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## The Utilization of ICT as Pedagogical and Professional Competencies to Support the Professionalism of Chemistry Teachers

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### Abstract

This purpose of this study was to determine the influence of ICT utilization as pedagogical and professional competencies to support the professionalism of chemistry teachers. This study used a quantitative method through a survey approach with 157 chemistry teachers. The survey was conducted to obtain the data through questionnaires. The results indicated that the ICT utilization in the learning as pedagogical and professional competencies significantly influenced toward the professionalism of chemistry teachers with the sig.  $0,000 < \alpha = 0.05$ . Simultaneously, the use of ICT in the learning as a pedagogical competence and the ICT utilization in communicating and developing themselves as professional competencies had a significant effect on supporting the professionalism of high school chemistry teachers that was indicated by the analysis result of the F 0,000 test probability value. It was smaller than  $\alpha = 0.05$ . The use of ICT needs to be improved by designing various efforts in the learning process i.e., conducting an education and ICT training to achieve the teacher skills in utilizing the ICT to support the teacher professionalism. The chemistry teachers should utilize the ICT in learning and follow an ICT training. The local government has to fix the facility and infrastructure as well as the evaluation and regulation of the ICT utilization in school to support the teacher professionalism.

### Keywords

Information and communication technology (ICT), pedagogical competence, professional competence, professionalism of chemistry teachers

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## Introduction

Nowadays, teachers are currently required to have skills in using technology due to the challenges of the future that the teachers are related to the ICT. Eggen and Kauchak (2012) assert that the 21<sup>st</sup> century/digital century standards for the teachers and students in schools are associated with the technology utilization in learning. Teachers are demanded to prepare their students in the digital era i.e., using their knowledge of learning materials, learning, and technology to facilitate students in the learning experiences, creativities, and innovation for private and virtual situations. Teachers in the 21<sup>st</sup> century must be literated with the technology since teacher professionalism is not only required to have pedagogical, personal, and social competencies but also professional competences. One of the professional competencies is technology by utilizing ICT that can emerge the teachers and students' creativity through the use of various media and the learning sources (Savitri, 2018).

The problem of teacher professionalism opposes teachers' competence. The blurred portrait of education in Indonesia is teacher competency. This refers to the results of the Teacher Competency Test (*UKG*) in 2015. It is based on the national average of 53.02 below the Minimum Competency Standard (*SKM*) target that is 55 (Supriyono, 2018). Providing the solution is needed; hence, the problem can be overcome immediately. Whereas, the problem especially in Riau is seen from the Teacher Competency Exams scores in 2015. The teachers' pedagogical competence is indicated by the intervals values of 47.73 to 53.04. In brief, the pedagogical competency score is still categorized as low compared to the national standard of *UKG* that is 55 (Kemdikbud, 2019). To improve the learning quality, curriculum 2013 responds and accommodates the ICT developments. The accommodation is through ICT implementation in all subjects, so the teachers can better optimize the ICT resources in the inside and outside of classroom. A teacher's high ability in ICT is not a guarantee that teachers can integrate the ICT well. The Ministry of Education and Culture (2014) explains that the function of ICT integration is to develop the learning sources and media, learning preparation, processes, assessment, and reporting of the learning outcomes. This means that the learning quality improvement can be integrated with the ICT utilization (Hidayat et al., 2016).

