

## Description of Student Responses to the Implementation of the Inquiry Learning Model in Physics

Jufrida <sup>1,a</sup>, Dwi Agus Kurniawan <sup>1,b,\*</sup>, Tanti <sup>2,c</sup>, Weni Sukarni <sup>1,d</sup>, Erika <sup>1,e</sup>, Roro Hoyi <sup>1,f</sup>, and Muhammad Ikhlas <sup>3,g</sup>

<sup>1</sup> Physics Education, Faculty of Teacher Training and Education, Universitas Jambi

Jl. Raya Jambi-Muara Bulian KM 15, Mendalo Indah, Jambi Luar Kota, Muaro Jambi 36361, Indonesia

<sup>2</sup> Physics Education, Faculty of Teacher Training and Education, UIN Sultan Thaha Saifuddin Jambi

Jl. Raya Jambi-Muara Bulian KM. 16, Muaro Jambi 36361, Indonesia

<sup>3</sup> College of Education, Central Luzon State University

Science City of Munoz, 3119, Nueva Ecija, Filipina

e-mail: <sup>a</sup> [jufrida@unja.ac.id](mailto:jufrida@unja.ac.id), <sup>b</sup> [dwiagus.k@unja.ac.id](mailto:dwiagus.k@unja.ac.id), <sup>c</sup> [tanti@uinjambi.ac.id](mailto:tanti@uinjambi.ac.id), <sup>d</sup> [wenisukarni282.ws@gmail.com](mailto:wenisukarni282.ws@gmail.com),  
<sup>e</sup> [erk.erikaaaaa@gmail.com](mailto:erk.erikaaaaa@gmail.com), <sup>f</sup> [rorohoyi3@gmail.com](mailto:rorohoyi3@gmail.com), and <sup>g</sup> [muhammadikhlas@clsu.edu.ph](mailto:muhammadikhlas@clsu.edu.ph)

\* Corresponding Author

### Abstract

*The model of learning is one of the approaches of strategy that teachers must carry out in a systematic and procedural to regulate the activities of learning to achieve the goal of learning. The process of learning by using a model of learning inquiry can increase the activity of the students, the courage of students in revealing ideas and ideas, and improve students' science process skills in the physics learning process. The purpose of the research is to know how students' response to models of learning of inquiry was used at the time of learning physics and see whether the application of the model the students are more skilled in learning. Research is conducted in SMA Negeri 8 Muaro Jambi on student grade X IPA 1, which aims to determine students' response when given an inquiry learning model during the process of learning physics. The instrument that is used is a questionnaire of students with a sample of 21 students. This study used a mixed-method with a sequential explanatory design. The descriptive statistics were employed in the data analysis technique to obtain the average, mode, median, minimum, and maximum values. Based on the findings of this study, it is possible to conclude that using inquiry learning models in physics learning can boost student activity, independence, and science skills. This is demonstrated by the students' responses in quite good categories. Students feel accountable for formulating, analyzing, and solving problems when using the inquiry learning methodology. So that students can learn physics in a more meaningful way, and the material is easier to retain. The student response rate to the learning model is rated as satisfactory.*

**Keywords:** *Inquiry learning model; Physics; Student response; Curriculum*

## Deskripsi Respon Siswa Terhadap Penerapan Model Inquiry Learning Pada Pembelajaran Fisika

### Abstrak

Model pembelajaran merupakan salah satu pendekatan strategis yang harus dilaksanakan oleh guru secara sistematis dan prosedural untuk mengatur kegiatan pembelajaran guna mencapai tujuan pembelajaran secara optimal. Proses pembelajaran dengan menggunakan model pembelajaran inkuiri dapat meningkatkan keaktifan siswa, keberanian siswa dalam mengungkapkan ide dan gagasan serta meningkatkan keterampilan proses sains siswa dalam proses pembelajaran fisika. Tujuan penelitian adalah untuk mengetahui bagaimana respon siswa terhadap model pembelajaran inkuiri yang digunakan pada saat pembelajaran fisika dan melihat apakah dengan penerapan model tersebut siswa lebih terampil dalam pembelajaran. Penelitian dilakukan di SMA Negeri 8 Muaro Jambi pada siswa kelas X IPA 1 yang bertujuan untuk mengetahui respon siswa ketika diberikan model berbasis penyelidikan selama proses pembelajaran fisika. Instrumen yang digunakan adalah angket respon dengan jumlah sampel sebanyak 21 siswa. Penelitian ini menggunakan metode campuran dengan desain penjelasan sekuensial. Teknik analisis data menggunakan statistik deskriptif untuk mendapatkan nilai rata-rata, modus, median, minimum, dan maksimum. Berdasarkan hasil penelitian dapat disimpulkan bahwa penggunaan model pembelajaran inkuiri dalam pembelajaran fisika dapat meningkatkan keaktifan siswa, kemandirian dan meningkatkan keterampilan sains siswa. Hal ini dibuktikan dengan melihat respon siswa pada kategori cukup baik. Melalui model pembelajaran inkuiri siswa juga merasa bertanggung jawab untuk merumuskan, menganalisis, dan memecahkan masalah. Sehingga pembelajaran fisika lebih bermakna bagi siswa dan materinya mudah diingat. Tingkat respon siswa terhadap model pembelajaran dikategorikan cukup baik.

