**TUNAS**
**JURNAL PENDIDIKAN GURU SEKOLAH DASAR**
http://journal.umpr.ac.id/index.php/tunas
Vol. 11, No. 1, December 2025, PP. 86-90
ISSN: 2477-6076 (print); 2685-8169 (online), DOI: 10.33084/tunas.v11i1.12266

# Development of an Interactive E-Comic Based on Digital Literacy for Contextual English Learning in Elementary Schools

[1]*Rahmatullah
[1]Universitas Muhammadiyah Palangkaraya, Central Kalimantan, Indonesia.

**Article Information**
*Received*: November 2025
*Accepted*: November 2025
*Published*: December 2025

**ABSTRACT**
*Aim:* This study examined the effect of the guided inquiry learning model on students' cognitive learning outcomes at the elementary school level. *Method:* The research employed a quasi-experimental design with a pretest–posttest control group. The participants were fourth-grade elementary school students, who were divided into an experimental group taught using the guided inquiry learning model and a control group taught using conventional instructional methods. Data on students' cognitive learning outcomes were collected through standardized achievement tests administered before and after the intervention. The obtained data were analyzed using inferential statistical techniques to determine differences between groups. *Results and Discussion: The results revealed a significant difference in cognitive learning outcomes between the experimental and control groups, with students in the experimental group demonstrating higher posttest scores than* those in the control group. These findings indicate that the guided inquiry learning model positively enhances students' cognitive achievement by actively engaging learners in the learning process, encouraging critical thinking, and promoting conceptual understanding. *Conclusion:* Based on the findings, the guided inquiry learning strategy is effective and can be implemented in elementary school classrooms as an alternative instructional approach to improve students' cognitive learning outcomes. The study also suggests that teachers should consider incorporating guided inquiry-based activities to foster more meaningful and student-centered learning experiences.
**Keywords:** Elementary School, Science, Inquiry.



***Corresponding Author:***
Rahmatullah,
Department of Biology Education,
Universitas Muhammadiyah Palangkaraya,
Milono RTA Road, Palangka Raya City, Central Kalimantan Province, Postal Code: 73111, Indonesia.
Email: hallutamhar@gmail.com

**Citation Information:** Rahmatullah, R. (2025). The Effect of Guided Inquiry Learning on Cognitive Learning Outcomes of Elementary School Students. *Tunas: Jurnal Pendidikan Guru Sekolah Dasar*, 11(1), 86–90. https://doi.org/10.33084/tunas.v11i1.12266

## INTRODUCTION

Natural Science (IPA) is scientific knowledge based on observations. It encompasses the dimensions of scientific attitude, scientific process, scientific product, scientific application, and creativity, acquired through a series of scientific methods (Lederman et al., 2013). Science learning is essentially aimed at helping students understand science in everyday life. Therefore, educators need to prepare a future generation ready to respond to all demands, not only in mastering concepts but also in assisting students in the process of thinking, formulating questions, and finding answers (Fuad et al., 2017).

Problems in science learning observed in Public Elementary Schools (SDN) in Hulu Sungai Utara (HSU) Regency, South Kalimantan, include low student learning outcomes. Learning remains teacher-centered, leading to low student engagement. This also results in a lack of interaction between teachers and students. Learning is not yet optimal, with the implementation of science learning activities still focused on mastering concepts. Based on data from observations conducted with two teachers at Pasar Senin Elementary School in January 2019, student learning outcomes were suboptimal in the 2018/2019 academic year. This was particularly true for the topic of sound properties and their relationship to hearing, which was still below the Minimum Competency. The average student score for this material was 50, still below the school's minimum competency criteria of 60.

The implementation of innovative, student-centered learning activities can create meaningful learning, thereby retaining the concepts presented in long-term memory (Hafizah et al., 2014). Learning can be more meaningful when a student-centered model is used, such as the Guided Inquiry Learning Model (GIL) or MPIT. This model can help improve students' understanding of science concepts, particularly in elementary school. Inquiry-based learning models emphasize the discovery and search for knowledge rather than its acquisition (Nur et al., 2016). This aligns with the objectives of science learning, which are expected to encompass knowledge, attitudes, and skills. With guidance, students can construct new knowledge through the inquiry process and gain understanding and skills (Lee & Kamarudin, 2014). Students' success in constructing new knowledge is evident in their learning outcomes.