Similarly to the chemistry teachers, chemistry discusses about the abstract concepts. A visionary, competent, and highly dedicated teacher is needed. The chemistry teachers are demanded to be sensitive and responsive toward the changes occurred i.e., the development of sophisticated science and technology. Therefore, the chemistry teachers must always learn about various things that continuously follow the current developments, try to improve their quality and can use the method and learning media. Those are in line with the materials presented. Thus, students can follow the learning process well. In brief, professional teachers are needed. The teachers who have competencies have been set in the education and teaching tasks. Though there are several studies that prove the benefits of ICT utilization to improve the learning quality (e.g., Budiana, 2015; Mutmainnah, 2017; Nurvitasari, 2018; Zuhriyah, 2016), in fact, the use of technology is still not implemented by

all of the teachers. The ICT integration of education experiences many obstacles (Mahdum, 2019). The mastery factor of ICT becomes one of the problems that arises along with the use of ICT in education. Teacher is the main stakeholder of learning processes in school. Integrating the ICT for learning is believed that it can assist teachers' tasks to run well though it is implemented inside and outside the classroom. Therefore, the mastery of ICT by the teachers is a must in order to improve teacher professionalism (Budiana et al., 2015).

This research discussed the competencies, namely pedagogical and professional competencies since those have a relationship with the ICT in learning and communicating and also developing themselves for the learning implementation in the classroom and schools, especially in urban and rural areas (Al-Munawwarah, 2014; Kristianto, 2017; Pramana, 2018). Although, there are several studies examining the use of ICT, no research has linked to those two aspects. Therefore, five research questions were formulated; 1) Is there any significant difference on the demographic characteristics of the respondents? 2) Is there any significant effect of the ICT usage as pedagogical and professional competencies on supporting the professionalism of high school chemistry teachers? 3) Is there any significant effect simultaneously the use of ICT as pedagogical and professional competencies on supporting the professionalism of high school chemistry teachers? 4) How is the influence effect of the ICT usage as pedagogical and professional competencies on supporting the professionalism of high school chemistry teachers? 5) How is the influence equation of regression to establish the influence of ICT utilization as pedagogical and professional competencies on support the professionalism of high school chemistry teachers?

### **Literature Review**

Utilizing ICT in the learning process is an adaptation form on the knowledge development that is currently developing to improve teachers' pedagogical and professional competencies. In fact, there are many schools which get difficulties to provide facilities and infrastructures, and to carry out up to date learning processes through the ICT utilization to support such competencies. Many obstacles are experienced by teachers when implementing the learning process based on the information technology. It is in line with Copriady (2014) who proposes that teachers really encounter not only the challenges but also the problems of ICT utilization in teaching and learning processes. One of the problems is the negative attitude on the ICT utilization and the lack of knowledge and skills to implement the ICT utilization.

The problem of low teacher pedagogical competence can be seen from the low of ICT usage in the learning process (Umar, 2013). The indication is that there are teachers who have low ability to operate the learning devices i.e., laptops, computers, and in-focus. When the teacher's operational ability of learning devices is low, it does not enable the teacher to integrate the ICT in the teaching and learning processes. Therefore, the learning is not interesting. The atmosphere can even make students bored quickly while learning processes take place.

Based on the previous explanation related to the teachers' problem in the 21<sup>st</sup> century i.e. skills, the globalization progress eases the teachers to communicate and develop themselves by utilizing the ICT. Additionally, the ICT utilization is very important to support the relationships with colleagues and develop the professions based on their fields. Based on various research results, there are approximately 70% to 90% of teachers who utilize the ICT in learning processes and activities. They are considered illiterate in technology (Lestariningsih, 2019; Nasution, 2018; Robbani, 2019; Wernely, 2018). If those are true, it would be ironic if the teacher has never used the least sophisticated information technology (Darmawan, 2013). Thus, this will certainly has an impact when the teachers communicate with the fellow teachers, parents, and students and it is also difficult to develop themselves based on their field of study, if they are still illiterate in technology, it is difficult to improve their professional competencies. In accordance with the demands of the industrial revolution 4.0, the ICT integration must be implemented in the ducation world.

