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Effectiveness of Inquiry Learning Models to Improve Students' Critical Thinking Ability

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ABSTRACT

Objective: This study aims to determine the effectiveness of the inquiry learning model in improving students' critical thinking skills. This type of research is a literature study using articles related to the influence of the inquiry learning model on students' critical thinking skills. **Method:** The method used is the descriptive qualitative research method. The data source used in this study is secondary data, namely articles that have been published. These articles were sourced from Google Scholar, Open Access Journal, sinta indexed journals, and national university websites between 2012 and 2022. Eight journals were suitable for research on critical thinking skills and inquiry. **Results:** The result of this study is that it is known that the inquiry learning model has a significant influence on improving students' critical thinking skills. There is a significant difference in critical thinking skills between students who use the inquiry learning model and those who are taught with the non-inquiry learning model. **Novelty:** The guided inquiry learning model has proven to be effectively applied to improve students' critical thinking skills.

INTRODUCTION

Science has a significant and strategic role in developing future technology. Science does not only contain theories or formulas to be memorized but also contains many concepts that must be understood in depth. Thus, students must build knowledge in their minds with their active role in the teaching and learning process. Science learning focuses more on students' ability to analyze their knowledge of events or natural phenomena that students experience in everyday life. Science studies require students to be able to think logically, critically, and creatively and be able to argue correctly (Saphira & Prahani, 2022). However, the tendency of learning science now is that students only study science as a product, memorizing concepts, theories, and laws. Students only study physics in the lowest cognitive domain, impacting the learning outcomes obtained (Nurmayani et al., 2018a).

The low student physics learning outcomes are because they need to become more accustomed to developing their thinking potential. As a result, the knowledge obtained is only temporary. The thinking potential referred to in this case is critical thinking. Critical thinking allows students to analyze their thoughts in making choices and draw conclusions intelligently (Nurmayani et al., 2018b). Students need critical thinking

To prepare themselves to face advances in science and technology in the 21st century (Saphira & Prahani, 2022). Therefore, to anticipate advances in science and technology, it is necessary to carry out various reforms and improvements in education to achieve success in the learning process (Maryam et al., 2020; Abdi, 2014).

The critical thinking skills possessed by each student are different. One of them is in developing critical thinking skills in learning physics. Students still experience many difficulties. This is because there still needs full training in solving scientific phenomena of physics problems (Arzak & Prahani, 2023). Students tend to only memorize physics theories or formulas without trying to understand them, so they experience difficulties in developing critical thinking skills because when students solve physics problems without being linked to critical thinking, mistakes in choosing the right strategy, lack of understanding of concepts and lack of thoroughness in solving a problem (Firman et al., 2019; Anugraheni, 2020). In addition, students only know physics material based solely on reference books without exploring other sources, so students are passive and rely only on explanations from the teacher. This causes the learning process to become less exciting and does not involve many thinking processes, including critical thinking (Maryam et al., 2020).

On the other hand, students receive less encouragement during the learning process. The learning model teachers use is more conventional, where the learning center only focuses on teachers so that the knowledge transfer could be more optimal. Students need to get direct experience, making it easier for them to remember and understand the studied topics. Students become bored with following lessons, especially physics subjects, which are generally considered difficult by students (Harahap et al., 2016). Therefore it is necessary to change the learning model to be more effective so that students can be more active in learning activities. According to the results of research by Royani et al. (2018), students who were given treatment in the form of a direct learning model had lower critical thinking skills and scientific processes compared to students who were taught with a practicum-based learning model (Mahulae & Sirait, 2017). Therefore, students need learning experiences that involve scientific thinking processes and experience in finding answers to existing questions independently.

