations (Spektor-Levy et al., 2009).

One aspect of the assessment required for each subject besides skills and attitudes is the aspect of knowledge. Guided inquiry can also facilitate aspects of student knowledge, especially concept mastery. Mastery of the concept is the ability of students to understand the material after a series of lessons (Siahaan et al., 2020). Not only understanding at the same time, students are also able to identify, give examples, apply known concepts in solving problems, and or synthesize known ideas into new concepts. Students can be said to have mastered the concept if these students can communicate back the concepts they already know ( Saputro & Pakpahan, 2021). Thus, students' mastery of concepts and scientific communication skills are two things that are continuous and must be owned by every student.

Learning at this time is still often found using traditional methods where the teacher only explains descriptively, then students sit and listen. Electronic learning was only used during the covid-19 pandemic, but after the pandemic was officially lifted, electronic learning was rarely used. Electronic-based learning can be used to support the achievement of meaningful learning for students. E-learning is also considered effective in use even though currently the covid-19 pandemic is no longer because electronic learning, allows students to learn without being limited by space and time (Wieland & Kollias, 2020).

E-learning is a form of the development of information and communication technology (ICT). This e-learning is a solution to one of the learning challenges, namely the retention of a dropout rate of more than 90%. This causes the use of e-learning to be an excellent innovation to attract back the enthusiasm of students to learn. Other support can be done by designing electronic learning that suits the needs of students and has characteristics that can attract students to learn (Tlili et al., 2019).

Electronic learning is also considered useful, helps students improve academic standards and can be used as a forum for replicating the scientific method in electronic/multimedia form (Maatuk et al., 2022). Enjoyable electronic learning, of course, will make students more enthusiastic about carrying out a series of knowledge. Therefore, teachers who have the initiative to use e-learning innovations in learning should have high
creativity to design exciting e-learning. The designed e-learning should provide more complete features than the student handbook (Al-Fraith et al., 2020). The features provided by e-learning should also give the impression of meaningful learning for students. One type of e-learning that can be used to support more meaningful electronic learning is Moodle. Moodle is considered more effective for accessing learning material content from various formats, so students are not fixated on getting material only from writing. Moodle also gives the impression of learning in other ways, such as adding videos, pictures, animations, interactive simulations, and etc. Moodle also allows students to re-access these learning features at home so that learning does not only take place in the classroom (Mpun戈se, 2020). One of the subjects that dominate the use of practicum in learning is science subjects (Prabandari et al., 2022).

Moodle can also provide science learning experiences through direct experiments through intermediary worksheets prepared by the teacher or through simulations added to Moodle classes. Junior high school students generally like science learning based on practicum because junior high school students can see first-hand the application of the material they are about to learn. Not only that, students don't get bored when studying because they are not just fixated on sitting in a chair and then only listening and then taking notes on the teacher's explanation (Trisnawati, 2020). If a material experiences problems when doing practical work directly, students can still choose another option, namely through a virtual simulation that is loaded in moodle. This does not prevent students from getting direct experience in understanding science material.

One natural science material with many applications in everyday life is the material of substance pressure. This material discusses the pressure on liquids, gases, and air, as well as its application in life, such as the mechanism of blood pressure in humans, the process of osmosis and capillary transport tissue in plants. This material also supports the process of students' communication skills and mastery of material concepts through defined essential competencies.

The implementation of electronic-based learning can usually be reached in schools located in urban areas, while in rural areas, it is still common to use e-learning in learning. The covid-19 pandemic began the spread of electronic learning systems to reach villages. When the pandemic is over, the learning system generally returns to the traditional model where students can no longer access electronic learning but only focus on listening to the teacher's explanation. This has the potential to hinder students' communication skills. Based on the explanation above, it is considered necessary to re-implement an online learning system with complete features supported by a guided inquiry learning model to optimize the quality of concept mastery and scientific communication skills for Junior high school students, especially on substance pressure material and its application in everyday life. The selected online learning is learning based on e-learning moodle so that it can add many media, which makes e-learning one enough to meet all the needs of learning support.