Professionalism as a support in carrying out the tasks is greatly influenced by the development and policy. Nowadays, adaptation to the revolution of technology and information is one of the challenges for Indonesia teacher to enhance the professionalism (Tanang et al., 2014). Professionalism has become one of the supports in carrying out their duties, currently it is highly influenced by the developments and policies used. The information technology development will change the pattern of teacher-student relations, learning models, and the overall education system. ICT must be integrated in education to achieve the goals; then, it is not regarded as a barrier. Nowadays, the learning sources do not only come from the teachers, because there are many learning sources and information used as the facilitation to learn. The schools are no longer to be the only center of learning since the learning is not limited to space and time (Tanang, 2014). The teacher professionalism that will be discussed is the teachers' professionalism relating to the ICT utilization in the learning process at school. The indicators used are to support the computers and internet in the learning processes.

## **Methodology**

### ***Research design, participants, and locale of the study***

This study used a quantitative method through a survey approach. The data were in the form of Chemistry teachers' perceptions on the ICT utilization as pedagogical and professional competencies. The sample was taken from the population using through a cluster random sampling technique; moreover, there were 157 chemistry teachers categorized based on school unit, gender, last education, majors, teaching experiences, employment and certification status in state and private high schools at Pekanbaru City, Siak, Pelalawan, and Indragiri Hulu Regencies. They voluntarily participated in this study by filling out an online questionnaire. The participants' anonymity was guaranteed and they welcomed to leave their contact number if they wished to participate in a follow-up study.

### *Data collection and analysis*

Data collection in this study used a non-test technique in the form of questionnaires. The answer of each item of the instrument had a gradation from “very positive to very negative” by using a Likert scale from one to five, of which scales were A scale of one for very rare answers and a scale of five for very frequent answers. The data collected were analyzed to determine the validity and reliability of 30 high school chemistry teachers in Kampar Regency that produced the item-total correlation coefficient of pedagogical competence, professional competence, and teacher professionalism, in which it was greater than  $r_{table} = 0.361$ , it meant that all items were valid. Meanwhile, the coefficient of alpha cronbach on pedagogical competence, professional competence, and teacher professionalism were greater than the value of alpha cronbach 0.5, it meant that the reliability of the each items for the variable studied was good (reliable).

The technique used to analyze the data was a descriptive statistical analysis technique, such as the technique applied by Arikunto (2006), the data collected were clarified into quantitative data in the form of figures. The categorization was grouped into 5 categories; very high, high, medium, low, and very low. Whereas for categorizing, it used the 5 norm boundary references (Sudijono, 2008). The independent variables in this research were pedagogical competence (X1) and professional competence (X2), while the dependent variable was the teacher professionalism (Y). Multiple linear regression analysis using SPSS 18.0 for Windows was chosen to analyze the research data. The analysis was to find out the significant difference in the influence of ICT utilization as pedagogical and professional competencies to support the professionalism of Chemistry teachers.

### *Ethical considerations*

This research used individuals as the main source of the information. To contend with the ethics, although in Indonesia there was no administrative body established to protect the rights and welfare of human research subjects recruited to participate in this research, the researcher covered the identities of people, places, and the research location by way of made-up names to keep the rights of human research participants. Additionally, the participation in this study was totally volunteer.

### **Findings**

#### *The Utilization of ICT as a pedagogical competence in the terms of demographics*

The followings are the percentage calculation data of ICT utilization as a pedagogical competence that were reviewed from the teachers’ demographic side:

**Table 1.** Percentage calculation of the utilization of ICT as a pedagogical competence

| Demography           | Percentage (%) |        |           |       |            |
|----------------------|----------------|--------|-----------|-------|------------|
|                      | Category       |        |           |       |            |
|                      | Rarely         | Seldom | Sometimes | Often | Very Often |
| School Units         |                |        |           |       |            |
| State                | 2.5            | 8.3    | 25.5      | 31.8  | 10.8       |
| Private              | 0.6            | 0.6    | 5.1       | 12.7  | 1.9        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Gender               |                |        |           |       |            |
| Male                 | 1.3            | 1.3    | 3.8       | 12.7  | 3.8        |
| Female               | 1.9            | 7.6    | 26.8      | 31.8  | 8.9        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Last Education       |                |        |           |       |            |
| D 3                  | 0.0            | 0.0    | 0.0       | 0.6   | 0.0        |
| S 1                  | 3.2            | 8.3    | 29.9      | 35.7  | 9.6        |
| S 2                  | 0.0            | 0.6    | 0.6       | 8.3   | 3.2        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Majors               |                |        |           |       |            |
| Education            | 3.2            | 7.6    | 24.2      | 36.9  | 9.6        |
| Non-Education        | 0.0            | 1.3    | 6.4       | 7.6   | 3.2        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Teaching Experience  |                |        |           |       |            |
| 1-5 years            | 0.0            | 0.0    | 4.5       | 7.0   | 2.5        |
| 6-10 years           | 0.0            | 0.6    | 5.1       | 13.4  | 2.5        |
| 11-15 years          | 1.3            | 4.5    | 8.3       | 10.8  | 4.5        |
| >15 years            | 1.9            | 3.8    | 12.7      | 13.4  | 3.2        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Job Status           |                |        |           |       |            |
| Civil Servants       | 2.5            | 6.4    | 18.5      | 24.8  | 6.4        |
| Non-Civil Servants   | 0.6            | 2.5    | 12.1      | 19.7  | 6.4        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |
| Certification Status |                |        |           |       |            |
| Certification        | 0.0            | 1.9    | 10.2      | 17.2  | 3.8        |
| Non-Certification    | 3.2            | 7.0    | 20.4      | 27.4  | 8.9        |
| Total                | 3.2            | 8.9    | 30.6      | 44.6  | 12.7       |

The conclusions could be drawn based on the school unit, the public school assessment was higher, while based on gender the assessment of women was higher, then based on the last education of bachelor degree was higher, for the assessment of major was higher while based on teaching experience was 6-10 years and >15 years that was similar and higher, based on employment status the PNS assessment was higher, and finally based on the certification status was higher.

*The utilization of ICT as a professional competence in the terms of demographics*

The followings are the percentage calculation data of ICT utilization as a professionalism competence that were reviewed from the teachers' demographic side:

**Table 2.** *Percentage calculation of the utilization of ICT as a professional competency*

| Demography           | Percentage (%) |        |           |       |            |
|----------------------|----------------|--------|-----------|-------|------------|
|                      | Category       |        |           |       |            |
|                      | Rarely         | Seldom | Sometimes | Often | Very Often |
| School Units         |                |        |           |       |            |
| State                | 1.9            | 5.7    | 15.9      | 39.5  | 15.9       |
| Private              | 0.0            | 0.6    | 3.8       | 12.1  | 4.5        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Gender               |                |        |           |       |            |
| Male                 | 1.3            | 0.6    | 4.5       | 12.7  | 3.8        |
| Female               | 0.6            | 5.7    | 15.3      | 38.9  | 16.6       |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Last Education       |                |        |           |       |            |
| D 3                  | 0.0            | 0.0    | 0.0       | 0.0   | 0.6        |
| S 1                  | 1.9            | 6.4    | 19.1      | 43.3  | 15.9       |
| S 2                  | 0.0            | 0.0    | 0.6       | 8.3   | 3.8        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Majors               |                |        |           |       |            |
| Education            | 1.9            | 5.1    | 14.6      | 45.2  | 14.6       |
| Non-Education        | 0.0            | 1.3    | 5.1       | 6.4   | 5.7        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Teaching Experience  |                |        |           |       |            |
| 1-5 years            | 0.0            | 0.0    | 1.9       | 10.2  | 1.9        |
| 6-10 years           | 0.0            | 0.0    | 3.2       | 13.4  | 5.1        |
| 11-15 years          | 0.0            | 3.2    | 8.3       | 10.8  | 7.0        |
| >15 years            | 1.9            | 3.2    | 6.4       | 17.2  | 6.4        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Job Status           |                |        |           |       |            |
| Civil Servants       | 1.9            | 5.7    | 10.8      | 29.3  | 10.8       |
| Non-Civil Servants   | 0.0            | 0.6    | 8.9       | 22.3  | 9.6        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |
| Certification Status |                |        |           |       |            |
| Certification        | 1.9            | 6.4    | 12.7      | 32.5  | 13.4       |
| Non-Certification    | 0.0            | 0.0    | 7.0       | 19.1  | 7.0        |
| Total                | 1.9            | 6.4    | 19.7      | 51.6  | 20.4       |

