Development of Science Worksheet Based on Multiple Intelligences with Guided Inquiry Model to Improve Critical Thinking Skills of Elementary School Students

Pramesti Mayaza Budiman [1✉], Sri Hariyani , Tri Suminar

Universitas Negeri Semarang, Indonesia

Article Info	Abstract
	The rapid advancement of information technology characterizes 21st-century education. In addition to cognitive, affective, and psychomotor aspects, 21st-century learning also requires students to develop several skills known as the 4Cs: Communication, Collaboration, Critical Thinking, and Creativity. This study aims to develop Student Worksheets (LKPD) that produce Science Worksheets based on Multiple Intelligences with the Guided Inquiry model, which meet the criteria of being appropriate and effective in improving students' critical thinking skills. This research is a Research and Development (R&D) study that adopts the 4D development model, which includes the stages of definition, design, development, and dissemination. Data collection techniques used in this study include interviews, observations, questionnaires, tests, and documentation. This research involved 90 students divided into two groups: a small group and a large group. The validation results of the LKPD were rated as highly feasible by the validators, with an average score of 97,7% in the media aspect, 98% in the material aspect, and 98,9% in the language aspect. The LKPD also improved students' critical thinking skills, with an average difference between pretest and posttest scores of 16.33 and an N-gain score of 0.504 in the large group trial, which falls into the medium criteria. Therefore, developing Science Worksheets based on Multiple Intelligences with the Guided Inquiry model is feasible and effective in improving students' critical thinking skills.

✉ Correspondence address:
Kampus Sekolah Pascasarjana UNNES
Bendan Ngisor Semarang 50237
E-mail: pramestymayaza@gmail.com

INTRODUCTION

Education strategically develops Human Resources (HR) to create a skilled, creative, innovative, and expert society. Education can develop a nation's potential and improve the quality of its human resources. Quality HR can be produced through teachers who educate and teach by 21st-century learning (Elitasari, 2022).

In addition to cognitive, affective, and psychomotor aspects, 21st-century learning also requires students to develop several skills known as the 4Cs: Communication, Collaboration, Critical Thinking, and Creativity. Critical thinking is among students' essential skills (Siti et al., 2019). Students' critical thinking skills are needed in learning because they will have an impact on students in facing problems in everyday life, namely explaining and solving problems (Isnaeni et al., 2021, Spector & Ma, 2019), Thomas, 2011)

According to the Trends in International Mathematics and Science Study (TIMSS), Indonesia's average science score for elementary school students (Level 4) was 397, ranking 51st out of 54 participating countries. Based on the data for 2015, Indonesia was ranked fourth from the bottom. According to Gandi et al (2021), TIMSS questions can be used to measure students' critical thinking skills. The aspects measured by TIMSS emphasize understanding, application, and reasoning within the cognitive domain, which can demonstrate students' critical thinking abilities (Idris, 2020). The critical thinking skills of Indonesian students still need to improve. These findings are consistent with several studies, such as those by Satriani et al (2022), Benyamin et al (2021), Rizza & Madiun (2020), dan Hidayat et al (2019), which state that students' skill levels can still be categorized as low.

The lack of critical thinking skills among students is caused by several factors, including (1) lack of student understanding of problems; (2) students easily forget the material that has been taught; (3) students cannot connect concepts to real situations; (4) students are unfocused and quickly bored during learning; (5) the given learning is not contextual (Benyamin et al, 2021, Simatupang, 2019, Widiansyah et al., 2018).

To the goals of education, every student has the right to receive learning services that match their potential. Educators have the task of ensuring that the learning process highlights the potential of their students (Arfandi & Samsudin, 2021; Damayanti et al., 2017). The potential possessed by students was first proposed by a scientist named Howard Gardner. Howard Gardner stated that humans have nine intelligences with different compositions (Nurbaiti et al., 2016). The nine intelligences are logical-mathematical intelligence, linguistic intelligence, musical intelligence, spatial-visual intelligence, bodily-kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, naturalistic intelligence, and existential intelligence (Indria, 2020).

