Exploration of confidence in research skill for pre-service physics teacher

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Abstract. Teacher is the main actor who has important role in problem solving in every learning process. The problem solving can be done through research studies. Uniquely, teachers’ research reports in Indonesia are more done by the male teachers than the female teachers. Teacher comes from a trained pre-service teacher. Research skills are obtained when they become pre-service teachers. This research exploring belief in the research skill of pre-service teacher and showing the difference of research skills based on gender. The method used was through some surveys on a Likert scale. This research skills questionnaire was measuring as follows: planning, choosing problems, studying literatures, choosing instruments, collecting data, choosing method and analyzing data, interpreting data and concluding research result. Samples were chosen from random sampling consists of 22 males and 140 female’s pre-service physics teachers of university in Lampung. The results showed that the average value of different test for each aspect of research skills obtained p-value ≥0.05. The conclusion that pre-service physics teachers have good research skills of average value = 4.03, there is no significant difference by gender. The result of this survey can be used in developing research skills of pre-service teachers, especially in publication of article.

1. Introduction
Teacher professional development is carried out with scientific publications. Scientific publications are part of research skills. Teacher’s research skills are trained when they become pre-service teachers. Unfortunately, learning in universities in Indonesia has not fully involved research in the learning process. Research is only carried out when completing a final project. Pre-service teachers have an important task in developing their research abilities. Produce research work that is useful in advancing public welfare and educating the life of the nation. This is stated in RI Law No. 12 of 2012 article 5. Research skills for pre-service teachers can be achieved through implementation research-based learning include content, process and assessment of learning outcomes. This matter is in accordance with the Regulation of the Minister of Research, Technology and Higher Education of the Republic of Indonesia Number 55 of 2017 concerning Teacher Education Standards.
1.1. Problem Statement
The importance of developing research skills is supported by countries throughout the world. Research is used for educational development. So, the teacher tries to be used as a researcher and adapts the role of research as a core activity to improve teaching and learning processes, including the development of academic competencies in schools [1]. These demands can be achieved by providing research skills to pre-service teachers through research-based learning. In Indonesia, the number of studies produced by male pre-service teachers is more than women. It is possible that the research skills of male pre-service teachers differ from those of women.

There are not many researches focusing on research skills of pre-service teachers. Therefore, the research skills of pre-service teachers can be known through exploration of confidence in the research skills of pre-service teachers. There are only 15 publications which are produced by pre-service physics teacher through research-based learning in Indonesia. This comes from the results of a review of the literature found in the library of Yogyakarta State University and other libraries in Indonesia. The number of publications which is found through online journals is mostly done by male teachers than female teachers. It is possible that the research skills of male teacher candidates differ from those of women. There are not many researches focusing on research skills of pre service physics teacher. Therefore, research skills of pre-service teachers can be known through exploration of beliefs in prospective teacher research skills.

1.2. Research Questions and Hypotheses
The following research questions are formulated to provide direction for this research:
1. What is the belief in the research skills of physics pre-service teachers?
2. Are there differences in beliefs about research skills between pre service male physics teachers and female physics pre-service teachers?

Research question 2 turns into the following hypothesis.
Hypothesis: There will be no statistically significant differences in confidence in research skills between pre service male physics teachers and female physics pre-service teachers.

1.3. Research skills of physics pre-service teachers
Research skills are needed for future life readiness [2]. Research skills are developed by RSD (research skill development) which can be used in accordance with scientific disciplines and research needs [3-5]. Involvement of the project, conducting research and collaboration in completing the project provide active communication feedback and good research skills [6,7]. Research skills are needed in evaluating teacher's performance on their tasks [8,9]. Research skills can provide positive learning outcomes for students and develop reflective thinking for pre-service physics teachers on learning problems [10,11].

Research skills can be taught through the STEM model [12]. Research for pre-service teachers is focused on solving problems related to learning. Pre service physics teachers develop research skills to solve problems in learning [3,13,14]. Problems can be identified through internet search and empirical studies [15]. Research in the form of assignments is given by lecturers for physics pre-service teachers. The demands of professional competencies and pedagogical competencies of physics pre-service teachers, research focuses on the discourse of teacher training disciplines. As the teacher colonizes the research theories and techniques, they will be prepared to examine the gaps in the field.

The assigned task assignments require pre-service teachers to be involved in the research process [16–18]. The application of the research methodology must be integrated into the pre-service teacher learning program in such a way that the paradigm of the pre-service teacher as researcher becomes a reality [19-s20]. Learning through investigation guides pre-service teacher research skills, independence and critical thinking [21].