One of the alternative efforts that can be done is by implementing inquiry learning. The inquiry approach is how scientific investigation-based learning is used in science education. The process of learning physics is well used as a place to practice being a scientist for students and is effective for developing their thinking according to their level of intellectual development (Lytra & Drigas, 2021; Putranta & Supahar, 2019). The application of the inquiry learning model provides more opportunities for students to have the opportunity to learn how to find facts, concepts, and principles through their own direct experience. Thus, students not only learn by memorizing physics material from textbooks or teacher lectures but also get the opportunity to practice and develop processing skills, thinking skills, and science (Maryam et al., 2020). This is supported by research conducted by Muhdana et al. (2020), which states that the guided inquiry learning model influences students' critical thinking abilities after the guided inquiry learning model is applied. Samadun & Diwkoranto (2022) explains that the ability to work scientifically must be supported by curiosity, the ability to cooperate, and critical thinking skills. Some of the characteristics of people who can think critically include having a particular set of thoughts that are used to approach their ideas and having a strong motivation to find and solve problems, as well as being skeptical, namely not

readily accepting ideas or ideas unless they have proven the truth themselves (Sugiarti & Diwkoranto, 2021; Turnip et al., 2016).

Guided inquiry learning begins with problems raised by educators that cannot be explained easily or cannot be explained quickly. Then students make observations to come to conclusions. However, educators control the questions expressed, hypotheses made, and what students observe. The educator's activity during the learning process is not transferring knowledge but becoming a facilitator, guiding and directing students to discover their concepts (Nurmayani et al., 2018a). Based on the description above, researchers encouraged the writer to conduct a study on the effectiveness of the inquiry learning model in improving students' critical thinking skills.

RESEARCH METHOD

This type of research is research with an approach in the form of literature or literature study. A literature study is a method used to collect data or sources related to the topic raised in a study (Istiqama et al., 2016). The method used in this research is the descriptive qualitative research method. This method describes facts followed by analysis, providing accurate understanding and explanation (Al-Ababneh, 2020; Bostley, 2019; Tomaszewski et al., 2020). The data source used in this study is secondary data, namely articles that have been published. These articles were sourced from Google Scholar, Open Access Journal, Sinta, and national tertiary websites between 2012 and 2022. So that a total of 8 journals were taken that were suitable for research. The data collection technique used in this research is documentation, namely finding data about things or variables in notes, books, papers or articles, journals, etc.

RESULTS AND DISCUSSION

Result

Some articles reveal that the inquiry learning model significantly influences students' critical thinking skills. Table 1 is the result of an analysis of articles related to the influence of the inquiry learning model on students' critical thinking skills.

Table 1. Articles showing the influence of the inquiry learning model on critical thinking skills.

No	Author	Experiment Class average	Control Class average	Hypothesis Test	Description
1	Supriyono et al., 2015	89.00	83.00	There is an influence of inquiry learning on critical thinking skills based on the results of the t-test with the t-test significance level (3.18>2.00)	Grades range from 0-100 on the material Optical device

No	Author	Experiment Class average	Control Class average	Hypothesis Test	Description
2	Anggareni et al., 2013	79.52	70.61	There are differences in critical thinking skills between groups of students who study with inquiry learning strategies compared to groups of students who learn with direct learning strategies based on the t-test with a significance level (of 8.60> 3.94)	The range of values is 0-100 on science material
3	Wastiti & Sulur, 2020	98.10	97.10	There are differences in critical thinking skills between the experimental class and the control class based on the t-test with a significance level **(8.56>2.03)**	Value range 0-100 on the material temperature and heat
4	Trisna & Jatmiko, 2013	82.03	76.37	There is a difference in critical thinking skills between the experimental group and the control group based on the t-test with a significance level (of 3.61> 2.14)	Value range 0-100 on Static fluid matter
5	Febrianne & Sinulingga, 2016	71.30	65.70	There is an interaction between the inquiry learning model and the student's critical thinking skills at the significance level t-test of (27.58 <3.97)	Value range 0-100 on Dynamic electricity subject matter
6	Kristanto & Susilo, 2015	65.96	58.23	There is a difference in the ability to think critically between the experimental class and the control class based on the t-test with a significance	Value range 0-100 on Global warming topic

