Professionalism of teacher in geogebra software

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Abstract. Research on teacher professionalism in the learning process experiences exponential growth. One form of teacher professionalism is how teachers can use media that can make learning interesting. Geogebra is an application that can be used by teachers in learning on certain material. This research was a survey research that sees teacher interest in the use of geogebra software. Sixteen teachers from 10 junior high schools in one sub-district in one of city at Indonesia were chosen as research subjects. The training was held for five hours. When the teacher training was videotaped, observed, and interviewed. Obtained 84.76% percent of teachers gave good attention and 73.18 % give good participation to this training.

1. Introduction
Research on teacher professionalism in the learning process experiences exponential growth. Professionalism important to do because teacher who have professional in teaching will produce good student in learning [1-4]. Curriculum, media, and learning tools that are well prepared by the teacher are included in the form of teacher professionalism in teaching. This is supported by research which says that the curriculum developed by the teacher is very strongly correlated with the achievement of students in learning [5].

Considering the very close relationship between teacher professionalism and student achievement in learning, many researchers who conducted training to improve the professionalism of the teacher. Such researchers include Muir [6] conducted research by providing training involving three elementary school teachers on how to reflect the class in the context of solving problems with number topics. The training method conducted by Muir is named the Supportive Classroom Reflection Process (SCRP). Furthermore, Muir [7] has also seen reflections on three teachers, namely: Sue, Jim, and Ronald. The research conducted by Muir involved 2 (two) main phases. The first stage involves observing and videotaping three school teachers, and the second stage of the reflection process using the Supportive Classroom Reflections (SCR) research approach. The SCR concept is an approach that combines the process of professional learning with classroom practice designed to encourage teachers to interpret, reflect on and improve their abilities in teaching. Further research also tries to develop teacher professionalism in learning mathematics. This process is done by asking the teacher to practice learning that they have been doing then the researcher provides input in the form of improvements to the theory, practice, and policy for the teacher in learning [8-9]. The development of teacher professionalism in the content of mathematics material has also been carried out by several previous studies. The process that has been carried out is by developing the professionalism capacity of teachers in understanding the material on certain subjects [10 – 11].
In addition to teacher professionalism in the curriculum, teacher professionalism in the use of technology is also needed. This is necessary because science and technology is needed to help teachers in the learning process especially to face 4.0 era. This is supported by Charischak [12] state that two more knowledge domains are added to this mix: the ability to (a) use technology and (b) teach with technology effectively is important to develop teacher professionalism in teaching. In his research Charischak helps middle school teachers use computer software to improve their mathematics teaching and learning. Agyei [13] states that the use of ICT can support mathematics learning in schools, but the fact that mathematics teachers in high schools in Ghana have not yet integrated ICT in their learning. Based on interview data and cause surveys from teachers not integrating ICT in learning because there is still a lack of training on ICT, this has an impact on the lack of teacher knowledge about ICT [13]. Based on the results of online discussions and face to face with the mathematics teacher it was concluded that some had used multimedia in their learning [14]. Base on literature review ICT is important thing to development professionalism of teacher in learning so that this paper to examine the teacher interest about geogebra software. Geogebra is an ICT application program that is intended to help learning Mathematics in the fields of Geometry, Physics, Calculus, and Algebra. We can connect points, lines, segments, vectors with more dynamic shapes [15]. This research was a survey research that sees teacher interest in the use of geogebra software. Sixteen teachers from 10 junior high schools in one sub-district at Indonesia in one of city were chosen as research subjects. The training was held for five hours.

2. Methods
This research was survey method. Sixteen teachers from 10 junior high schools in one sub-district Indonesia city were chosen as research subjects. Initially the teacher was given training on geogebra by the researcher around four hours. After the training is complete, each teacher was given a sixteen questionnaires with indicators that measure the teacher's interest in the training provided. Participation and attention would be measured. In Table 1 would be presented the example of statement from questionnaire.

| No | The Example of Statement from Questionnaire |
|----|------------------------------------------|
| 1  | Training on using geogebra software is new to me |
| 2  | I am very interested in the geogebra application after the speaker person explained it |
| 3  | I only talk / chat when the speaker explains the material about the geogebra application |
| 4  | I often ask the speaker if I don't know a certain feature in geogebra software |
| 5  | I cannot follow the instructions of the module provided in this activity |
| 6  | I will use this application to help my students solve problems if needed |

Besides using questionnaires the results obtained were also triangulated with observation sheets and open questions to the teacher. Observation sheets consist of six observations that correlate with the statement on the questionnaire. Example of observation sheets would be seen in Table 2.

| No | Name of Teacher | a | b | c | d | e | f |
|----|----------------|---|---|---|---|---|---|
| 1  |                |   |   |   |   |   |   |
| 2  |                |   |   |   |   |   |   |

  a. The teacher does not speak / chat when the speaker explains the material (attention)
  b. The teacher asks the speaker if he does not know a certain feature in geogebra software (participation in training)
c. The teacher answers the question if the speaker occasionally gives questions during the training (participation in training)

d. The teacher can follow the instructions in the module if there is an independent assignment from the resource person (participation in training)

e. The teacher is not sleepy during the training

f. The teacher can create creative ideas outside the material presented by the resource person

The last triangulation is by looking at the teacher's videos that have been highlighted one by one during the training. Data analysis was done by simple percentage analysis both for questionnaire data and for observation data namely the total score divided by the maximum score multiplied by one hundred percent.