The nine intelligences mentioned by Howard Gardner are referred to as the Theory of Multiple Intelligences. All of these intelligences have different value compositions in each individual. All intelligences work simultaneously to form a complete unit (Ayu & Pangesty, 2022). Intelligence plays a crucial role because optimizing the intelligence within students can increase their activeness and achieve maximum learning outcomes (Hairunisa & Hakim, 2018).

A suitable learning model is one of the supports for Multiple Intelligences learning. One learning model that can be used is the Guided Inquiry learning model. The guided inquiry learning model involves teachers guiding students in determining initial hypotheses and directing students to discuss solving a learning problem (Yulaidi & Hardhita,2023).

One subject that trains students in critical thinking is Natural Sciences. According to Bandu (dalam Anggraeni & Atmojo, 2017), natural science is based on the idea that the universe can be studied, understood, and explained through causality methods and specific processes such as observation, experimentation, and rational analysis.

In the Merdeka Curriculum, Natural Science and Social Studies subjects are combined into Science and Social Studies (IPAS), hoping

that students can manage the natural and social environment as one unit. The basic principles of the scientific methodology in IPAS learning will train scientific attitudes such as high curiosity, critical and analytical thinking, and the ability to draw correct conclusions, thus fostering wisdom in students (Habbah et al., 2023).

The goal of the IPAS subject matter, as stated in the SK of the Board of Standards, Curriculum, and Education Assessment Number 33 of 2022, is that by studying IPAS, students can develop themselves according to the profile of Pancasila learners and develop inquiry skills to identify, formulate, and solve problems through tangible actions.

Based on classroom observations, students tend to be passive and less interactive because learning is still teacher-centered. During interviews with classroom teachers, the learning models most frequently implemented by the three teachers are Problem-Based Learning (PBL) and Project Based Learning (PjBL). Thus, research will be conducted using other learning models compared to the models commonly used by teachers in the classroom.

Classroom teachers understand that students have different components of Multiple Intelligences. The teachers mentioned that when students advance to a higher grade at the beginning of the school year, they are asked to take initial assessment tests and questionnaires to identify their interests and talents. Multiple Intelligences in learning need to be emphasized as a basis for developing students' intelligences.

The diversity of students' intelligence does not mean a teacher should carry out learning activities individually. Teachers should use the variety of intelligences that students possess as a resource to develop learning models and create learning tools that can facilitate students through their multiple intelligences (Amir, 2020). The learning process can be successful if the learning objectives are achieved through smooth communication. To determine this achievement, assessment and evaluation of students' learning outcomes, covering cognitive, psychomotor, and affective domains, are necessary (Abidin & Wangsih, 2021). One form of assessment and evaluation that supports student learning activities is the Student Worksheet (LKPD).

The Student Worksheet is one of the learning components that must be prepared during the learning process as a guide for students' steps to systematically understand concepts (Sari & Haryani, 2020 (Pratama & Saregar, 2019, Febriyanto et al., 2019). In addition, learning using LKPD can provide encouragement for students to think actively and act actively (learning by doing) (Fauziyah & Hamdu, 2022, Fitriyah et al., 2023). LKPD as a teaching medium can be used as a guideline for students to develop their cognitive aspects through investigative or problem-solving activities (Edwar et al., 2021). In problem-solving, students are not only required to think but must also think critically (Yuwono et al., 2019).

Appropriate strategies and teaching materials can enhance students' critical thinking skills and Multiple Intelligences (Mardana et al., 2018). Multiple Intelligences-based student worksheets (LKPD) can be used as learning media, with guided inquiry as a supporting learning model (Canna et al., 2021). This is supported by several previous studies relevant to this research, such as the study conducted by Hairunisa & Hakim (2018), which found that guided inquiry-based learning tools based on the Multiple Intelligences theory meet the criteria of validity, practicality, and effectiveness, making them suitable for implementation and capable of training students' science process skills.

Another study by Wijayanti et al (2015), found that developing science worksheets (LKS) based on Multiple Intelligences effectively enhances students' creative thinking abilities. The application of multiple intelligences-based science worksheets was measured using the N-gain test, with an increased value of 0.71, which was categorized as high. Meanwhile, students' creative attitudes increased, with an average score of $\geq 62\%$ each session.

Research by Firdaus dan Wilujeng (2018) indicated that the developed LKPD is suitable for science learning. The study's results showed an improvement in students' critical thinking skills

by 0.43, categorized as moderate, and an improvement in students' learning outcomes by 0.34, categorized as moderate.