**Methods**

This descriptive research focuses on describing the results of the early stages of analysis in a mixed methods research series with the context of developing an e-learning moodle. The mixed research that will be used is the sequential exploratory type, while the stages of the mixed sequential exploratory research consist of: (1) collecting and analyzing qualitative data; (2) designing instruments; (3) collecting and analysing quantitative data; (4) interpreting. The results presented in this article are the first phase of a series of sequential exploratory mixed-type research in the form of preliminary data in the qualitative form related to the urgency in the development of e-learning moodle using the...
guided inquiry learning model to improve conceptual mastery and scientific communication skills for junior high school students on substance pressure and its application in everyday life. The subjects of this study consisted of 81 grade VIII students and two junior high school science teachers in Banuayu Village, Muara Enim Regency, South Sumatra Province. The sample selection used a purposive sampling technique based on specific considerations. The data collection techniques used were: (1) literature study, (2) curriculum analysis, (3) needs analysis questionnaire, (4) open interviews with science teachers, and (5) survey of students' abilities using problem instruments.

A literature study was conducted to find information and basic theory relevant to research interests. Furthermore, the distribution of needs analysis questionnaires was carried out to see the state of learning from the student's point of view. The needs analysis questionnaire instrument given to students was compiled based on the following indicators.

**Table 1. Student Questionnaire Indicators**

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Students' perceptions of science learning</td>
</tr>
<tr>
<td>2.</td>
<td>Obstacles during science learning</td>
</tr>
<tr>
<td>3.</td>
<td>Student activity during the learning</td>
</tr>
<tr>
<td>4.</td>
<td>The method of delivering science learning material</td>
</tr>
<tr>
<td>5.</td>
<td>Students' perceptions of electronic science learning</td>
</tr>
</tbody>
</table>

The questionnaire given to students was structured in 7 open questions along with a suggestion column to accommodate students' aspirations regarding the way they wanted science learning to be packaged. Before the questionnaire was distributed to students, it had passed validation beforehand to 2 experts in their fields and had been adapted to the character of junior high school students. This needs analysis questionnaire is also used as the basis for the next stage of data collection stage, namely curriculum analysis.

Curriculum analysis is carried out to determine the material to be included in the learning media. Not only that, but curriculum analysis is also carried out as a basis for selecting learning models to be used in conjunction with learning media to be developed. Next is the interview stage. The interview questions conducted with junior high school Science teachers were structured based on the following indicators.

**Table 2. Indicators of Junior High School Science Teacher Interview Questions**

<table>
<thead>
<tr>
<th>No</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Experience implementation of learning using e-learning</td>
</tr>
<tr>
<td>2.</td>
<td>The learning model used in science subjects</td>
</tr>
<tr>
<td>3.</td>
<td>The learning method used in science subjects</td>
</tr>
<tr>
<td>4.</td>
<td>Permission to use electronic devices for learning purposes</td>
</tr>
<tr>
<td>5.</td>
<td>Science learning outcomes of students</td>
</tr>
<tr>
<td>6.</td>
<td>Communication that exists during the learning process</td>
</tr>
<tr>
<td>7.</td>
<td>Teacher perceptions regarding electronic learning, especially in science subjects</td>
</tr>
</tbody>
</table>

Interviews were conducted in a structured manner using open questions that had been prepared according to indicators. Interviews were also conducted directly with two junior high school science teachers in one of the schools in Banuayu Village. In addition to interviews, observations were also made using question instruments to see students' abilities related to mastery of concepts and scientific communication skills as, well as strengthening the urgency of research. Before the question instrument is used, the question has passed the validation and testing stages and is analyzed so that the item is
ready to be used as an instrument. The instrument consists of 20 questions, 17 of which are multiple choice questions, and the other 3 are description questions. The questions are given to a higher class, where the class has taught the material to be selected. The criteria for students’ concept mastery refer to the following Table 3.