1.4. Research Skills Aspects
The pre-service teacher's research skills begin with an investigation and determine the need for knowledge, find / produce the data needed by using the right methodology. Pre-service teachers then
critically evaluate information / data and processes to find them, organize information they have collected, synthesize and analyze new knowledge, and communicate knowledge. Understanding and the process used to produce it. Research skills for pre-service teachers include identifying scientific issues, explaining scientific phenomena and using scientific evidence. In this paper, data on research skills for pre-service teachers are adopted from instruments developed by Meerah [22-23] which consists of seeking information, planning research, finding research problems, designing instruments, collecting survey data, writing abstracts, preparing articles, choosing articles for publication, choosing research methods, choosing data analysis methods, and making conclusions. Confidence in pre-service teacher research skills is then discussed.

2. Methods
This study explores the research skills of pre-service teachers in solving physics learning problems. This study used a cross-sectional descriptive survey design because the researchers tried to present a description of the pre-service teacher's research skills about their activities solving the problem of physics learning by conducting research. Cross-sectional design is also considered appropriate to enable researchers to obtain information from large population samples and to collect demographic data that illustrates the composition of the sample. Finally, a cross-sectional design is relatively easy to make generalizations.

2.1. Population and Sample Selection
The population for this study was a preservice at Lampung Indonesia University during the 2016/2017 academic year. The list obtained from the Lampung Central Statistics Agency showed that there were 3 universities that hold physics education study programs totalling 270 of preservice physics teachers in Lampung, Indonesia.

In this study, the first phase of sampling consisted of 3 universities in Lampung and purposive samples that were active in class lectures, they are 5 up to 7 semester of preservice physics teachers. This criterion is based on that the preservice physics teachers which is active in the classroom process. The research skills sub-subject of preservice physics teachers was developed and adopted from [22-23]. Then it was used as a survey instrument for this study. The survey instrument consisted of 10 items on a 5-point Likert scale (1-strongly disagree with 5- strongly agree) measuring confidence in the research skills of physics pre-service teachers.

2.2. Data Collection Procedure
Questionnaires were given privately to respondents in the universities starting from September to October, 2017. At each university, the purpose of this study was explained to preservice physics teachers and they are given certainty for anonymity and confidentiality. All ethical procedures were fully fulfilled. All physics pre-service teachers who were sampled from universities were asked to work on the questionnaire as many as 10 questions.

2.3. Data analysis
Data analysis used descriptive and inferential statistical tools. Data generated from descriptive analysis were arranged in frequency tables and simple percentages. Independent sample t-tests were conducted to investigate possible differences in research skill beliefs of male physics pre-service teachers and female physics pre-service teachers. The alpha level of 0.05 was used as a statistical significance criterion for all statistical procedures performed. The results of data analysis are presented in the next section.

3. Results and Discussion
162 pre services for physics teachers participated in this study. Age of respondents ranged from 19 to 22 years. There were 22 men and 140 women. This research skill was given in the form of a questionnaire with 10 questions.
3.1. Research skills of physics pre-service teachers

Ten question items on five Likert scales were used to measure research skills of physics pre-service teachers. The response of pre-service teachers was coded as follows: 1 = Strongly disagree (SD), 2 = Disagree (D), 3 = Neither agree nor disagree (NAND), 4 = Agree (A), 5 = Strongly Agree (SA). In the interpretation of scores, frequencies, mean and standard deviations used, the meaning is interpreted as follows: 1.00-2.49 indicates that confidence in the research skills is low and 2.50-5.00 indicates a high research skill. As presented in Table 1.