Previous research has shown that inquiry learning is effective in improving student learning outcomes. The use of MPIT in experimental classes resulted in better learning outcomes compared to control classes, with N-Gain scores in the high category (Hasrida et al., 2018). Other research indicates that implementing MPIT among fourth-grade elementary school students in Turkey positively affected conceptual understanding, science interest, group work, and teacher attitudes. Implementing MPIT helps teachers recognize their role in student learning and develop awareness of required competencies, skills, and self-confidence (Aydın, 2020).

Previous research indicates that inquiry has positive effects on improving learning outcomes, including in elementary school. The implementation of MPIT is still very rarely applied at the elementary school level, so it still needs to be studied, as seen at Pasar Senin Elementary School in Hulu Sungai Utara Regency, South Kalimantan. So far, science material learning activities have been delivered through the lecture method, so the learning outcomes students need to master remain focused on concepts. This certainly does not align with the nature of science learning, which focuses on the mastery of products, processes, and scientific attitudes. Supported by various previous research results, of course MPIT also needs to be tried to be applied to science learning activities at Pasar Senin Elementary School in Hulu Sungai Utara Regency, South Kalimantan, the implementation of which in addition to implementing MPIT is also integrated with local potential in the area on science material about the concept of Sound. Based on the description of the problem, the purpose of this study is to test the effect of MPIT on the cognitive learning outcomes of elementary school students, especially on the material of sound properties which is integrated with local potential in the area, namely the province of South Kalimantan, especially in Hulu Sungai Utara Regency itself.

## METHOD

This research is a quantitative study with a quasi-experimental design and a pretest-posttest control group. This design was chosen to determine whether there are differences in cognitive science learning outcomes in the experimental class using MPIT and in the control class using conventional learning. This research will be conducted in two groups of classes designated as research subjects: the experimental class and the control class. The research design can be seen in the following table:

**Table 1.** Research Design

| | Pretest | Treatment | Posttest |
|---|---|---|---|
| Experiment Class | O1 | X | O2 |
| Control Class | O1 | - | O2 |

The research instruments included treatment instruments, including lesson plans and student worksheets, while the measurement instrument used was a cognitive learning outcome test. Before being used as research instruments, the lesson plans, student worksheets, and cognitive learning outcome test items were validated by experts in their respective fields. In this case, they were validated by one lecturer specializing in Physics, one lecturer specializing in elementary school science learning, and one elementary school teacher. The cognitive learning outcome test items were then piloted with 22 students who had received instruction on the material. The test reliability, calculated from pilot-test data, was 0.84, indicating a very high reliability coefficient. Regarding the 20 items tested empirically, 11 were found valid, and 9 were deemed invalid. All valid items were used in the study, while the invalid items were excluded, as the number of valid items accounted for all the indicators used.

Data were analyzed using descriptive statistics and one-way ANOVA using SPSS for Windows. The subjects of this study were 32 fourth-grade students in the odd semester of an elementary school in the 2019/2020 academic year. The sampling technique used in this study was purposive sampling.

## RESULTS AND DISCUSSION

### Results

This study aims to examine the effect of using MPIT on the cognitive learning outcomes of students at Pasar Senin Elementary School, Hulu Sungai Utara Regency, Central Kalimantan. Learning activities using MPIT on Sound for fourth-grade students at Pasar Senin 1 Elementary School, implemented in the experimental class, began with problem-orientation. In the first meeting, students were oriented to the problem by providing instructions to observe one of South Kalimantan's traditional musical instruments, the terbang madihin, using a Student Worksheet (LKS). This problem-orientation stage aims to stimulate students' curiosity about the material they will be learning. Next, the teacher provides a problem statement, and students are asked to formulate a hypothesis. Student-formulated hypotheses lead to understanding (C2) according to Bloom's taxonomy.

In the next stage, students are directed to observe the pieces of paper on the terbang madihin. Then, students are asked to answer analytical questions to support hypothesis testing based on the data from the observations and draw conclusions. At the end of the learning activity, students were directed to share their observations in turn. They actively participated in this activity, both sharing their observations and responding to others' observations. Overall, all groups were able to answer questions and draw conclusions effectively, fostering curiosity in the observation activities on the worksheets (LKS), which further honed their cognitive understanding.

