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Implementation of Moodle platform to acquire the students' knowledge and science process skills

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Abstract

Teachers are demanded to design learning tools to develop students' learning motivation. Limited and monotonous learning models or tools have been a common reason for students' lack of interest in learning. This study aims at describing the benefits of learning tools, especially 1. Teacher's Guidebook and Students' Worksheets developed through the Moodle platform. Both were used to support the learning activities to 2. acquire the knowledge dimensions and Science Process Skills in the excretory system concepts. This study employed a one-group pretest-posttest design. The population of this research was the eleventh-grade students in state senior high schools 13, Bekasi. It involved 3. 102 students taken by the purposive sampling technique. The research instrument employed tests and observation sheets. Data analysis used paired sample t-test and quantitative descriptive. The results showed that the student learning activities using the developed worksheet in the Moodle platform could be categorised as "very active". The acquisition of students' knowledge dimensions increased after using the developed Teacher's Guidebook and Students' Worksheets or in the medium category. It also significantly improves the students' science process skills in the learning process. The improvement occurs in every aspect of science process skills, including observing, classifying, predicting, inferencing, hypothesising, interpreting data, planning experiments, and communicating.

Keywords: Moodle, Teacher's Guide, Students' worksheets, Students' Knowledge Dimension, Science Process Skills, Excretory System Concepts.

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1. Introduction

The use of information technology-based learning media has been an integral part in education, especially in this globalisation era. Technology mastery is needed to prepare students to face the global challenges. It should also be supported with the development of higher-order thinking skills so that students can adapt to rapid changes due to technological developments (Zubaidah, 2019). However, several obstacles appear in many classroom implementations (Karim and Arsanti, 2022.) The learning process by utilising information and communication technology is essential in increasing the effectiveness and quality of education (Chania et al., 2022). The learning media can realise practical benefits such as clarifying messages and improving learning processes and outcomes (Muazizah et al., 2016). Computer-based learning media is proven crucial to promoting the success of the classroom learning process (Prasetya et al., 2008), primarily to raise students' learning motivation and improve knowledge and skills (Amayati & Mariono, 2010).

The latest science and technology urge teachers to develop their knowledge to respond to the digital to be productive and professional (Hermann et al., 2016). Having a role as a facilitator (Bye, 2017), teachers must be able to design learning activities which are effective, efficient, scientific and fun. This demand is in line with the national goal of education, to create professional teachers as the main component to achieving qualified education (Richter et al., 2021). Teachers should be able to develop learning strategies and facilitate autonomous learning based on the surrounding environment to produce competent students with high learning enthusiasm and skills mastery (Alhodiry, 2016). A teacher must be highly motivated to gain innovation and creativity to improve learning quality (Supriadi, 2017). Based on the national standard, teachers must be able to manage and design the learning tools (Suryanti & Arifani, 2021). The government, policy maker and curriculum designer, has made various efforts, such as conducting professional teacher training to enhance teachers' creativity (Suryanti & Arifani, 2021). However, most schools seem to find it difficult to achieving the government target. Only a few teachers have developed their learning tools and instruments because they find it confusing to design them and prefer to use the existing media, which are simple and conventional (Sani et al., n.d.). Teachers' abilities to utilise learning resources for acquiring knowledge, skills, and strategies are insufficient (Supriadi, 2017). Many teachers and school principals have low technological literacy, so ICT integration in the learning process is rarely used (Winda & Dafit, 2021). The large area of this country might be the real challenge. Several regions have no access to the internet connection, even electricity (Novita & Harlina, 2019).

The design of learning tools is one of the teacher's efforts to optimise learning activities that provide opportunities for students to develop their potential based on their character and needs (Sribekti et al., 2016). The student's interest and motivation in learning will be higher if they are treated with appropriate learning media (Effiyanti et al., 2018). Unfortunately, the learning media used by the teacher is unsuitable for students' conditions (Baber, 2020). The learning media should be arranged based on the students' characteristics to facilitate them in developing their potential. It can be realised by compiling learning tools with varied learning strategies so that the learning process can run well and the learning objectives can be achieved (Salas-Rueda, 2019).

Teacher's guidebooks and students' worksheets are two such examples of learning tools that the teacher should design. However, most teachers just utilise the existing model from the publishers, which are slightly oriented towards developing students' science process skills (Sari & Yarza, 2021). Many teachers admit that they experience difficulty making learning tools, including students' worksheets and assessment tools (Murwitaningsih, 2020). They use the learning tools by directly imitating from the internet or from their peers (Handayani & Amirullah, 2019).