No	Author	Experiment Class average	Control Class average	Hypothesis Test	Description
				level (of 3.89> 0.35)	
7	Siagian, 2015	67.00	62.50	There are differences in critical thinking skills between the experimental class and the control class based on the t-test with a significance level (0.05>0.0025)	Range of grades 0-100 on Hooke's law material
8	Royani et al., 2018	73.50	58.60	There are differences in critical thinking skills between the experimental class group and the control class group based on the t-test with a significance level (of 4.64> 2.34)	The value range is 0-100 on a practicum basis

Discussion

After being treated with the guided inquiry learning model in the experimental class, the post-test average score for each meeting was more significant than the control class, which was taught using conventional learning. Based on the results of research data processing, there appear to be differences in post-test results between the experimental and control classes. Figure 1 shows the influence of the guided inquiry learning model on students' critical thinking skills based on the post-test results of Table 1.

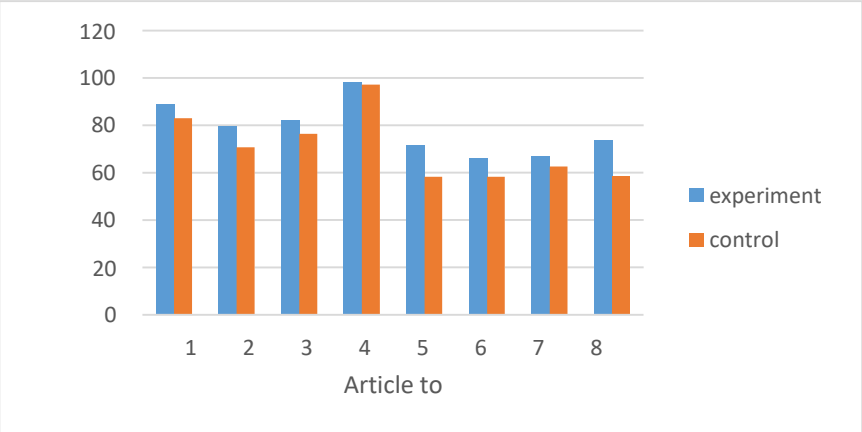

Figure 1. Students' critical thinking skills differ in learning models inquiry with the conventional model.

Based on Figure 1, it can be seen that students in the experimental class using the guided inquiry learning model are superior to students in the control class, with differences in the scores of students' critical thinking skills in each class. The two articles

show that the post-test scores of experimental class students are better when compared to the post-test scores of control class students (Khoirunnisa & Dwikoranto, 2021). Hajrin et al. (2019) revealed a difference between the average scores of each treatment group. The group with the guided inquiry learning model had a higher post-test average score than the direct learning model (Lestari et a., 2022). This proves that the guided inquiry learning model positively influences students' critical thinking skills. Furthermore, Kristanto & Susilo (2015) revealed a significant difference between the average pretest and post-test results of students' critical thinking skills after being treated with the guided inquiry learning model. This research is supported by Muhdana (2020), who revealed in his research that the inquiry learning model has a positive effect on improving critical thinking skills. Three articles reveal that the inquiry learning model significantly influences students' critical thinking skills. Figure 2 shows the influence of the inquiry learning model on students' critical thinking skills.

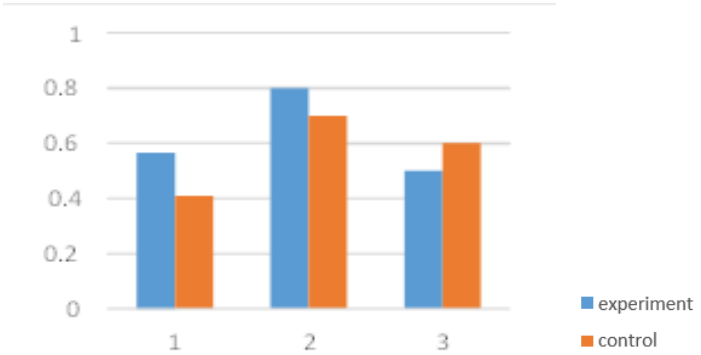

Figure 2. Effect of guided inquiry learning model on students' critical thinking skills.