The learning activities on Sound for fourth-grade students at Pasar Senin Elementary School 2, or the control class, involved conducting similar observations using the same tools. The difference in the implementation of learning activities compared to the experimental class is the absence of the problem formulation, hypothesis formulation, and hypothesis testing stages. These stages are unique to the MPIT (Introduction to Integrated Learning), which aims to hone students' critical thinking skills and enable them to address a problem.

Based on the research results, after implementing MPIT in the experimental and conventional classes, data on students' cognitive learning outcomes were obtained. Test scores measured students' cognitive learning outcomes after instruction on the concept of Sound. A comparison of the cognitive learning outcomes of students in the experimental and control classes is presented in Figure 1.

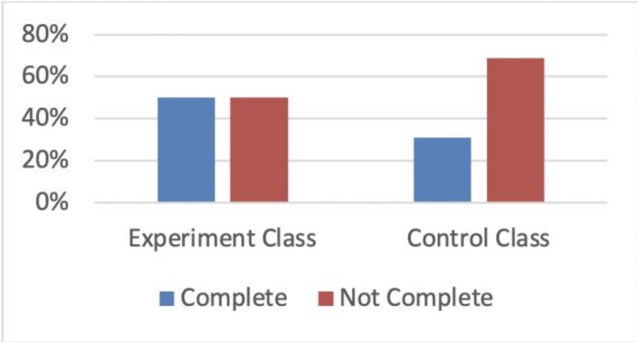


**Figure 1.** Pretest Posttest Graph

The implementation of MPIT can improve students' cognitive learning outcomes; this is evident in their ability to answer questions at levels C2 to C4. Statistically, it also shows a difference in students' cognitive learning outcomes between the experimental and control classes. Student learning outcome data are shown in Table II, where the data meet the requirements for normality with sig. (0.200 and 0.200) > 0.05 and homogeneity with sig. (0.807) > 0.05.

**Table II.** Hypothesis Test Results with Cognitive Learning Outcome Variables

**ANOVA**

Student Learning Outcome

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1069.531 | 1 | 1069.531 | 5.919 | .021 |
| Within Groups | 5420.438 | 30 | 180.681 | | |
| Total | 6489.969 | 31 | | | |

The results of the hypothesis test with the cognitive learning outcome variable shown in Table II state that the significance of the results of the SPSS analysis is <0.05 (0.021 <0.05). This suggests a significant difference in cognitive learning outcomes between students in the control and experimental classes.

**Discussion**

The MPIT had a positive impact on students' cognitive learning outcomes, as seen by a comparison between the cognitive learning outcomes of students in both the experimental and control classes, particularly on Sound for fifth-grade elementary school students at SDN Pasar Senin. These results align with several previous studies on the implementation of MPIT (van der Graaf et al., 2020; Pedaste et al., 2015; Suárez et al., 2018).

Learning using MPIT is defined as learning that involves scientific research activities, from formulating hypotheses and conducting investigations to concluding (van der Graaf et al., 2020). MPIT involves applying several problem-solving skills to discover new knowledge (Pedaste et al., 2015), thereby helping students develop complex abilities (Suárez et al., 2018). These findings, supported by previous research, indicate that MPIT can help improve student learning outcomes. This is because the experimental class implementing MPIT places greater emphasis on the inquiry process, enabling students to construct their own knowledge, compared to the learning activities implemented in the control class. The stages of problem orientation, hypothesis formulation, and data analysis (hypothesis testing) in MPIT help students construct their own knowledge.

Students' understanding of the sound source material can be clearly demonstrated through experiments or investigations in MPIT learning activities. This is evident in the answers provided by students on the Student Worksheet, which includes reasons regarding the sound source being caused by vibrations.

In the control class, the students' answers differed from those in the experimental class. The questions in the worksheets for the control class were only C1-level; students were not asked to justify their answers. In the experimental activities in the control class, students were only asked to observe the movement of a guitar string, pieces of paper placed on the top of a whistle, and a whistle. Students were not directed to formulate a hypothesis before the experiment. As a result, students' knowledge only reached the C1 level (memory).

In the experimental class, the teacher first provided guidance to students through problem-oriented activities. The teacher linked the material to be presented, specifically sound sources, with phenomena frequently encountered in everyday life. The teacher gave the example of a traditional musical instrument from South Kalimantan, the terbang madihin. The teacher asked students to observe the pieces of paper placed on the top of the terbang madihin when struck. The teacher asked why, when the terbang skin was struck, the wad of paper on top of it bounced and a sound was heard. This question was given to focus students' attention on the material being presented.