The use of technology in the learning process and designing learning tools becomes the main focus for all components of education (Wilson et al., 2013) because technology ³ has been an essential factor in improving the quality of education. Teachers are demanded to enhance technological literacy among students, improve the learning quality, and encourage problem-solving activities (Carugati & Selleri, 2014). Teachers are required to master TPACK, i.e., knowledge of technology, pedagogy and areas of expertise to help them create their media, materials, and learning tools with the latest technology.

(Irdalisa et al., 2020). For a better learning process, the Moodle platform is beneficial (Egorov et al., 2021). It is an application with many suitable features for learning needs. The findings from Turrahma et al. (2017) mention that the Moodle application is a valuable tool for teachers to manage learning materials and test items. Moodle has been a popular LMS used by many educational institutions because it aligns with educational philosophies. Moodle is built based on direct experience and can accommodate most conventional educational needs that are transferred into online learning. (Darmawan, 2014).

Based on this study, the authors conducted research to describe the benefits of the learning tools in the form of Teacher's Guidebooks and Students' Worksheets through the Moodle platform. The developed tools are to acquire the dimensions of knowledge and Science Process Skills among XI grade science students on Excretory System concepts.

2. Method and Material

2.1 Research Design

This study employed a one-group pretest-posttest design to know the acquisition of students' knowledge dimensions and a quantitative approach to learning activities and students' science process skills.

2.2 Population and Research Sample

The population of this study were students of XI grade science students from state senior high school 13, Bekasi. The research sample involved 102 students determined using the purposive sampling technique. These techniques were designed by considering the students' abilities. The teacher's guidebook and students' worksheet were applied through the Moodle platform for once a week.

2.3 Data collection Techniques and Instruments

Data collection techniques and instruments in this study were (1) the observation sheets to gain data on students' learning activities and science process skills, (2) the multiple-choice test to determine the acquisition of students' knowledge dimensions.

2.4. Data analysis

The analysis for the acquisition of knowledge dimensions employed the standard gain. The differences in the acquisition of knowledge dimensions were tested using t-test. The assessment of learning activities and students' science process skills was done by calculating the percentage on the observation sheet from each student's answer. The raw scores were then converted into percentage values.

3. Results and discussion

3.1 Students' Learning Activities

Based on the analysis results, the obtained data from students' learning activities are shown in Table 1.

Table 1. The Achievement Percentage of Student Learning Activities.

No	Students' Learning Activities	Meeting I	Meeting II	Meeting III	Meeting IV	Mean	Achievement Categories
1	Paying attention to the teacher's explanation	98	99	100	100	99,25%	Very Active
2	Asking question	95	95	98	98	96,5%	Very Active
3	Completing assignments in groups	96	98	98	98	97,5%	Very Active
4	Paying attention to group discussions	95	95	98	99	96,75%	Very Active
5	Solving the problem	77	84	90	93	86%	Very Active
6	Presenting the results of group work	90	93	95	98	94%	Very Active

7	Responding to questions	88	92	95	95	92,5%	Very Active
8	Accepting and respecting others' opinions	99	100	100	100	99,75%	Very Active

Based on Table 1, the student learning activities using the worksheet in the Moodle platform obtained the lowest average score of 86% for the problem-solving aspect, and the highest average score of 99.25% for students' attention to teachers' explanations. The data showed that students' learning activities could be categorised as "very active".

3.2. Acquisition of Students' Knowledge Dimensions

Before the learning process took place, the average scores on the acquisition of the students' knowledge dimension obtained the average pretest score of 58.87 and the posttest aof 86.96, respectively. The escalation in the dimensions of students' knowledge can be seen from the gap between the students' post-test and pretest scores (gain). It was followed by the normalisation of gain (N-Gain).

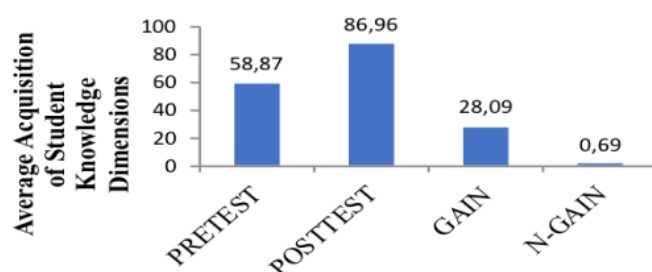


Figure 2. The Average Value of Students' Knowledge Dimension Acquisition

Data on the acquisition of students' knowledge dimensions improved after using the developed students' worksheet and teacher book guide in the Moodle platform with an average N-Gain score of 0.69 (Medium category). The average difference test in the acquisition of knowledge dimensions obtained t-test result of 56.18 while t-table of 1.97 (α 0.05). It indicates that the data are significant.