Based on Figure 2, it can be seen that the average score of the experimental class students is superior to the average value of the control class students. This means that the guided inquiry learning model significantly influences students' critical thinking skills. There is an increase in students' critical thinking skills after the guided inquiry learning model is applied. Agustin et al. (2015) stated that the increase was caused by using the guided inquiry learning model, which can make students play an active role in the learning process. Students' critical thinking skills taught by the guided inquiry learning model show satisfactory results (Yerita, 2017). This research is supported by Nurmayani (2018b), which states that there is an increase in critical thinking skills between students with the guided inquiry learning model and students taught using the direct model. The guided inquiry learning model makes students better understand the subject matter through observing, asking, trying, associating, and communicating the material being studied during the learning process (Suwondo & Wulandari, 2017). Constructivism theory is an activity that allows students to construct their knowledge. This is to the theory of constructivism, which seeks to build its knowledge or understanding of a concept. According to Wahyuni (2018), in constructivism theory, students can build new knowledge and understanding based on experience. Therefore, the learning process must be designed and managed in such a way as to encourage students to organize their own experiences into meaningful knowledge. This is to the concept of guided inquiry learning itself.

CONCLUSION

Fundamental Finding: Based on the description of the results and discussion, the inquiry learning model significantly influences improving students' critical thinking skills. There are differences in the critical thinking abilities of students who are taught using the inquiry learning model with students who are taught with non-inquiry (conventional) learning models. **Implication:** The guided inquiry learning model has proven to be effectively applied to improve students' critical thinking skills. **Limitation:** This research is a limited and open data source. **Future Research:** The suggestion for further research is to prepare further investigative research on the influence of the inquiry learning model on improving students' critical thinking skills in other materials.

REFERENCES

Abdi, A. (2014). The effect of inquiry-based learning method on students' academic achievement in science course. *Universal Journal of Educational Research, 2*(1), 37–41. https://doi.org/10.13189/ujer.2014.020104.

Agustin, R. S. (2015). Penerapan model pembelajaran inkuiri terbimbing unuk melatihkan kemampuan keterampilan berpikir kritis siswa kelas XI SMAN 1 kalianget. *Inovasi Pendidkan Fisika, 3*(2), 14-19.

Al-Ababneh, M. M. (2020). Linking ontology, epistemology and research methodology. *Science & Philosophy*, *8*(1), 75–91. https://doi.org/10.23756/sp.v8i1.500

Anggareni, N. W., Ristiati, N. P., & Widiyanti, N. L. P. M. (2013). Implementasi strategi pembelajaran inkuiri terhadap kemampuan berpikir kritis dan pemahaman konsep IPA siswa SMP. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha*, *3*(1), 1–11.

Anugraheni, I. (2020). Analisis kesulitan mahasiswa dalam menumbuhkan berpikir kritis melalui pemecahan masalah. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *4*(1), 261–267. https://doi.org/10.31004/cendekia.v4i1.197

Arzak, K. A., & Prahani, B. K. (2023). The physics problem solving skills profile of high school students in elasticity material and the implementation of augmented reality book-assisted PBL model. *Momentum: Physics Education Journal*, *7*(1), 1–15. https://doi.org/10.21067/mpej.v7i1.6704

Bostley, M. A. (2019). Basics of research design: A guide to selecting appropriate research design. *International Journal of Contemporary Applied Researches*, *6*(5), 76–89.

Febrianne, N. E., & Sinulingga, K. (2016). Pengaruh model pembelajaran inkuiri dan kemampuan berpikir kritis siswa terhadap hasil belajar siswa pada materi pokok listrik dinamis di kelas X SMA negeri 12 medan. *Jurnal Ikatan Alumni Fisika Universitas Negeri Medan, 2*(2), 40-44. https://doi.org/10.24114/jiaf.v2i2.4369

Firman, M. A., Ertikanto, C., & Abdurrahman, A. (2019). Description of metaanalysis of inquiry-based learning of science in improving students' inquiry skills. *Journal of Physics: Conference Series*, 1-6. https://doi.org/10.1088/1742-6596/1157/2/022018.