**Kata Kunci:** Model pembelajaran inkuiri; Fisika; Respon siswa; Kurikulum

**PACS:** 01.30.-y; 01.40.-d; 01.40.Fk; 01.40.gb

© 2021 Jurnal Penelitian Fisika dan Aplikasinya (JPFA). This work is licensed under [CC BY-NC 4.0](https://creativecommons.org/licenses/by-nc/4.0/)

**Article History:** Received: April 14, 2020

Aproved with minor revision: December 07, 2020

Accepted: July 18, 2021

Published: June 30, 2021

**How to cite:** Jufriada, et al. Description of Student Responses to the Implementation of the Inquiry Learning Model in Physics. *Jurnal Penelitian Fisika dan Aplikasinya (JPFA)*. 2021; 11(1): 16-28. DOI: <https://doi.org/10.26740/jpfa.v11n1.p16-28>.

## I. INTRODUCTION

Physics is considered essential to be taught as a separate subject. However, providing knowledge to students, Physics is a subject that can help students have the ability to think and act scientifically [1]. This ability is useful for students to support the times and solve problems in everyday life [2] Physics learning that is racing on the concept requires a high understanding [3]. The success of the learning process is influenced by the quality and way of teaching a teacher. A qualified

teacher not only knows but also has skills [4].

One of the initiatives done in the creation of the educational curriculum [5]. The curriculum is a vital tool for the success of educational goals because a suitable curriculum will facilitate the achievement of the desired educational goals and objectives. The current curriculum in Indonesia, notably the 2013 curriculum, employs the principle to encourage students to become more engaged students. The core action in this model is carried out by observing specific events for

the teacher to stimulate students' interest in these events [6]. So, in essence, the teacher is merely a motivator or facilitator, but the teacher confirms a thorough explanation of student activities at the end of the core activity [7].

Learning Physics in the 2013 curriculum now focuses on student-centered learning. As a result, it is intended that the teacher will be able to create the lesson plan as thoroughly as possible for the subject to be delivered extensively and deeply [8]. So the teacher must design a learning strategy or a fun learning model. While using learning models in teaching and learning activities is necessary to increase student interest in teaching and learning activities.

The selection of learning models must be adjusted to the themes and basic competencies that must be mastered by students and adapted to the conditions of the student's learning environment, student abilities, learning resources, and supporting resources owned by the teacher or school [9]. The 2013 curriculum strategy encourages students to take an active role in their learning so that it is student-centered rather than teacher-centered. However, because Curriculum has not been adopted in all Indonesian schools, it is common to encounter learning which still oriented on the teacher. [10].

Teachers must be able to establish enjoyable learning environments, inspire motivation, and stimulate students' interest in learning. This aims to make learning enjoyable to improve students' mastery of physics concepts. The development of physics is very influential for technological advances because physics is a basic science needed by other branches of science. Teachers must be skilled in choosing and using the right learning model or approach to achieve these goals, not just a conventional method [11].

Learning is said to be successful if

students have mastered cognitive, psychomotor, and affective physics material. One model that can be applied is the inquiry learning model. The inquiry method can also be used in the implementation of the 2013 curriculum with a scientific approach. The main emphasis in the inquiry-based learning process lies in the ability of students to understand, identify carefully and thoroughly, then provide answers or solutions to the problems presented. Also, this learning aims to encourage students to be bolder and more creative in their imagination [12]. The Inquiry learning model aims to train students to learn independently. Students can develop knowledge discoveries independently through scientific activities, which is known as the scientific approach. Using a scientific approach to learning is one strategy to emphasize inquiry learning. A scientific approach to inquiry-based learning is intended to satisfy the demands of the twenty-first century, explicitly shifting the learning process from teacher-centered to student-centered [13].

The inquiry learning model provides more opportunities for students to learn directly. This model is suitable to be applied in physics learning. Furthermore, model syntax can develop basic science skills: observing, classifying, calculating, formulating hypotheses, designing experiments, measuring, collecting data, interpreting data, drawing conclusions, and communicating [14]. The inquiry learning model is a student-centered learning model that provides the broadest possible opportunity for students to find and investigate the concepts they learn through experimental activities to answer questions that arise about a given problem, solve the problem under study, and find themselves according to his abilities [15].

The inquiry process allows students to have real learning experiences, students are trained on how to solve problems while

making decisions. Inquiry-based learning enables the integration of multiple disk paths. The role of the teacher in inquiry learning is more of guidance, direction if needed by students [16]. One of the recommended learning models is the inquiry learning model that offers student-centered, improving students' innovation skills in thinking, and so on. Inquiry learning requires students to work collaboratively to ask questions, make provisional hypotheses, design investigations, develop results, and findings with what is obtained, and build communication [17].