Observations conducted at SD Negeri Ungaran 01 revealed that the teaching materials typically used are limited to teacher's books, student books, and other supporting sources from the internet. Teachers rarely use LKPD in the classroom learning process; LKPD is mainly for group practical activities. Therefore, this presents an opportunity to explore the development of Multiple Intelligences-based LKPD with the guided inquiry learning model to enhance students' critical thinking skills.

This research aims to describe the characteristics of the LKPD, produce an LKPD that meets the criteria of feasibility, and test its effectiveness in improving students' critical thinking skills. The benefits of the results of this study are that it will produce an LKPD with feasible and effective criteria to improve students' critical thinking skills in the subject of Science and Social Studies (IPAS).

METHOD

This research is a research and development (R&D) study that adopts the 4D development model. According to Thiagarajan et al. (1974), the 4D model consists of four stages: define, design, develop, and disseminate. This development model was chosen because its implementation stages are detailed and systematic. The flowchart of the 4D research steps is shown in Figure 1.
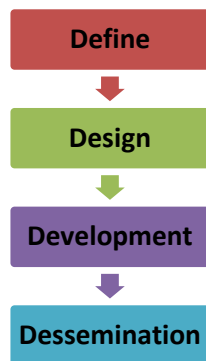
Figure 1. Steps of the 4D Development Model

The research subjects were divided into two groups: a large group and a small group. The small group, consisting of 30 students, was selected using the purposive sampling technique, and the large group, consisting of 60 students from the fourth grade at SD Negeri Ungaran 01, was selected using the purposive sampling technique.

Data collection techniques include observation, interviews, questionnaires, tests, and documentation. Data collection instruments include interviews, teacher and student needs questionnaires, expert validation questionnaires, and tests to measure critical thinking skills. The data analysis technique uses questionnaires to determine the feasibility of the LKPD and tests to measure students' critical thinking skills. There are four criteria for media feasibility: very feasible, feasible, moderately feasible, and less feasible. The feasibility criteria are outlined in Table 1. (Purwanto,2016)

Table 1. LKPD Feasibility Criteria

Percentage	Criteria
86%-100%	Highly Feasibility
76%-85%	Feasibility
60%-75%	Moderately Feasibility
<54%	Not Feasibility

RESULTS AND DISCUSSION

The development research resulted in a product in the form of Student Worksheets (LKPD) on plants in the Science and Social Studies (IPAS) subject. The LKPD was developed to focus on the parts of plants for fourth-grade students at SD Negeri Ungaran 01 in Semarang Regency. The research examined (1) the Characteristics of the LKPD, (2) the Feasibility of the LKPD, and (3) the Effectiveness of the LKPD in improving students' critical thinking skills.

Characteristics of the LKPD

The characteristics of the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model developed include: a) The LKPD is developed in print form, containing material on plant parts for Phase B, Grade IV; b) The

Multiple Intelligences-based IPAS LKPD includes 5 out of 9 Multiple Intelligences, namely linguistic intelligence, naturalistic intelligence, musical intelligence, linguistic intelligence, and interpersonal intelligence; c) The learning model used is the Guided Inquiry model; d) It includes learning steps with the Guided Inquiry syntax; e) Learning steps are contextually structured and relevant to everyday life to direct students to utilize hands-on activity the environment as a learning resource.; and f) It provides stimuli in learning activities to enhance critical thinking skills.

This research produced a Student Worksheet (LKPD) designed using Canva and distributed to students in print form. The main components in creating the Multiple Intelligences-based LKPD include the cover page, introduction, main content, and closing section. The LKPD contains material on plant parts aligned with the Learning Outcomes and Learning Objectives. The cover page and introduction are shown in Figure 2.