The assessment from the school unit was higher, based on the gender assessment of women was higher, then based on the latest education of SI was higher, for the assessment majors was higher, while based on teaching experience assessment was >15 years higher, whereas based on the employment status of PNS was higher, and finally based on the certification status was higher.

***The result of T test (individual parametric significance test)***

The ICT utilization effect as pedagogical and professional competencies to support the professionalism could be known using the t-test as follow:

**Table 3.** *Partially independent variable test results (t-Test Results)*

| Model                   | Unstandardized Coefficients |            | Standardized Coefficients | T     | Sig.  |
|-------------------------|-----------------------------|------------|---------------------------|-------|-------|
|                         | B                           | Std. Error | Beta                      |       |       |
| (Constant)              | 0.540                       | 1.716      |                           | 0.315 | 0.754 |
| Pedagogical Competence  | 0.139                       | 0.032      | 0.309                     | 4.324 | 0.000 |
| Professional Competence | 0.439                       | 0.054      | 0.586                     | 8.192 | 0.000 |

Based on the Table 3, to use the ICT as a Pedagogical Competence, the Sig was 0,000. Sig value 0,000 was smaller than  $\alpha = 0.05$ , then the decision of  $H_0$  was rejected. Thus, it could help some of the positive and significant influence between the use of ICT as pedagogical competence to support the professionalism of high school chemistry teachers in Riau Province. Sig value 0,000 was smaller than  $\alpha = 0.05$ , then the decision of  $H_0$  was rejected. Thus, it could be summed up partially about the positive and significant effect between the use of ICT as a professional competence to support the professionalism of high school chemistry teachers in Riau Province.

***The Result of F test (simultaneous significance test)***

The effect of the use of ICT as pedagogical and professional competencies to support the professionalism was instantaneously tried by using the F test. The following was the results of the F test.

**Table 4.** *Simultaneous test results (Test-F Results)*

| Model |            | Sum of Squares | Mean Square | F       | Sig.              |
|-------|------------|----------------|-------------|---------|-------------------|
| 1     | Regression | 6508.626       | 3254.313    | 211.605 | .000 <sup>b</sup> |
|       | Residual   | 2368.393       | 15.379      |         |                   |
|       | Total      | 8877.019       |             |         |                   |

Based on the Table 4, the Sig. was 0,000. Sig value 0,000 was less than 0.05; then, the  $H_0$  was rejected. Hence, it could be concluded that there was a significant influence between the use of ICT as pedagogical and professional competences to support the professionalism of high school chemistry teachers in Riau Province.

***The result of correlation coefficient and determination coefficient***

The effect of the use of ICT as pedagogical and professional competence to support the teacher professionalism could be known from the coefficient of determination, which was indicated by *Adjusted R Square*. The results of the correlation coefficient and determination analysis could be presented in Table 5.

**Table 5.** *Results of correlation coefficient calculation (R) and determination coefficient (Adj R2)*

| Model | R                  | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|--------------------|----------|-------------------|----------------------------|
| 1     | 0.856 <sup>a</sup> | 0.733    | 0.730             | 3.922                      |

Departing from the Table 5, the calculation results of the coefficient of determination were 0.730. It indicated that 73% of teacher professionalism variables were influenced by pedagogical and professional competencies variables, while 27% were affected by other factors that not included in this study.

