Professional teachers: Study of ICT capabilities and research competencies in urban and rural?

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Abstract
This study aims to examine ICT competencies, research competencies, and teacher professionalism. The research method used is a mixed method. This study was conducted on urban and rural residents. The instruments used are teacher competency questionnaires, research competency questionnaires, questionnaires that measure teacher professionalism and interview instruments. Based on the results of data analysis, it is known that there is a relationship between teacher professionalism, ICT competence and research competence. This finding is that there is a relationship between ICT competence and research competence simultaneously on teacher professionalism.

Keywords: Professional Teacher, ICT, Research Competencies, Urban, Rural

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1. Introduction

1.1 Conceptual and Theoretical Framework

Education is an important aspect in the era of globalization which continues to develop according to the times. Education is currently called the era of education 4.0 which can encourage increased education in areas of interest as well as, learning media that are aligned with technology (Bonfield et al. 2020; Feldman 2018). This is followed by the industrial revolution 4.0 that uses artificial intelligence, robotics, the internet, energy storage, materials science and quantum computing (Anaelka 2018; Diwan 2017). In education 4.0 in their daily lives, humans and technology are aligned to create the latest innovations (Anaelka 2018). The existence of the linkage of technology in education shows that technology has an important role in education.

Education has an important relationship with technology. The rapid changes in education in the field of information and communication technology development have become the forerunner to the emergence of various interactive learning innovations (Billman et al., 2018; Nofaizzi et al., 2020). Advances in technology provide many advantages in accessing various information and being connected without limits, without being limited by space and time (Dabbagh, 2002; Du, X. et al., 2019; Farida et al., 2019; Chaeruman, 2020). To support interesting learning, teachers are required to adapt to the internet and future technology as a tool for delivering material (Ally, 2019; Nurdyansyah and Riananda, 2016). Teachers use technology to find solutions to meet the tools and skills they need in learning (Kola, 2017; Niiranen, 2021). Therefore, teachers are required to master ICT.

Information and Communication Technologies (ICT) is a terminology foundation for processing and conveying digital-based information which is very important to be applied in an education. Since the 1990s education and research has been directed towards the integration of ICT as a supporting tool in learning (van der Westhuizen, 2005; Jimoyiannis & Komis, 2007). For example, ICT in competency education for teachers described by national standards from KLH is an important contextual information and primary need as a good learning support tool (Brakels et al., 2002; Muhammad et al., 2011; Lim et al., 2015). Because we live in a digital era, information and communication technology (ICT) penetrates more and more areas of life with an established technology infrastructure is useful for teachers in learning activities (Shah et al., 2020; Fraillon et al., 2019; Becker, 2021). However, in reality, not all teachers can apply ICT in learning. The causes of this delay include technical factors such as lack of technology and software in schools and limited skills of teachers regarding the use of ICT to other factors such as teacher knowledge about how to integrate ICT into teaching (Hsu & Sharma, 2008; Jedeskog, 2005; Nivala, 2009; Player-Koro, 2012). Therefore, the use of ICT is important to support the implementation of good learning which is a teacher competency that must be mastered.

As an educator, you need a skill to do work more effectively, which is called teacher competence. Teacher competence is a factor in determining the quality of education (Aishath and Omar 2021; Austin, Rickard, and Reilly 2017). Of course, this will have a positive influence on the development of students in understanding the subject matter and can make students think, behave and be creative when teachers can achieve their competencies (Herlina, Ahmad, and Wahidy 2020; Ruslan, Lian, and Fitria 2020). However, it will also have a negative value when the teacher does not have the knowledge or research competence (Udompong, Traiwichitkhun, and Wongwanich 2014). The learning environment will be more effective for students at school if the teacher has confidence (Devine, Fahie, and McGillicuddy 2013). Good learning ability by linking Research competence and ICT
ability can encourage professionalism by having teaching competence, collaborating and facilitating practice.

The dynamic and complex process of carrying out a role within the limits of the ability and value of educators is the professionalism of teachers (Sardabi, Biria, and Golestan 2018). Quality of students and the effectiveness of teachers will have an impact on the educational experience of students (Ismail et al. 2018; Zugelder et al. 2018). The process of learning activities, expert presenters of knowledge and skills that consider instructional objectives, student characteristics, class conditions, and methodological aspects are carried out with the professionalism of educators (de Paor 2019; Renani, Afghari, and Hadian 2019). It is systematically sustainable with the impact of student growth by ensuring every policy (Munyengabe et al. 2017; Yaakob et al. 2020; Zugelder et al. 2018). The professionalism teacher can be seen from the teacher's competence in carrying out learning activities by linking ICT competence and the ability of Research teachers.

1.2 Related Research

There is research that is relevant to the research to be carried out by the researcher. Among them is the research conducted by Willegems et al., (2016) on the role of teacher educators in developing teacher collaborative research teams. Similar research was also conducted by Alvunger & Wahlström (2018), the research includes research on teacher education based on the potential of teacher education in Sweden. Ibieta et al., (2017), conducted another study on the ability of teachers to learn the Internet in the practice of the teaching profession. Furthermore, research Mukhamadovna et al (2020) examines the urgency of forming the professionalism of primary school teachers for the future. And research Suhartini et al., (2021) examines the effect of professional competence and teacher competence in improving the quality of education in Langsa City.

Other research has also been linked by Unwin (2007), with the focus of research on Teacher Professionalism related to the ICT ability of teachers in universities, the findings state that teacher skills in ICT are needed in the implementation of teacher professionalism to support a good education system. Research Amirova et al., (2020), examines creative competencies and research competencies as professional factors for prospective teachers in the perspective of learning technology. Of these several studies, many examine ICT competencies, research competencies and professionalism. However, no one has discussed the three in one study, so the novelty of this study is to analyze teacher research abilities related to ICT skills and teacher professionalism in learning and how the three competencies differ when viewed from rural and urban schools.