The preliminary research results show that students' responses to physics subjects still tend to be lower. This was proven when the learning took place. Some students did not pay attention to the teacher but were busy themselves and even chatting with their friends, students did not respond to the teacher's questions, and some students were just silent in the learning process. This happens because students do not understand the material presented by the teacher. When a physics teacher or prospective physics teacher does not have process skills when the learning occurs, the teacher can only explain the theory using conventional methods. Therefore, teachers prefer to keep applying conventional models in learning physics [18].

However, the real conditions in learning Physics are still not optimally implemented. First of all, the use of learning model used is not following the learning material. Second, the teaching materials used do not yet support the applied learning model. This can be seen in the learning process that still uses conventional methods or is better known as the lecture method. This actual condition shows that the problems in learning cannot be separated from the problem of the learning model and teaching materials used. This makes students less understanding of Physics learning material, because students are less encouraged to be more active, critical,

creative in learning [13].

Teachers still think that the conventional model is considered more effective, and the material is easy to understand when explained by the teacher. So that the physics learning process remains teacher-centered, with the teacher still delivering the general concept on the blackboard, which is not required by the 2013 curriculum. This demonstrates that the teacher did not implement a learning approach that met the requirements of the 2013 curriculum. As a result, this study aims to see how students respond to the inquiry learning model implemented during physics learning at SMAN 8 Muaro Jambi and evaluate if using this model improves students' learning skills.

## II. METHOD

The research uses a mixed-method with an explanatory sequential design. Explanatory mixed methods designs are a combined research method that sequentially combines quantitative and qualitative research methods. The first step employs quantitative methods in the form of data and numerical findings, which are followed by qualitative approaches in the form of data and text results in the second stage. In this design, quantitative data and results are more important than qualitative data and results. So the qualitative method serves to explain and expand the quantitative data obtained at an early stage [19].

The explanatory sequential mixed method design includes a two-phase scheme. In the first phase, the researcher gathers quantitative data and analyzes the findings, and in the second, using the results to design the qualitative part. The general goal of this study was to acquire qualitative data that would aid in explaining and exploring the preliminary quantitative results in greater depth [20]. Quantitative data is in the form of a student response questionnaire to the

inquiry learning model, which consists of 20 statements that have been declared valid and reliable, taken from Devi's research in 2012, and qualitative data in interviews with students.

Quantitative research is one type of research to examine the object of the sample used systematically, planned, and structured using data in the form of numbers. Quantitative data collection using a survey method aims to find a general description of the characteristics of the sample. Survey research methods are one type of research method by taking data in written questions, not oral questions [21]. So that in this study, researchers analyzed and classified questionnaire data supported by interviews that were narrated to describe the data in full. Qualitative data is used to strengthen and supplement quantitative data regarding the problem under study [22].

The sampling technique of this research is the purposive sampling technique. Purposive sampling is a sample that is done by taking subjects not based on strata random, or region but based on the existence of certain objectives [23]. The sample of this study was taken from the class of 21 students of senior high school in Jambi. The study used a test assessment instrument in the form of a questionnaire or questionnaire. The type of instrument used was the student response questionnaire adapted from the thesis [24].

The choice of the five scale response was chosen because it has a better or more complete response variability than the four scales so that it can express more fully the differences in the attitude of the respondents [25]. The data obtained were processed and analyzed using SPSS data processing software. The following is a table of Likert scale [26].

**Table 1. Likert Scale**

Positive Statement	Negative Statements
Strongly Agree (5)	Strongly Disagree (5)
Agree (4)	Disagree (4)
Neutral (3)	Neutral (3)
Disagree (2)	Agree (2)
Strongly Disagree (1)	Strongly Agree (1)

### III. RESULTS AND DISCUSSION

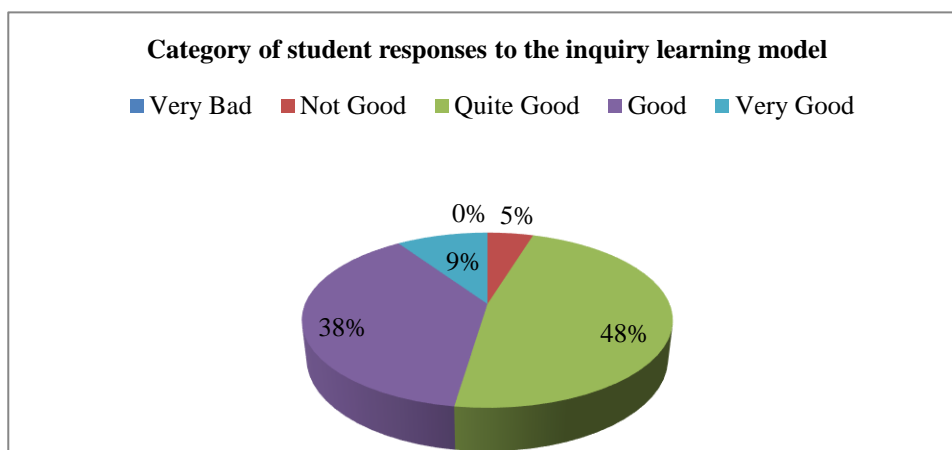
The renewal of this research is applying the inquiry learning model used to describe students' responses to physics subjects at SMAN 08 Muaro Jambi. The success of physics learning objectives at the high school level is expected to be mainly determined by the learning experienced by students with the accuracy of the learning model used by teachers when teaching physics. A learning model will be effective if the application is carried out following the learning objectives

[27]. One example of a learning model that can be applied is the inquiry learning model.

