The effect of laboratory processing capability and science literacy of readiness become a professional pre-service physics teachers

M M Chusni¹ ² *, A Hasanah³, A M Ghazali⁴, R Zakwandi² and A Malik²

¹ Program Studi S-3 Pendidikan IPA, Universitas Sebelas Maret Surakarta, Jl. Ir. Sutami 36 A, Surakarta (Solo), 57126, Indonesia
² Physics Education Department, UIN Sunan Gunung Djati, Jl. A.H Nasution No. 105 Bandung 40614, Indonesia
³ Islamic Education Department, UIN Sunan Gunung Djati, Jl. A.H Nasution No. 105 Bandung 40614, Indonesia
⁴ Fakultas Ushuludin dan Studi Agama, UIN Sunan Gunung Djati, Jl. A.H Nasution No. 105 Bandung 40614, Indonesia

* minan.chusni@uinsgd.ac.id

Abstract. This research aims to describe the readiness of preservice physics teacher are graduate from PTKIN, especially in education. The aspect that observed in this research are capability of laboratory processing and science literacy that affected to pre-service physics teacher quality. The research was conducted by collecting data of management laboratory capabilities and science literacy of students in physics education department of UIN Sunan Gunung Djati as graduate by PTKIN and to be a physics teacher. The subjects in the research are students of physics education department at UIN Sunan Gunung Djati Bandung in three years. The data in this research were collected by spreading the instruments of management laboratory capability as form of a multiple choice test and essay for determine the ability of students in science literacy. The second instrument was a questionnaire of student’s attitude as a prospective physics teacher about the implementation of learning theoretical. The collected data were analysed using multiple regression analysis to determine the effect of management laboratory capability (X1) to readiness professional physics teacher (Y) and the same analysis was also conducted to clarify the effect of the science literacy (X2) to readiness professional physic teachers (Y). The result of this research are expected to be reference to make improvements in the course have a planning for prepare the professional of pre-service physic teachers. Generally, the research gives a conclusion that laboratory management capability and science literacy do not give effect to readiness become a professional pre-service physics teacher.

1. Introduction
The curriculum that used at the university is directing the student to have a plan after their studies. Based on the president regulation number 8 of 2008 is make the rule that the student has choice their job corresponding to the performance. To student of physics education have three choices as minimum profession there are the teacher, laboratory assistant and the researchers [1].
To be a professional teacher the student must be have the interesting and good performance in educational process, because the key of teacher is not transfer knowledge only. More than that, the teacher must be able the student to be interest in the lesson and let them to get the knowledge alone [2]. To make the student interest in the lesson so the teacher is must be come from the good background in education, interesting to be a teacher and have a good ability to teach the students.

Based on the results of research conducted suggests, that the average laboratory processing at the school/ Madrasah is still in the poor category. It is shown by the acquisition of laboratory processing in madrasah/school which shows the average value of 37.28 with aspect that reviewed by the knowledge about laboratory processing and observations about the conditions and management system [3–5]. Other related research indicates there is a significant correlation between laboratory processing capabilities with the skill to design and implement practical by the teacher. So that the weakness of teachers in managing the laboratory must be overcome so that the implementation can be optimized in physics learning through practical activities [6, 7].

In 2015 the majority of children in Indonesia get a test by the programed for International Students Assessment (PISA). It tested include science literacy which Indonesia students have. PISA result obtained showed that Indonesia students still has a low science literacy levels, the rate Indonesia ranks is 62nd out of 69 countries evaluated [8, 9]. Accordingly, one of other research suggested that the low level of science literacy Indonesia students come from the low of level of science literacy by the teacher at school/madrasah [10–12].

The second indication, would be a consideration for Institutions of Higher Education Teaching (LPTK) to seriously prepare the pre-service teacher as graduates to be able the problems and obstacles encountered in the vocations. This research aims to show the profile of readiness of pre-service physics teacher, especially the graduate teachers under the auspices of Kementerian Agama on both aspects. Furthermore, the research aims too to identify how the influence of a skill of laboratory processing and level of science literacy readiness prospective professional physics teachers. The result of this research, may be use as references to making any decision to improvements in the lecture program planning in the order to prepare the professional pre-service physics teachers.