***The result of multiple linear regression analysis***

Based on the results of multiple linear regression analysis, it could be seen from the equation of regression to establish the influence of ICT utilization as pedagogical and professional competencies to support the professionalism by using beta coefficient analysis. The results of the calculation of constants and beta coefficients for regression analysis were elucidated in Table 6.

**Table 6.** *Beta coefficient calculation results*

| Model |                         | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig.  |
|-------|-------------------------|-----------------------------|------------|---------------------------|-------|-------|
|       |                         | B                           | Std. Error | Beta                      |       |       |
| 1     | (Constant)              | 0.540                       | 1.716      |                           | 0.315 | 0.754 |
|       | Pedagogical Competence  | 0.139                       | 0.032      | 0.309                     | 4.324 | 0.000 |
|       | Professional Competence | 0.439                       | 0.054      | 0.586                     | 8,192 | 0.000 |

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Based on the multiple linear regression calculation found in the Table 6, the regression equation results were obtained:  $Y = 0.540 + 0.139X_1 + 0.439X_2$ . According to the regression line equation model, the results could be interpreted that a constant of 0.540 indicated if the variable use of ICT in learning as pedagogical competence ( $X_1$ ) and the use of ICT in communicating and developing themselves as professional competence ( $X_2$ ) had a constant or zero value; consequently, the teacher professionalism variable ( $Y$ ) had a positive value of 0.540. Furthermore, the use of ICT variables in learning as pedagogical competence ( $X_1$ ) had a positive coefficient of 0.139, the variable utilization of ICT in communicating and developing themselves as professional competence ( $X_2$ ) had a positive coefficient of 0.439. Positive regression coefficient values indicated that the use of ICT in learning as a pedagogical competence ( $X_1$ ) and the use of ICT in communicating and developing themselves as professional competence ( $X_2$ ) on the teacher professionalism ( $Y$ ) had a positive effect. It illustrated that it increased the use of ICT in learning as a pedagogical competence ( $X_1$ ) and the use of ICT in communicating and developing themselves as professional competencies ( $X_2$ ) by one unit; moreover, it would be able to increase the teacher professionalism ( $Y$ ) by the value of the beta coefficient of each independent variable multiplied with a large increase that occurred.

### Discussion

The findings of of this study were based on the differences in the status of schools, in which it also had an impact on the availability of ICT devices in schools. The results of Zia, Naz, and Qureshi (2017) and Asaolu & Fashanu (2012) research found that the ICT devices in private schools are more complete and more supportive for the student's activities to access new information rather than in the state schools. Even though the technology facilities in schools are complete, Moore (2012) argues that not all of the teachers use the technology in the learning process. The result of gender aspect obtained was different from the research of Ayu (2013) that there was no difference in the tendency of gender biased data for the interest of the profession of internet adoption patterns by the teachers. Thus, although information technology (internet) has been introduced early on both women and men, men will continue their interest in the ICT utilization than women; thereby, it creates gender gaps both in the terms of experience and knowledge about th ICT (Vivi, 2014) .

The result of study was in line with Dalrohman (2016) that the teachers who teach in public school are higher with an average of 19.5% in developing the professional competence of teachers compared with the teachers who teach in private school, in which the average is 15.5%. This is because of the public schools are given more attention by the government since all sources of funds obtained by the public schools come from the government, especially in carrying out professional teacher competency development activities, all funds come from the government and in terms of the teachers themselves, the schools with the public/state status are mostly *PNS*-registered teachers (Civil Servants) and certified. For the aspect of staffing status, the results were different from the research of Yulia (2018) that there is no difference in the pedagogical competence of teachers in public