The inquiry learning model is a learning model in which the student formulates the problem, designing experiments, collecting, analyzing data, and making decisions all by themselves and must meet four criteria: clarity, appropriateness, accuracy, and complexity [28]. Inquiry learning with science context is learning developed by using the context of science as a medium to build and improve the critical thinking skills of students [29].

**Table 2. Descriptive Statistics of Student Responses to The Inquiry Learning Model**

Variable	Interval	Frequency	Percentage (%)		
	20.0 – 36.0	0	0	Mean	67.24
<i>Inquiry</i>	36.1 – 52.0	1	4.8	Median	68.0
<i>Learning</i>	52.1 – 68.0	10	47.6	Modus	66.0
<i>Model</i>	68.1 – 84.0	8	38.1	Minimum	50.0
	84.1 – 100.0	2	9.5	Maximum	86.0



**Figure 1. Pie Chart Category of Student Responses to The Inquiry Learning Model**

Inquiry-based learning aims to encourage students to be more creative in their imagination. The process of the invention in this model is regulated and valued as a form of natural curiosity. Therefore, they are encouraged not only to understand the subject matter but also to make a discovery. Furthermore, students are in the scope of learning science and are also encouraged to do science [30]. An inquiry-based learning process is a learning model that focuses on the development and confrontation of problems or actual situations by adopting critical thinking to review problems and explore and figure out the cause of the problems. Students that adopt inquiry-based learning tend to develop the ability to think critically better than students in the general education management system [31]. Inquiry-based learning is a learning approach that helps students stimulate an active, self-directed, contextual, and better understanding of the topics being studied,

collaborative learning, based on active participation, through developing their literature search skills, problem problem-solving, and critical thinking [32]. Inquiry learning is a teaching method emphasizing students actively developing their knowledge, which is not directly transmitted from their teachers and is compatible with the constructivist approach. Inquiry-based learning has the potential to promote students' intellectual engagement and foster their understanding through a hands-on, minds-on, and research-based disposition towards teaching and learning, particularly in the science subject [33]. The application of inquiry-based learning is supposed to have pedagogical implications and present a more attractive teaching environment in which to learn. However, students of inquiry-based learning laboratories have been found to experience a sense of complexity and frustration in practice [34].

The inquiry learning model significantly impacts the prospective teachers' metacognition knowledge and metacognition awareness in learning. Besides, Inquiry-based learning can grow up student engagement in learning, formulating problems, investigating extensively, and then building understanding, interpretation, and acquiring new knowledge to be applied towards different problems that may generate several types of action in solving problems [35]. Learning inquiry is a dynamic approach that engages learners in investigating, ask questions, create a hypothesis, and test the hypothesis to get a new understanding. There are four levels in the inquiry, which is a level confirm by giving learners issues, procedures, and solutions to be found [36]. In inquiry learning, students discover for themselves the concept of the material being studied [37].

Learning Inquiry Learning is carried out in the following stages: the teacher gives stimulus questions to students, entices students to gather information, the teacher gives directing questions and guides students to observe the given problem, formulate the problem, identify the problem, make a hypothesis, and design experiment, students conduct experiments or data collection, students discuss to conclude results based on data obtained and students are asked to record the results of conclusions, and each group presents their findings in front of the class [38]. The inquiry learning model requires students to have good abilities in communication and in the ability to work together in groups. So in addition to inquiry learning can increase students' insights, can also improve the ability to find concepts from the experiments they do [39].

The analysis of student responses to the inquiry learning model showed the average percentage overall included in the quite good and good categories, but the more dominant student responses were categorized quite well.

This shows that physics learning using the inquiry learning model gets positive responses from students, although some students still show poor responses. The learning process using the inquiry learning model can increase student activity, students 'courage to express ideas and ideas and improve students' science process skills in the physics learning process.

The interviews were conducted with 2 students. The interview results obtained from questions about negative students' responses to physics subjects before using the inquiry learning model are as follows:

*Question 1 : Do you like studying physics, if you like to explain why?*

*Answer 1 : I don't like to study physics because the material is difficult to understand, there are a lot of formulas, and the teacher explains the material more complicated.*

*Question 2 : Do you like learning with experiments or experiments? Give reasons?*

*Answer 2 : I like to experiment because it gives me scientific process skills and can improve my scientific abilities*

*Question 3 : Is the inquiry learning model more interesting? Give reasons?*

*Answer 3 : Yes, it is interesting because learning to use the inquiry learning model makes my curiosity about the concept of physics and its applications and improve science skills and investigate scientific problems that can be seen from its application.*

Based on the results of the interview, students did not like physics, but by using the inquiry learning model, students were more active. This is because there are experiments

to find the right solution to solve problems regarding the studied physics material. Then the reason students do not like physics is because it is difficult to understand and does not match their desire to enter the science major. The interview results obtained from questions about positive students' responses to physics subjects after using the inquiry learning model are as follows:

*Question 1: Do you like studying physics? If you like to explain why!*

*Answer 1: Sometimes I like to study Physics because the material is easy to understand and the teacher explains the material more cheerfully. Besides, studying Physics has many benefits because I can find out the application which of course we often encounter in everyday life, but sometimes I don't like it when the material is difficult to understand and there are a lot of formulas.*

*Question 2: Do you like learning with experiments or experiments, give reasons?*

*Answer 2: I find it easier to learn physics when the teacher explains the material, but I also like experimenting because it makes me more skilled and critical.*

*Question 3: Is the inquiry learning model more interesting, give reasons?*

*Answer 3: Yes, it's interesting, because learning using the inquiry learning model makes me curious to do experiments about physics, train to make decisions in concluding, solve problems, work together to find solutions, increase enthusiasm for learning, and foster my positive attitude in learning physics. As well as improving science skills*

*and being able to investigate scientific problems that can be seen from practicum activities.*

Based on the results of the interview, students feel interested in learning Physics by using the inquiry learning model because it can improve student activity by continuing to find out what is the right solution to solve problems regarding the experiments of Physics material being studied. Also, students can connect the material learned with the phenomena that exist in the surrounding environment because the implementation of physics is often encountered in daily life.

The implementation of good learning can occur if the teacher and students work together in implementing the learning process so that the learning that is carried out can be successful. The success of learning activities can be seen from the increased student learning outcomes. While the use of learning models can increase student learning activities so that students feel responsible for solving problems in the learning process [40]. Learning using inquiry learning helps the development of student independence by encouraging students to take responsibility for their learning. Based on the principles of the scientific method, through this model students observe a phenomenon, synthesize research questions, test these questions repeatedly and finally analyze and communicate their findings [41].

Inquiry learning is learning in which students are likened to a scientist who is solving a problem and trying to find answers about the problems raised by the teacher in class. Inquiry learning is designed to invite students directly into the scientific process in a relatively short time [42]. The inquiry learning model has advantages because students will conduct repeated research with the guidance of the teacher. This model trains students to have independent learning in collecting data from an event, processing it



logically, and enhancing their intellectual capacity. Students are encouraged to actively look for answers and draw conclusions on the problems they face through scientific thought processes that are critical, logical, and systematic [43].

The use of an inquiry-based learning model is expected to improve student's learning achievement in the psychomotor and affective aspects. Students are invited to actively conduct experiments or investigations and construct their understanding of a topic. This model can train students to observe macroscopic, microscopic, and symbolic chemicals through practicum activities [44]. The learning inquiry model is a learning model based on constructivism. Constructivism is a point of view in learning that students must be active to build their knowledge to understand the theory and gain knowledge [45]. The inquiry-based learning model is a type with a model that is considered an ideal model. In this model, students are asked to design their experiments to be considered the most difficult model to implement but allow a better understanding of the concept of material, especially to stimulate abilities that are following the demands of 21st-century skills [46].

There are several limitations experienced by researchers and can be a factor that is more considered for future researchers to refine their research because this research certainly has shortcomings that need to be improved in future research. There are some limitations to this study, including the following: the number of respondents is only 21 students, which is, of course, insufficient to depict the real scenario, and the learning methodology utilized is simply the inquiry learning model.

Physics learning is closely connected to practical activities. As a result, the inquiry learning paradigm can be implemented during practicum. The use of this approach can help

pupils enhance their scientific attitudes, teamwork, respect for differences, and high levels of curiosity. Thus, the influence of this research in the field of physics education is that it may increase students' attitudes' competency by employing the inquiry model and is highly useful in accomplishing the learning objectives required by the curriculum.

#### IV. CONCLUSION

Based on the findings and discussion in this study, it is possible to conclude that using inquiry learning models in physics learning can boost student activity, independence, and science skills. Students feel accountable for conceiving, analyzing, and solving problems when using the inquiry learning methodology. As a result, learning physics becomes more meaningful for kids, and the subject is easier to retain. This can be demonstrated by examining the replies of students in quite good categories.

#### REFERENCES

- [1] Kurniawan DA, Astalini, and Sari DK. An Evaluation Analysis of Students' Attitude Towards Physics Learning At Senior High School. *Jurnal Penelitian dan Evaluasi Pendidikan*. 2019; **23**(1): 26-35. DOI: <http://dx.doi.org/10.21831/pep.v23i1.20821>.
- [2] Darmaji, Astalini, Kurniawan DA, Perdana R, and Putra DS. A Study Relationship Attitude Toward Physics, Motivation, and Character Discipline Students Senior High School, in Indonesia. *International Journal of Learning and Teaching*. 2019; **11**(3): 99-109. DOI: <http://dx.doi.org/10.18844/ijlt.v11i3.4207>.
- [3] Putri AR, Maison, and Darmaji. Kerjasama dan Kekompakan Siswa dalam Pembelajaran Fisika di Kelas XII MIPA SMAN 3 Kota Jambi. *Edufisika: Jurnal Pendidikan Fisika*. 2018; **3**(2): 32-40.