The teacher then asked students to answer several questions as a form of problem formulation: How does an object/sound source produce Sound? And when can an object produce Sound? The students tentatively answered that an object/sound source can produce Sound when struck, blown, plucked, or rubbed. They then answered that an object can produce Sound when it vibrates. These tentative answers demonstrate that applying the guided inquiry learning model can help direct students' thinking, which is expected to improve cognitive learning outcomes at the C2 level and above.

After experimenting as part of the guided inquiry learning model, students were asked several questions about the results of their observations. Students not only answered the questions but were also asked to provide reasons for their answers. The students' answers demonstrate that the guided inquiry learning model can help them discover their own answers through the experiments they conduct.

These results are also consistent with previous research relevant to the current study. The use of the inquiry learning model in science subjects in elementary schools has shown a positive impact and significant differences in learning outcomes (Mbari et al., 2018). At the junior high school level, the use of the inquiry learning model has a positive impact on the learning outcomes of eighth-grade students at SMPN 1 Mataram, particularly on movement (Anggraini et al., 2020).

The guided inquiry learning model can further enhance students' understanding of real-world concepts (Laksana et al., 2019). The inquiry learning model encourages students to learn through problem-oriented activities, creating student-centered learning experiences (Löfgren et al., 2013). Learning activities using the inquiry learning model can be guided through the learning tools used. The use of learning tools that utilize the guided inquiry learning model can help direct students toward more meaningful learning activities (Zaini et al., 2020). The positive role of the guided inquiry learning model stems from its characteristics. Exploration activities in the guided inquiry learning model can help students build their knowledge structure as they understand the material (Wang et al., 2015).

## CONCLUSION

Based on the study's results, the guided inquiry learning model can be effectively implemented to improve students' cognitive learning outcomes. This conclusion is supported by the hypothesis-testing results, which indicate a statistically significant difference in learning outcomes between students in the experimental (treatment) class and those in the control class. Students taught using the guided inquiry learning model achieved higher cognitive performance than those who received conventional instruction.

The improvement in learning outcomes is particularly evident in the topic of sound properties, where guided inquiry activities encouraged students to actively explore concepts, formulate questions, conduct observations, and draw conclusions, with structured teacher guidance. This learning process enables students to develop deeper conceptual understanding and enhances their critical thinking skills, which are essential components of cognitive learning.

Therefore, the guided inquiry learning model is recommended as an alternative instructional strategy in elementary science education, especially for abstract topics that require conceptual exploration. Future research may explore its application across different subject areas, grade levels, or learning contexts to validate its effectiveness and broader educational impact further.


## ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the school principals, teachers, and fourth-grade students who participated in this study for their cooperation and support during the research process. Appreciation is also extended to colleagues and reviewers who provided valuable feedback and suggestions that contributed to the improvement of this manuscript. This research could not have been completed without the assistance and encouragement of all parties involved.


## REFERENCES


Anggraini, B. N. W., Syachruddin AR, S. A., & Ramdani, A. (2020). Pengaruh Penerapan Model Pembelajaran Inkuiri Terhadap Hasil Belajar Peserta Didik Tentang Sistem Gerak. Jurnal Pijar Mipa, 15(1), 32. https://doi.org/10.29303/jpm.v15i1.1056

Aydın, G. (2020). The effects of guided inquiry-based learning implementations on 4th grades students and elementary teacher; a case study. Elementary Education Online, 19(3), 1155–1184. https://doi.org/10.17051/ilkonline.2020.727298

Becker, S., Klein, P., Gößling, A., & Kuhn, J. (2020). Using mobile devices to enhance inquiry-based learning processes. Learning and Instruction, 69(April), 101350. https://doi.org/10.1016/j.learninstruc.2020.101350

Hasrida, Danial, M., & Salempa, P. (2018). Pengaruh Model Pembelajaran Dan Kemampuan Awal Terhadap Pemahaman Konsep Dan Motivasi Belajar Peserta Didik Kelas X Sma Negeri 1 Maniangpajo (Studi Pada Materi Pokok Larutan Elektrolit Dan Nonelektrolit). Chemistry Education Review (CER), 1(1), 44. https://doi.org/10.26858/cer.v0i1.5611

Jiang, Y., Clarke-Midura, J., Keller, B., Baker, R. S., Paquette, L., & Ocumpaugh, J. (2018). Note-taking and science inquiry in an open-ended learning environment. Contemporary Educational Psychology, 55(August), 12–29. https://doi.org/10.1016/j.cedpsych.2018.08.004

Katlea, & Subroto. (2017). Pengaruh Model Pembelajaran Inkuiri Dalam Peningkatan Aktivitas SMA. Jurnal Pendidikan Ekonomi, 5(3).