| Statement                                                                 | SD | D  | NAND | A   | SA  | Total | Mean | STD |
|---------------------------------------------------------------------------|----|----|------|-----|-----|-------|------|-----|
| I am looking for various types of information that I need such as books,  | 0  | 11 | 4    | 84  | 63  | 162   | 4.23 | 0.792 |
| journals and others.                                                      |    | 6.7% 2.4% 51.8% 38.8% |       |     |     |       |     |     |
| I was able to plan research                                               | 3  | 9  | 7    | 87  | 56  | 162   | 4.13 | 0.874 |
| 1.8% 5.5% 4.3% 53.7% 34.5%                                               |    |     |      |     |     |       |     |     |
| I can search for research problems                                        | 7  | 23 | 5    | 82  | 45  | 162   | 3.83 | 1.115 |
| 4.3% 14.1% 3.0% 50.6% 27.7%                                               |    |     |      |     |     |       |     |     |
| I can choose an instrument                                                | 5  | 14 | 14   | 76  | 53  | 162   | 3.96 | 1.024 |
| 3.0% 8.6% 8.6% 46.9% 32.7%                                               |    |     |      |     |     |       |     |     |
| I can collect survey data                                                 | 2  | 12 | 5    | 81  | 62  | 162   | 4.16 | 0.893 |
| 1.2% 7.4% 3.0% 50.3% 38.2%                                               |    |     |      |     |     |       |     |     |
| I can write abstracts                                                      | 5  | 23 | 9    | 93  | 32  | 162   | 3.76 | 1.024 |
| 3.0% 14.1% 5.5% 57.4% 19.7%                                               |    |     |      |     |     |       |     |     |
| I can prepare articles for publication                                    | 6  | 22 | 12   | 88  | 34  | 162   | 3.75 | 1.051 |
| 3.7% 13.5% 7.4% 54.3% 20.9%                                               |    |     |      |     |     |       |     |     |
| I can choose the right research method                                    | 2  | 17 | 11   | 85  | 47  | 162   | 3.97 | 0.945 |
| 1.2% 10.4% 6.7% 52.4% 29.0%                                              |    |     |      |     |     |       |     |     |
| I can choose the right data analysis method                               | 2  | 13 | 9    | 84  | 54  | 162   | 4.06 | 0.919 |
| 1.2% 8.0% 5.5% 51.8% 33.3%                                               |    |     |      |     |     |       |     |     |
| I can make conclusions                                                    | 1  | 4  | 2    | 90  | 65  | 162   | 4.47 | 0.706 |
| 0.6% 2.4% 1.2% 55.5% 40.1%                                              |    |     |      |     |     |       |     |     |
| Overall Mean Score                                                        |    |    |      |     |     |       | 4.03 | 0.934 |

As shown Table 1, the skill of preservice physics teacher in writing abstract is on low average score. This matter is not shocking because writing is one of the students’ problems in doing research. It is suitable with Ruhmiati (2014) stated that the writing of research results becomes one of problems to the students.

3.2. Hypothesis testing

This study assumes that confidence in research skills which is had by pre-service teacher is not dependent on men and women. This assumption informs the research hypothesis formulated for research. The hypothesis was tested using statistical techniques independent sample t-test at p-value 0.05. Hypothesis: there is no statistically significant difference in confidence in the research skills of male and female physics pre-service teachers.

3.3. Research skills of male and female physics pre-service teachers

Hypothesis: there will be no statistically significant differences in beliefs about the research skills of male and female physics pre-service teachers.
The independent results of the sample t-test show that there were no statistically significant differences (p-value> 0.05). This means that the research skills of male and female physics pre-service teachers are not significantly different.

The results of the independent test sample t-test of confidence in the research skills of male and female pre service physics teachers showed that their research skills were not significantly different (p-value> 0.05). Even though, the publication of research result which is done by pre-service teacher through research-based learning, is mostly done by male pre-service teachers, the findings of this study are not surprising given the learning process in private or state universities is the same. At state and private universities, facilities and learning processes seem to be more expecting successful pre service physics teachers in the academic field, so that pre service physics teachers show more effort to deepen material content. Several studies in Indonesia explain that the focus of learning on physics pre-service teachers deepens content [24]. Another reason that contributes to the insignificant difference is that pre service physics teachers at private or state universities are directed to research skills when they have begun to compile the final project.

This finding does not show a statistically significant difference (p>0,05 for all practices) in confidence in the research skills of male and female pre service physics teachers. In general, there are studies to explore the belief in the research skills of male and female pre service physics teachers. The results show that the highest level of confidence in research skills of students is in good criteria. The researchers believe that no significant differences were found between beliefs in the research skills of male and female pre-service teachers. It could be partly due to the fact that pre-service teachers need to master research skills to be able to solve the problems surrounding their professional duties. In addition, they need research skills to complete their undergraduate final assignments.

4. Conclusion
Based on the results of the study, the conclusions are as pre-service physics teachers at universities in Lampung Indonesia have confidence in good research skills. This implies that they have professional competence in carrying out their duties. Confidence in the research skills will help resolve problems in the teaching process. The findings of this study have implications for research and practice. First, teacher education in Indonesia must focus more on teaching them to be able to solve learning problems. Problem solving through research activities will help them succeed in teaching and learning activities. Second, further research on the research skills of physics pre-service teachers in solving the problems of physics learning must be carried out with larger samples taken from widely distributed ones. Finally, a clear limitation of this research is that it only relies on the data of the physics pre-service teachers reported. Further studies on the application of research skills for physics teacher’s candidate in their classroom
learning are needed. This is to give an overview of the process of research skills given in their classrooms.

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