



## Implementing Inquiry-Based Science Learning on the Topic World and its Changing of Grade 8 Students

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**Abstract:** Although Thailand's 2008 primary education curriculum emphasizes the importance of developing critical thinking and science competencies, there is still a gap between the theory and implementation of inquiry-based learning, particularly in science learning for grade 8 students in Thailand. The objectives of this study were 1) to improve academic achievement on the topic of the world and change using the inquiry-based learning management of grade 8 students to meet the criteria of 70% of the full score, and 2) to study the satisfaction of learning management by using inquiry-based learning management. The research method used is a quantitative research method. The research tools used in the study were: 5 learning management plans with a total of 10 hours, 4 multiple-choice achievement tests with 20 questions, and satisfaction questionnaire on learning management by using inquiry-based learning as a 5-level estimation of 10 items. The descriptive statistics were used by percentage, mean, and standard deviation. The results showed that the academic achievement of grade 8 students was 15.94 or 88.89% of full score, and the students who did not pass accounted for 11.11%. Also, they had highest level of satisfaction towards learning management. The study can be used and implied to science classroom for promoting science lessons and instructional practices. The implication of the results of this study is that this approach can be an effective strategy to bridge the gap between theory and practice in the Thai science education system and can be applied to other subjects to achieve educational goals in accordance with the 2008 Basic Education Curriculum. The recommendation for the results of this study is the need for further research to explore the effectiveness of inquiry-based learning in other subjects and different grade levels in order to maximize its potential in meeting the objectives of the 2008 Thai Basic Education Curriculum.

**Keyword :** Implementing, Inquiry-based, Science Learning, Topic World and its Changing

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### Introduction

The 2008 Basic Education Core Curriculum is an extension of the 2008 Basic Education Curriculum and aims to develop learners to be complete human beings both physically and mentally, knowledge, morality, ethics, and a sense of Thainess. Adhere to the regime of democracy, the monarch is the head of state. Learners must be knowledge owner that is relevant to professional practice. The aim is to make learners

important on the basis of the belief that everyone can learn and develop themselves to their full potential, and to aim for learners to be good, intelligent, happy, and have the potential to continue their education and career (Rotaru, 2021; Karatsiori, 2023; Nuangchalerm et al., 2024a; Nuangchalerm et al., 2024b).

Science and technology are the subjects that drive the progress of the country. It develops the nation's youth with other developed countries (Shavkidinova et al., 2023). The government must support and improve the country's education system to improve living in today's highly developed society. It can be considered that it is the duty of all parties to urgently adjust the corrections, especially teachers who are the managers of teaching and learning in the classroom. The teacher will convey the content to the students with a variety of teaching styles (Moşteanu, 2021; Moè et al., 2022). Teachers must have a way to manage teaching and learning to be interesting and motivate students to learn in accordance with the better science achievement (Ozcan, 2021).

Science learning in this era requires students' understanding of the nature of science and technology that equipping them with skills to navigate a rapidly changing world. Inquiry-based science learning. A pedagogical approach emphasizing students learn to have exploration, questioning, and hands-on experimentation (Salinas-Navarro et al., 2024). It emerges a transformative strategy to foster deeper comprehension and engagement among students to meet science education. This method aligns well with contemporary educational frameworks that prioritize critical thinking, problem-solving, and active participation over rote memorization.

For grade 8 students in Thailand, the study of earth and its dynamic changes provides a compelling context for inquiry-based learning. Exploring phenomena such as global warming, climate change, environmental degradation, and environmental transformations. Engaging students to deal with learning science activities that simulate real-world scientific practices, students can develop essential competencies, including hypothesis formulation, data collection, evidence-based reasoning, and concluding their learning outcomes (Asiyah et al., 2024; Kotsis 2024).

The researchers has studied the inquiry-based learning, which is the process of organizing learning activities used in learning science and technology. Students can build knowledge through a variety of learning processes, especially the process of seeking knowledge. It is a teaching that focuses on the process of seeking knowledge that will help students discover various truths on their own. The objective of this study aims to improve academic achievement by using the inquiry-based learning of grade 8 students to pass 70% of the full score and to study the satisfaction of learning management by using inquiry-based learning management. The importance of this study can be used for school science and teachers in classroom management. The findings contribute to the growing body of literature advocating for innovative teaching methodologies in science education.

Although the 2008 Thai primary education curriculum emphasizes the importance of developing critical thinking and science competencies, there is still a gap between the theory and implementation of inquiry-based learning, especially in science learning for grade 8 students in Thailand. There has been no comprehensive study that links the effectiveness of inquiry-based learning methods to academic achievement in earth and environmental change materials, especially those that

achieve the target of 70% of the full score. This research will fill that gap by investigating how inquiry approaches can improve students' academic achievement in the context of Thai science education and measure students' satisfaction levels with this learning model.

