

TREND ANALYSIS OF PHYSICS PROSPECTIVE TEACHERS' RESEARCH: AN EFFORT TO IMPROVE THE ACADEMIC QUALITY OF PHYSICS STUDY PROGRAM

Muhammad Minan Chusni^{*1}, Rizki Zakwandi²

^{1,2} Physics Education, Tarbiyah and Teacher Training Faculty, UIN Sunan Gunung Djati Bandung, Indonesia

^{*}Correspondence address: minan.chusni@uinsgd.ac.id

Accepted: November 16th, 2017. Approved: April 2nd, 2018. Published: April 29th, 2018

Abstract: Research should be focused on topics that are appropriate to the needs of the times so that the results of the research can be applied. Students in completing their studies are required to make final assignments in the form of research. Therefore, this study aims to identify the tendency of research of the Physics Education students Indicator the last five years and to determine the theme of educational research studies that allows for further study by Physics Education students in the future. This research was conducted in physics education program with research objects were taken from the written thesis of 2013 until 2017. This research design is a case study with data analysis technique of descriptive qualitative and quantitative. this study found the theme of research studies most studied by Physics Education students were a model of learning and research studies that may still be studied further, namely the evaluation of learning, learning media, and learning strategies on subjects other than temperature and heat and static fluids. The results of this study can be used as a consideration to determine the topic of the thesis and reduce the risk of plagiarism and increase the variety of research in the environment of the study program.

© 2018 Physics Education, UIN Raden Intan, Lampung, Indonesia

Keywords: physics research, research, students' researchers, trend analysis

INTRODUCTION

Science education is an education with an orientation to make learners possess a scientific attitude after finishing the learning. Some of the scientific attitudes required after implementing science learning are objective, skeptical, rational, critical, analytical, and evaluative mindset that can be embodied in scientific research. Many curricula try to direct learners to conduct scientific research during the learning process. In Indonesia, the curriculum guides learners to think scientifically and to conduct researches as a result of the new learning at university level. In carrying out the research, basically, there are some observed signs called the ethics of scientific papers which includes originality, scientific wisdom, honesty, repeatability and appreciation to others and nature. Related to the factor of repeatability of a research where the focus of research is to analyze the level of repetition and variation of originality of

research done by senior students in physics education department.

Research of education is generally difficult to implement because of three things, (1) the concept of research is complicated; (2) several theories of education are contradictive; (3) involves the human factor which is a difficult variable to control, unlike science, although there are many variables involved, but they are relatively easy to control, as in the experiment (Setyosari & Punaji, 2016). The difficulty of variable control is caused by subjects that cannot be controlled completely. This is because human nature is not constant and will be very easily changed by something very simple, such as lack of rest, body condition, or other factors such as the stress caused by the pressure of learning is too heavy. This factor will cause an error of the result of the measurement to be generalized. This will be different when

the object of research is in the form of inanimate objects.

However, research in the field of education is very important, because we cannot continue to depend on feelings and experience alone to improve the quality of education. The data obtained are then analyzed and interpreted. The research results can be used to address educational issues (Kitto et al., 2015). The results of educational research can provide an overview, explanation, prediction, innovation and theoretical foundations for educational development (Kyriakides, Creemers, & Charalombous, 2018; Sukmadinata, 2009).

Along with the advancement of times, the theme of the research will also change according to the development of the era itself. Some developments of such phenomena tend to be centered on research methods, and the field of study tentatively arises and disappears (White, 1997). The type of research that focuses on research methodology has shifted from experimental research into qualitative descriptive research using data as a result of observation and not from the result of the evaluation (Wang, Ho, Chen, & Cheng, 2015).

Changes in the focus of research subject beginning in the 1980s to 1990s. In the 1980s the subjects of the research were the learners, especially on understanding the concept of learners. While in the 1990s the subjects of research were more focused on constructivism and contextual approach (Duit, 2007). Now in the 2000s there are nine categories of topics that interest the researchers, they are (1) understanding the concept of science; (2) learning practices; (3) concept change and concept mapping; (4) professional development; (5) change of concept and analogy; (6) the nature of science and social issues; (7) reasoning and problem-solving skills; (8) education in urban-based design; (9) attitude and gender. The most studied topics were the topic of concept change and concept

mapping, but the numbers experienced a slight decline in the 2000s. The thesis is one of the basic courses of education that must be faced and must be passed by every graduate students of Physics Education Study Program UIN Sunan Gunung Djati Bandung. This course produces one of the research products in the form of scientific papers that become the highest achievement to complete the education level. The purpose of this course is to provide students with direct experience of knowledge, skills, and attitudes in conducting research in the field of education.