### 2. Method

This research was conducted using quantitative research methods. These quantitative research methods must use a valid and reliable instrument, but it must be using appropriate statistical analysis and precise so that the result does not deviate from actual conditions [13].

The variable of this research are laboratory management capabilities, the level of science literacy of students and readiness of students into professional physics teacher. Skill of laboratory processing and science literacy is the independent variable with each as X1 and X2. The readiness become a professional physics teacher is the dependent variable (Y) of the study. In these simple mapping of variables can be seen in the table 1:

| No. | Variable                              | Type              | Symbol |
|-----|---------------------------------------|-------------------|--------|
| 1.  | Capabilities of Laboratory Management | Independent Variable | X1     |
| 2.  | Physical Science Literacy             | Independent Variable | X2     |
| 3.  | Readiness become a professional physics teacher | Dependent Variable | Y      |
Diagrams of research conducted as follows:

![Diagram](image)

**Figure 1.** Diagram variables.

The diagram in figure 1, are described in table 2:

| No. | Independent Variable                          | Dependent Variable                                      | Formula                  |
|-----|-----------------------------------------------|---------------------------------------------------------|--------------------------|
| 1   | Capabilities of Laboratory Management         | Readiness become a professional physics teacher          | X1 \(\rightarrow\) Y     |
| 2   | Physical Science Literacy                    | Readiness become a professional physics teacher          | X2 \(\rightarrow\) Y     |
| 3   | Capability of Management Physics Laboratory and Science Literacy | Readiness become a professional physics teacher | X1 and X2 \(\rightarrow\) Y |

The data in this research collected by spreading the instruments to the pre-defined subject. The instrument that used are multiple-choice test, essay test, and questionnaires. Data obtained from this research were analysed with receipts regression of each variable as seen on the research chart. Before that, the data must be being tested prerequisite of research data covering normality test, homogeneity test and linearity test.

### 3. Results and discussion

Based on the results of data processing research, data obtained a description that is not a significant effect of science literacy and laboratory management capabilities toward readiness of professional pre-service physics teacher. Prerequisite test indicates all of data collected is have the level of normality and homogeneity of data. So, in this stage we can to check the hypothesis research that how the influence of each independent variable on the dependent variable.

The first research hypothesis is having the significant effect of laboratory management capabilities to become a readiness of professional pre-service physics teacher.

| Table 3. Linearity X1-Y. |
|---------------------------|
| Variable                  | F    | Sig  |
| Readiness to be a professional pre-service physics teacher and Laboratory Management Capability | 1.515 | 0.216 |

| Table 4. Regression X1-Y. |
|---------------------------|
| Variable                  | F    | Sig  |
| Readiness become a teacher* Capabilities of Laboratory Management | 0.107 | 0.746 |
Table 5. The regression coefficient X1-Y.

| Variable                                              | Constant | B  |
|-------------------------------------------------------|----------|----|
| Readiness become a teacher* Capabilities of Laboratory Management | 0.835    | 0.000 |

Based on the calculation of the data indicates the significance value of 0.746 with the interpretation of regression does not significantly [14]. It is if the review is more deeply to see the great value given the regression coefficient is 0.162 or 4% only. By plotting the data use the regression equation resulting for the variable of laboratory management capabilities and readiness to become a professional pre-service physics teacher is Y = 0.835 + 0.00X2. From these equations we can see that the contribution that provided by the laboratory management capabilities is very little. This is shown by the coefficient of the variable X in the equation is 0.00 only [15]. Such data when presented in chart form are as follows:

![Figure 2](image_url)  

**Figure 2.** Laboratory management influence on the readiness to become a teacher.

Thus, it can be stated that the initial hypothesis of the study which states that a significant effect of laboratory management capabilities toward the readiness to become a professional pre-service physics teacher was rejected because of influence exerted by the variable laboratory management capabilities are too small.