Figure 2. Cover Page and Introduction of the LKPD

The cover page includes the logo, the LKPD title on fourth-grade plant parts, and the developer's name. The introduction includes the developer's identity, learning outcomes, learning objectives, guidelines for working on the LKPD, and an introduction to the types of intelligences. The main content of the LKPD is shown in Figure3.
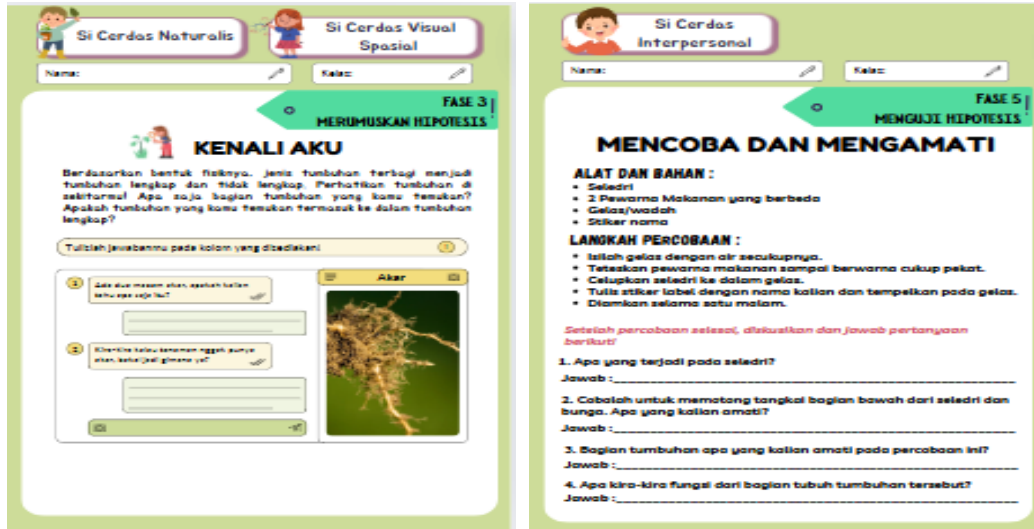
Figure 3. The main content of the LKPD

The main content of the LKPD consists of learning activities based on Multiple Intelligences and learning activities using the Guided Inquiry syntax. It is designed to be varied and interactive. The curriculum involves five types of intelligence: visual-spatial intelligence, linguistic intelligence, musical intelligence, naturalistic intelligence, and interpersonal intelligence. The materials and tasks presented in the Student Worksheet (LKPD) are relevant to the students' daily lives, allowing them to see the connection between classroom learning and the real world. The guided inquiry learning syntax includes orientation, formulating problems, formulating hypotheses, collecting data, testing hypotheses, and drawing conclusions. The closing section is shown in Figure 4.

Figure 4. Closing part of the LKPD

The closing section of the LKPD consists of learning conclusions and a bibliography. This product's latest development, along with previous research, is the Multiple Intelligences-based LKPD, integrated with the Guided Inquiry learning model in its learning activities.

Developing the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model provides a new learning experience for

both students and teachers. After undergoing each stage of the research, the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model is considered capable of providing a new and enjoyable experience for students, enhancing their critical thinking skills.

Feasibility of the LKPD

The feasibility of the Multiple Intelligences-based IPAS LKPD on plant material was assessed through several tests to evaluate the product's feasibility. The feasibility test of the Multiple Intelligences-based IPAS LKPD involved validation by experts and practitioners in the aspects of media, material, and language.

The assessment components for the media aspect consist of four evaluation indicators: first, the media displays the learning objectives, learning goals, and the sequence of learning objectives; second, the media's appropriateness for the student's learning level; third, the ease of use of the media by both teachers and students; and fourth, the visual design's appeal.

Four criteria for assessing the content aspect include the relevance of the content to the learning objectives, learning goals, and the sequence of learning objectives; the alignment of the content with the student's cognitive level; the consistency of the content with the questions in the media; and the appropriateness of the images in relation to the content.

Four indicators for assessing the language aspect include the structure of the sentences used, the language used, its appropriateness for the student's developmental level, the use of effective and simple sentences, and the clarity and comprehensibility of the language used. The results of the LKPD feasibility evaluation by experts are presented in Figure 5.
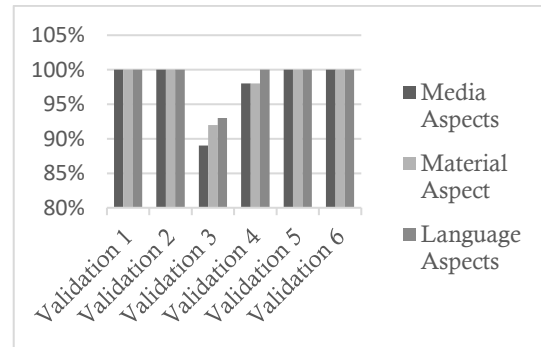

**Figure 5.** LKPD Feasibility Criteria.

Based on these scores, the six validators gave an average score of 97,7% for media, 98% for material, and 98,9% for language, indicating that the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model is highly feasible for learning.