- DOI: <http://dx.doi.org/10.22437/edufisika.v3i02.5552>.
- [4] Darmaji, Kurniawan DA, Suryani A, and Lestari A. An Identification of Physics Pre-Service Teachers'science Process Skills Through Science Process Skills-Based Practicum Guidebook. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*. 2018; **7**(2): 239-245. DOI: <http://dx.doi.org/10.24042/jipfalbiruni.v7i2.2690>.
- [5] Usman EA, Cahyati MT, Putri YA, and Asrizal. Meta Analisis Pengaruh Penerapan Model Inquiry-Based Learning dalam Pembelajaran Fisika untuk Menjawab Tantangan Kurikulum 2013 Pada Abad 21. *Pillar of Physics Education*. 2019; **12**(4): 873-880. Available from: <http://ejournal.unp.ac.id/students/index.php/pfis/article/view/7911>.
- [6] Agustin EW and Sugiyono. Development of Curriculum 2013 as an Effort to Improve the Quality of Education in Indonesia. *Proceedings of the 3rd International Conference on Current Issues in Education: Advances in Social Science, Education and Humanities Research*. 2018; **326**: 178-182. DOI: <https://dx.doi.org/10.2991/iccie-18.2019.32>.
- [7] Supriatna E. Penerapan Model Pembelajaran Problem Based Learning (PBL) Untuk Meningkatkan Hasil Belajar Siswa. *Journal of Classroom Action Research*. 2020; **2**(1): 15-19. DOI: <https://doi.org/10.29303/jcar.v2i1.398>.
- [8] Prabowo LSB and Sunarti T. Penerapan Model Pembelajaran Inkuiri pada Materi Alat Optik untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Kelas VII SMP Cendekia Sidoarjo. *Jurnal Inovasi Pendidikan Fisika (JIPF)*. 2015; **4**(1): 6-11. Available from: <https://jurnalmahasiswa.unesa.ac.id/index.php/inovasi-pendidikan-fisika/article/view/11084>.
- [9] Ulfah M, Fatmah H, and Herlanti Y. Penerapan Model Pembelajaran Problem Based Learning (PBL) Dipadu Metode Student Team Achievement Division (STAD) untuk Meningkatkan Hasil Belajar Peserta Didik Kelas X IPA 4 SMA Negeri 1 Parung Tahun Ajaran 2014/2015 pada Konsep Perubahan Lingkungan dan Daur Ulang Limbah. *EDUSAINS*. 2015; **7**(2): 202-208. DOI: <http://dx.doi.org/10.15408/es.v7i2.2789>.
- [10] Annisak SK, Indriyanti NY, and Mulyani B. Constructive Controversy dan Inkuiri Terbimbing Sesuai Representasi Tetrahedral Pembelajaran Kimia Ditinjau dari Kemampuan Berpikir Kritis. *Jurnal Inovasi Pendidikan IPA*. 2019; **5**(1): 10-22. DOI: <https://doi.org/10.21831/jipi.v5i1.20448>.
- [11] Wahyuni S, Kosim, and Gunawan. Pengembangan Perangkat Pembelajaran Fisika Berbasis Inkuiri Terbimbing Berbantuan Eksperimen untuk Meningkatkan Penguasaan Konsep Siswa. *Jurnal Pendidikan Fisika dan Teknologi*. 2018; **4**(2): 240-246. DOI: <http://dx.doi.org/10.29303/jpft.v4i2.891>.
- [12] Rismawati, Sarwanto, and Saputro B. Project-Based (PJBL) and Guided Inquiry learning: Students' Response To Rectilinear and Circular Motion Phenomena. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*. 2019; **8**(2): 187-196. DOI: <http://dx.doi.org/10.24042/jipfalbiruni.v0i0.4422>.
- [13] Putri YA, Usman EA, and Cahyati MT. Meta-Analisis Pengaruh penggunaan Model Inquiry Based Learning terhadap Kompetensi Keterampilan Peserta Didik dalam Pembelajaran Fisika. *Jurnal Penelitian Pembelajaran Fisika*. 2019; **5**(1): 65-72. Available from: <http://ejournal.unp.ac.id/index.php/jppf/article/view/107423>.
- [14] Gunawan, Harjono A, Hermansyah, and Herayanti L. Guided Inquiry Model Through