1.3 Aims and research questions of the study

From the description above, several objectives of this study emerged, namely to determine the influence and differences between ICT competence, teacher research competence, and teacher professionalism in urban and rural areas. The questions posed in this study are as follows.

Is there an influence between ICT competence, teacher research competence, and teacher professionalism?

Is there a difference between ICT competence, teacher research competence, and teacher professionalism in rural schools and urban schools?
2. Method and Material

2.1. Research design

The method in this research is a mix-method using explanatory sequential which combines quantitative and qualitative research where in the first stage the research is carried out using quantitative methods and in the second stage is carried out using qualitative methods (Groleau et al., 2007; Kamid et al., 2021; Putri et al., 2021; McCrudden & McTigue, 2019; Maryani, Astalini, and Kurniawan 2022). In this study, it will be more focused on the results of quantitative data analysis, while qualitative data as supporting data in this study. Quantitative methods were used to obtain data on teacher research competencies, teachers’ ICT abilities and teacher professionalism for teachers in rural and urban areas through the provision of questionnaires.

2.2. Participants

The population in this study were all elementary school teachers in urban and rural areas of Jambi City and Batanghari Regency. The sample in this study were elementary school teachers in urban areas who were elementary school teachers in the city of Jambi totaling 120 people, while the sample of elementary school teachers in rural areas was teachers in Batanghari amounting to 120 people who were taken using purposive sampling technique. In addition, the informants in this study were 6 informants consisting of 3 elementary school teachers in urban areas and 3 elementary school teachers in rural areas. Purposive sampling technique is a sampling technique based on the criteria and considerations of the researcher (Fitriani, Putri, et al., 2021; Setiya Rini et al., 2022). The reason for using the purposive sampling technique is that this technique is appropriate because the sample selection in this study is based on several criteria from the researcher.

2.3. Data collection tools

The instruments used a teacher competency questionnaire, a teacher ICT ability questionnaire and a questionnaire that measured teacher professionalism and was strengthened by interviews. The teacher professionalism questionnaire instrument consists of 23 statements with 4 Likert scales including never, sometimes, often and always. The teacher professionalism questionnaire instrument was valid at 0.807 and reliable with a reliability value of Cronbach’s Alpha 0.811. The grid of teacher professionalism questionnaires is shown in the table below.

| Indicator | teacher professionalism questionnaires |
|-----------|----------------------------------------|
| The ability to master the material | 1,2,3,4,5,6 |
| Research ability and preparation of scientific papers | 7,8,9,10,11 |
| Professional development skills | 12,13,14,15,16,17,18 |
| Understanding of insight and educational foundation | 19,20,21,22,23 |

The ICT questionnaire instrument consists of 26 statements with 4 Likert scales. The ICT questionnaire instrument was valid at 0.815 and reliable with a reliability value of Cronbach’s Alpha.
0.823. The grid of the ICT questionnaire in the form of computer technology, multimedia technology and telecommunications technology. The research questionnaire instrument consists of 26 statements with 4 Likert scales. The research questionnaire instrument was valid at 0.781 and reliable with a reliability value of Cronbach’s Alpha 0.793. Furthermore, the instrument of teacher research competence, teacher ICT capabilities and teacher professionalism were distributed to teachers in Jambi City and teacher in Batanghari. The interview instrument was used to support the results of quantitative research that had been obtained by asking 5 questions as shown in table 8.

2.4. Data collection process

The procedure of this research starts from the selection of the population and research sample, namely teachers in Jambi Province which consists of 2 regions, namely Jambi and Batanghari cities. The sampling technique was done by purposive sampling. Purposive sampling technique is used to identify phenomena that occur in the city of Jambi and Batanghari (Darmaji et al., 2022; Palinkas, 2014; Setiya Rini et al., 2022). After the sample is obtained, then the data is collected through quantitative data and qualitative data. This quantitative data was obtained from the instrument of teacher research competency, teacher ICT ability and teacher professionalism. After the data is collected, then proceed with collecting qualitative interviews. This interview is important to do to strengthen the quantitative results in order to get more accurate results in this study.

2.5. Data Analysis

The data quantitatively analyzed using descriptive statistical testing and hypothesis testing in the form of Two Way Anova and Multiple Correlation tests. Descriptive statistical tests in the form of frequency, percentage, mode, mean, minimum value and maximum value which is equipped with a narrative explanation (Fitriani et al. 2021; Setiya Rini et al. 2021; Simamora et al. 2020). Furthermore, before testing the hypothesis, the data must be tested for assumptions, which are normality test, homogeneity test and linearity test (Darmaji et al. 2022; Kholilah et al. 2020; Setiya Rini 2020; Yolvianysah et al. 2021). Meanwhile, to test the hypothesis, correlation test was used to see the relationship between variables in urban and rural areas. A Two Way ANOVA test was also carried out which was used to see the differences in the instrument of teacher competence Research, teacher ICT skills and teacher professionalism in the cities of Jambi and Batanghari (Matondang et al., 2021; Zhu et al., 2019; Masni, Ralmugiz, & RukMale, 2020). Acceptance of decision making to test the hypothesis if the significance value is below 0.05. Furthermore, qualitative data derived from interviews were analyzed using the Miles and Huberman method in the form of data reduction, data presentation and drawing conclusions (Miles and Huberman 1994; Setiya Rini, Darmaji, and Kurniawan 2022).