high schools and vocational schools in Sleman based on the staffing status. Furthermore, the results of study about the teacher certification program were also in line with Rahmat (2014), that generally, the analysis results of the data regarding to the four competencies possessed by the teachers indicated that between the teachers who had passed certification directly, *PLPG* training, and those who had not yet taken certification of teacher professionalism show significant quality differences in the pedagogical competencies, where the teachers who had passed direct certification and *PLPG* training had better pedagogical competence than the teachers who had not been certified. A study conducted by Heny (2017) also found that the teacher certification programs in improving the teacher professionalism in terms of the pedagogical and professional aspects of teacher competencies were generally in good criteria proved by the teachers from the aspects of mastering the theory in learning and learning principles that educated, utilized the ICT for learning activities, communicated effectively and politely with the students, as well as organized, and utilized the results of learning assessments. Thus, it can enhance the teacher professionalism. While in the professional aspect, this is based on the aspects of mastering the material, structure, and scientific concepts of subjects taught, mastering competency standards and basic competencies of subjects of development which are taught, conducting reflective action to develop the professionalism in a sustainable manner, and to communicate and develop the teacher professionalism; furthermore, it can be conducted by integrating the ICT utilization.

The result of certification status aspect was in line to Kustini (2011) which stated that the teacher certification also required the ability and expertise of ICT utilization in learning, it means that the teachers must integrate the technology usage to improve the learning quality. Perhaps, one of the reasons due to the teachers who have been certified, they do not have enough expertise to increase the intensity of ICT utilization both in learning and in developing themselves. The results effect of this study was in accordance with the research of Tiananda (2015), in which the teaching experience had a positive effect on the teachers' pedagogical competence Based on the results of multiple linear regression analysis (t test), it was known that  $t_{\text{value}} > t_{\text{table}}$ , that is  $2.629 > 2.004$  and the significance value  $< 0.005$  is 0.011 with an effective contribution of 15.73%. Additionally, Restiyani (2014) said that the teachers were required to master the ICT usage as a source of learning i.e. the internet utilization. In addition, the teachers are also required to create creative and innovative learning by integrating the ICT in the learning processes. This brings a good impact on the students' learning outcomes and they can understand the material provided by the teacher using various learning sources and interesting learning media. Besides, according to Tekege (2017) who argues that nowadays, the world of education begins to integrate the technology in various aspects including of learning. Educational policy is directed to utilize the ICT so that it is able to prepare human resources capable to face up the global challenges. Thus, integrating the use of ICT in learning is needed to improve the education quality in Indonesia. The results dealt with the effect of ICT usage in communicating and developing themselves as professional competencies to support the teacher professionalism, in which it was supported with Dalrohman's (2016) study, who found that the average for indicators of utilizing ICT in communicating and developing themselves classified as very low sequentially

that was 18.9% and 17.5%. It indicated that the development of teacher professional competence through the school institutions in utilizing ICT for communication and self-development still needs special attention such as being involved in *MGMP* activities, workshops or training.

It was in accordance with the research of Budiana et al. (2015) that the problem arose along with the use of ICT in the world of education is the mastery of ICT by the teachers. As we know, the teachers became the main stakeholder in the learning. Another opinion stated by Copriady (2015) that the ICT utilization was determined by the extent to which users knew the ICT function and the ability to use it. The use of technology can affect the form of teaching and learning activities. The use of ICT as a tool can assist the task of teachers, so the teaching and learning process run well. Therefore, the mastery of ICT is a must for the teachers to improve their professionalism. This study only discussed three factors that influenced the use of ICT to support the teacher professionalism, namely pedagogical and professional competencies. There are still many other factors in the use of ICT that affect the teacher professionalism. Those are the use of ICT, the teacher attitude of ICT, the ease of ICT, ICT knowledge, ICT skills, applications of ICT in Education, and etc. These limitations are suggested for further researchers to conduct research using these other factors so that the use of ICT to support the teacher professionalism can be optimally studied and optimally beneficial. Because of the limitations of this study, it is possible for other researchers to uncover and discuss additional factors that are not explained and discussed in this study.

#### **Disclosure statement**

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