Students who will take the course of the thesis must meet several requirements such as the number of credits that have been taken to reach 140 credits point and has passed the course of Research Methodology of Physics Education. This is because the prerequisite subject is a basic provision of research steps, types of research, research methods, and processing and analysis of research data.

Based on preliminary observations made by researchers on the thesis of Physics Education Student UIN Sunan Gunung Djati in the last five years (2013-2017) showed very diverse results. The diversity has not been identified in detail, so the exact trend direction is not known. Meanwhile, information about trends in a research is very important to be known in order to trace the factors that influence it to become important information in policy-making related to academic quality improvement.

Analysis of students' thesis allows the development of research themes, an extension of a subject, and updating of research variables that allow for further study by students. If the issue of education that can be studied by students is rich Indicator numbers, it will make it easier for the students to determine the theme of the study so that students can immediately complete the study on time. This will indirectly support the accreditation

improvement of Physics Education Study Program on the standard 3 of students and graduates because one of the indicators is the existence of a timely study period. It will also improve the quality of Physics Education graduates as a prospective teacher in Senior High Schools and Islamic Senior High Schools.

As discussed in the aforementioned section of the above discussion, the problems to be solved in this research are: (1) Identification of research tendency of Physics Education student during the last 5 years; (2) Which research subject that is possible to be studied further by Physics Education students in the coming period?

The purpose of this study are (1) To identify the tendency of research Physics Education students during the last 5 years; (2) To determine the theme of the study of educational research that allows for further study by Physics Education students in the future.

The research that researchers have done focuses on physics education students' research documented from 2012 to 2017 and has not been done since the opening of physics education program until now. The results of this study become important because it can map the theme of research studies that have been studied too much and the theme of the study is still rarely studied so that it can provide input for improving the management and implementation of physics education academic activities.

THEORETICAL FRAMEWORK

Research is an activity that is done by following scientific principles. A study can be done individually or in groups. In doing scientific research, there are some rules that must be considered by the researchers, namely: Original, Need / Important, Scientific, Consistent (Yudistira & Dadang, 2012). Originality means that any research done should not replicate or repeat similarly to the research of others (previous researchers). In the

ethics of scientific work, this will also be related to the factor of plagiarism. A good study is research that comes from a new idea. The degree of originality of a study will determine the quality of the research conducted (Winfrey, 2017). An important aspect of the research shows the use of the current research. This is related to the target and the possible form of implementation of the research results. In the world of research, an education conducted should lead to implementation at the school level. This means that the results of research that has been done can be used to support the process and learning outcomes (Setyosari & Punaji, 2016). Scientific is the nature of a research article. Without scientific aspects, the result of a study will be questioned. scientific aspects include the empirical factors of a study. Research made from fictitious data will be a public fraud so it will get researchers into the realm of law. As well as the last aspect of the research implementation to be reviewed is the consistency of the research results. Consistency in terms of research results obtained can be done by others if they follow the same way to support learning (Yudistira & Dadang, 2012).

METHOD

The method used in this research was the descriptive method. The descriptive research aims to describe precisely the properties of a particular individual, state, phenomena, or group, or to determine the frequency or spread of a phenomenon or the frequency of a particular relationship between a phenomenon and another phenomenon in society (Veal, 2017).

This research was conducted in Physics Education Study Program UIN Sunan Gunung Djati Bandung with 406 theses written by the students within 5 years period (2013-2017) as the object of the research. The procedure of this research was to identify, analyze and map the results of students' research during the last 5 years. Based on the procedure, this

research was conducted using a case study research design (Johnsons & Christensen, 2008). The variables in this study were the identification and mapping of the theme of research, the variables studied, and the subject studied.

Data collection employed was non-test techniques through document analysis. All data collected were then analyzed through the following steps: 1) data collection; b) data grouping; c) Descriptive quantitative and qualitative analysis and d) result interpretation (Sugiyono, 2014).

The data analyzed in this research included research theme, research topic and also subject matter raised in research. The analysis is related to the distribution and variation of the data, the causes and

advantages and disadvantages of the research findings.

RESULTS AND DISCUSSION

During the last five years (2013 - 2017) 395 theses of Physics Education Study program has been produced. Several findings based on case study analysis that has been done by the researcher can be described as follows:

The theme of the research study

The theme of the study selected by Physics Education students can be grouped into seven categories: evaluation, media, methods, model, approaches, learning materials, and learning strategies. The results of the identification can be seen in Table 1.