3. Result

Descriptive statistical results of teacher professionalism competence show in table 2.

| Table 2. The Result of descriptive statistical teacher professionalism |
| --- |
| Category | F | % | Mean | Mode | Min | Max |
| Very Not Good | 10 | 2% | | | | |
| Not Good | 30 | 35.7% | 70.5 | 62 | 65 | 76 |
| Good | 68 | 52.3% | 65 | 62 | 65 | 76 |
| Very Good | 12 | 4% | | | | |
| Very Not Good | 5 | 1.4% | | | | |
| Not Good | 10 | 3.6% | | | | |

Teacher in School Area

Rural

Urban
Good 88 87% 81 87 70 92
Very Good 17 8%

Table 2 shows that the professional competence of teachers living in rural areas is categorized as good with a percentage of 52.3% with an average of 70.5, then the second highest percentage is in the bad category of 35.7%. Furthermore, the professional competence of teachers living in urban areas is included in the good category with a percentage of 87% with an average of 81. The second highest percentage is categorized as very good at 8%. Then, descriptive statistical results of ICT Capabilities show in table 3.

Table 3. The Result of descriptive statistical teacher ICT Capabilities

| Category          | F  | %    | Mean | Mode | Min | Max |
|-------------------|----|------|------|------|-----|-----|
| Very Not Good     | 30 | 24%  |      |      |     |     |
| Not Good          | 35 | 25.6%|      |      |     |     |
| Good              | 50 | 49%  | 60.5 | 60   | 53  | 68  |
| Very Good         | 5  | 1.4% |      |      |     |     |
| Very Not Good     | 2  | 1%   |      |      |     |     |
| Not Good          | 11 | 4%   |      |      |     |     |
| Good              | 92 | 90.2%| 85   | 88   | 74  | 96  |
| Very Good         | 15 | 4.8% |      |      |     |     |

Table 3 shows that the ICT Capabilities of teacher living in rural areas is categorized as good with a percentage of 49% with an average of 60.5, then the second highest percentage is in the bad category of 25.6%. Furthermore, the ICT Capabilities of teacher living in urban areas is included in the good category with an average of 85. The second highest percentage is categorized as very good at 4.8%. Then, descriptive statistical results of research competencies teachers show in table 4.

Table 4. The Result of descriptive statistical research competencies teachers

| Category          | F  | %    | Mean | Mode | Min | Max |
|-------------------|----|------|------|------|-----|-----|
| Very Not Good     | 20 | 15%  |      |      |     |     |
| Not Good          | 32 | 23%  |      |      |     |     |
| Good              | 58 | 59%  | 72   | 62   | 62  | 82  |
| Very Good         | 10 | 3%   |      |      |     |     |
| Very Not Good     | 4  | 2.5% |      |      |     |     |
| Not Good          | 15 | 6%   |      |      |     |     |
| Good              | 89 | 87%  | 82   | 84   | 70  | 94  |
| Very Good         | 12 | 4.5% |      |      |     |     |
Table 4 shows that the research competencies teachers living in rural areas is categorized as good with a percentage of 59% with an average of 72, then the second highest percentage is in the bad category of 23%. Furthermore, the research competencies teachers living in urban areas is included in the good category with an average of 82. The second highest percentage is categorized as not good at 6%.

Before testing the hypothesis, namely the ANOVA test and the correlation test, it is necessary to test the assumptions in normally, linearity, and homogeneous test. The data in the study have been confirmed to meet the assumption requirements so that the researchers continue to test the hypothesis, namely the Two Way ANOVA test. The differences in teacher competencies in Jambi City and Batanghari Regency are as follows.

Table 5. The Result of Two Way ANOVA Urban and Rural School

| Source        | Mean Square | F     | Sig.  |
|---------------|-------------|-------|-------|
| Corrected Model | 57,729      | 1,820 | 0.015 |
| Intercept     | 367023,495  | 11571,944 | 0.000 |
| Research      | 63,024      | 1,987 | 0.023 |
| Ict           | 82,846      | 2,612 | 0.047 |
| Research*Ict  | 48,485      | 1,529 | 0.023 |

A. R Squared = 0.952 (Adjusted R Squared = 0.429)

| Source        | Mean Square | F     | Sig.  |
|---------------|-------------|-------|-------|
| Corrected Model | 42,315      | 3.017 | 0.41  |
| Intercept     | 495566,241  | 35337,491 | 0.00  |
| Research      | 32,312      | 2,304 | 0.049 |
| Ict           | 66.855      | 4,767 | 0.035 |
| Research*Ict  | 50.824      | 0.502 | 0.027 |

A. R Squared = 0.897 (Adjusted R Squared = 0.753)

Based on table 5, it explains the differences in ICT competencies, research competencies, and professionalism in urban and rural areas. When viewed in urban areas, the research significance is 0.023, meaning 0.023 < 0.05, so it can be concluded that there are differences in teacher professionalism based on teacher research competencies. Furthermore, the ICT significance value was 0.047, meaning 0.047 < 0.05, so it was concluded that there were differences in teacher professionalism based on teacher ICT competencies. Furthermore, a significance value of 0.023 was obtained, meaning 0.023 < 0.05, so it was concluded that there was an interaction between research competence and ICT competence in determining teacher professionalism. When viewed in rural areas, the significance of the research is 0.049. 0.049 < 0.05, so it can be concluded that there are differences in teacher professionalism based on teacher research competencies. Then obtained ICT significance of 0.035, which means 0.035 < 0. 05 so it can be concluded that there are differences in teacher professionalism based on teacher ICT competencies. Then, obtained a p-value of 0.027, which means 0.027 < 0.05 so it can be concluded that there is an interaction between teacher research and teacher ICT competence in determining teacher professionalism.

After conducting the Two Way Anova test, the researcher continued to conduct multiple correlation tests on urban school data to find out whether there was a relationship between the
variables of ICT competence, teacher research competence and teacher professionalism. The test results are obtained.