The Second analysis is about the effect of science literacy toward the readiness become a professional pre-service physics teacher. At the initial hypothesis of the researchers, we stated that a significant effect of the level of science literacy of students with the readiness become a professional pre-service physics teacher. Based on the research result, it can be stated that the initial hypothesis was rejected. This is based on linearity and regression test results in table 6, 7, and 8 as follows:

Table 6. Linearity X2-Y.

| Variables                                              | F       | Sig |
|-------------------------------------------------------|---------|-----|
| * Readiness to be a teacher of Science Literacy       | 1,279   | 0,331 |

Table 7. Regression X2-Y.

| Variables                                              | F       | Sig |
|-------------------------------------------------------|---------|-----|
| Readiness to be a teacher of Science Literacy         | 0,363   | 0,552 |

Table 8. Coefficients of Regression X2-Y.

| Variable                                              | Constant | B  |
|-------------------------------------------------------|----------|----|
| Readiness to be a teacher * capabilities of Management Laboratory | 0.831    | 0.000 |
In Table 7 and Table 8 obtained information that the results of the regression of the data do not show a good linearity. It refers to the value obtained for 0.552 significance far greater than 0.05 degrees of freedom. On the basis of this interpretation indicates that there is no significant effect between the level of science literacy of students with a readiness become a professional pre-service physics teacher [16, 17]. Furthermore, the influence number that exerted by science literacy variable regression coefficient in otherwise only obtained a value of 0.113 with a given level of contribution of 1.3% to support the readiness become a professional pre-service physics teacher. The result of this calculation is supported by the results of plotting the data and identification of the linear correlation shown by the linearity of the equation Y = 0.831 + 0.00X1. The value of the coefficient for literacy variable is 0.00. So it can be stated that there is no contribution [18]. In the diagram the influence given by figure 3:

\[
\text{Science Literacy} \quad 1.3\% \quad \text{Readiness Professional Teachers}
\]

**Figure 3.** Science Literacy contribution to the readiness professional teachers.

The final testing is to test the hypothesis that the second linkage independent variables on the dependent variable. The third hypothesis of this research reads: "There is a significant effect of laboratory management ability and science literacy to be a readiness professional pre-service physics teacher ". Based on the research results, obtained refute the hypothesis put forward at the beginning of the research. This is evidenced by the low index of regression resulting from the research conducted.

**Table 9.** Regression [X1 X2] – Y.

| Variable | F    | Sig |
|----------|------|-----|
| Readiness become a teacher* Ability Laboratory Management and Science Literacy | 0.205 | 0.816 |

**Table 10.** Coefficient Regression [X1 X2] - Y

| Variable | Constant | X1   | X2   |
|----------|----------|------|------|
| Readiness become a teacher* Ability Laboratory Management and Science Literacy | 0.818 | 0.047 | 0.107 |

Based on the tables 9 and 10 which illustrate the regression of the three variables that provides enormous significance value is 0.816 with a variable data interpretation does not make a significant contribution. Followed by reviewing formula regression produced by Y = 0.818 + 0.00 X1 + 0.00 X2 shows that the contribution of independent variables X1 (laboratory management capabilities) and X2 (scientific literacy) together does not significantly [19]. The correlation is given as follows:
Figure 4. Contributions laboratory management capabilities and readiness literacy to become teacher of science.

Based on the figure 4 above can be seen that the contribution made by the independent variable is below 5%, which means very little. In this research the effect of laboratory management capabilities is not the focus of research so that in Figure 4 are also not included how the influence exerted by both.

4. Conclusion
Based on the results of the discussion there are conclusions of this research are: 1) There is not significant effect between the ability of the management of laboratory toward the readiness professional prospective physics teachers, 2) There is not significant effect between science literacy toward the readiness professional prospective physics teachers, 3) there is not significant influence of laboratory management ability and science literacy toward the readiness professional prospective physics teacher. Based on this result, the future research is needed on the development of physics teaching model to improve the management laboratory capability and the scientific literacy of physics. And is also necessary for the development of teaching materials such as books, student worksheets and lectures authentic observation sheet.

Acknowledgment
The researches thank you to Research Centre of UIN Sunan Gunung Djati Bandung as help us in material research.

