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The validity of learning tools based on guided inquiry learning on the topic of respiratory system

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Abstract: This research aims to analyze the validity of learning tools based on guided inquiry learning on respiratory system material. Research and development of the ADDIE model were used in this research. This research was limited to the "develop" stage, which was limited to the results of expert validation tests. The learning tools developed include lesson plans (four meetings), student worksheets (four meetings), and tests (a total of six items in the form of essays). Two experts and one practitioner validated the learning tool—analysis by calculating the acquisition score based on the validator's assessment. The findings reveal that the lesson plans, student worksheets, and tests have been proven valid according to validity standards. This research concludes that inquiry-based learning tools are valid based on expert assessment. Thus, learning tools based on guided inquiry are suitable for biology learning in high school, especially material on the respiratory system.

Keywords: Learning expert, learning tools, practitioner, respiratory system

Validitas perangkat pembelajaran berbasis inkuiri terbimbing pada topik sistem respirasi

Abstrak: Penelitian ini bertujuan untuk menganalisis validitas perangkat pembelajaran berbasis pembelajaran inkuiri terbimbing pada materi sistem respirasi. Penelitian dan pengembangan model ADDIE digunakan dalam penelitian ini. Penelitian ini hanya sebatas pada tahap "mengembangkan" yaitu hanya sebatas hasil uji validasi ahli. Perangkat pembelajaran yang dikembangkan meliputi RPP (empat pertemuan), LKPD (empat pertemuan), dan tes (total enam butir soal berbentuk esai). Dua orang ahli dan satu orang praktisi memvalidasi perangkat pembelajaran. Analisis dengan menghitung perolehan skor berdasarkan penilaian validator. Hasil penelitian menunjukkan bahwa RPP, LKPD, dan tes terbukti valid sesuai standar validitas. Penelitian ini menyimpulkan bahwa perangkat pembelajaran berbasis inkuiri valid berdasarkan penilaian ahli. Dengan demikian, perangkat pembelajaran berbasis inkuiri terbimbing cocok untuk pembelajaran biologi di SMA khususnya materi sistem respirasi.

Kata Kunci: Ahli pembelajaran, perangkat pembelajaran, praktisi, sistem respirasi

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INTRODUCTION

Current education emphasizes interaction processes that encourage students' abilities. Education focuses on the processes experienced by students during learning and results in better achievement (Junaedi, 2019). Teachers must be able to choose, determine, and develop appropriate learning to achieve maximum student learning outcomes. According to Duengo et al. (2020), learning is an activity that requires systematic organization because learning is related to the goals to be achieved. The learning process must begin with a thorough planning process so that its implementation can be carried out effectively (Anggarini et al., 2023; Obielodan et al., 2021). Choosing the right strategy can improve students' learning outcomes (Nwuba et al., 2023; Prihantini & Khoirunnisa, 2023; Rangga et al., 2023).

The teacher's role is very important in creating effective learning (Lelasari et al., 2021; Sartika et al., 2023). An effective learning process requires planning learning activities. One of the learning plans is to create learning tools. According to Duengo et al. (2020), learning tools are supporting tools so that learning can run well. Learning tools that can be developed include syllabi, lesson plans, student worksheets, student handbooks, science teaching aids, learning outcomes tests, and questionnaires (Fimansyah et al., 2023; Nasir et al., 2023). Designing learning tools requires choosing the right learning model because it can help teachers determine learning techniques, strategies, and methods to achieve learning goals. Students' cognitive development needs to be considered in choosing a learning model. This consideration can encourage student success in learning (Purnasari et al., 2022).

We have conducted interviews with biology teachers at SMA Negeri 1 Tilango. We received information that teachers need learning references for developing lesson plans. The learning used in the lesson plan has remained the same. The student worksheets used only contain questions and do not involve innovative learning. In the 2013 Curriculum, teachers must be innovative in developing varied learning tools so students are active in learning. The results of the material analysis show that student learning outcomes, especially in material about the respiratory system, are below the minimum standard, namely 75. Based on the description of the problems found, it is necessary to develop an innovative learning tool. Respiration material requires innovative learning to be taught to students well. In this way, students can absorb the material presented well.

A lot of biology material is difficult for students to learn. Respiratory system material is an example of material that is difficult for students to understand. Ritonga (2016) has researched students' difficulties understanding respiratory sister material. This researcher found that the cause of students' low scores on this material was that they were unable to do the questions, were slow to absorb the material presented by their teachers, and needed more innovation in the learning carried out by their teachers. Sani et al. (2019) also researched the difficulty of students learning material on the respiratory system. They found that health, interest, student attention, motivation, lesson standards, subject matter, school atmosphere, intelligence, teacher teaching methods, and media were their inhibiting factors. Munandar et al. (2019) have found that inquiry learning is an alternative solution to overcome students' difficulties in learning the respiratory system. Rafiqa et al. (2022) found that guided inquiry is appropriate learning.