3.2 Science Process Skills

The data from the analysis of science process skills based on the urine testing practicum in the excretory system material can be seen in Figure 3. The inference aspect is higher than other aspects, i.e., 91 (very good). The aspects of hypothesising and communicating rank the lower score with 81.

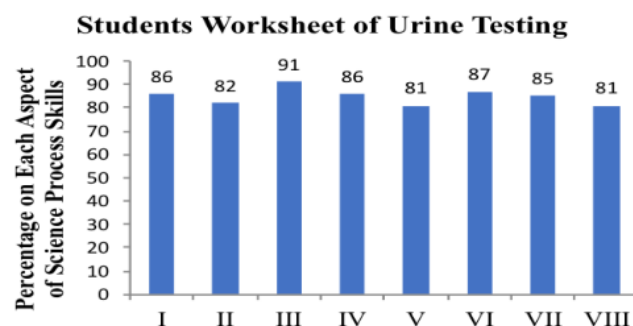


Figure 3. Percentage of Students' Science Process Skills in Each Aspect

Explanation:

- I = Observing aspect
- II = Classifying aspect
- III = Predicting aspect
- IV = Inferencing aspect of
- V = Hypothesizing aspect
- VI = Data interpretation aspect
- VII = Experiment plan aspect
- VIII = Communication aspect

The analysis data of the science process skills from the lungs practicum as an excretory organ shows that the inference aspect ranked as the highest, i.e., 91 (very good). Meanwhile, the elements of hypothesising and communicating were the lowest with 84 but improved compared to the first practicum (Figure 4).

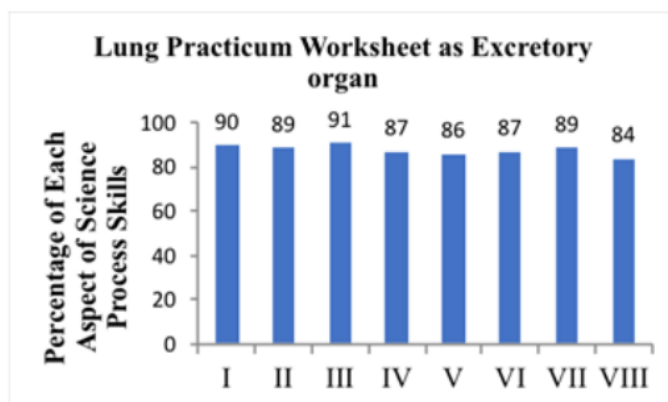


Figure 4. Percentage of Students' Science Process Skills in Each Aspect

Explanation:

- I = Observing aspect
- II = Classifying aspect
- III = Predicting aspect
- IV = Inferencing aspect of
- V = Hypothesizing aspect
- VI = Data interpretation aspect
- VII = Experiment plan aspect
- VIII = Communication aspect

The data from the analysis of the total scores in all practicums based on each worksheet can be seen in Figure 5 below.

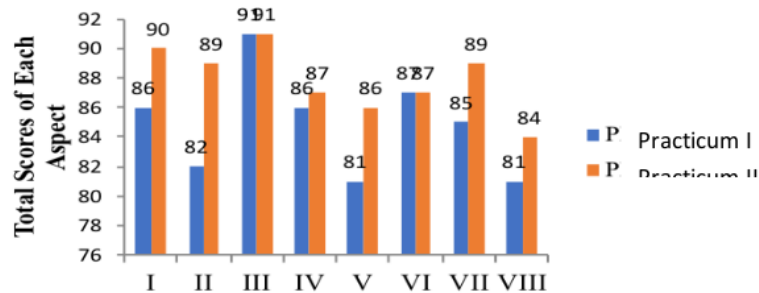


Figure 5. Total Value Escalation in Each Aspect of Science Process Skills

Explanation:

- I = Observing aspect
- II = Classifying aspect
- III = Predicting aspect
- IV = Inferencing aspect of
- V = Hypothesizing aspect
- VI = Data interpretation aspect
- VII = Experiment plan aspect
- VIII = Communication aspect

The aspects that experienced a significant escalation were observing, classifying, inferencing, hypothesising, planning experiments and communicating with the percentages of 9%, 89%, 87%, 86%, 89%, and 84%, respectively (Figure 5).

Biology learning needs to provide direct experience to students, which is realised by the existence of learning media containing the guidelines to conduct scientific activities or problem-solving, to facilitate the students to build their knowledge. The developed teacher's guidebook consists of three parts: the beginning, the core, and the closing. The initial section contains instructions for use, learning instructions and learning stages. The core section consists of the material content and students' worksheets, while the final section involves alternative student answers to specific problems in the worksheet. There is also a follow-up part for deepening the material (Effiyanti et al., 2018). The appropriate worksheet should adapt to the students' characteristics, the learning situation, and the school conditions.