References
[1] Pemerintah Negara Republik Indonesia 2008 Peraturan Presiden Nomor 8 Tahun 2008
[2] K Komalasari 2016 The effect of contextual learning in civic education on students’ civic skills Educare 4(2)
[3] R Kastijono 2011 Implementasi Student Centered Learning Dalam Praktikum Fisika Dasar J. Penelit. Fis. and Apl. 1(2) 19–32
[4] N Hidayah, U Rosidin, and D Maulina 2015 Deskripsi Kemampuan Guru IPA di SMP Swasta Bandar Lampung dalam Mengelola Laboratorium Jural Bioterdidik 3(4)
[5] H Wattimena, A Suhandi, and A Setiawan 2014 Profil Penyelenggaraan Praktikum Fisika Sekolah sebagai Penyiapan Mengembangkan Kreatifitas Calon Guru J. Pendidik. MIPA 15(2)
[6] R Jonuarti, Yurnetti, Hidayati, and F Mufit 2014 Efektifitas Pengetahuan Pengelolaan Laboratorium dan Substansi Bahan Ajar Terhadap Pengetahuan Guru Membuat Modul Praktikum IPA SMP dalam Menyambut Kutikulum 2013 J. Penelit. Pendidik. 5(1) 1–8
[7] F Schauer, M Krbecek, P Beno, M Gerza, L Palka, P Spilaková, and L Tkac 2016 REMLABNET III—Federated Remote Laboratory Management System For University And Secondary
Schools in Remote Engineering and Virtual Instrumentation (REV), 2016 13th International Conference 238–241

[8] H Iswadi 2016 Sekelumet dari Hasil PISA 2015 yang Baru Dirilis [Online] Retrieved from: http://www.ubaya.ac.id/2014/content/articles_detail/230/Overview-of-PISA-2015-result-that-have-just-been-Realesed.html

[9] L M Thien, I G H Darmawan, and M Y Ong 2015 Affective Characteristics and Mathematics Performance in Indonesia, Malaysia, and Thailand: What Can PISA 2012 Data Tell Us? Large-scale Assessments Educ. 3(1) 3

[10] J Maknun 2015 Pembelajaran Mitigasi Bencana Berorientasi Kearifan Lokal Pada Pembelajaran IPA Di Sekolah Menengah Kejuruan J. Kaji. Pendidik 5(1) 143–156

[11] T Barnhart and E Van Es 2015 Studying Teacher Noticing: Examining The Relationship Among Pre-Service Science Teachers’ Ability to Attend, Analyze And Respond to Student Thinking Teach. Teach. Educ. 44 83–93

[12] J Sun and E Van Es 2015 An Exploratory Study of The Influence That Analyzing Teaching Has on Preservice Teachers’ Classroom Practice J. Teach. Educ. 66(3) 201–204

[13] M Yusuf 2014 Kuantitatif, Kualitatif dan Penelitian Gabungan (Jakarta: Kencana)

[14] A Gani and S Amalia 2015 Alat Analisis Data (Yogyakarta: Penerbit Andi)

[15] D Sambada 2012 Peranan Kreativitas Siswa Terhadap Kemampuan Memecahkan Masalah Fisika dalam Pembelajaran Kontekstual J. Penelit. Fis. and Apl. 2(2) 3

[16] E Listia, Asrul, and A Fauzi 2016 Pengaruh Lembar Kerja Peserta Didik (LKPD) Terintegrasi Materi Tsunami Terhadap Kompetensi Fisika Dalam Pembelajaran Reasoning And Problem Solving Pada Materi Getaran Harmonik, Impuls Dan Momentum Di Kelas XI Sman 10 Padang Pillar Phys. Educ. 7(1)

[17] J A Taylor, K Roth, C D Wilson, and E Tipton 2017 The Effect of An Analysis-0f-Practice, Videocase-Based, Teacher Professional Development Program on Elementary Students’ Science Achievement J. Res. Educ. Eff. 10(2) 615–621

[18] R Bean and D Kern 2018 Multiple Roles of Specialized Literacy Professionals: The ILA 2017 Standards Read. Teach. 71(5) 615–621

[19] A N Surie, N Maharta, and U Rosidin 2015 Hubungan Pembelajaran Berbasis Tugas Terstruktur Terhadap Hasil Belajar dan Minat Belajar Fisika J. Pembelajaran Fis. Univ. Lampung 2 7