**Table 3. Concept Mastery Criteria**

<table>
<thead>
<tr>
<th>Score</th>
<th>Concept Mastery Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>85 &lt; x ≤ 100</td>
<td>Very High</td>
</tr>
<tr>
<td>70 &lt; x ≤ 85</td>
<td>High</td>
</tr>
<tr>
<td>55 &lt; x ≤ 70</td>
<td>Middle</td>
</tr>
<tr>
<td>40 &lt; x ≤ 55</td>
<td>Low</td>
</tr>
<tr>
<td>0 &lt; x ≤ 40</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

(Source: Ramdani et al., 2020)

**Results and Discussion**

Based on the research that has been done, several results have been found that support the urgency of developing e-learning moodle using the guided inquiry learning model on junior high school substance pressure material to improve concept mastery and scientific communication skills. The first urgency was reviewed using a needs analysis questionnaire distributed to research subjects. The needs analysis questionnaire in the outline discussed students’ perceptions of learning science. Based on the needs analysis questionnaire, as many as 77.8% of students liked learning science however, 63.9% of students still found it difficult to understand the material in learning science. Students' difficulties in understanding science learning were caused by several factors including: (1) 61.1% of students felt that the material presented was difficult to understand and not concise; (2) as many as 30.6% of students feel that explanations are monotonous and tend to be boring; (3) as many as 8.3% of students felt that there was a lack of references to support science learning. Until now, science learning still gives a negative stigma to students, so students still find it challenging to understand and like learning science. Based on the results of the needs questionnaire they also explained that the factor that most influenced students’ difficulties in understanding science material was the method of packaging science learning itself. This is in line with research conducted by (Insani, 2016), who explained that as many as 30% of teachers had difficulty visualizing material so that as many as 32% of teachers thought that applying the discussion method in learning and 77% of teachers felt they needed a source of support to make science learning more enjoyable. In line with that, the researcher also examined suggestions from students for future science learning. The needs analysis questionnaire does not only contain a column of questions with several choices but also a column for suggestions. This suggestion column is intended for students who wish to provide constructive recommendations regarding future science learning. The tips given by students include the following:

- "I prefer science lessons to practice/experiments";
- "fun simulation";
- "It is easier to understand science learning through animated videos, electronics and charts";
- "The teacher must teach more fully, for example formulas and things that are difficult to understand";
- "Using learning by watching so students don't get bored easily";
- "Science learning uses experiments".

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Based on some of the suggestions taken, students want learning that involves practicum, the use of videos/simulations, and the delivery of interesting learning to make science learning more meaningful and easy to understand. After reviewing the learning process in class, the researcher made observations on students’ mastery of ideas to strengthen the urgency from the point of view of student learning outcomes and mastery of concepts so that they could be used as support in finding solutions to any obstacles found. The researcher made observations using the instrument in the form of multiple-choice questions, which were tested in higher grades. This higher class is a class that has passed the material to be used so that previously these students have studied the material. The questions given during the observation have passed trials and validations against experts. The questions compiled also refer to bloom taxonomy but only up to stage C3 (applying). This is based on the essential competencies compiled in the material. The results of student scores which have then been processed using SPSS, are as follows.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samples</td>
<td>27</td>
</tr>
<tr>
<td>Lowest Score</td>
<td>80</td>
</tr>
<tr>
<td>Highest Score</td>
<td>30</td>
</tr>
<tr>
<td>Average</td>
<td>54.51</td>
</tr>
<tr>
<td>St. Deviation</td>
<td>15.59</td>
</tr>
</tbody>
</table>