Effectiveness of the LKPD in Improving Students' Critical Thinking Skills

Once the LKPD was deemed feasible, the next stage was to conduct limited trials on small and large groups to determine the effectiveness of using the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model in improving students' critical thinking skills.

The effectiveness of the LKPD on students' critical thinking skills was measured using pretest and post-test results. The pretest was conducted before students were given the treatment, which involved learning using the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model. The post-test was conducted after the treatment.

The large group trial involved 60 students. The pretest and posttest scores were significantly different. The average pretest and posttest scores are presented in Figure 6.
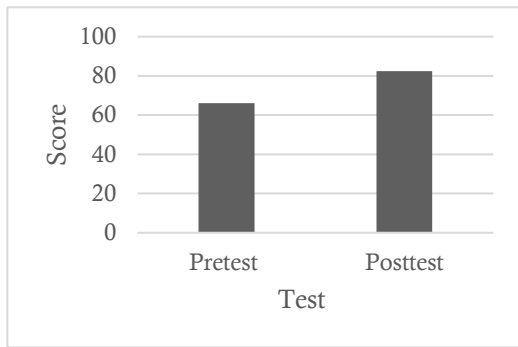
Figure 6. Average Pretest and Posttest Scores

Based on Diagram 1, there is a noticeable difference between the average pretest and post-test scores. The average pretest score was 66, and the average post-test score was 82.33. After obtaining pretest and post-test data, normality testing was conducted with a significance level of 0.05. The normality test results are shown in Table 3.

Table 3. Normality Test Results.

Test	Kolmogrov-Smirnov[a]			Conclusion
	Statistic	df	Sig.	
Pretest	0.112	60	0.058	Normal
Posttest	0.113	60	0.054	Normal

According to Table 3, the normality test results for the pretest and post-test data using the Kolmogorov-Smirnov test show a significance value > 0.05, indicating that the data is normally distributed. After confirming normal distribution, homogeneity testing was conducted to see if the pretest and post-test data came from a homogeneous or heterogeneous variance. The homogeneity significance value for the pretest and post-test data is 0.668, which is > 0.05. This indicates that the pretest and post-test data variances are homogeneous.

After conducting normality and homogeneity tests, it was concluded that the data is normally distributed and homogeneous. The next step was to perform a paired t-test to compare the average pretest and post-test scores of the Multiple Intelligences-based IPAS LKPD

with the Guided Inquiry model. The paired t-test results are shown in Table 4.

Table 4. Paired T-test Results

Paired Differences

Std. Dev.	Std.Error Mean	95%		t	df	Sig
		Low	Up			
3.32	0,43	-17.19	-15.48	-38.14	59	0.0 0

The paired t-test criteria state that if the significance value (2-tailed) > 0.05, there is no significant difference between the pretest and post-test scores. Based on the paired t-test results in the table, the significance value (2-tailed) is 0.000, indicating a significant difference between the pretest and post-test critical thinking scores.

Furthermore, the difference between pretest and post-test scores was measured using the gain index. The normalized gain (N-gain) used in this study shows increased students' critical thinking skills on plant material after using the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model. The N-gain test results for pretest and post-test scores before and after using the LKPD are shown in Table 5.

Table 5. Average Gain Results (N-gain)

Tes	N	Average	Difference	$\langle g \rangle$	Criteria
Pretest	60	66.00	16.33	0.5 04	Medium
Posttest	60	82.33			

The N-gain value from the large group trial was 0.504, with a difference in average pretest and post-test scores of 16.33, categorized as moderate. The N-gain test results indicate an improvement in the average pretest and post-test scores of fourth-grade students before and after using the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model. The categorization of fourth-grade students' critical thinking skills based on pretest results is shown in Table 6.