**Table 6. The Result of Multiple Correlation Competency Teacher in Urban School**

| Model | R | R Square | Adjusted R Square | Std. Error of the estimate | Change Statistics | F Change | df1 | df2 | Sig. F Change |
|-------|---|----------|------------------|---------------------------|------------------|----------|-----|-----|-------------|
|       |   | 0.995    | 0.991            | 0.991                     | 0.714            | 0.991    | 6427,640 | 2   | 117         | 0.000        |
| a. (Constant), professionalism, research |

Table 6 shows the results of the dual correlation of teacher competencies in urban schools where when viewed from the simultaneous contribution of the ICT competence variable and research competence to teacher professionalism, it is $0.991 \times 100\% = 99.1\%$ and the remaining $100\% - 99.1\% = 0.9\%$ influenced by other variables outside the variables tested.

Next, the researcher continued to examine the multiple correlations regarding ICT competence, research competence and professional teachers in rural schools. The result is as follows.

**Table 7. The Result of Multiple Correlation Teacher in Rural School**

| Model | R | R Square | Adjusted R Square | Std. Error of the estimate | Change Statistics | F Change | df1 | df2 | Sig. F Change |
|-------|---|----------|------------------|---------------------------|------------------|----------|-----|-----|-------------|
|       |   | 0.985    | 0.970            | 0.970                     | 1.326            | 0.970    | 1897,188 | 2   | 117         | 0.000        |
| a. (Constant), professionalism, research |

Table 7 shows the results of the double correlation of teacher competencies in urban schools where when viewed from the R square value obtained a value of 0.970, which means that there is a relationship between ICT competence and research competence simultaneously on teacher professionalism. To examine more deeply the interviews were conducted, as for the results of the interviews as follows:

**Table 8. Interview result**

| Question | Answer |
|----------|--------|
| **Urban** | **Rural** |
| “In your view, what is the general picture of the performance of educators and education staff at this school? So far, has the role of educators and education staff in supporting educational activities in schools been fulfilled?” | 80% has been fulfilled, from the level of education that is in accordance with the profession, then the available infrastructure, as well as learning activities that are going well indicate that the school supports educational activities during the teaching and learning activities. The performance of educators and education staff has carried out a fairly good performance. During the learning process, the teacher has carried out | Not yet fully, such as in infrastructure that requires a good signal or computer network or the ability to use electronics is still difficult to do. However, for learning activities such as direct learning activities with nature or learning activities that should have been carried out well. But there are some constraints such as time and infrastructure that support activities to export materials more widely |
| Question                                                                 | Answer                                                                 |
|------------------------------------------------------------------------|------------------------------------------------------------------------|
| Have you ever done learning by using a variety of learning media? If so, what kind of learning media are there? | Yes, as long as I teach. I always do learning media. Both print and electronic media. Usually by using an image attached to a cardboard or blackboard, then using a book, and sometimes I also use Infocus to show power-points, videos or other learning resources. |
| Have you ever reflected on the learning that has been carried out in the form of a questionnaire or questionnaire to students? If not why? If so, what are the results of the questionnaire used for? | There are some teachers who have done reflection and some have never done reflection using questionnaires or questionnaires. Some teachers who do not carry out reflection with a questionnaire/questionnaire because they usually reflect on learning to students based on their learning outcomes after evaluation. For teachers who have done reflection using questionnaires and interviews, the data is used to make an evaluation or make an article. |
| So far, have you carried out research activities on students or research that covers the teaching environment? | Most of the teachers have conducted research on students related to school-related research on students, where this research helps the learning process to be more interesting and increase students' enthusiasm for learning. |
| In your opinion, is there a relationship between learning activities using teachers' ICT competence, teacher research abilities and teacher professionalism? | Yes, teacher competence can support teacher professionalism. With the competence that exists in the teacher, the professional level of the teacher becomes good. This is also closely related to the implementation of learning activities that can make students develop as well. |

Yes, every material I teach to children must use learning media. These learning media are of various kinds, either just pictures that are pasted in front of the class using a blackboard or poster, or directly exploring from nature. Sometimes I also teach with electronic teaching materials such as power points or videos.

Never, teachers do reflection on student learning outcomes. And see whether during the learning takes place students can listen well or not. Meanwhile, to see the responses from students, I usually just use a short interview.

Actually, this research activity is diverse, yes, research can be done through observation in class during learning or not. Of course, research activities have been carried out by each teacher indirectly. Some teachers have done it but only about one or two times, while in the near future no research activities have been carried out.

Yes, professional teachers certainly have broad ICT knowledge competencies and also have extensive research capabilities. Of course, all teacher competencies are also related to the implementation of learning activities. However, it does not mean that teachers who are old-fashioned to technology are not.
4. Discussion

The focus of this research is to examine more deeply the differences in the competencies of teachers which include ICT competence, Research competence, and professionalism. Then, the researcher saw whether there was a relationship between the three variables. This research is supported Suhartini et al., (2021) shows that professionalism and competence have a positive effect on the quality of education. Further research Amirova et al., (2020), examines creative competencies and research competencies as professional factors of teacher candidates based on the perspective of learning technology. This shows that research on teacher competence is very important to study.

In the first step, researchers conducted descriptive statistical tests on teacher professionalism competence, teacher ICT skills and teacher research competence, both in rural and urban schools. Table 2 shows that the professional competence of teachers living in urban areas is better than rural areas is categorized as good with a percentage of 87% with an average of 81. Then, descriptive statistical results of ICT Capabilities in table 3 shows that the ICT Capabilities of teacher living in rural areas and urban areas is categorized as good with a percentage of 49% in rural areas and 90.2% in urban areas. Next, descriptive statistical results of research competencies of teachers shows that the research competencies of teachers living in rural areas are lower than research competencies of teachers living in urban areas but categorized as good with a percentage of 59%

The data in this study have been confirmed to be normal and homogeneous. So the researcher continued to do the ANOVA test between the three variables. Based on table 5, it explains the differences in ICT competencies, research competencies, and professionalism in urban and rural areas. When viewed in urban areas, it can be concluded that there are differences in teacher professionalism based on teacher research competencies. Furthermore, the ICT significance value is 0.047, it means that there are differences in teacher professionalism based on the teacher's ICT competence. Furthermore, the obtained significance value of 0.023 means that there is an interaction of research competence with ICT competence in determining teacher professionalism. When viewed in rural areas, The research significance obtained is 0.049, which means that there are differences in teacher professionalism based on teacher research competencies. Then obtained an ICT significance of 0.035, which means 0.035 there is a difference in teacher professionalism based on the teacher's ICT competence. Then obtained a p-value of 0.027, meaning that there is an interaction of teacher research competence with ICT competence of teachers in determining teacher professionalism.