3. Results and Discussion

In this section, the results of the processing of the questionnaire and the observation sheet that have been triangulated with the video and the results of open interviews with the teacher will be presented. In Table 3 the percentage of each questionnaire and indicator was presented. The indicators used are attention and active participation.

Table 3. The percentage of each item questionnaire to total

| No | Statement in questionnaire | Indicator       | Percentage the total score divided by the maximum score |
|----|---------------------------|-----------------|------------------------------------------------------|
| 1  | Statement 1               | Attention       | 89.06%                                               |
| 2  | Statement 2               | Attention       | 81.25%                                               |
| 3  | Statement 3               | Attention       | 87.50%                                               |
| 4  | Statement 4               | Attention       | 87.50%                                               |
| 5  | Statement 5               | Attention       | 85.94%                                               |
| 6  | Statement 6               | participation.  | 70.31%                                               |
| 7  | Statement 7               | participation.  | 90.63%                                               |
| 8  | Statement 8               | Attention       | 89.06%                                               |
| 9  | Statement 9               | participation.  | 90.63%                                               |
| 10 | Statement 10              | participation.  | 89.06%                                               |
| 11 | Statement 11              | participation.  | 84.38%                                               |
| 12 | Statement 12              | Participation   | 76.56%                                               |
| 13 | Statement 13              | Attention       | 79.69%                                               |
| 14 | Statement 14              | Attention       | 78.13%                                               |
| 15 | Statement 15              | participation.  | 85.94%                                               |
| 16 | Statement 16              | Participation   | 85.94%                                               |

Then Table 3 will be summarized into the two indicators measured in Table 4 below

Table 4. The percentage of each indicator

| No | Indicator   | Percentage the total score divided by the maximum score |
|----|-------------|--------------------------------------------------------|
| 1  | Attention   | 84.76%                                                 |
| 2  | participation. | 73.18%                                                |

Based on Table 4, it can be seen that teacher participation and attention was high for ICT-based training conducted specifically on GeoGebra software.
Furthermore data from questionnaire will triangulate with observation shed. The percentage of observation shed for each activity that seen would be presented in Table 5.

**Table 5. The percentage of activity in observation shed**

| No | Observed activity                                                                 | Percentage of activity |
|----|-----------------------------------------------------------------------------------|-----------------------|
| 1  | The teacher does not speak / chat when the speaker explains the material (attention)| 100%                  |
| 2  | The teacher asks the speaker if he does not know a certain feature in geogebra software (participation in training) | 69%                   |
| 3  | The teacher answers the question if the speaker occasionally gives questions during the training (participation in training) | 63%                   |
| 4  | The teacher can follow the instructions in the module if there is an independent assignment from the resource person (participation in training) | 100%                  |
| 5  | The teacher is not sleepy during the training                                      | 100%                  |
| 6  | The teacher can create creative ideas outside the material presented by the resource person | 73%                   |

Base on observation shed percentage of teacher indicator attention and participation also high too for ICT-based training conducted specifically on geogebra software. The attention and participation of teacher can we see in Picture 1 above.

![Image](image_url)

**Figure 1. The attention and participation of teacher in training geogebra software**

After training, some teacher was given some open questions. The following will be presented snippets from the interviews of several teachers.

**Researcher**: How did you fell after training about geogebra software

**Teacher**: I feel that the training time was lacking and training must be conducted on other software.

Base on interview seems that the teacher had interested with training. The other teacher also give comment about training. The following will be presented about the answer of teacher.

**Researcher**: What was your response about this training

**Teacher**: Implemented more software-based learning so that the ability of teachers to use IT and face the 21st century learning can be better

We think that teacher would be afraid to face training that correlation with ICT. Based on the results of the research collected through a questionnaire, observation sheets and interviews were
obtained that the teacher showed good interest and participation during the training. That fact had correlations with statement of Carlgren [16] that the growing revolution of instruction requires teachers to develop their own potential. Hennessy [17] also state that in some elementary schools teachers also have no fear in integrating ICT into the core subjects of English, mathematics, and science. The finding of Drent [18] research the use of innovative tick supports the goals of education based on the knowledge needs of the people of this era. Teachers fear of using ICT is related to teachers' beliefs about: a) about learning and knowledge, b) beliefs about effective teaching methods, and d) the linkages between technology integration practices[19]. Beside from the teacher's belief in the existence of learning itself, the teacher's beliefs about students having to learn independently with the help of technology will also affect the integration of ICT into learning [20]. The findings from this research on geogebra training show that ICT skills of teachers can be improved because of internal factors teachers are very interested in the training provided and make the belief of teacher about ICT is easy to learn.