Table 6. Pretest Critical Thinking Skills Categorization Results

Score	Students	Percentage	Ability Level
x ≤ 60	20 students	34%	Low
60 < x ≤ 75	28 students	46%	Medium
75 < x ≤ 100	12 students	20%	High

Based on the pretest results, taken before the students used the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model, 46% of students had moderate critical thinking skills, 20% had high critical thinking skills, but 34% had low critical thinking skills with scores ≤ 60.

According to pre-research interviews, teachers noted that some students struggled to understand questions and needed more time to complete tasks than their peers, affecting their pretest results. To help students with low critical thinking skills improve, they were given more time during the post-test to understand the questions better.

After learning using the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model and the post-test, the students' critical thinking skills levels are shown in Table 7.
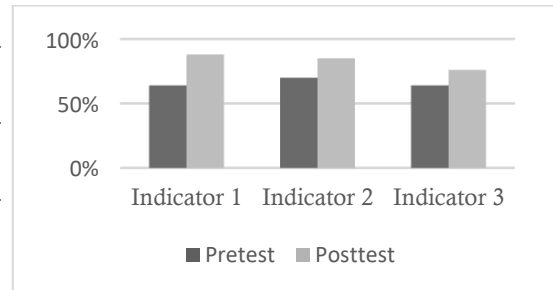
Table 7. Post-test Critical Thinking Skills Categorization Results

Score	Students	Percentage	Ability Level
x ≤ 60	0	0	Low
60 < x ≤ 75	10 students	17%	Medium
75 < x ≤ 100	50 students	83%	High

After learning with the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model, the final results showed that 17% of students had moderate critical thinking skills

between 60 < x ≤ 75, and 83% had high critical thinking skills 75 < x ≤ 100.

The increase in the average pretest and posttest scores of students on each indicator of critical thinking skills is presented in Figure 7.

Figure 6. Percentage of Pretest and Posttest Results of Critical Thinking Skills Based on Indicators

Based on Figure 6, the first indicator of critical thinking skills, which involves developing basic skills, shows an increase in percentage from 64% to 88%. This indicator is related to each stage of the Guided Inquiry model, specifically the orientation phase of identifying plant parts, understanding the functions of these plant parts, and relating their functions to the plant's needs through activities of experimentation and observation. Therefore, the improvement in critical thinking skills for this first indicator is the highest compared to the second and third indicators.

The second indicator of critical thinking skills, which involves providing simple explanations, shows an increase in percentage from 70% to 85%. This activity corresponds to the third, fourth, and fifth stages of the Guided Inquiry learning model, starting from formulating hypotheses about the functions of plant parts, collecting data on flower parts, to testing the hypotheses through group discussions in the experimentation and observation activities.

The third indicator of critical thinking skills, which involves providing further explanations, shows an increase in percentage from 64% to 76%. This third indicator's posttest percentage is lower than the first and second indicators. Because the third indicator focuses solely on the fifth and sixth stages of the Guided

Inquiry model, which involve experimenting and observing plant part functions and the results of these activities, this indicator's percentage increase in posttest scores is lower than for the other two indicators.

Based on the implementation of the research results, developing the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model for fourth-grade students at SD Negeri Ungaran 01 effectively enhances students' critical thinking skills. Thus, it can support IPAS learning, especially on plant material, and provide an enjoyable experience for students to understand the material being studied better.

CONCLUSION

The development of the Multiple Intelligences-based IPAS LKPD with the Guided Inquiry model for fourth-grade students at SD Ungaran 01 concluded that the product's characteristics are: the LKPD is developed in print form containing material on plant parts for Phase B, Grade IV; the Multiple Intelligences-based IPAS LKPD includes 5 out of 9 Multiple Intelligences, namely linguistic intelligence, naturalistic intelligence, musical intelligence, linguistic intelligence, and interpersonal intelligence; the learning model used is the Guided Inquiry model; the learning steps are designed to guide students in utilizing the environment as a learning resource; and it provides stimuli in learning activities to enhance critical thinking skills. The LKPD was rated very feasible by validators, with an average score of 97,7% for media, 98% for material, and 98,9% for language. The LKPD is also effective in improving students' critical thinking skills, with an average pretest-posttest score difference of 16.33 and an N-gain of 0.504 in the large group trial, categorized as moderate.

