

## Analyze Implementation of Inquiry-Based Learning in Physics for Learning Outcomes and Thinking Skills

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### ABSTRACT

**Objective:** The Inquiry Based Learning model is one of the learning models that can be applied in today's learning process. In the process of learning not only the learning results are necessary values but also the thinking ability of the student should be taken into account. This Inquiry Based Learning model is a learning model that is centered on the student and requires the ability to think in finding a concept. Therefore, the author is interested in studying further on the implementation of Inquiry Based Learning in the learning process of physics. **Method:** The method used in this study is conducting a literature study of scientific journal articles, with data analysis using qualitative research. **Results:** Based on the research that has been done, it can be concluded that by implementing Inquiry Based Learning in the learning process of physics, can improve the learning outcomes and thinking skills of the pupils. So the model of inquiry based learning can be applied in the physical learning process in schools with the expectation of pupils more active in the process of learning and have improved learning results and have the ability to think to solve problems.

### INTRODUCTION

Nowadays, students are expected to graduate with knowledge and good skills, creativity, attitudes, and behavior. The relationship between educators and students is significant. The connection must be well established for education to achieve harmony between educators and students. According to a study (Wuju & Putra, 2020) that says that there is a very strong relationship between the teacher and the student's learning process. In the learning activities, it is hoped that there will not only be one way where learning is only centered on the educator or teacher but, learning must be carried out in two directions, namely, students can also behave actively when learning activities are carried out.

In the learning process, many problems arise when the learning process is carried out. These problems can be found in teachers and students, specifically in students. According to Zakir in (Samudra et al., 2014) learning difficulties are symptoms found in the process which can be seen from various forms of behavior caused by factors within and outside the learner (student). According to Maas in (Samudra et al., 2014) learning difficulties can be caused by several factors, namely students' perceptions of a subject, incomplete learning facilities such as books and others, as well as lack of motivation and applying inappropriate learning methods. Menurut (Ady, 2022) mengatakan bahwa siswa mengalami kesulitan belajar fisika disebabkan oleh aspek intelegensi dan asumsi terhadap pembelajaran fisika.

Not only this, (Riaz et al., 2008) found that consulting outside the classroom with teachers can also affect Learning. External factors that can cause learning difficulties for students are the lack of precise learning models applied in the learning process.

According to (Setyaningrum, 2015), the learning model is a basis for practice derivative of learning theory and psychological theory made according to an analysis of curriculum implementation and application at the operational level in class. From the 2013 curriculum, teachers are required to be able to teach their students by applying a scientific-based learning model so that students can discover and search for concepts independently (inquiry and discovery), can solve the problem alone (problem-based learning), and can create works or projects (project-based learning) (Bertema.com, 2019).

Physics is the subject most disliked by students, and even laziness to be studied by students. It is prevalent because, according to most students, physics subjects are challenging to understand, and too many formulas are memorized. After distributing the questionnaires to some students, they said physics was complicated. It is also reinforced by the findings of (Samudra et al., 2014). Not only do students think physics is complex, but the public also thinks physics is complicated. According to research results from (Imahara et al., 2008) found, Physics is the most hated and complex subject by high school students in particular.

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Using Inquiry-Based Learning can make students more active in the learning process. Student learning outcomes also increase with the level of student activity in education. Therefore, this study aims to determine students' learning outcomes and thinking skills by implementing Inquiry-Based Learning.

## RESEARCH METHOD

The type of research used is explanatory quantitative research using a survey design, a method used to obtain data from a particular place by circulating questionnaires on variable X (metacognitive) there are 7 instrument grids namely declarative knowledge, procedural knowledge, conditional knowledge, strategies, planning, monitoring and evaluation. Variable Y1 (self-efficacy) has 3 instrument grids, namely magnitude, strength, and generality. Variable Y2 conducts an economic problem-solving test by conducting a problem test consisting of four economic essay questions. This study aims to explain the relationship between variables.

This study uses conducting a literature study of scientific journal articles. According to Miles and Huberman, data analysis in qualitative research is as follows: 1) data collection is collecting data in the field and reviewing articles to obtain the necessary information according to the research objectives; 2) data reduction, namely summarizing the research results on articles focusing on important things, things that are essential, and things that are needed; 3) presentation of data, namely qualitative research data, will be

presented in narrative form, with relationships between subjects, graphics, etc; 4) the conclusion is concluding new things that have never been found.