After the researcher conducted the ANOVA test, the next researcher conducted a multiple correlation test to see if there was a relationship between the three teacher competency variables. Based on Table 6 shows the results of the multiple correlation of teacher competencies in urban schools where when viewed the R value obtained is 0.995, which means that there is a relationship between ICT competence and research competence simultaneously on teacher professionalism with a correlation coefficient of 0.991. While the simultaneous contribution of the ICT competence variable and research competence to teacher professionalism is 0.991 x 100% = 99.1% and the remaining 100% - 99.1% = 0.9% is influenced by other variables outside of the variables that are tested. Multiple correlation testing was also carried out in rural schools where table 7 shows the results of the double correlation of teacher competencies in urban schools where the R square obtained is 0.970, which
means that there is a simultaneous contribution of ICT competence and research competence on teacher professionalism with a coefficient of determination of 0.970 x 100% = 97%.

The results of the interviews concluded that not all teachers have the same research abilities and ICT competencies, as well as the professionalism of teachers. However, in an interview with one of the teachers mentioned that “Teacher competence certainly has a close relationship with teacher professionalism in learning activities. However, it does not mean that teachers who are conservative on technology are not professional in generating learning activities that are able to make students understand the subject. Another opinion states that "professional teachers certainly have broad ICT knowledge competencies and also have extensive research capabilities. Of course, all teacher competencies are useful in learning activities. From the results of interviews with 6 samples consisting of 3 samples in rural areas and 3 samples in urban areas, it was stated that the ICT competence of teachers and the insight of teachers' research abilities had an effect on teacher professionalism.

Based on quantitative and qualitative research, it shows that teacher competence is the spearhead of students' understanding and implementation of teaching in schools. The main objective of the IT School initiative is to provide services and training to enable teachers to use ICT in teaching (Kristiawan 2019). Utilization of ICT is very important in supporting learning. In addition, teachers need to have research competence because lack of research competence can be the cause of the current decline in the authority of teachers (Ghavifekr and Rosdy 2015). Research competence is a very important aspect to develop the quality of teaching and learning. In addition, various competencies possessed by teachers can increase teacher professionalism and have a significant impact on student growth (Astutik and Roesminingsih 2021; Pahrudin, Martono, and Murtini 2016).

Research by Alvunger & Wahlström (2018), this study discusses the potential of teacher education in Sweden. Ibieta et al., (2017), conducted another study that touched on the ability of teachers to learn the Internet by teachers inside and outside the classroom. Furthermore, research by Mukhamadovna et al (2020) examines the urgency of forming teacher professionalism for the future. Research by Suhartini et al., (2021) examines the effect of professional competence and teacher competence. Research by Amirova et al., (2020), examines creative competence and research competence as teacher professional factors.

Of these several studies, many examine ICT competencies, research competencies and professionalism. However, no one has discussed the three in one study, so the novelty of this study is to analyze relationship teacher research abilities related to ICT skills and teacher professionalism in learning and how the three competencies differ when viewed from rural and urban schools.

5. Conclusion

The results of hypothesis testing show that there is a relationship between research competencies, ICT skills and teacher professionalism with a coefficient of determination of 99.1% in urban areas and 97% in rural areas. Furthermore, there are differences in ICT competencies, research competencies and teacher professionalism in urban and rural schools. These results are supported by the results of interviews with several teachers, namely teacher research competencies, ICT abilities and professionalism of each teacher which is certainly different, so that professional teachers certainly have good and broad ICT knowledge and research competencies.

6. Recommendation

This research is limited to a sample of low-grade elementary schools, so suggestions for further research are to research with the same topic, namely teacher research competencies, ICT skills
and teacher professionalism competencies at various levels of education. In addition, the researcher also recommends that future researchers examine innovations that can improve research competence, ICT capabilities and teacher professionalism in encouraging the teaching process in the classroom.

References
Aishath, Zuha, and Intan Marfarrina Omar. 2021. “Correlation between Lecturers’ Professional Development Activities and Their Competencies in Maldives Higher Education Institutes.” International Journal of Learning, Teaching and Educational Research 20(9):18–37.

Ally, Mohamed. 2019. “Competency Profile of the Digital and Online Teacher in Future Education.” International Review of Research in Open and Distributed Learning 20(2).

Alvunger, Daniel, and Ninni Wahlström. 2018. “Research-Based Teacher Education? Exploring the Meaning Potentials of Swedish Teacher Education.” Teachers and Teaching: Theory and Practice 24(4):332–49. doi: 10.1080/13540602.2017.1403315.

Amirova, Amina, Jeksembekova Menslu Iskakovna, Taubayeva Galiya Zakaryanovna, Zhundibayeva Turarkhan Nurmakhanovna, and Uaidullakyzy Elmira. 2020. “Creative and Research Competence as a Factor of Professional Training of Future Teachers: Perspective of Learning Technology.” World Journal on Educational Technology: Current Issues 12(4):278–89.

Anaelka, A. H. 2018. “Education 4.0 Made Simple: Ideas For Teaching.” International Journal of Education and Literacy Studies 6(3):92.