Based on the results above, it can be seen that students’ lowest score is 30 and the highest is 80. The average score shows a score of 56.59, where this score is still relatively low in terms of concept mastery indicators. Based on the analysis per bloom taxonomy indicator, 50% of students mastered the C1 indicator, 30% mastered C2 indicator and the remaining 20% mastered C3 indicator in the questions presented. This shows that the higher the taxonomy indicator, the lower the student's ability. The highest taxonomic indicator is aimed at C3, but students still need to gain more mastery of concepts related to applying items. This shows an imbalance between students’ mastery of concepts and results even though students have previously studied the material being tested. Not only students who have passed a material, but even students who have studied a material also do not significantly impact their mastery of the concept. As for students who have passed a material, they still need to gain mastery of concepts. This is caused by several factors, including less meaningful learning, affecting students' memory of a learning material (Tarmidzzi, 2019). It is also supported by (Muamanah, 2020), where meaningful learning means learning that has a continuous effect and is continued so that even though students have passed a material, they still remember the concept of that material. Creating meaningful learning will be better if learning is student-centred so that students can directly experience the learning process and be directly involved in each process of receiving material (Suarsana et al., 2019).

Before selecting a student-centred learning model, the researcher also conducted a preliminary study of the communication among students to make student-centered learning more optimal. Student communication, when viewed from interviews with subject teachers, what happened in class was minimal. This is influenced by several factors, including the lack of self-confidence possessed by students. On the other hand, students feel afraid of being wrong when answering questions posed by the teacher while learning is in progress. This was also supported by the results of the questionnaire given to students, where as many as 55.6% of students felt they were rarely involved during learning with a frequency of <3 times at each meeting, and as many as 13.9% of students thought they had never been actively involved in learning science. The active involvement of students in this class can be seen through discussion and question-and-answer activities. Meanwhile, communication is not only oral but also through writing.
However, from the point of view of teachers and students, communication that exists either orally or in writing is equally minimal. Communication, the standard for teachers is only based verbally through discussions and questions and answers throughout the lesson. Considering the obstacles found based on the needs analysis results, students' suggestions for future science learning, observations of students' mastery of concepts, and students' communication skills, the researchers chose to create meaningful learning through a student-centered learning model and the use of various learning media.

Science learning that has been carried out so far also still uses traditional methods where the teacher only explains the material that has been contained in the student handbook, and then the teacher gives several sample questions followed by giving homework to students. Therefore, science learning has yet to be student-centered so far, so it has not fulfilled students' desires to be able to experience learning using practicums or experiments. Science learning in its implementation also has obstacles in practising experiments because it is hindered by several factors, such as supporting facilities in the laboratory and minimal time availability in the performance of science learning if it involves practicum. Another reason felt by the teacher is the difficulty in conditioning students when learning involves practicum. The teacher also said there is no benchmark in selecting a particular learning model to be applied in class. Viewed from the perspective of students and teachers, the implementation of learning has only been supported by one medium, PPT. PPT is used to occasionally replace the method of delivering material to students. The displayed PPT also contains material and some interesting images without the support of other media such as interactive videos, simulations, etc. In fact, at this time, there have been many learning models found that are considered to be able to increase student enthusiasm for learning, which thus has an impact on aspects of student knowledge and skills. One learning model regarded as effective in improving student learning outcomes is guided inquiry. Guided inquiry is practicum-based learning. As for the creation of meaningful learning and active interaction in class, it starts with the management of learning. Based on the student needs analysis questionnaire, students want practicum or experiment-based learning because it will make learning more fun and meaningful (Najib & Misrochah, 2020). Much research has been conducted regarding the positive relationship between practicum-based learning on students' mastery of concepts and communication skills. Research conducted by (Wati, 2021) shows that practicum-based learning can improve mastery of material concepts and students' independence in learning. The practicum carried out in class is not always by inviting students to go to a real laboratory, but can make a virtual laboratory an option. Learning that involves practicum should be paired with a supportive learning model. Guided inquiry is a learning model solution for meaningful learning and supports active learning in the classroom (Rusyadi, 2021).

However, creating meaningful learning conditions also cannot be done instantly, but there are several influencing factors, including communication, that exists throughout learning. The focus of communication in learning is independent of oral but also on writing. Many indicators of scientific communication can be honed in learning including seeking information from various sources, reading, listening, and observing, scientific writing, information representation, and presenting knowledge (Spektor-Levy et al., 2009). The linkages between aspects of scientific communication skills and guided inquiry syntax are clearly seen as follows.