The research "Implementing Inquiry-based Science Learning on the Topic World and its Changing of Grade 8 Students" offers significant novelties that have not been explored by previous studies by implementing inquiry-based learning specifically on the topic of the world and its changes for grade 8 students in Thailand, setting measurable academic achievement targets of 70% of the full grade, as well as integrating contemporary global environmental issues such as global warming and climate change in the context of learning that is relevant to students' real lives. In contrast to the research of Bunwirat & Boonsathorn (2018) which discusses IBL in general, Khonkla et al. (2024) who integrate IBL with problem-based learning on the topic of style and movement, and Sukontawaree (2022) who combines IBL with cooperative learning for grade 4 students, this study focuses on the pure implementation of IBL in the specific context of the 2008 Thai education curriculum, measuring both academic achievement and student satisfaction simultaneously, and make practical contributions to science teachers in implementing innovative learning approaches that bridge the gap between theory and practice in the classroom.

## Methodology

The research method used is a quantitative research method to solve this problem. The study's population comprised 18 classes, totalling 670 students. We collected data from thirty-six pupils from a single classroom using a cluster random sampling method. The researcher randomly selected a sample of thirty-six kids from Phadung Naree School, located in the Mueang District of the Mahasarakham Province, during the second semester of the 2023 school year. Inquiry-based learning management with students, the researchers were able to clarify the goals, as well as provide an evaluation of academic performance and get an understanding of learning management.

This study makes use of several different methods, including: 1) an inquiry-based learning management plan with five steps, 2) four multiple-choice accomplishment assessments with twenty questions, and 3) ten satisfaction surveys for learning management.

The researchers gathered the data by following the steps outlined in the data-collecting procedure. After completing all the material instruction, the researchers administer a post-test based on a scientific accomplishment exam to the students and then score was tested by statistical analysis. Finally, the researchers inquire about the level of satisfaction experienced by the students and then evaluate the data. The researchers evaluate the findings by calculating the average score at the highest, high, medium, low, and lowest levels combined.

## Result and Discussion

The data analysis showed that 70% of the students passed the achievement score and 4 students had 70% of the achievement scores, of which 88.89% of the students passed and 11.11% of the students who did not pass the standard of 15.94 points, which compared to the 70% threshold is considered to have passed the criteria (Table 1).

**Table 1.**  
**Academic Achievement of Grade 8 Students with the Threshold of 70%**

Students	Full score	criterion 70%	Mean	Interpretation
36	20	14	15.94	Pass the criterion

Academic achievement of grade 8 students with an average score of 15.94 points, which is considered to be a pass compared to the 70% threshold. The students achieved 70% of the full score, accounting for 88.89% of the total 36 students. The students had an average score of 15.94, accounting for 79.50%, which was found to pass the criteria of 70%. They have observed, experimented, and practiced until they understand and let them learn as well. Lessons help motivate students to be interested in learning and encourage them to enjoy learning, resulting in their developing more learning skills.

Students' academic achievement averaged 15.94 points, representing 79.50% of the total score. This indicating showed that students have successfully met the criteria. Methods such as observation, experimentation, and practice directly impact to students' performance. Inquiry-based learning is likely contributed to their understanding and ability to achieve high scores. Also, it encourages student-centered learning with a strong pedagogical strategy that supports deeper understanding and retention.

Constructivist learning theory provides a framework which is a constructive process. This theory emphasizes hands-on and engage students in activities such as observation, experimentation, and practice to construct their own understanding of concepts (Anderson et al., 2021; Chuang, 2021; Spaan et al., 2024). It also develops deeper conceptual understanding rather than just memorizing content. The high achievement (88.89% passing rate) suggests that active engagement helped students internalize knowledge more effectively than passive instruction.

Constructivist theory emphasizes the role of social interaction and scaffolding in learning. Students are likely collaborated, discussed, and engaged in guided problem-solving activities. The Zone of Proximal Development (ZPD) concept suggests that with appropriate support, students can achieve more than they could independently (Barrs, 2021; Newman & Latifi, 2021). The improvement in scores indicates that teachers or peers provided scaffolding that facilitated the transition from basic understanding to mastery. The high pass rate (88.89%) and average score of 79.50% suggest that constructivist teaching methods effectively supported student learning. The findings align with Piaget's and Vygotsky's theories, emphasizing active, inquiry-based, and socially interactive learning as key drivers of academic success.