## RESULTS AND DISCUSSION

### Results

Based on the data in Table 1 that has been carried out, a summary is obtained from several journals published in 2015-2022 concerning Inquiry-Based Learning in physics learning as follows:

**Table 1.** Research article data on inquiry-based learning

Identity of Articles	Findings
Pillar of Physics Education, 12 (4), 2019, 873-880 Title: (Meta-Analysis of the Effect of Applying the Inquiry-Based Learning Model in Physics Learning to Answer the Challenges of the 2013 Curriculum in the 21 <sup>st</sup> Century) Author: Esti Aprilia Usman, Mona Trisna Cahyati, Yosa Auliya Putri, and Asrizal (Septiani et al., 2019)	This research found Inquiry Based-Learning can increase the learning outcome and thinking skills of students.
Wahana Pendidikan Scientific Journal, 8 (7), 2022, 344-353 Title: (Application of the Inquiry Method to Increase Student Interest in Class XI MAS Al-Ikhwan Gotowasi On Business Concepts) Author: Haryati Mahyudin and Ernawati Muhtar (Haryati Mahyudin, 2022)	In this study, the results obtained were that students' interest in learning increased by applying Inquiry Learning to presentation learning.
Journal of Mathematics Education, 3(2), 2020,75-80 Title: (The Influence of Inquiry Learning Model and Student Learning Creativity on High School Students' Understanding of Physics Concepts (Experiment at Public High Schools in Karawang Regency)) Author: Ratih Komala (Komala, 2022)	This study found that Inquiry-Based Learning can increase the understanding of concepts and skills of the student
Physikos Journal of Physics and Physics Education, 1(1). 2022, 1-9 Title: (Implementation of the Inquiry Learning Model with the Concept of Analogy to Improve Physics Learning Outcomes in the Material of Uniform Straight Motion and Uniform Circular Motion) Author: Dano Samdan Sitania, Estevanus Kristian Huliselan, and Seska Malawau (Samdan Sitania et al., 2021)	This study found that by applying Inquiry-Based Learning in the learning process, students' learning outcomes have increased significantly.

Identity of Articles	Findings
<p>Online Creative Journal (JKO) 9(3), 2021, 22-130 Title: (The Effect of the Open Inquiry Learning Model on Student Learning Outcomes in Physics Subjects) Author: Delianus Lembong and Muslimin (Lembong &amp; Muslimin, 2021)</p>	<p>In this study it was found with the Open Inquiry learning model in the subject of sound and light can increase learning outcomes for students.</p>
<p>Journal of Physics and Learning (PHYDAGOGIC). 2(2), 2020, 55-60 Title: (Application of the Inquiry-Based Learning Learning Model to Improve Students' Physics Problem-Solving Skills) Author: Karmila, Hardi Hamzah, and Mutmainna (Karmila et al., 2020)</p>	<p>In this study, the problem-solving skills possessed before using Inquiry-Based Learning were in a reasonably good category. Still, when Inquiry-Based Learning was used, students' problem-solving skills increased to a good type.</p>
<p>Journal of the Physics Alumni Association of Medan State University. 5(4), 2019, 48-51 Title: (Implementation of the Inquiry Training Learning Model on Student Learning Outcomes in Class X SMA) Author: Indah Kesuma Putri and Juniar Hutahaeon (Putri &amp; Hutahaeon, 2019)</p>	<p>In this study, it was found the Inquiry Training learning model could achieve the Minimum Completeness Criteria score in the excellent category. Student learning activities are also in the active category. And finally, the students' physics learning outcomes on impulse material experienced a significant increase.</p>
<p>UNDIKSHA Physics Education Journal, 11(1). 2021, 47-55 Title: (Application of the Phet Simulation-Based Virtual Practicum Method Assisted by the Guided-Inquiry Module to Increase Knowledge of Physics Content) Author: Aprina Defianti, Dedy Hamdani, and Ahmad Syarkowi (Defianti et al., 2021)</p>	<p>This study found that the content knowledge possessed by students had increased by implementing the Guided Inquiry Module.</p>
<p>Unnes Physics Education Journal, 8(3). 2019, 288-298 Title: (The Effect of the Guided Inquiry Learning Model with the Experimental Method on Students' Process Skills) Author: Dyah Ayu Woro Hastuti, and Wiyanto Wiyanto (Hastuti &amp; Wiyanto, 2019)</p>	<p>In this study, it was found can be seen was a significant increase in student science process skills and learning outcomes. students' science process skills.</p>