- Virtual Laboratory to Enhance Students' Science Process Skills on Heat Concept. *Cakrawala Pendidikan*. 2019; **38**(2): 259-268. DOI: <http://dx.doi.org/10.21831/cp.v38i2.23345>.
- [15] Simbolon DH and Sahyar. Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbasis Eksperimen Riil dan Laboratorium Virtual Terhadap Hasil Belajar Fisika Siswa. *Jurnal Pendidikan dan Kebudayaan*. 2015; **21**(3): 299-315. DOI: <http://dx.doi.org/10.24832/jpnk.v21i3.192>.
- [16] Sasmita PR. Penerapan Metode Inkuiri Terbimbing Menggunakan Media Kit Fisika: Upaya Meningkatkan Aktivitas dan Hasil Belajar Fisika Siswa. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*. 2017; **6**(1): 95-102. DOI: <http://dx.doi.org/10.24042/jpifalbiruni.v6i1.599>.
- [17] Wartono, Alfroni YF, Batlolona JR, and Mahapoonyanont N. Inquiry-Scaffolding Learning Model: Its Effect on Critical Thinking Skills and Conceptual Understanding. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*. 2019; **8**(2): 249-259. DOI: <http://dx.doi.org/10.24042/jipfalbiruni.v8i2.4214>.
- [18] Darmaji D, Kurniawan DA, and Irdianti I. Physics Education Students' Science Process Skills. *International Journal of Evaluation and Research in Education (IJERE)*. 2019; **8**(2): 293-298. DOI: <http://dx.doi.org/10.11591/ijere.v8i2.16401>.
- [19] Maison, Astalini, Kurniawan DA, and Sholihah LR. Deskripsi Sikap Siswa SMA Negeri pada Mata Pelajaran Fisika. *EDUSAINS*. 2018; **10**(1): 160-167. DOI: <https://doi.org/10.15408/es.v10i1.7214>.
- [20] Bazrafkan L, Hayat AA, Tabei SZ, and Amirsalari L. Clinical Teacher as a Positive and Negative Role Model: An Explanatory Sequential Mixed Method Design. *Journal of Medical Ethics and History of Medicine Research Center*. 2019; **12**(11): 1-15. DOI: <http://dx.doi.org/10.18502/jmehm.v12i11.1448>.
- [21] Rukajat A. *Pendekatan Penelitian Kuantitatif*. Yogyakarta: Deepublish; 2018.
- [22] Isnawati, Jalinus N, and Risfendra. Analisis Kemampuan Pedagogi Guru SMK yang sedang Mengambil Pendidikan Profesi Guru dengan Metode Deskriptif Kuantitatif dan Metode Kualitatif. *INVOTEK: Jurnal Inovasi Vokasional dan Teknologi*. 2020; **20**(1): 37-44. DOI: <http://dx.doi.org/10.24036/invotek.v20i1.652>.
- [23] Heridiansyah J. Pengaruh Advertising Terhadap Pembentukan Brand Awareness Serta Dampaknya pada Keputusan Pembelian Produk Kecap Pedas ABC (Studi Kasus pada Konsumen Pengguna Kecap Pedas ABC di Kota Semarang). *Jurnal STIE Semarang*. 2012; **4**(2): 53-73. Available from: <http://jurnal3.stiesemarang.ac.id/index.php/jurnal/article/view/168>.
- [24] Sari DD. Penerapan Model Problem Base Learning (PBL) untuk Meningkatkan Kemampuan Berpikir Kritis Peserta Didik pada Pembelajaran IPA Kelas VII SMP Negeri 5 Sleman. Yogyakarta: Universitas Negeri Yogyakarta; 2012.
- [25] Hardiyanti K, Astalini, and Kurniawan DA. Sikap Siswa Terhadap Mata Pelajaran Fisika di SMA Negeri 5 Muaro Jambi. *Edufisika: Jurnal Pendidikan Fisika*. 2018; **3**(2):1- 12. DOI: <http://dx.doi.org/10.22437/edufisika.v3i02.4522>.
- [26] Astalini, Kurniawan DA, and Sumaryanti. Sikap Siswa Terhadap Pelajaran Fisika di SMAN Kabupaten Batanghari. *Jurnal Ilmu Pendidikan Fisika*. 2018; **3**(2); 59-64. DOI: <http://dx.doi.org/10.26737/jipf.v3i2.694>.
- [27] Sugiyono. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta; 2016.
- [28] Lidiana H, Gunawan, and Taufik M. Pengaruh Model Discovery Learning