This study suggests that the educational approach not only helped students pass but also equipped them with skills that may be transferable to other areas of

study. When studying the satisfaction with the inquiry-based learning management, it was found that the students were at highest level of satisfaction towards learning management (Table 2).

**Table 2.**  
**Students' Satisfaction with the Management of Inquiry-Based Learning**

Item	Mean	SD	Level of satisfaction
1. Learning management activities are consistent with the content	4.83	0.38	Highest
2. Teachers are ready to use media and equipment for learning activities	4.78	0.42	Highest
3. Learning management allow students to learn the content of science easier to understand	4.81	0.47	Highest
4. Learning activities are fun and interesting	4.75	0.50	Highest
5. Learning activities to meet the needs of students	4.75	0.55	Highest
6. Students enjoy learning management activities	4.78	0.42	Highest
7. Learning management make students like science courses more	4.75	0.50	Highest
8. Students have more courage to work with others	4.78	0.42	Highest
9. Students have summarized their knowledge by themselves, with the teacher giving advice	4.86	0.35	Highest
10. Students have studied and researched from various learning sources	4.86	0.35	Highest
<b>Average</b>	<b>4.79</b>	<b>0.44</b>	<b>Highest</b>

Table 2 shows that when considered individually, it is found that there are 10 items with the highest level of satisfaction, including item 9. And in Question 10, students have studied and researched from various learning sources ( $\bar{X}=4.86$ ,  $SD=0.35$ ). The highest average is item 1, learning management activities are consistent with the content ( $\bar{X}= 4.83$ ,  $SD=0.38$ ), and the item 3, learning management makes the content of science easier to understand ( $\bar{X}= 4.81$ ,  $SD=0.47$ ) respectively. The lowest mean value is in items 4, 5 and 7 with a mean value of 4.75, namely in the items learning activities are fun and interesting, learning activities to meet the needs of students and Learning management makes students like science courses more.

We can discuss a successful implementation of inquiry-based learning for grade 8 students. Students demonstrated strong academic performance with an average score of 15.94 points (79.50%), exceeding the 70% pass threshold. This suggests the learning process was effective in meeting academic goals. The satisfaction is at the highest level across all 10 aspects of the learning process, with an overall average score of 4.79 ( $SD = 0.44$ ). The use of active, hands-on methods such as observation, experimentation, and practice enhanced comprehension and skill development. Inquiry-based learning fostered collaboration, enjoyment, and motivation, resulting in students developing more confidence and a greater liking for science subjects.

The high satisfaction levels align with constructivist learning theories, particularly those proposed by Piaget and Vygotsky. The results reinforce the effectiveness of inquiry-based learning in improving students' engagement, comprehension, and research skills. Educators should continue integrating this approach into science curriculum. Students enjoyed and interest in learning activities, which made learning fun and relevant (Malone & Lepper, 2021 Abnisa & Zubairi, 2022). They are more likely to retain concepts and skills, self-learning, summarize knowledge, and reflect of what they have learned. The study suggested that inquiry-based learning goes beyond traditional learning or recitation the science contents for examination. This approach in this context highlights its potential for replication in other subjects or grade levels for helping students meet nature of science education.

The results show that the implementation of inquiry-based learning on world topics and its changes significantly improved the academic achievement of grade 8 students with a graduation rate of 88.89% and the highest satisfaction rate, implying that this approach can be an effective strategy to bridge the gap between theory and practice in the Thai science education system and can be applied to other subjects to achieve educational goals in accordance with the Basic Education Curriculum 2008.

## Conclusion

The research on "Implementing Inquiry-based Science Learning on the Topic World and its Changing of Grade 8 Students" provides a convincing conclusion that the inquiry-based learning approach has proven to be effective in improving the academic achievement of grade 8 students on world topics and their changes, with 88.89% of students achieving a score above the 70% threshold and an average score of 15.94 points (79.50%). The level of student satisfaction with learning is also at the highest level (average 4.79) in all aspects measured, especially in terms of students' ability to learn and research from various learning sources and summarize knowledge independently. These results confirm that inquiry-based learning involving observation, experimentation, and hands-on practice not only succeeds in bridging the gap between theory and implementation in the Thai education system, but also supports learning constructivism by providing active, collaborative, and enjoyable learning experiences that build students' critical thinking skills, increase learning motivation, and facilitate a deeper understanding of science concepts in accordance with the objectives of the 2008 Basic Education Curriculum.

The recommendation from the results of this study is that teachers need to be given comprehensive training on effective inquiry-based learning strategies, including the preparation of learning media, discussion facilitation techniques, and appropriate assessment methods. Schools should provide diverse learning resources and a learning environment that supports students to conduct observations, experiments, and practices independently. Education policymakers can consider providing greater support to the implementation of inquiry-based learning through the development of more flexible curricula, adequate allocation of resources, and incentives for schools that successfully implement this approach. Further research is also needed to explore the effectiveness of inquiry-based learning in other subjects and different grade levels

in order to maximize its potential in meeting the objectives of the 2008 Thai Basic Education Curriculum.