REFERENCES

Abidin, Z., & Wangsih, D. (2021). Implementasi EvaluasiSistem Pembelajaran di Indonesia. *Jurnal Tarbiyatuna*, 2(1), 121–134.

Amir, F. A. (2020). Pengembangan Bahan Ajar Panca Indera Berbasis Multiple Intelligences Pada Siswa Kelas I Sekolah Dasar. *Pedagogik Journal of Islamic Elementary Schoo*l, 3(1), 105–118. https://doi.org/10.24256/pijies.v3i1.1141

Arfandi, & Samsudin, M. A. (2021). Peran Guru Profesional Sebagai Fasilitator dan Komunikator dalam Kegiatan Belajar Mengajar. *Edupedia*, 5(2), 124–132.

Ayu, D., & Pangesty, R. (2022). The Development of Multiple Intelligence-Based E-Books on Grade V Science Learning in Elementary Schools. *International Journal on Engineering, Science and Technology*, 4(3), 450–455.

Benyamin, Qohar, A., & Made Sulandra, I. (2021). Analisis Kemampuan Berpikir Kritis Siswa SMA Kelas X Dalam Memecahkan Masalah SPLTV. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(2), 909–922.

Elitasari, H. T. (2022). Kontribusi Guru dalam Meningkatkan Kualitas Pendidikan Abad 21. *Jurnal Basicedu*, 6(6), 9508–9516. https://doi.org/10.31004/basicedu.v6i6.4120

Fauziyah, S., & Hamdu Attadib, G. (2022). Implementasi E-LKPD Berbasis ESD pada Kompetensi Berpikir Kritis di SD. *Journal of Elementary Education*, 6(1), 172–179. https://www.jurnalfai-uikabogor.org/attadib

Firdaus, M., & Wilujeng, I. (2018). Pengembangan LKPD inkuiri terbimbing untuk meningkatkan keterampilan berpikir kritis dan hasil belajar peserta didik. *Jurnal Inovasi Pendidikan IPA,* 4(1), 26–40. https://doi.org/10.21831/jipi.v4i1.5574

Fitri Anggraeni, Y., & Ragil Widianto Atmojo, I. (2019). Penerapan Model Pembelajaran Inkuiri Terbimbing (Guided Inquiry) untuk Meningkatkan Keterampilan Mengkomunikasikan Pembelajaran IPA pada Siswa Sekolah Dasar. *JPI (Jurnal Pendidikan Indonesia): Jurnal Ilmiah*

Pendidikan, 2(5), 88–95. https://doi.org/https://doi.org/10.20961/jpiuns.v5i2

Fitriyah, D., Wardani, S., & Nurhayati, S. (2023). Desain LKPD Berbasis Multiple Intelligences untuk Meningkatkan Kecerdasan Intrapersonal dan Hasil Belajar Kognitif. *Chemistry in Education*, 12(1), 42–49.

Habbah, E. S. M., Lingga, A., & Sari, L. A. D. (2023). Evaluasi Motivasi Belajar Peserta Didik dalam Mata Pelajaran IPAS Kelas IV di Sekolah Dasar. *Jurnal Tonggak Pendidikan Dasar*, 2(2), 193–200. https://doi.org/10.22437/jtpd.v2i2.29172

Hairunisa, & Hakim, A. R. (2018). Pengembangan Perangkat Pembelajaran IPA Model Inkuiri Terbimbing Berbasis Multiple Intelligences untuk Melatihkan Keterampilan Proses Sains Peserta Didik SMP. *Jurnal Pendidikan MIPA*, 8(1), 2088–0294. http://ejournal.tsb.ac.id/index.php/jpm/index

Hidayat, F., Akbar, P., Bernard, M., Siliwangi, I., Terusan, J. L., Sudirman, J., Tengah, C., Cimahi, K., & Barat, J. (2019). Analisis Kemampuan Berfikir Kritis Matematik Serta Kemandiriaan Belajar Siswa Smp Terhadap Materi SPLDV. *Journal on Education*, 1(2), 515–525. https://doi.org/https://jonedu.org/index.php/joe/article/view/106

Idris, N. W. (2020). Pengaruh Model Pembelajaran Berbasis Masalah Terhadap Kemampuan Berpikir Kritis Peserta Didik. *Jurnal Sains Dan Pendidikan Fisika (JSPF)*, 16(1), 39–50.