4. Conclusion
This research give information about how the teacher interesting of geogebra software. We have though that teacher will afraid to face training about ICT. In the fact teacher very Interest to explore them creativity trough this software. Obtained 84.76% percent of teachers from ten junior high school from one sub-district in of city Indonesia gave good attention to this training and 73.18% give good participation. Through observation it was also shown that the teacher had high attention and participation during the training. This paper still looks at the percentage of teacher attention through questionnaires, observation sheets and interviews with simple data analysis. The continued from this research could see the attitude, belief, pedagogy and didactic, and how teacher reflections when the training about ICT was running with the other various software that can help teacher in teaching and learning.

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References
[1] Harisman Y, Kusumah YS and K Kusnandi 2019 How teacher professionalism influences student behaviour in mathematical problem-solving process J Phys Conf Ser 1188 1-9
[2] Harisman Y, Kusumah YS and K Kusnandi 2018 Teachers reflections on students mathematical problem solving in junior high school Journal of Physics Conference Series 1088 1 - 8
[3] Harisman Y, Kusumah YS and K Kusnandi 2019 Beliefs of junior high school teachers on learning process on mathematical problem solving J Phys Conf Ser 1157 1 - 8
[4] Harisman Y, Kusumah YS and Kusnandi K and MS Noto 2019 Experience teacher background and their professionalism invinity Journal 8 1-11
[5] Huffman D and K Thomas 2003 Relationship between professional development, teachers’ instructional practices, and the achievement of students in science and mathematics Journal School Science and Mathematics 8 378 – 387
[6] Muir T and K Beswick 2007 Simulating reflection on practice: using the supportive classroom reflection process Journal Mathematics Teacher Education And Development Spesial 8 74-79
[7] Muir T BK and J Williamson 2010 Up close and personal: teachers response to an individualised professional learning opportunity asia-pacifik Journal of Teacher Education 38 2
[8] Even R, Robinson N and M Crmeli 2003 The work of providers of professional development for teachers of mathematics: two case studies of experienced practitioners international Journal of Science and Mathematics Education 1 227–249
[9] The International Commission on Mathematical Instruction (ICMI) 2004 The Fifteenth ICMI Study: The Professional Education and Development of Teachers of Mathematics 56 359–372
[10] Tytler R, Symington D, Darby L, D Malcolm and CK Valda 2011 Discourse communities: a framework from which to consider professional development for rural teachers of science and mathematics Journal Teaching and Teacher Education 27 871 – 879

[11] McGee J R, Polly D and W Chuang 2013 Guiding teachers in the use of a standards-based mathematics curriculum: teacher perceptions and subsequent instructional practices after an intensive professional development program Journal Perceptions of Professional Development 113 16 – 28

[12] Charischak I 2000 A look at technology’s role in professional development of mathematics teachers at the middle school level Journal School Science and Mathematics 7 100 - 117

[13] Agyei D D and V Joke 2011 ICT Use in the teaching of mathematics: Implications for professional development of pre-service teachers in Ghana Journal Educ Inf Technol 16 423–439

[14] McGraw R, Lynch K K, Yusuf B and B A Catherine 2007 The multimedia case as a tool for professional development: an analysis of online and face-to-face interaction among mathematics pre-service teachers, in-service teachers, mathematicians, and mathematics Teacher Educators J Math Teacher Educ 10 95–121

[15] Gudang News Info 2014 Utilization of Geogebra in Facilitating Mathematics Lessons (https://www.gudangnews.info/2014/11/pemanfaatan-geogebra-dalam-memudahkan.html)

[16] Carlgren I 1999 Professionalism and teachers as designers Journal of Curriculum Studies 31 1

[17] Hennessy Sara Ruthven Kenneth And Brindley Sue 2007 Teacher Perspectives on Integrating ICT into Subject Teaching: Commitment, Constraints, Caution, and Change Journal of Curriculum Studies 37 155–192

[18] Drent M and ‘M Martina 2008 Which Factors Obstruct or Stimulate Teacher Educators to Use ICT Innovatively? Journal Computers & Education 51 187–199

[19] Kim C, Kim M K, Lee C S ,Michael J and D Karen 2013 Teacher beliefs and technology integration Journal Teaching and Teacher Education 29 76 – 85

[20] Ertmer P A, Ottenbreit L, Anne T, Sadik O, Sendurur E and S Polat 2012 Teacher Beliefs and Technology Integration Practices: A Critical Relationship 59 423–435