Identity of Articles	Findings
<p>Title: (Meta-Analysis of the Effect of Using the Inquiry-Based Learning Model on the Skills Competence of Students in Learning Physics) Author: Yosa Aulya Putri, Esti Aprilia Usman, and Mona Trisna Cahyati (Usman et al., 2019)</p>	<p>In this study, the results were obtained that applying Inquiry-Based Learning in the learning process could improve students' thinking skills, especially in the competence of communicative skills.</p>
<p>Journal of Physics Education, 10(1). 2020, 56-60 Title: (The Influence of the Process-Oriented Guided Inquiry Learning Learning Model on the Understanding of Physics Concepts) Author: Ali Umar Dani and Qurana (Dani &amp; Qurana, 2022)</p>	<p>This study found that applying Process Oriented Guided Inquiry Learning can improve students' learning outcomes and understanding of concepts.</p>
<p>Journal of Education and Humanities, 4(2), 2020, 685-703 Title: (Application of the Inquiry Learning Model Can Improve Student Learning Outcomes in the Subject of Physics Subject of Harmonic Motion) Author: Zainul Arifin (Arifin, 2020)</p>	<p>This study found Inquiry learning model can improve student achievement in physics subjects.</p>
<p>Journal of Physics Education, 6(1). 2018, 95-105 Title: (Implementation of the Inquiry Learning Model Using the React Strategy to Improve High School Students' Physics Learning Outcomes) Author: Dwi Esti Kusumandari, Feriansyah Sesunan, and Ismu Wahyudi (Kusumandari et al., 2018)</p>	<p>In this study, it was found that inquiry-based learning compared to DI will result in increased learning outcomes</p>
<p>Journal of Indonesian Physics Education, 11 (2). 2015, 162-169 Title: (Implementation of the Inquiry Training Learning Model in Physics Learning to Improve Students' Firm Thinking Ability) Author: Derlina, S. Mihardi (Derlina et al., 2015)</p>	<p>In this study, it was found that Inquiry Training learning can improve students' traditional thinking skills in the subject matter of particle kinematics. The N-gain value in the experimental class for traditional thinking skills in the medium category and proportional thinking in the high sort is evidenced by the N-gain value of the practical course. While the weight of N-gain in the control class for formal consideration is in a low category, and proportional thinking is in the moderate category.</p>

Identity of Articles	Findings
Navigation Physics Journal of Physics Education, 2 (2). 2020, 69-73 Title: (Meta-Analytic Study of Guided Inquiry Learning Models in Physics Learning) Author: Nurhasanah, Dasmu (Nurhasanah & Dasmu, 2020)	In this study, it was found that Guided Inquiry could not only improve cognitive learning outcomes but could improve science process skills and students' understanding of concepts.
Pillar of Physics Education, 12 (4). 2019, 865-872 Title: (Meta-Analysis of Inquiry-Based Learning Models for Learning Science and Physics in the 21st Century) Author: Tri Septiani, Novelia Prima, and Fitri Nisak (Septiani et al., 2019)	This study found that Inquiry-Based Learning is usually applied to learning material that requires concept discovery or experimentation. So that Inquiry-Based Learning will be carried out very well if using virtual laboratory learning media and worksheets.

### **Discussion**

The Inquiry-Based Learning learning model approach is an approach that refers to problems that exist in daily life so that students can think critically, and creatively, and problem-solving skills to complete and acquire appropriate conceptual knowledge of the material being studied. The implementation of the application of the Inquiry-Based Learning learning model has stages to achieve the expected goals, where the steps are, (1) Orientation, where at this stage the teacher first explains the topic, objectives, and desired results, then gives a short description of the learning activities that will be carried out by applying the inquiry-based learning model, as well as the teacher providing motivation and appreciation. (2) Formulate the problem. In formulating problems, students must be able to formulate their problems to have high learning motivation, and the problems to be studied are problems in which some questions or puzzles have definite answers. (3) Formulating hypotheses, here, the teacher's role is only to provide questions that stimulate students' minds so that they can formulate hypotheses or quick answers. (4) Collecting data, here, the teacher gives questions that encourage students to want to find answers and the information needed, and the teacher must also provide opportunities for students to hold discussions. (5) Making the hypothesis, here, the teacher allows students to prove the truth of the quick answers based on the evidence of the data found. (6) Formulating conclusions.

Based on the data obtained from several articles and journals, applying Inquiry-Based Learning can improve the learning outcome and activity of students. With Inquiry-Based Learning, students actively search and investigate what causes the information or knowledge obtained to be embedded longer in their memory. From the data above it is also proven that applying the Inquiry-Based Learning learning model can improve learning outcomes very significantly because the teacher is only a guide or facilitator, so students will be more active in the process of learning activities. Inquiry-Based Learning

can be applied with the help of various media, for example, virtual laboratories and so on. It is done to support the objectives of Inquiry-Based Learning. The Inquiry-Based Learning learning model can not only be applied to students but can also be applied to students, and it is also proven that student content knowledge has increased. Inquiry-Based Learning can also increase scientific knowledge, concept knowledge, content knowledge, critical thinking, creative thinking, etc.

Therefore student learning outcomes do not only depend on the factors themselves but there are other factors. Teachers must understand and understand the state of the class to use appropriate learning models students need to achieve maximum learning objectives. The learning objectives are that students have competence abilities, content abilities, or main concepts, and students need to master variation abilities namely, critical, creative, and high-level thinking skills. Therefore, teachers can apply this inquiry-based learning model in the learning process. Consequently, the teacher can use this inquiry-based learning model in the learning process.

## CONCLUSION

Based on the results of research in the form of literature studies, it can be concluded that Inquiry-Based Learning can be applied effectively in the learning process. This is because the output or results obtained is an improvement in the quality of learning results and thinking skills. Using Inquiry Based Learning can make students more active in the process of learning.

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Analyze Implementation of Inquiry-Based Learning in Physics for Learning Outcomes and Thinking Skills

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