Laksana, D. N. L., Dasna, I. W., & Degeng, I. N. S. (2019). The effects of inquiry-based learning and learning styles on primary school students' conceptual understanding in multimedia learning environment. Journal of Baltic Science Education, 18(1), 51–62. https://doi.org/10.33225/jbse/19.18.51

Lederman, N. G., Lederman, J. S., Nature, A., Lederman, N. G., Lederman, J. S., & Antink, A. (2013). Nature of Science and Scientific Inquiry as Contexts for the Learning of Science and Achievement of Scientific Literacy. International Journal of Education in Mathematics, Science and Technology, 1(3), 138–147. https://doi.org/10.18404/ijemst.19784

Löfgren, R., Schoultz, J., Hultman, G., & Björklund, L. (2013). Exploratory talk in science education: Inquiry-based learning and communicative approach in primary school. Journal of Baltic Science Education, 12(4), 482–496.

Mbari, M. A. F., Yufrinalis, M., & Nona, T. (2018). Pengaruh Penggunaan Metode Pembelajaran Inkuiri Terhadap Hasil Belajar Dan Motivasi Siswa. Prisma Sains : Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram, 6(2), 94. https://doi.org/10.33394/j-ps.v6i2.1019

Pedaste, M., Mäeots, M., Siiman, L. A., de Jong, T., van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z. C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. Educational Research Review, 14, 47–61. https://doi.org/10.1016/j.edurev.2015.02.003

Raes, A., & Schellens, T. (2012). The Impact of Web-based Inquiry in Secondary Science Education on Students' Motivation for Science Learning. Procedia - Social and Behavioral Sciences, 69(Iceepsy), 1332–1339. https://doi.org/10.1016/j.sbspro.2012.12.070

Şimşek, P., & Kabapinar, F. (2010). The effects of inquiry-based learning on elementary students' conceptual understanding of matter, scientific process skills and science attitudes. Procedia - Social and Behavioral Sciences, 2(2), 1190–1194. https://doi.org/10.1016/j.sbspro.2010.03.170

Suárez, Á., Specht, M., Prinsen, F., Kalz, M., & Ternier, S. (2018). A review of the types of mobile activities in mobile inquiry-based learning. Computers and Education, 118(March 2017), 38–55. https://doi.org/10.1016/j.compedu.2017.11.004

Suduc, A.-M., Bizoi, M., & Gorghiu, G. (2015). Inquiry Based Science Learning in Primary Education. Procedia - Social and Behavioral Sciences, 205(May), 474–479. https://doi.org/10.1016/j.sbspro.2015.09.044

Sumarni, S., Santoso, B. ., & Suparman, A. . (2016). Pengaruh Model Pembelajaran Inkuiri Terbimbing Terhadap Hasil Belajar Kognitif Peserta Didik. Jurnal Pena Ilmiah, 1(1), 0–10.

Unlu, Z. K., Dokme, I., & Tufekci, A. (2015). An Action Research on Teaching Science through Technology Supported Inquiry - based Learning: A Pilot Study. Procedia - Social and Behavioral Sciences, 186, 46–52. https://doi.org/10.1016/j.sbspro.2015.04.183

van der Graaf, J., Segers, E., & de Jong, T. (2020). Fostering integration of informational texts and virtual labs during inquiry-based learning. Contemporary Educational Psychology, 62(June), 101890. https://doi.org/10.1016/j.cedpsych.2020.101890

Wang, P.-H., Wu, P.-L., Yu, K.-W., & Lin, Y.-X. (2015). Influence of Implementing Inquiry-based Instruction on Science Learning Motivation and Interest: A Perspective of Comparison. Procedia - Social and Behavioral Sciences, 174, 1292–1299. https://doi.org/10.1016/j.sbspro.2015.01.750

Zaini, M., Ita, & Zannah, F. (2020). Development of lesson plan device based on inquiry based learning to improve learning outcome and critical thinking skill. Journal of Physics: Conference Series, 1567(4). https://doi.org/10.1088/1742-6596/1567/4/042027