Table 1. The Data of Research Themes

No	Category	Number	Percentage
1	Learning Evaluation	18	4.56%
2	Learning Media	36	9.11%
3	Teaching Method	18	4.56%
4	Teaching model	276	69.87%
5	Approach	15	3.80%
6	Learning Material	19	4.81%
7	Strategy	13	3.29%
Total		395	100%

The data in Table 1 shows that the tendency of Physics Education students tends to study about the learning model with the percentage of 69.87% and the other still very little ranged between 3% - 9%. This shows that the variation and diversity of the research type are still at a very low level. The piled theme of research on one theme can indicate that the direction of the graduate product becomes uniform and more likely to be the fabrication of graduates (De Mauro, Greco, & Grimaldi, 2015). Based on the data obtained there are only seven main themes with a very significant percentage difference whereas 11 students took different themes with others so that in this discussion is not the focus of research. In addition to the indication of graduate

fabrication, the less diverse research themes raised may also indicate that the available educators are also less diverse. This is of course based on the selection of research titles that are based on the capabilities of mentors in guiding the students. The weakness of the accumulation of research themes usually occurs in research instruments that have a large indication of the results of plagiarism, because basically the research instrument to follow the type of research in this case related to the theme of research. The challenge that arises is to open the opportunities for research on the theme of the study. Even on the theme of curriculum study, learning, laboratory management has not been done at all.

The data in Table 1 can be presented in Figure 1. The results of interviews with several advisors provided a different analysis of the accumulation on a research theme. Based on the results of the interviews it was found out that the theme of learning model is suitable for undergraduate students (S-1) since the purpose of the research for undergraduate students is to exercise and implement what has been studied. So by using the learning model as a theme, the students can use all

learning components such as Lesson Planning, Assessment, learning interaction and other learning components. The research of learning model also has a very close relationship with learning so that by varying the learning model the students can improve the effectiveness of learning because basically, the learning model focuses on the interaction in the learning process (Rerung, Sinon, & Widyaningsih, 2017).

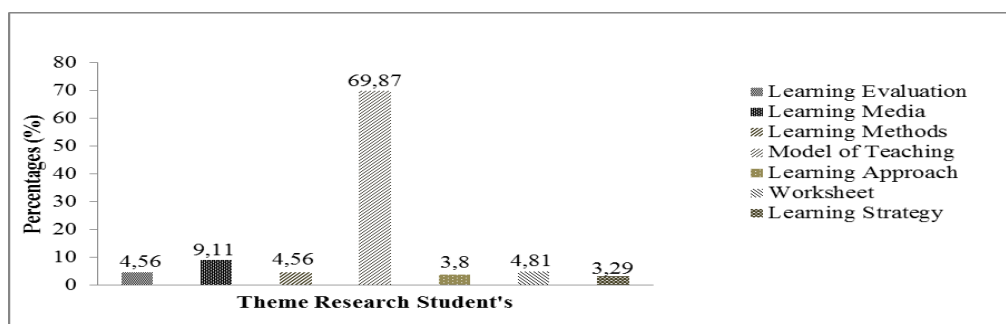


Figure 1. The Distribution of Research Theme

Research variables

The variables studied by Physics Education Study Program students for five

years have been identified and grouped in the following Table.

Table 2. The Data Of Research Variable

No	Variable	Number	Percentage
1	Creative Thinking	18	4.43%
2	Critical Thinking	71	17.49%
3	Learning Barriers	7	1.72%
4	Learning Outcome	49	12.07%
5	Collaboration	1	0.25%
6	Analytical Skills	2	0.49%
7	General skill	3	0.74%
8	Arguments skill	4	0.99%
9	Scientific thinking	1	0.25%
10	The generic science skills	9	2.22%
11	Process skill	40	9.85%
12	Science literacy	43	10.59%
13	Problems solving	19	4.68%
14	Conceptual understanding	128	31.53%
Total		395	100%

Based on the data obtained in table 2 it is known that variations of research variables that have been done more than the theme of research. The tendency of student research variables leads to the mastery of the concept with a percentage of 31.53%; this is relevant to the statement by (Duit, 2007) that the focus of the object of research is understanding the concept of learners. Mastery of the concept itself indicates how learners (research subjects) capture the main information (essence) of physics learning (Sari, Suyanto, & Suana, 2017). Based on the background of students' research, the mastery of the concept is chosen to be the research variable based on the issues of physics learning found in the majority field using mathematical approach.