Based on the results of the study, the students' learning activities were observed based on eight aspects, namely, paying attention to the teacher's explanation, asking questions, completing assignments in groups, paying attention to group discussions, solving problems, presenting the results of group work, responding to questions as well as accepting and respecting others' opinions. The learning activity data for each aspect were assessed from the direct observations in 4 meetings. The student learning activities using the developed teacher guidebook and students' worksheets in the Moodle platform can be categorised as "very active". The students learning motivation are high in using the developed Moodle worksheet. It can be seen from their positive involvement during the learning process, such as asking questions, expressing opinions, discussing with fellow group members, responding to questions, and completing experiments based on the worksheet instructions. The learning tools can enhance the students' learning enthusiasm in comprehensive and attractive forms to decrease boredom during the learning activities (Febrita & Ulfah, 2019). The use of appropriate worksheet can improve student

learning activities because it will be more student-centred, encouraging them to be active during the learning process (Umbaryati, 2016).

The use of learning media can generate learning interest, motivation and stimulation so that students will better understand the learning material. Students can express their ideas through the worksheet based on their laboratory observations. This condition will enhance students' learning activities, especially Science Process skills, to positively impact the acquisition of student knowledge dimension. (Marsa et al., 2016). Similarly, the findings from Hamidah et al. (2018) clarify that student learning activity can be more active with the use of students' worksheets that will have positive influence on students' learning outcomes.

Moreover, the post-test series for acquiring the knowledge dimension on the excretory material from the Moodle application of teacher guidebook and students' worksheet promote students' autonomous learning and group collaboration to solve a problem (Mursalim and Rumbarak, 2021). The use of worksheets can raise students' material understanding based on their experience and investigation (Aristiadi & Putra, 2018). The worksheet is also a means to assist and facilitate teaching and learning activities with effective interaction between students and educators. This circumstance can support students' activities to accelerate their learning achievement (Mursalim & Rumbarak, 2021).

The analysis results on the students' science process skills showed a better outcome during the use of the Moodle worksheet in the learning process. The improvement occurs in every aspect of science process skills, including observing, classifying, predicting, inferencing, hypothesising, interpreting data, planning experiments, and communicating (Indriani et al., 2019). The escalation of science process skills aspects was observed in every practicum activity, such as urine test practicum and lung practicum as an excretory organ. It is in line with Astutik and Tutut's study (2018) results that the worksheet application can improve science process skills.

The observing aspect is measured when students identify the collected data with or without correct measuring instruments during their observations. The classification aspects are assessed when students obtain experimental data arranged within an observation table in the worksheet. The predicting aspects are revealed when students use the results of their observations to predict answers from the information in the worksheet. The inferencing aspect is gained when students use the observation results to confirm or prove the hypothesis. The hypothesising is determined when students construct statements that can be tested through experiments. The aspect of experiment planning can be seen when students conduct an investigation following the worksheet instructions. The aspects of data interpretation are measured when students draw conclusions based on the observations data. Meanwhile, the communication aspect is concluded from the students' reports based on their discussion results. It is clear that science process skills are so crucial that are obtained through the scientific procedure to gain new knowledge or develop existing knowledge (Depari & Hasruddin, 2020).

4. Conclusion

Based on the results of this study, it can be concluded that student learning activities using the developed teacher guidebook and students' worksheet designed in the Moodle platform can be categorised as "very active". The acquisition of the student's knowledge dimension is getting better after using the Moodle platform, which is in the medium criteria. The analysis results on the students' science process skills showed an escalation during the learning process. Significant improvements also occur in every aspect of science process skills. The developed learning tools which are appropriate with the material characteristics, the students' background, and the school environment can support the manifestation of the attractive and interesting learning tools. Referring to the research findings, learning tools should be designed in such innovative models with varied materials and ICT integration. It can also be used as guides for teachers to enhance their insight and skills in designing learning tools to support their professionalism. The pedagogical implications of this research show that the learning innovations in their tools or media with IT integration significantly improve the learning quality. It supports the claim that e-learning can be a beneficial alternative for learning. This research is limited to the use of the Moodle platform as an e-learning.

5. Recommendation

After a thorough analysis of data, the following recommendations are hereby made. This research suggests that teachers should use technology-based learning media in Biology learning, such as teacher's guidebooks and students' worksheets in the Moodle platform since it is crucial to clarify the delivery of messages and information. Teachers can facilitate and improve learning processes and outcomes. Moreover, the use of teacher's guidebooks and students' worksheets through the Moodle platform should be adjusted to the characteristics of students' development. It also demands teachers' creativity and innovation that is align with the learning objectives.

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