Inquiry learning has been widely researched and produces good performance for students. Andriyanto et al. (2021), Nunaki et al. (2019), and Pambudi et al. (2022) have

researched how inquiry learning affects students' metacognition. The results of their research show that inquiry learning has had an impact on students' metacognition compared to students without inquiry learning. (Nunaki et al., 2020) have designed learning that uses inquiry. His research found that students' skills improved when involved in inquiry learning. Students who are not involved in inquiry learning show low scores. Bunterm et al. (2014) have found that one type of inquiry learning, namely guided inquiry, has a great effect. Their research found that cognitive abilities, skills, and even attitudes and stress were reduced when students were involved in guided inquiry learning. Inquiry has positively affected student learning outcomes and skills (Damopolii et al., 2018). However, Ismail et al. (2020) stated that they must meet validity criteria in developing inquiry-based learning tools.

A learning tool developed must be innovative. Apart from that, learning tools must meet valid criteria. Valid learning tools can be a reference source for teachers in learning. Thus, this research aims to analyze the validity of learning tools based on guided inquiry learning on respiratory system material.

METHOD

Research and development of the ADDIE model was used in this research (Branch, 2009). This research is limited to the "Develop" stage, which is limited to the results of expert validation tests. The product that has been produced is a learning tool based on guided inquiry learning. The subject matter studied in this research is the respiratory system.

The tools developed were lesson plans (four meetings), student worksheets (four meetings), and tests (a total of six items in the form of essays). Lesson plans and student worksheets were developed based on the 2013 Indonesian curriculum. Tests developed to measure student learning outcomes. The learning tools' standards follow the standards for senior high school. Two experts and one practitioner validated the learning tool. The expert validators came from lecturers in biology education at the State University of Gorontalo. The practitioner comes from a biology teacher at SMA Negeri 1 Tilango.

Table 1. Aspects of learning tools assessment

Code	Aspect for		
	Lesson Plan	**Student Worksheet**	**Tes**
A1	Subject identity	Substance	Material
A2	Time Allocation	Didactic	Construction
A3	Core competency	Construction	Language
A4	Basic competencies	Technique	
A5	Achievement indicators		
A6	Material description		
A7	Learning Activities		
A8	Evaluation		
A9	Media/tools, learning materials and resources		
A10	Linguistics		

The validation process is carried out by providing learning tools to all validators. The validator then carries out validation based on the validation sheet that has been provided. The validation results were analyzed—validation analysis by calculating the acquisition score given by each validator. Expert validator scores are averaged, and practical scoring is not carried out. Practitioner scores were not averaged because there was only one practitioner.

Table 2. Categories for assessing the validity of learning tools (Akbar, 2013)

Category	Score
Very valid	85.01 – 100
Valid	70.01 – 85.00
Valid with major revisions	50.00 – 70.00
Invalid	< 50.00