<table>
<thead>
<tr>
<th>Guided Inquiry Syntax</th>
<th>Scientific Communication Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulate Problems</td>
<td>Information Retrieval</td>
</tr>
<tr>
<td>Making a Hypothesis</td>
<td>Information Retrieval</td>
</tr>
<tr>
<td>Collecting data</td>
<td>Read Scientific Writing; Listening and Observing</td>
</tr>
<tr>
<td>Data analysis</td>
<td>Information Representation</td>
</tr>
<tr>
<td>Making Conclusions</td>
<td>Information Representation</td>
</tr>
</tbody>
</table>

Table 5. The Correlation of Guided Inquiry Syntax with Scientific Communication Skills

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The stages of formulating a problem invite students to develop a problem based on the phenomena presented by the teacher. This stage trains students' skills to find as much information as possible from various literature, which is then used as the basis for formulating hypotheses from the problems that have been formulated. Then the data collection stage trains students' skills to read scientific writing for data collection, which is then used to solve problems. Data collection can be done through experimental activities or literature reviews through articles, reports, or the internet. Furthermore, the data obtained, either through experiments or literature reviews is represented and analyzed. Not only reading scientific writings, but students can also collect data from videos, interviews, recordings, etc. Collecting data in this way can also practice scientific communication skills in listening and observing aspects. The data obtained will be represented in the form of schematics, graphs, or descriptive writing. Furthermore, students will enter the stage of making conclusions from the investigation that has been carried out. Then the results of the entire series of investigations will be compiled as a report and presented in front of the class. This stage will train scientific communication skills in the form of knowledge presentation, where students convey back the knowledge they get from a series of investigations in oral form in the form of presentations to the class and or writing a report on the investigation results. Not only that, the results of the investigation and the knowledge that students already have can also be presented in the form of posters and wall magazines so that they can share their knowledge with other readers. This is supported by research conducted by (Rizki et al., 2021) which explains that the guided inquiry syntax is considered support meaningful learning so that it can improve students' scientific communication both orally and in writing.

Support between guided inquiry syntax to scientific communication skills will undoubtedly have an impact on students' mastery of concepts, as research has been conducted by (Syahfira et al., 2021) proves that the guided inquiry learning model is proven to be able to increase students' mastery of concepts with an average normalized gain of 76.12 in the high category. Other research states that guided inquiry is considered effective in improving students' cognitive scores with an average of 50.8 compared to conventional methods with an average yield of only 39.5 (Kristanto & Susilo, 2015) and proven to improve student’s communication skills. This certainly has a long-term impact on student memory, where even though students have advanced to the next level of education students still need to remember past material. The implementation of guided inquiry is identical to inquiry activities. Not only using practicum-based learning, but teachers can also add other media to optimize science learning, including using visual media. Visual media in learning is more able to help students understand learning material compared to just reading from textbooks. This is in line with research conducted by (Utomo et al., 2022) where visual media can also increase students' interest in learning science. As for visual media, there are so many types that if separated it will take a lot of time to show it to students. Therefore, it would be better if the material and learning support media were packaged in a learning platform, namely e-learning. The use of e-learning in learning is considered to support meaningful learning by combining several sources and learning media in it (Afify, 2018).