Hajrin, M., Sadia, I. W., & Gunandi, I. G. A. (2019). Pengaruh model pembelajaran inkuiri terbimbing terhadap keterampilan berpikir kritis siswa pada pembelajaran fisika kelas X IPA SMA negeri. *Jurnal Pendidikan Fisika Undiksha, 9*(1), 63-75. https://doi.org/10.23887/jjpf.v9i1.20650

Harahap, M. B., Manurung, S. R., Marbun, M. A., & Mihardi, S. (2016). Effect model inquiry training on students science process skill. *Advances in Social Sciences Research Journal, 3*(11), 38–42. https://doi.org/10.14738/assrj.311.2288

Istiqamah, N., Doyan, A., & Taufik, M. (2016). Pengaruh model pembelajaran discovery dan inkuiri terbimbing berbasis eksperimen terhadap hasil belajar dan sikap ilmiah siswa. *Jurnal Penelitian Pendidikan IPA, 2*(1), 27-39. https://doi.org/10.29303/jppipa.v2i1.30

Khoirunnisa, J. P. N., & Dwikoranto, D. (2021). Profil keterampilan berpikir kritis siswa dalam penyelesaian masalah materi hukum newton. *Edukatif: Jurnal Ilmu Pendidikan, 3*(3), 806-816. https://doi.org/10.31004/edukatif.v3i3.429

Kristanto, Y., & Susilo, H. (2015). Pengaruh model pembelajaran inkuiri terbimbing terhadap kemampuan berpikir kritis dan hasil belajar IPA siswa kelas VII SMP. *Jurnal Pendidikan Dan Pembelajaran*, *22*(2), 197–208.

Lestari, N. A., Hariyono, E., Dwikoranto, D., Prahani, B. K., & Deta, U . A. (2022). Project-based inquiry-science: An innovative learning for thinking, teaching and assessing science-physics. *Momentum: Physics Education Journal 6*(1), 86-92. https://doi.org/10.21067/mpej.v6i1.6254

Lytra, N., & Drigas, A. (2021). STEAM education- metacognition – Specific Learning Disabilities. *Scientific Electronic Archives*, *14*(10), 41-49. https://doi.org/10.36560/141020211442

Mahulae, P. S., & Sirait, M. (2017). The effect of inquiry training learning model using PhET media and scientific attitude on students 'science process skills. *IOSR Journal of Research & Method in Education (IOSR-JRME), 7*(5), 24–29. https://doi.org/10.9790/7388-0705012429

Maryam, M., Kusmiyati, K., Merta, I. W., & Artayasa, I. P. (2020). pengaruh model pembelajaran inkuiri terhadap keterampilan berpikir kritis siswa. *Jurnal Pijar MIPA*, *15*(3), 206–213. https://doi.org/10.29303/jpm.v15i3.1355

Muhdana, M. (2019). Penerapan model inkuiri terbimbing terhadap kemampuan berpikir kritis siswa di SMA negeri 2 majene. *Jurnal Sains dan Pendidikan Fisika (JSPF), 15*(3), 9-16. https://doi.org/10.35580/jspf.v15i3.13493

Nurmayani, L., Doyan, A., & Sedijani, P. (2018b). Pengaruh model pembelajaran inkuiri terbimbing terhadap hasil belajar fisika siswa. *Jurnal Penelitian Pendidikan IPA, 4*(2), 2–7. https://doi.org/10.29303/jppipa.v4i2.113

Nurmayani, L., Doyan, A., & Verawati, N. N. S. P. (2018a). Pengaruh model pembelajaran inkuiriterbimbing terhadap kemampuan berpikir kritis siswa. *Jurnal Pendidikan Fisika dan Teknologi*, *4*(1), 98–104. https://doi.org/10.29303/jpft.v4i1.548

Putranta, H., & Supahar. (2019). Development of physics-tier tests (PysTT) to measure students' conceptual understanding and creative thinking skills: A qualitative synthesis. *Journal for the Education of Gifted Young Scientists*, *7*(3), 747–775. https://doi.org/10.17478/jegys.587203