Astutik, Kurnia Fuji, and Erny Roesminingsih. 2021. “The Improvement of Teachers’ Professional Competency Through Hots-Based Training.” JPI (Jurnal Pendidikan Indonesia) 10(1):145. doi: 10.23887/jpi-undiksha.v10i1.22407.

Austin, Roger, Angela Rickard, and Jacqueline Reilly. 2017. “Face-to-Face Contact in Blended Learning for Intercultural Education: The Role of Teachers.” Irish Educational Studies 36(3):323–40. doi: 10.1080/03323315.2017.1327364.

Becker, Birgit. 2021. “Educational ICT Use Outside School in the European Union: Disparities by Social Origin, Immigrant Background, and Gender.” Journal of Children and Media 00(00):1–20. doi: 10.1080/17482798.2021.1902359.

Billman, Anneli, Ansie Harding, and Johann Engelbrecht. 2018. “Does the Chalkboard Still Hold Its Own against Modern Technology in Teaching Mathematics? A Case Study.” International Journal of Mathematical Education in Science and Technology 49(6):809–23. doi: 10.1080/0020739X.2018.1431852.

Bonfield, Christopher Alan, Marie Salter, Alan Longmuir, Matthew Benson, and Chie Adachi. 2020. “Transformation or Evolution?: Education 4.0, Teaching and Learning in the Digital Age.” Higher Education Pedagogies 5(1):223–46. doi: 10.1080/23752696.2020.1816847.

Brakels, Jenny, Els van Daalen, Wim Dik, Sofia Dopper, Fred Lohman, Andre van Peppen, Simon Peerdeman, Dirk Jan Peet, Ellen Sjoer, Willem van Valkenburg, and Maarten van de Ven. 2002. “Implementing ICT in Education Faculty-Wide.” European Journal of Engineering Education 27(1):63–76. doi: 10.1080/03043790110100191.

Chaeruman, Uwes Anis. 2020. “RUANG BELAJAR BARU DAN IMPLIKASI TERHADAP PEMBELAJARAN DI ERA TATANAN BARU.” Jurnal Teknologi Pendidikan 08(01):142–53.

Dabbagh. 2002. “The Evaluation of Authoring Tools and Hypermedia Learning System: Current and Future
Implications.” *Educational Technology* 42(4):1–14.

Darmaji, Darmaji, Dwi Agus Kurniawan, Astalini Astalini, and Endah Febi Setiya Rini. 2022. “Science Processing Skill and Critical Thinking: Reviewed Based on the Gender.” *Jurnal Pendidikan Indonesia* 11(1). doi: http://dx.doi.org/10.23887/jpi-undiksha.v11i1.35116.

Devine, Dymnna, Declan Fahie, and Deirdre McGillicuddy. 2013. “What Is ‘good’ Teaching? Teacher Beliefs and Practices about Their Teaching.” *Irish Educational Studies* 32(1):83–108. doi: 10.1080/03323315.2013.773228.

Diwan, P. 2017. “Is Education 4.0 an Imperative for Success of 4th Industrial Revolution?”

Du, X., Zhang, B. E. M., Shelton, and J. L. Hung. 2019. “Learning Anytime, Anywhere: A Spatio-Temporal Analysis for Online Learning.” *Interactive Learning Environments* 1(2):1–15.

Farida, Ratna, Amru Alba, Rudi Kurniawan, and Zamzami Zainuddin. 2019. “Pengembangan Model Pembelajaran Flipped Classroom Dengan Taksonomi Bloom Pada Mata Kuliah Sistem Politik Indonesia.” *Kwangsan: Jurnal Teknologi Pendidikan* 7(2):104. doi: 10.31800/jtp.kw.v7n2.p104–122.

Feldman, P. 2018. “The Potential of Education 4.0 Is Huge – The UK Must Take the Lead.” *JISC*.

Fitriani, Riska, Kholilah, Endah Febi Setiya Rini, A. Pratiwi, Maharani Rizky Ramadhanti, Hikmah Syiarah, and Haini Safitri. 2021. “Analisis Karakter Kerja Keras Siswa Kelas X IPADi SMAN 1 Kota Jambi.” *PENDIPA Journal of Science Education* 5(2):188–94.

Fraillon, J., J. Ainley, W. Schulz, T. Friedman, and D. Duckworth. 2019. “Preparing for Life in a Digital World.” in *IEA International Computer and Information Literacy Study 2018 International Report*. Amsterdam: EIa.

Ghavifekr, Simin, and Wan Athirah Wan Rosdy. 2015. “Teaching and Learning with Technology: Effectiveness of ICT Integration in Schools.” *International Journal of Research in Education and Science* 1(2):175–91. doi: 10.21890/ijres.23596.

Groleau, Danielle, Pierre Pluye, and Lucie Nadeau. 2007. “A Mix-Method Approach to the Cultural Understanding of Distress and the Non-Use of Mental Health Services.” *Journal of Mental Health* 16(6):731–41. doi: 10.1080/09638230701496386.

Herlina, T., S. Ahmad, and A. Wahidy. 2020. “Kemampuan Kepala Sekolah Dalam Membina Hubungan Dengan Guru Untuk Meningkatkan Mutu Pendidikan.” *Journal of Education Research* 1(3):301–7.

Hsu, P., and P. Sharma. 2008. “A Case Study of Enabling Factors in the Technology Integration Process.” *Educational Technology & Society* 11(4):213–228.

Ibieta, Andrea, J. Enrique Hinostroza, Christian Labbé, and Magdalena Claro. 2017. “The Role of the Internet in Teachers’ Professional Practice: Activities and Factors Associated with Teacher Use of ICT inside and Outside the Classroom.” *Technology, Pedagogy and Education* 26(4):425–38. doi: 10.1080/1475939X.2017.1296489.

Ismail, Siti Noor, Yahya Don, Fauzi Husin, and Rozalina Khalid. 2018. “Instructional Leadership and Teachers’ Functional Competency across the 21st Century Learning.” *International Journal of Instruction* 11(3):135–52.