The selection of media to make science learning more optimal should also examine how the teacher's experience in electronic learning and the choice of learning models. The use of electronic platforms is considered to be a solution because of the use of electronic learning platforms. Based on interviews that were conducted with science teachers, previously electronic learning was only carried out in distance learning during the covid-19 pandemic. The e-learning platform that is carried out usually only contains materials, discussion rooms, attendance and pages for accessing assignments. The discussion space provided is not used optimally because discussions are more often used in video conferencing such as zoom. Then the material included on the e-learning platform is a
material that is also contained in the student handbook. After the covid-19 pandemic was declared over, electronic-based learning was also stopped and returned to textbooks and face-to-face classes. When viewed from the point of view of supporting the implementation of electronic learning, based on interviews conducted with subject teachers, schools only give permission to students to carry electronic devices with clear reasons. As for the sake of learning, schools allow students to bring electronic devices to school with the condition that after learning ends, the teacher concerned is responsible for withdrawing all electronic devices belonging to students and returning them when study hours are over. Then, based on the needs analysis questionnaire, it showed that all students had electronic devices in the form of smartphones. All students stated that they used data packages to access the internet because basically schools do not offer Wi-Fi facilities to support electronic learning. Even though the school does not provide Wi-Fi facilities, the signal in the school area is supported by the 4G LTE network, making it easier for students to access electronic learning. The student's point of view can also be used to support the implementation of electronic learning based on the results of student questionnaires. As many as 44.4% of students spend their time accessing learning using electronic devices with a frequency of 2 to 5 hours per day. This can be used as a support for the application of electronic learning for students so that electronic devices that are owned can provide positive benefits for students. Electronic learning or e-learning can accommodate all the needs of students in making learning meaningful. One of the e-learning platforms that is quite complete in accommodating learning media is moodle. Research conducted by (Fatmawati et al., 2023) supports that the development of electronic-based learning tools can increase students' knowledge and insights related to science learning because through electronic learning, students can access various forms of knowledge representation so as to make students' memories of a material stronger.

Moodle can support media such as virtual labs, simulations, interactive videos, images, animations, etc., so that learning is not only focused on the material. Moodle also contains pages for quizzes, discussions, and attendance filling so that moodle is sufficient to cover all learning needs for teachers and students. Research conducted by (Halmuniati et al., 2022) supports that learning by including additional media such as instructional videos, animations, and images effectively improves student learning outcomes compared to only using textbooks, with a score of 0.69 in the medium category. Moodle can also be accessed on any electronic device, be it a mobile phone or laptop. The ease of accessing Moodle is also a compelling reason to make Moodle a platform that can support students' mastery of scientific concepts and communication. Research conducted by (Aryani et al., 2023) also agreed that electronic-based learning can make students’ memories of a material stronger and research conducted by (Herayanti et al., 2017) shows that using moodle in learning can improve students' mastery of concepts by 80%.

Therefore, based on the data obtained from both the student and teacher perspectives, to achieve meaningful learning in improving students' mastery of scientific concepts and communication skills, an online learning platform in the form of moodle can be developed and used a guided inquiry learning model. Through the moodle e-learning platform together with the guided inquiry learning model, this can be more effective and efficient in improving students' mastery of concepts and communication skills. The survey results of the available facilities and infrastructure are considered sufficient to implement electronic learning using moodle, along with the application of the guided inquiry learning model.
**Conclusion**

Based on the results of the analysis stages in the research based on the needs analysis questionnaire, interviews, and observation of concept mastery through the instrument questions, it can be concluded that student's knowledge of concepts and communication skills still need to be improved. This is caused by less supportive learning that still uses conventional methods and the lack of meaningful learning implementation in schools. The teacher does not use a unique learning model to create a fun learning atmosphere. From the student's perspective, they want to learn in a new and exciting atmosphere, such as using learning media and involving practicum. Various learning models can bring up different learning environments that allow learning to be fun and involve practicum, one of which is the guided inquiry learning model. Not only that, using a single learning resource, namely printed books, also limits students' access to various ways to gain knowledge. Therefore, the creating a meaningful learning environment that is balanced with the development of instructional media needs to be implemented considering the detected constraints. It is deemed necessary to develop an online learning platform to add learning resources and media for students and support the implementation of meaningful learning. The development of e-learning by involving the guided inquiry learning model can also be a solution so that students' communication skills are honed and can be used to continue carrying out practicum activities without relying on real laboratories. The use of e-learning, which covers all needs, is deemed necessary to be developed so that learning becomes practical on only one hand. The development of e-learning, followed by applying the guided inquiry learning model, is expected to assist teachers in creating a meaningful learning environment to improve students' mastery of concepts and scientific communication skills.

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