Royani, I., Mirawati, B., & Jannah, H. (2018). pengaruh model pembelajaran langsung berbasis praktikum terhadap keterampilan proses sains dan kemampuan berpikir kritis siswa. *Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika dan IPA IKIP Mataram*, *6*(2), 46-55. https://doi.org/10.33394/j-ps.v6i2.966

Samadun, S., & Dwikoranto, D. (2022). Improvement of student's critical thinking ability in physics materials through the application of problem-based learning. *IJORER: International Journal of Recent Educational Research, 3*(5), 534-545. https://doi.org/10.46245/ijorer.v3i5.247

Saphira, H. V., & Prahani, B. K. (2022). Profile of senior high school students' critical thinking skills and the need of implementation PBL model assisted by augmented reality book. *Jurnal Pendidikan Sains Indonesia*, *10*(3), 579–591. https://doi.org/10.24815/jpsi.v10i3.25031

Siagian, A. F. (2015). Pengaruh model pembelajaran inkuiri terbimbing terhadap keterampilan berpikir kritis siswa sma. *INPAFI (Inovasi Pembelajaran Fisika)*, *3*(3), 299–306. https://doi.org/10.24114/inpafi.v3i3.5289

Sugiarti, M. I., & Dwikoranto, D. (2021). Peningkatan kemampuan berpikir kritis peserta didik melalui pembelajaran blended inquiry learning berbantuan schoology pada pembelajaran fisika: Literature review. *Quantum: Jurnal Inovasi Pendidikan Sains*, *12*(1), 49-62. http://dx.doi.org/10.20527/quantum.v12i1.10262

Supriyono, L., Prabowo, B., & Sunarti, T.(2015). Penerapan model pembelajaran inkuiri pada materi alat optik untuk meningkatkan keterampilan berpikir kritis siswa kelas VIII SMP cendekia sidoarjo. *Jurnal Inovasi Pendidikan Fisika*, *4*(1), 6–11. https://doi.org/10.26740/ipf.v4n1.p%25p

Suwondo, S., & Wulandari, S. (2017). Inquiry-based active learning: The enhancement of attitude and understanding of the concept of experimental design in biostatics course. *Asian Social Science*, *9*(12), 212–219. https://doi.org/10.5539/a.v9n12p212

Tomaszewski, L. E., Zarestky, J., & Gonzalez, E. (2020). Planning qualitative research: Design and decision making for new researchers. *International Journal of Qualitative Methods*, *19*, 1–7. https://doi.org/10.1177/1609406920967174

Trisna, P. A., & Jatmiko, B. (2013). Implementasi model pembelajaran inkuiri terbimbing (guided inquiry) terhadap keterampilan berpikir kritis siswa pada pembelajaran fisika materi fluida statis kelas XI di SMA negeri 2 sidoarjo. *Jurnal Inovasi Pendidikan Fisika*, *2*(3), 121–125. https://doi.org/10.26740/ipf.v2n3.p%25p

Turnip, B., Wahyuni, I., & Ifda, Y. (2016). The effect of inquiry training learning model based on just in time teaching for problem solving skill. *Journal of Education and Practice, 7*(15), 177– 181.

Wahyuni, S. (2018). Penerapan model inkuiri terbimbing (guided inkuiry) dalam meningkatkan kemampuan berpikir kritis pada pembelajaran fisika. *Education and Development, 3*(1), 1-5.

Wastiti, L., & Sulur, S. (2020). Pengaruh STEM- thinking maps pada model pembelajaran inkuiri terbimbing terhadap kemampuan berpikir kritis siswa kelas XI pada materi suhu dan kalor. *Jurnal Literasi Pendidikan Fisika*, *4*(2), 110–115. http://dx.doi.org/10.17977/um058v4i2p110-115

Yerita, S. W. S. (2017). Penerapan model pembelajaran inkuiri terbimbing terhadap penguasaankonsep dan kemampuan berpikir kritis fisika siswa kelas X SMAN 1 kuripan tahun ajaran 2017/2018. *Pendidikan Fisika dan Tekhnologi, 3*(2), 1-7.

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