## References

- Abnisa, A. P., & Zubairi, Z. (2022). Personality competence educator and students interest in learning. *Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme*, 4(1), 279-290.
- Anderson, A., Kollmann, E. K., Beyer, M., Weitzman, O., Bequette, M., Haupt, G., & Velázquez, H. (2021). Design strategies for hands-on activities to increase interest, relevance, and self-efficacy in chemistry. *Journal of Chemical Education*, 98(6), 1841-1851.
- Asiyah, A., Febrini, D., Topano, A., Mustamin, A. A., & Hakim, M. A. R. (2024). Measuring the impact of Islamic values-based scientific literacy on scientific competency of madrasah teachers. *International Journal of Learning, Teaching and Educational Research*, 23(4), 476-496.
- Barrs, M. (2021). *Vygotsky the teacher: A companion to his psychology for teachers and other practitioners*. Routledge.
- Bunwirat, N., & Boonsathorn, S. (2018). Inquiry-based learning: An effective pedagogical approach for empowering 21st century learners and education 4.0 in Thailand. *Political Science and Public Administration Journal*, 9(1), 163-183.
- Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. *Performance Improvement*, 60(3), 6-14.
- Karatsiori, M. (2023). In the pursuit of "Quality Education": From ancient times to the digital era, can there be a consensus?. *Cogent Education*, 10(2), 2286817.
- Khonkla, J., Thumsirawat, J., Supakesorn, B., Polyiem, T., & Prasertsang, P. (2024). Learning outcomes of an integrated inquiry-based and problem-based learnings for grade 8 science students. *Journal of Green Learning*, 4(1), 23-32.
- Kotsis, K. T. (2024). The significance of experiments in inquiry-based science teaching. *European Journal of Education and Pedagogy*, 5(2), 86-92.
- Malone, T. W., & Lepper, M. R. (2021). Making learning fun: A taxonomy of intrinsic motivations for learning. In *Aptitude, learning, and instruction* (pp. 223-254). Routledge.
- Moè, A., Consiglio, P., & Katz, I. (2022). Exploring the circumplex model of motivating and demotivating teaching styles: The role of teacher need satisfaction and need frustration. *Teaching and Teacher Education*, 118, 103823.
- Moşteanu, N. R. (2021). Teaching and learning techniques for the online environment. how to maintain students' attention and achieve learning outcomes in a virtual environment using new technology. *International Journal of Innovative Research and Scientific Studies*, 4(4), 278-290.
- Newman, S., & Latifi, A. (2021). Vygotsky, education, and teacher education. *Journal of Education for Teaching*, 47(1), 4-17.
- Nuangchalerm, P., Matchimo, P., & Polyiem, T. (2024b). promoting students about sustainable development in primary school science. *Pedagogi: Jurnal Ilmu Pendidikan*, 24(2), 159-167.

- Nuangchalerm, P., Prachagool, V., Nuangchalerm, A., Chimpali, K., & El Islami, R. A. Z. (2024a). Framing citizen science and sustainable education development. *Multidisciplinary Reviews*, 7(2), 2024028.
- Ozcan, M. (2021). Factors affecting students' academic achievement according to the teachers' opinion. *Education Reform Journal*, 6(1), 1-18.
- Rotaru, I. G. (2021). Current values of education and culture. In *Proceedings of the 23rd International RAIS Conference on Social Sciences and Humanities* (pp. 87-92). Scientia Moralitas Research Institute.
- Salinas-Navarro, D. E., Vilalta-Perdomo, E., Michel-Villarreal, R., & Montesinos, L. (2024). Designing experiential learning activities with generative artificial intelligence tools for authentic assessment. *Interactive Technology and Smart Education*, 21(4), 708-734.
- Shavkidinova, D., Suyunova, F., & Kholdarova, J. (2023). Education is an important factor in human and country development. *Current Research Journal of Pedagogics*, 4(01), 27-34.
- Spaan, W., Oostdam, R., Schuitema, J., & Pijls, M. (2024). Analysing teacher behaviour in synthesizing hands-on and minds-on during practical work. *Research in Science & Technological Education*, 42(2), 219-236.
- Sukontawaree, N., Poonputta, A., & Prasitnok, O. (2022). Development of Problem-Solving Abilities in Science by Inquiry-Based Learning with Cooperative Learning for Grade 4 Students. *Journal of Educational Issues*, 8(2), 771-782.