Furthermore, the tendency of research variables is critical thinking. It is also in accordance with the research that

has been done by (Chang, Chang, & Tseng, 2010) that research issues that are popular are about reasoning skills and problem-solving. The ability to think critically becomes one of the hot topics of research along with the emergence of new phenomena and has anomalies with events in general. In the field of physics, the new phenomenon becomes a subject that needs to be improved, especially to learners. In addition, the tendency of research towards critical thinking aims to prepare learners to a higher level, i.e., universities which are critically desirable personalities in both scientific and socio-political and social issues (Klening, 2018).

Referring to the data contained in table 2, the other research variables are still relatively low, so the opportunity to conduct such researches is still open. In more detail, the data in Table 2 can be presented in Figure 2.

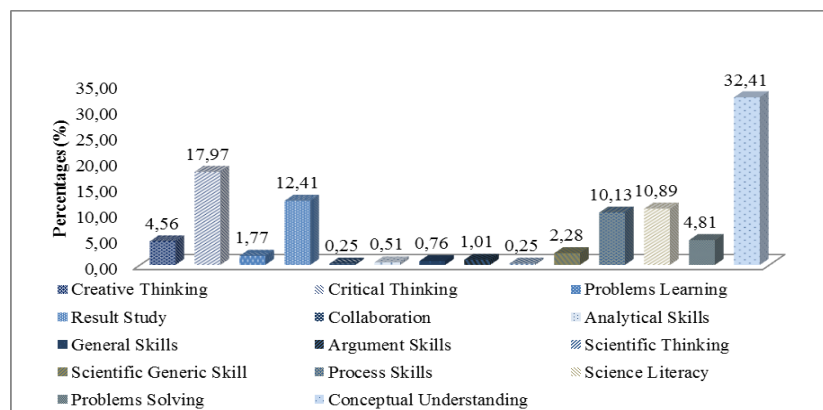


Figure 1. The distribution of research variables

Subject to physics

There is a tendency in the research of Physics Education Study program students that they tend to focus on a certain subject and there is no equality on other subjects.

This fact can be seen from the distribution of physics subject on the students' research as shown in Table 3.

Table 3. The data of physics research subject

No	Physics Subjects	Quantity	Percentage
1	Quantity and units	3	0.76%
2	Soundwave	6	1.52%
3	Particle dynamics	2	0.51%
4	Rotational dynamics	1	0.25%

No	Physics Subjects	Quantity	Percentage
5	Renewable energy	3	0.76%
6	Elasticity	12	3.04%
7	Basic physics	4	1.01%
8	Advanced physics	3	0.76%
9	Modern physics	1	0.25%
10	Dynamics fluids	13	3.29%
11	Static fluid	65	16.46%
12	Electromagnetic wave	3	0.76%
13	Oscillation	2	0.51%
14	Linear motion	18	4.56%
15	Rotational motion	2	0.51%
16	Wave and vibration	16	4.05%
17	Newton's law of motion	7	1.77%
18	Momentum and impulse	7	1.77%
19	Rigid bodies	2	0.51%
20	Electrodynamics	16	4.05%
21	Electrostatics	10	2.53%
22	Disaster mitigation	3	0.76%
23	Optics	28	7.09%
24	Global warming	4	1.01%
25	Natural resources	5	1.27%
26	Heat and temperature	85	21.52%
27	Pressure	22	5.57%
28	Atomics theory	1	0.25%
29	Thermodynamics	6	1.52%
30	Force and Energy	26	6.58%
31	Vector	5	1.27%
32	Matter and their phase	14	3.54%
Total		395	100%

Table 3 shows that the subjects of physics as the research focus of the Physics Education Study Program Students have not been equally spread for the last five years. The most frequent subjects were temperatures and heat (21.52%), static fluids (16.46%), while atomic physics, modern physics, rigid bodies and rotational dynamics are still rarely studied by students. One of the considerations in choosing the material used as the subject matter of the research is the availability of the material within the scope of its implementation. The results of the investigation on the distribution of the

material on which the subject is based are that the tendency of students to choose the material available in the even semesters compared with the material in the odd semesters. In addition, based on the data obtained, it can be seen that the level of material complexity is also a consideration of choosing the material (Thomas, 2017). Table 2 shows that abstract materials have a smaller percentage compared to more general materials.