- Berbantuan Media Phet Terhadap Hasil Belajar Fisika Peserta Didik Kelas XI SMAN 1 Kediri Tahun Ajaran 2017/2018. *Jurnal Pendidikan Fisika dan Teknologi*. 2018; **4**(1): 33-39. DOI: <http://dx.doi.org/10.29303/jpft.v4i1.519>.
- [29] Setiawan B, Sunarti T, and Astriani D. The Application Of Inquiry Learning Model To Improve "Satu Atap" Students' Learning Results at SMPN 4 Singosari Malang. *Jurnal Pendidikan IPA Indonesia*. 2016; **5**(1): 45-50. DOI: <http://dx.doi.org/10.15294/jpii.v5i1.5788>.
- [30] Pursitasari ID, Suhardi E, Putra AP, and Rachman I. Enhancement of Student's Critical Thinking Skill Through Science Context-Based Inquiry Learning. *Jurnal Pendidikan IPA Indonesia*. 2020; **9**(1): 97-105. DOI: <http://dx.doi.org/10.15294/jpii.v9i1.21884>.
- [31] Anam K. *Pembelajaran Berbasis Inkuiri: Metode dan Aplikasi*. Yogyakarta: Pustaka Pelajar; 2015.
- [32] Thaiposri P and Piriyasurawong P. Development of Reasonable Inquiry-Based Learning on Social Cloud Model to Enhance Undergraduate Students' Critical Thinking. *International Journal of e-Education, e-Business, e-Management, and e-Learning*. 2016; **6**(3): 162-174. DOI: <http://dx.doi.org/10.17706/ijejee.2016.6.3.162-174>.
- [33] Tornee N, Bunterm T, and Tang KN. The Impacts of Inquiry-Based Learning Model on Teaching Science Subject: A Case Study in Thailand. *TOJET: The Turkish Online Journal of Educational Technology*. 2017; 395-402. Available from: <http://www.ic.kku.ac.th/documents/pdf/tang5.pdf>.
- [34] Khalaf BK. Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review. *International Journal of Instruction*. 2018; **11**(4): 545-564. DOI: <http://dx.doi.org/10.12973/iji.2018.11434a>.
- [35] Asy'ari M, Ikhsan M, and Muhali. The Effectiveness of Inquiry Learning Model in Improving Prospective Teachers' Metacognition Knowledge and Metacognition Awareness. *International Journal of Instruction*. 2019; **12**(2): 455-470. DOI: <http://dx.doi.org/10.29333/iji.2019.12229a>.
- [36] Nurhayati, Hasyim M, and Yani A. Development of Physics Learning Device Based on Modified Free Inquiry as a Supporting Curriculum 2013 at Senior High School. *Proceedings of the 1st International Conference on Advanced Multidisciplinary Research (ICAMR 2018)*. 2019; **227**: 245-249. DOI: <https://dx.doi.org/10.2991/icamr-18.2019.61>.
- [37] Fatmawati, Sukariasih L, Fayanto S, and Retnawati H. Investigating the Effectiveness of Inquiry Learning and Direct Learning Models toward Physics Learning. *Proceedings of the 1st International Conference on Advanced Multidisciplinary Research (ICAMR 2019)*. 2019; **317**: 260-265. DOI: <https://dx.doi.org/10.2991/iconprocs-19.2019.54>.
- [38] Metwally NS, Ebrahim RM, and Husseiny, A. Effect of Inquiry-Based Learning versus Conventional Approach on Maternity Nursing Students' Satisfaction, Motivation, and Achievement. *World Journal of Nursing Sciences*. 2017; **3**(2): 33-44. Available from: [https://idosi.org/wjns/3\(2\)17/1.pdf](https://idosi.org/wjns/3(2)17/1.pdf).
- [39] Purba N. Meningkatkan Hasil Belajar Siswa Materi Penerapan Ragam Hias Pada Benda Keras Melalui Model Inquiry Learning Pada Siswa Kelas VIII-B MTs Keutapang Dua Aceh Besar. *Jurnal Serambi Edukasi*. 2019; **3**(1): 9-18. Available from: <http://ojs.serambimekkah.ac.id/serambi-edukasi/article/download/1850/1476>.
- [40] Pramudyawan MTS, Doyan A, and 'Ardhuha J. Pengaruh Model Pembelajaran Inkuiri Terbimbing Berbantuan Kit Alat

- Percobaan Usaha dan Energi terhadap Penguasaan Konsep Fisika Peserta didik. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*. 2020; **6**(1): 40-44. DOI: <http://dx.doi.org/10.29303/jppipa.v6i1.290>.
- [41] Nur RA, Haeruddin, and Tewa Y. Penerapan Model Pembelajaran Berbasis Masalah Untuk Meningkatkan Hasil Belajar Siswa Kelas XI IPA 1 SMAN 10 Kendari Pada Materi Asam Basa. *Jurnal Pendidikan Kimia Universitas Halu Oleo*. 2020; **5**(1): 15-19. DOI: <http://dx.doi.org/10.36709/jpkim.v5i1.13086>
- [42] Nasar A and Kurniati K. Comparing Students' Learning Outcomes Using Problem Based Learning Model and Inquiry-Based Learning Model. *Jurnal Pendidikan Fisika Universitas Muhammadiyah Makassar*. 2020; **8**(1): 43-55. DOI: <http://dx.doi.org/10.26618/jpf.v8i1.2127>.
- [43] Halek EF, Oetpah V, and Seran Y. Peningkatan Motivasi dan Hasil Belajar Siswa Melalui Model Pembelajaran Inkuiri Pada Siswa SMA. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*. 2016; **1**(10): 2047-2049. Available from: <http://journal.um.ac.id/index.php/jptpp/article/view/7621>.
- [44] Siregar RA. Effectiveness of the Development of the Inquiry-Based Learning Model to Improve Students' Psychomotor Achievement. *Journal of Physics: Conference Series*. 2018; **1088**: 012102. DOI: <http://dx.doi.org/10.1088/1742-6596/1088/1/012102>.
- [45] Nisa EK, Koestiari T, Habibulloh M, and Atmiko B. Effectiveness of Guided Inquiry Learning Model to Improve Students' Critical Thinking Skills at Senior High School. *Journal of Physics: Conference Series*. 2018; **997**: 012049. DOI: <http://dx.doi.org/10.1088/1742-6596/997/1/012049>.
- [46] Havid M, Yulkifli, and Septiani T. Preliminary Analysis to Develop Student Worksheet Based on Inquiry-Based Learning Model for 21st-Century Physics Learning. *Journal of Physics: Conference Series*. 2020; **1481**: 012057. DOI: <http://dx.doi.org/10.1088/1742-6596/1481/1/012057>.