Indria, A. (2020). Multiple Intelegences. *Jurnal Kajian Dan Pengembangan Umat*, 3(1), 26–41.

Isnaeni, W., Sujatmiko, Y. A., & Pujiasih, P. (2021). Analysis Of the Role Of Android-Based Learning Media In Learning Critical Thinking Skills And Scientific Attitude. *Jurnal Pendidikan IPA Indonesia*, 10(4), 607–617. https://doi.org/10.15294/jpii.v10i4.27597

Mas Yulaidi, E., & Septa Hardhita, R. (2023). Komparasi Model Pembelajara Inquiry Learning dan Guided Inquiry Learning Terhadap Hasil Belajar Peserta Didik dalam Pembelajaran Matematika di Sekolah Dasar. *Jurnal Review Pendidikan Dasar*, 9(1). http://journal.unesa.ac.id/index.php/PD

Sari, N. N., & Haryani, S. (2020). Pengembangan Lembar Kerja BerbasisDiscovery Learning untuk Meningkatkan Kemampuan Pemecahan Masalah. *CiE*, 9(2), 1–7. http://journal.unnes.ac.id/sju/index.php/chemined

Satriani, Amran, M., Taris, L., & Syahrir Amin, M. (2022). Analisis Kemampuan Berpikir Kritis Siswa Kelas V Sd Dalam Mengerjakan Soal Higher Order Thinking Skills (HOTS). *Jurnal Pendidikan & Pembelajaran Sekolah Dasar*, 1(4), 551–557. https://ojs.unm.ac.id/jppsd/index

Simatupang, S. (2019). Pengambangan LKPD Berbasis Pendekatan Science, Technology, Engineering, and Mathematic (STEM) untuk Menumbuhkan Keterampilan Berpikir Kritis Siswa. *Pelita Pendidikan*, 7(4), 170–177. https://jurnal.unimed.ac.id/2012/index.php/pelita/index

Siti, R., Sadiyyah, H., Gustiana, M., Punuluh, S. D., & Sugiarni, R. (2019). Pengembangan Lembar Kerja Siswa (LKS) dangan Pendekatan Inkuiri Terbimbing Berbasis Mobile Learning untuk Mengoptimalkan Kemampuan Berpikir Kritis Matematis. *PRISMA*, 80(1). https://jurnal.unsur.ac.id/prisma

Spector, J. M., & Ma, S. (2019). Inquiry and critical thinking skills for the next generation: from artificial intelligence back to human intelligence. *Smart Learning Environments*, 6(1). https://doi.org/10.1186/s40561-019-0088-z

Sri Kuwita Gandi, A., Haryani, S., & Setiawan, D. (2021). The Effect of Project-Based Learning Integrated STEM Toward Critical Thinking Skill Article Info. *Journal of Primary Education*, 10(1), 18–23. https://doi.org/10.15294/jpe.v10i1.33825

Thomas, T. (2011). Developing First Year Student's Critical Thinking Skills. *Asian Social Science*, 7(4), 26–35.

Widiansyah, A., Sitasi, C., Widiansyah,:, Peranan,), Daya, S., Sebagai, P., & Penentu, F. (2018). Peranan Sumber Daya Pendidikan sebagai Faktor Penentu dalam Manajemen Sistem Pendidikan. Manajemen Sistem Pendidikan. *Cakrawala*, 18(2), 229–234. https://doi.org/10.31294/jc.v18i2

Wijayanti, F., Widiyatmoko, A., Januari, D., & Alamat, *. (2015). Pengembangan LKS IPA Berbasis Multiple Intelligences pada Tema Energi dan Kesehatan untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa. *Unnes Science Education Journal*. http://journal.unnes.ac.id/sju/index.php/usej

Zuryanty, Kenedi, A. K., Chandra, R., Hamimah, & Fitria, Y. (2019). Problem based learning: A way to improve critical thinking ability of elementary school students on science learning. *Journal of Physics: Conference Series*, 1424(1). https://doi.org/10.1088/1742-6596/1424/1/012037