Temperature and heat itself are one of the materials contained in the second semester of X grade on the KTSP curriculum while in the National

Curriculum, this material is contained in the first semester of XI grade. Based on the research analysis ranging from 2012 to 2017, the majority of schools were still applying the KTSP curriculum (School-based Curriculum).

CONCLUSION

Based on the analysis of the research data and identification of the thesis of Physics Education Study Program for the last five years, it can be concluded that (a) The research subject of the research most studied by the students of Physics Education Study Program is the learning model, (b) evaluation of learning, learning media, and learning strategies, and the subjects other than temperature and heat and static fluids are the topics that still need to be studied further.

SUGGESTION

The suggestions from the results of this study are (a) This mapping can be used as a reference for the management of thesis in Physics Education Study Program in order to direct the student's research so that quality works can be produced, (b) Lecturer of academic Advisors and thesis Advisors should know the mapping of thesis research so that they can guide the students to choose a research that has not been studied and to avoid repeated research.

The limitations of this study are that the data sources were only taken from research titles, while the primary sources of interviews with researchers and advisors have not been done thoroughly. The further researches can be done by considering the methodology and data collection techniques presented as well as variations of research sites.

REFERENCES

De Mauro, A., Greco, M., & Grimaldi, M. (2015). Is what big data? A consensual definition and a review of

- key research topics. *AIP Conference Proceedings*, 1644(1), 97–104. <https://doi.org/10.1063/1.14907823>
- Duit, R. (2007). Science Education Research Internationally: Conception Research Methods, Domain of Research. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(1), 3–15.
- Johnsons, B., & Christensen, L. (2008). *Educational Research: Quantitative, Qualitative, and Mixed Approach 3rd Edition*. Los Angeles: SAGE Publications.
- Kitto, S., Goldman, J., Etchells, E., Silver, I., Peller, J., Sargent, & Bell, M. (2015). Quality improvement, patient safety, and continuing education: a qualitative study of the current boundaries and opportunities for collaboration between these domains. *Academic Medicine*, 90(2), 240–245.
- Klening, J. (2018). Trust and Critical Thinking. *Educational Philosophy and Theory*, 50(2), 133–143. <https://doi.org/10.1080/00131857.2016.114416>
- Kyriakides, L., Creemers, B., & Charalombous, E. (2018). The Impact of the European School Improvement Study on Quality an Equity in Education. *Equity and Quality Dimensions in Educational Effectiveness*, 151–180.
- Rerung, N., Sinon, I. L. S., & Widyaningsih, W. (2017). Penerapan model pembelajaran problem based learning (PBL) untuk meningkatkan hasil belajar peserta didik SMA pada materi usaha dan energi. *Jurnal Ilmiah Pendidikan Fisika Al-BiRuNi*, 6(1), 47–55. <https://doi.org/10.24042/jipfalbiruni.v6i1.597>
- Sari, W. P., Suyanto, E., & Suana, W. (2017). Analisis Pemahaman Konsep Vektor Pada Siswa Sekolah Menengah Atas. *Jurnal Ilmiah Pendidikan Fisika Al-BiRuNi*, 6(2),

- 159–168.
<https://doi.org/10.24042/jipfalbiruni.v6i2.1743>
- Setyosari, & Punaji, H. (2016). *Metode Penelitian Pendidikan & Pengembangan*. Jakarta: Penada Media.
- Sugiyono. (2014). *Metode Penelitian Kuantitatif Kualitatif dan R & D*. Bandung: Alfabeta.
- Sukmadinata, N. S. (2009). *Metode Penelitian Pendidikan*. Bandung: Rosda Karya.
- Thomas, G. (2017). *How to Do Your Research Project: A Guide for Student*. London: Sage Publication Ltd.
- Veal, A. J. (2017). *Research Methods for Leisure and Tourism*. The UK: Pearson.
- Wang, C. ., Ho, H. ., Chen, L. M., & Cheng, Y. Y. (2015). The Trend of Research in Educational Psychology. *Jiaoyu Yanjiu Yueken, Journal of Education Research*, 252(80), 80–96.
- White, R. (1997). Trends in Research in Science Education. *Research in Science Education*, 27(2), 215–221.
- Winfrey, J. (2017). Physics education research and student development. *Physics Today*, 70(2), 1–10.
- Yudistira, & Dadang, H. (2012). *Menulis Penelitian Tindakan Kelas yang APIK*. Jakarta: PT. Grasindo.