Jedeskog, G. 2005. *Changing School Implementation of ICT in Swedish School, Campaigns and Experiences 1984–2004*. Sweden: aculty of Educational Science Uppsala Universitet.

Jimoyiannis, Athanassios, and Vassilis Komis. 2007. “Examining Teachers’ Beliefs about ICT in Education: Implications of a Teacher Preparation Programme.” *Teacher Development* 11(2):149–73. doi: 10.1080/13664530701414779.

Kamid, Rohati, Dwi Agus Kurniawan, Rahmat Perdana, Diki Chen, and Mashelin Wulandari. 2021. “Impact of the
Integration of Ethno-Mathematics with TPACK Framework as a Problem-Based Learning (PBL) Model.”
*Eurasian Journal of Educational Research* 96:217–39. doi: 10.14689/ejer.2021.96.14.

Kholilah, Auliya Ramadhanti, Risia Fitriani, Endah Febri, and Maharani Riski Pratiwi. 2020. “Hubungan Kerja Keras Dan Hasil Belajar Fisika Di Sma Negeri 1 Kota Jambi.” *Journal of Science Education And Practice* 4:41–48.

Kola, Malose Isaac. 2017. “Technology Teacher Trainees’ Lesson Planning Approach in South Africa: Room for Improvement.” *African Journal of Research in Mathematics, Science and Technology Education* 21(3):293–303. doi: 10.1080/18117295.2017.1379215.

Kristiawan, Muhammad. 2019. *Analisis Pengembangan Kurikulum Dan Pembelajaran*. Bengkulu: Universitas Bengkulu.

Lim, Cher Ping, Hanbing Yan, and Xibei Xiong. 2015. “Development of Pre-Service Teachers’ Information and Communication Technology (ICT) in Education Competencies in a Mainland Chinese University.” *Educational Media International* 52(1):15–32. doi: 10.1080/09523987.2015.1005425.

Maryani, Shella, Astalini2, and Dwi Agus Kurniawan. 2022. “Analysis of Student Needs for Development of Innovative Learning Media E-Module on Linear Equations Mathematical Physics.” *Attractive : Innovative Education Journal* 4(1):165–72.

Masni, Eva Dwika, Uke Ralmugiz, and Nia Kurniaty Rukman. 2020. “Peningkatan Kemampuan Penalaran Dan Komunikasi Statistik Mahasiswa Melalui Pembelajaran Statistik Inferensial Berbasis Proyek Dengan Meninjau Gaya Kognitif Mahasiswa.” *Pedagogy* 5(2):12–26.

Matondang, Maria Marisa, Endah Febri Setiya Rini, Novita Dwi Putri, and Fauziah Yolvinysah. 2021. “Uji Perbandingan Motivasi Belajar Siswa Kelas XI MIPA 2 Dan XII MIPA 2 Di SMA Negeri 1 Muaro Jambi.” *Jurnal Sains Dan Pendidikan Fisika* 16(03):218–27.

McCrudden, Matthew T., and Erin M. McTigue. 2019. “Implementing Integration in an Explanatory Sequential Mixed Methods Study of Belief Bias About Climate Change With High School Students.” *Journal of Mixed Methods Research* 13(3):381–400. doi: 10.1177/1558689818762576.

Miles, Matthew B., and A. Michael Huberman. 1994. *Qualitatif Data Analysis*. SAGE Publications.

Muhammad, H., Yusuf Rahim, Jurusan Pendidikan, Agama Islam, Fakultas Tarbiyah, Keguruan Uin, Alauddin Makassar, Alamat : Btn, and Agraria Makassar. 2011. “Pemanfaatan Ict Sebagai Media Pembelajaran Dan Informasi Pada Uin Alauddin Makassar.” *SULESANA* 6(3):127–35.

Mukhamadovna, Tilavova Matlab, Husenova Aziza Sharipovna, and Hakimova Nargiza Supkhonovna. 2020. “The System Of Development Of Professional Competence In Future Primary School Teacher.” *Journal of Critical Reviews* 7(19).

Munyengabe, Sylvestre, Zhao Yiyi, He Haiyan, and Sabin Hitimana. 2017. “Primary Teachers’ Perceptions on ICT Integration for Enhancing Teaching and Learning through the Implementation of One Laptop Per Child Program in Primary Schools of Rwanda.” *Eurasia Journal of Mathematics, Science & Technology Education* 13(11):1305–8215.

Niiranen, Sonja. 2021. “Supporting the Development of Students’ Technological Understanding in Craft and Technology Education via the Learning-by-Doing Approach.” *International Journal of Technology and Design Education* 31(1):81–93. doi: 10.1007/s10798-019-09546-0.

Nivala, M. 2009. “Simple Answers for Complex Problems: Education and ICT in Finnish Information Society Strategies.” *Media, Culture & Society* 31(3):433–448.

Nofaizzi, Mafrur Udhis, Saida Ulfa, and Dedi Kuswandri. 2020. “Pengembangan Pembelajaran Berbasis Web Dengan Menggunakan Teori Belajar Generatif.” *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*
Syahrial, S., Kuniawan, D. A., Asrial, A., Sabil, Husni, Maryani, S., & Rini, E. F. S. (2022). Professional teachers: Study of ICT capabilities and research competencies in urban and rural? Cypriot Journal of Educational Science. 17(7), 2247-2261. https://doi.org/10.18844/cjes.v17i7.7590

5(4):537–43.

Nurdyansyah, and Luly Riananda. 2016. “Developing ICT-Based Learning Model to Improve Learning Outcomes IPA of SD Fish Market in Sidoarjo.” Jurnal Takpen 1(2010).