RESULTS

Lesson plan

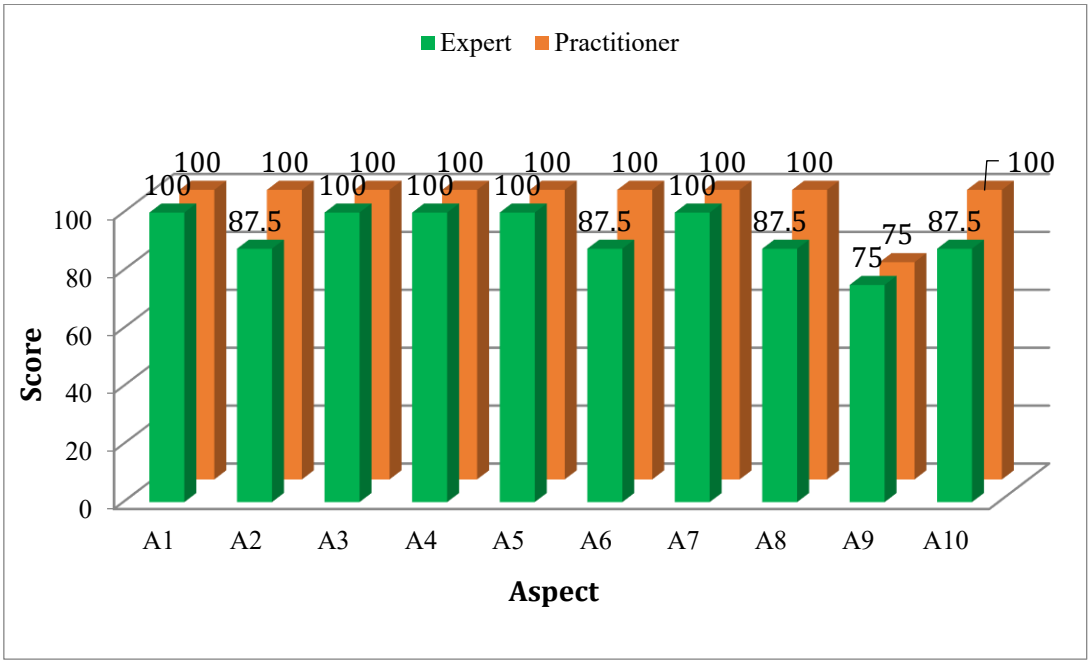

Fig. 1. Lesson plan validation result

The results of expert and practitioner validation (Figure 1) show that the lesson plan is valid. The practitioner validation results revealed that nine aspects were very valid, and only one aspect was included in the valid category. That aspect is A9 (Media/tools, learning materials, and resources). The expert validation results found that the very valid aspects were A1 – A8 and A10, while A9 (media/tools, learning materials, and resources) indicated the valid category. Research has found that the lesson plans developed meet valid criteria. This indicates that the lesson plan can be used for the next stage.

Student worksheet

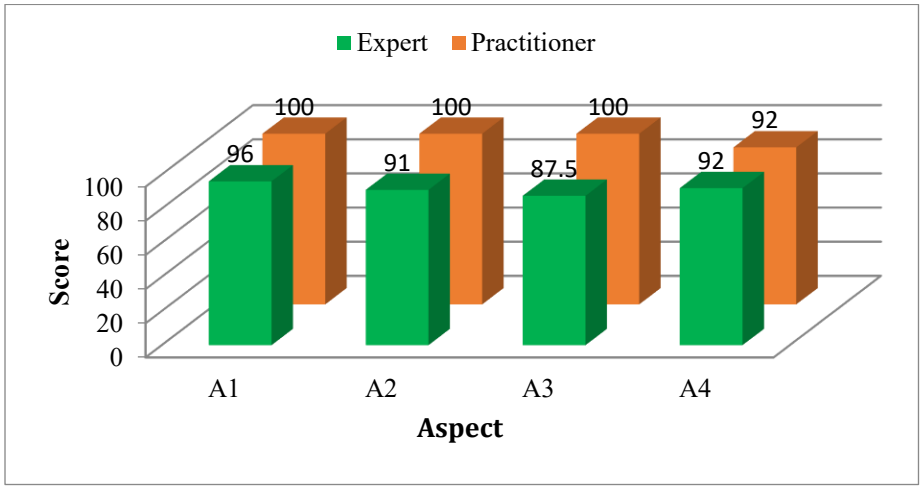

Fig. 2. Student worksheet validation result

Based on the data presented in Figure 2, it is indicated that all aspects assessed from the student worksheet are very valid. Practitioners gave a score of more than 90 for all aspects assessed. Experts have also provided the same value as practitioners. All aspects that have been assessed receive a very valid category. Research has found that the student worksheet developed meets the valid criteria. This indicates that the student worksheet can be used for the next stage.

Fig. 3. Example of a validated student worksheet cover

Test

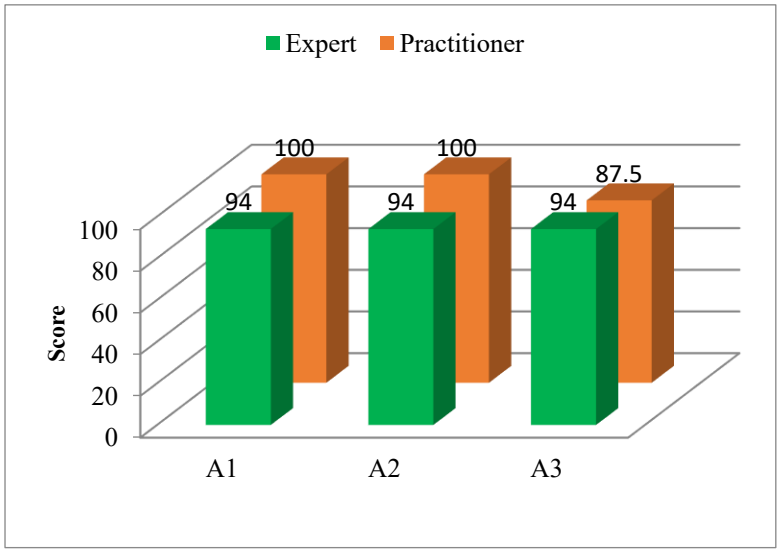

Fig. 4. Tes validation result

Figure 4 indicates that all aspects assessed to determine the level of validity have been met. Both practitioners and experts assessed more than 90, and the test was declared very valid. Research has found that the test developed meets the valid criteria. This indicates that the test can be used for the next stage.