Pahrudin, Trisno Martono, and Wiedy Murtini. 2016. “The Effect of Pedagogic Competency, Personality, Professional and Social Competency Teacher to Study Achievement of Economic Lesson in State Senior High School of East Lombok District Academic Year 2015/2016.” The 2nd International Conference on Teacher Training and Education Sebelas Maret University 2(1):332–45.

de Paor, Cathal. 2019. “Lesson Observation, Professional Conversation and Teacher Induction.” Irish Educational Studies 38(1):121–34. doi: 10.1080/03323315.2018.1521733.

Player-Koro, Catarina. 2012. “Factors Influencing Teachers’ Use of ICT in Education.” Education Inquiry 3(1):93–108. doi: 10.3402/edui.v3i1.22015.

Putri, Wita Ardina, Riska Fitrini, Endah Febri Setya Rini, Febri Tia Aldila, and Tri Ratnawati. 2021. “Pengaruh Motivasi Terhadap Hasil Belajar Siswa IPA DI SMAN 6 Muaro Jambi.” SAP (Susunan Artikel Pendidikan) 5(3).

Renani, Ghasemali Azadi, Akbar Afghari, and Bahram Hadian. 2019. “Effect of Awareness of Teacher Education Philosophy on EFL Teachers’ Professional Knowledge: A Postmethod Perspectivisation.” International Journal of Instruction 12(2):535–44.

Ruslan, B. Lian, and H. Fitria. 2020. “The Influence of Principal’s Situational Leadership and Teacher’s Professionalism on Teacher’s Performance.” International Journal of Progressive Sciences and Technologies (UPSAT) 20(1).

Sardabi, Narges, Reza Biria, and Ahmad Ameri Golestan. 2018. “Reshaping Teacher Professional Identity through Critical PedagogyInformed Teacher Education.” International Journal of Instruction 11(3):3617–34.

Setiya Rini, Endah Febri. 2020. “Pengaruh Kemandirian Terhadap Prestasi Belajar Siswa Kelas XI DI SMA Negeri 11 Kota Jambi.” Jurnal Pendidikan IPA 6(2):256–63.

Setiya Rini, Endah Febri, Darmaji Darmaji, and Dwi Agus Kurniawan. 2022. “Identifikasi Kegiatan Praktikum Dalam Meningkatkan Keterampilan Proses Sains Di SMPN Se-Kecamatan Bajubang.” Edukatif: Jurnal Ilmu Pendidikan 4(2):2476–81.

Setiya Rini, Endah Febri, Riska Fitriani, Wita Ardina Putri, Agnes Aktaipienti Br. Ginting, and Maria Marisa Matondang. 2021. “Analisis Kerja Keras Dalam Mata Pelajaran Fisika Di SMAN 1 Kota Jambi.” SAP (Susunan Artikel Pendidikan) 5(3):221–26. doi: 10.30998/sap.v5i3.7764.

Shah, Uzair, Shahadat Hossain Khan, and Michael Reynolds. 2020. “Insights into Variation in Teachers’ Pedagogical Relationship with ICT: A Phenomenographic Exploration in the Pakistani Higher Education Context.” Technology, Pedagogy and Education 00(00):1–15. doi: 10.1080/1475939X.2020.1810751.

Simamora, Nadia Natalia, Wita Ardina Putri, Muhammad Iqbal, Auliya Ramadhanti, and Endah Febri Setiya Rini. 2020. “Description of Student Discipline Attitudes at SMP Negeri 16 Jambi City.” Lensa: Jurnal Kependidikan Fisika 8(2):76. doi: 10.33394/j-lkf.v8i2.3175.

Suhartini, Suhartini, Sri Milfayetty, and Arif Rahman. 2021. “The Effect of Teacher Professionalism and Competency on the Quality of Education in the City of Langsa.” Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences 4(2):2271–76. doi: 10.33258/birci.v4i2.1921.

Udompong, Lertporn, Duangkamon Traiwichitkhun, and Suwimon Wongwanich. 2014. “Causal Model of Research Competency Via Scientific Literacy of Teacher and Student.” Procedia - Social and Behavioral Sciences 116(2001):1581–86. doi: 10.1016/j.sbspro.2014.01.438.

van der Westhuizen, Duan. 2005. “ICT in Education.” Education as Change 9(2):1–4. doi: 10.1080/16823200509487113.
Syahrial, S., Kuniawan, D. A., Asrial, A., Sabil, Husni, Maryani, S., & Rini, E. F. S. (2022). Professional teachers: Study of ICT capabilities and research competencies in urban and rural? Cypriot Journal of Educational Science. 17(7), 2247-2261. https://doi.org/10.18844/cies.v17i7.7590

Yaakob, Mohd Faiz Mohd, Yahya Don, Ibrahim Sufi, and Mat Rahimi Yusof. 2020. “Teachers’ Professional Development Level across Cohort of Generations in Malaysia.” International Journal of Instruction 13(4):436–56.

Yolvianysah, Fauziah, Suryanti, Endah Febri Setiya Rini, Sri Wahyuni, and Maria Marisa Matondang. 2021. “Hubungan Minat Belajar Siswa Terhadap Hasil Belajar Fisika Di SMAN 3 Muaro Jambi.” Tunjuk Ajar: Jurnal Penelitian Ilmu Pendidikan 4(1).

Zhu, Anqi, Avi Srivastava, Joseph G. Ibrahim, Rob Patro, and Michael I. Love. 2019. “Nonparametric Expression Analysis Using Inferential Replicate Counts.” Nucleic Acids Research 47(18):e105. doi: 10.1093/nar/gkz622.

Zugelder, Bryan S., H. Carol Greene, Louis L. Warren, and Mark L’Esperance. 2018. “Master’s Students’ Perceptions toward Teacher Leadership.” International Journal of Learning, Teaching and Educational Research 17(12):60–77. doi: 10.26803/ijlter.17.12.4.