KISI-KISI SOAL TES HASIL BELAJAR

Materi : **Sistem Respirasi Manusia**

Kelas/Sesmeter : **XI/Genap**

No	Indikator Pencapaian Kopetensi	Materi	Indikator Soal	Level Kognitif	Bentuk Soal	Nomor Soal	Skor
4	Menganalisis faktor-faktor yang mempengaruhi frekuensi pernapasan	Faktor-faktor yang mempengaruhi frekuensi pernapasan manusia	Disajikan soal essay mengenai frekuensi pernapasan manusia dipengaruhi oleh faktor eksternal dan internal	C4	Esaay	4	20

Fig. 5. Question grid

DISCUSSION

Riset yang telah dilakukan telah memenuhi kriteria valid berdasarkan standar kevakidan. Lesson plan, student worksheet dan tes hasil belajar telah dinyatakan valid ioleh ahli dan praktisi.

Lesson plan

The research results show that the expert and practitioner validator assessments have a low score of 75 in the valid category. The aspects assessed are media/tools, materials, and learning resources. The score for this aspect is low because the learning resources in the RPP have not been varied. According to Supriadi (2017), learning resources are not only

printed materials such as textbooks. Teachers can utilize other learning resources such as educational radio, television, computers, e-mail, interactive video, satellite communications, and multimedia computer technology to increase interaction and provide student feedback. Other learning resources from inquiry-based lesson plans can be integrated with local resources (Rumalolas et al., 2021). Inquiry-based lesson plans enriched with learning resources can help teachers improve their students' performance (Mandasari et al., 2021; Nasir et al., 2020).

Based on the lesson plan assessment results assessed by expert practitioner validators, a score range of 75 – 100 was obtained, which was included in the valid and very valid categories. According to Latjompoh (2018), the valid learning tool aligns with scientific studies, and all its parts are interconnected. According to Daud et al. (2020), learning tools have an adequate level of validity if the calculation results are in the very valid and valid category. Research conducted by Yusuf et al. (2019) found that teachers can use validated inquiry-based lesson plans as a guide in implementing teaching. Implementing inquiry-based learning requires lesson plans that are appropriate to the stages. In this research, lessons have followed the steps of inquiry learning. The validation results do not indicate that there are steps from inquiry learning that need to be added to the lesson plan. The Learning resource components need improvement from the lesson plans that have been developed.

Student worksheet

The aspects assessed by expert and practitioner validators on student worksheets are substantive, didactic, construction, and technical. Based on the validation results by expert validators, the score range was 87.5 – 96 in the very valid category. The assessment by practitioner validators obtained a score range of 92 – 100 in the very valid category. According to Mastang and Rapi (2018), learning tools meet validity criteria if they are made with a consistent design for all components and suitability between objectives, material, and assessments given to students. Our research's results align with the findings of Novita et al. (2023), who found that guided inquiry-based student worksheets met valid criteria. Valid student worksheets can be used in the learning process. Its use can help students understand the material arranged in guided inquiry learning.

Test

The aspects assessed by expert and practitioner validators in learning outcomes tests are material, construction, and language. Based on the validation results by expert validators, a score of 94 was obtained, which is in the very valid category, and practitioner validators obtained a score range of 87.5 – 100, which is included in the very valid category. According to Mustofa et al. (2021), the validity criteria for a product used in learning with an achievement of 90 – 100 are included in the very valid criteria and can be used with slight revision. The test in this research is to measure student learning outcomes. Based on the findings of this research, the test developed can be used to measure student learning outcomes after they are involved in guided inquiry-based learning. A valid test is a test that can accurately measure student learning outcomes (Nurpitasari, 2022). Thus, this test can measure students' knowledge of the respiratory system material.

CONCLUSION

This research concludes that the validity test of learning tools based on guided inquiry learning on respiratory system material has met valid requirements. This was shown by the validation results of the validator used, which was declared valid with slight revisions. The lesson plan gets a score of 75 – 100, student worksheets range of 87.5 – 96, and a test score 94 for expert assessors. The lesson plan gets a score range of 75-100, 92-100 for student worksheets, and a test range of 87.5 – 100 based on practitioner assessment. Thus, learning tools are suitable for use as biology learning tools at SMA Negeri 1 Tilango, especially material on the respiratory system.

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