Increasing mathematical communication skill using Quantum Teaching based on Hypnoteaching (QTH) in the Primary School Teacher Education (PSTE) students

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Abstract. The lack of mathematical communication ability of the students is the result of less precisely applied learning model. Quantum Teaching based on hypnoteaching is a learning that is expected to improve student’s mathematical communication because by this model the material is explained in an effective and efficient way, and also the provision of hypnoteaching during learning its cause students eager to learn. This study is an experimental research. There are 50 seventh semester students of PSTE student as sample in this experiment selected randomly. An experimental class is provided with Quantum Teaching based on hypnoteaching (QTH), and a control class is given Ordinary Learning (OL). The instruments used are: test, observation sheet, and interview guide. Techniques of data analysis in this study using two-way Analysis of Variance with unequal cells. The result of this research is QTH learning have a better mathematical communication ability than student with OL. Based on the level of early mathematical ability (high, medium, and low), medium and low-ability students show significant differences, but not for high-ability students. Based on the response shown through the test, students with QTH showed an activity, and better Ability compared to OL.

1. Introduction
Learning in higher education focuses on developing science and technology and producing intellectuals, and/or professionals who are cultured and think creatively, tolerant, democratic, have strong character, and dare to defend the truth for the benefit of the nation. The word professional here means that it is professional in accordance with the areas of interest that it engages in. the Primary School Teacher Education (PSTE) in Open University is a study program whose student input is a teacher with a minimum of 2 years teaching experience. So that the establishment of this study program is expected to improve the professional ability of elementary school teachers.

The subject of elementary mathematics learning is a course that contains mathematics learning in elementary schools in accordance with the curriculum material that applies in elementary schools, so that students who are also teachers can develop themselves as professional mathematics teachers in elementary schools. Based on research observations in the field, there are still many students who do not know the principles in learning mathematics in elementary school, even though everyday he has implemented these materials. This is really dangerous, because the teacher's mistake in instilling concepts during elementary school can be carried to higher levels of education, so it is important for
teachers to learn to increase their knowledge so that what is taught to their students can be as they should be taught.

Based on observations at the research location in the last three semesters as in Table 1 below:

| No. | Registration year | The Score (in %) |
|-----|-------------------|------------------|
| 1.  | 2017.1            | 95               |
| 2.  | 2017.2            | 93               |
| 3.  | 2018.1            | 71               |

The table above shows that of the three registration periods the student scores are below 70 of the maximum score of 100. Almost all students get less grades. The low learning outcomes above are a natural thing when viewed from the background of UT students who were not too deep in mathematics before, also the age factor of the students even though the human learning process lasted until the end of life (long life education). However, there is a negative correlation between increasing age and adult learning abilities. That is, every individual adult, the more he ages, the harder it will be for him to learn (because all aspects of his physical abilities are decreasing). For example, memory, physical strength, reasoning Ability, ability to concentrate, etc. all show a decrease in age as well. The fatigue factor of students can also be the cause of low grades, because students attend lectures after teaching, so that exhaustion results in students not being able to concentrate properly in lectures.

Conventional learning activities that tend to only use the lecture method result in students becoming saturated so that they do not understand the subject matter, so that the understanding of mathematical concepts is low, cannot solve mathematical problems if given rather complex mathematical problems, students become less able to think creatively in answering mathematical questions, consequently learning is less meaningful. Learning techniques by memorizing result in the level of cognitive abilities that are formed only at a low level. Students tend to be trapped in the thought of memorizing because of the mistakes of the learning process carried out in lectures. Students are increasingly intensive in memorizing techniques before the exam, because they cannot apply the memorized formulas to answer questions.

Learning by memorizing does not require too much thinking activity and has bad consequences on emotional development [1]. Students tend to find it easy to learn. Students lose sense of learning, habits that make a person passive or take for granted whatever material is taught which results in someone not accustomed to creative thinking. This learning process is the characteristic of education in developing countries including in Indonesia [2].

The ability of students to ask or explain mathematical questions in lectures is also unclear, and not systematic, making mathematical models of mathematical problems given are not appropriate, mathematical communication Ability (mathematics) in learning mathematics are also important to note, this is due to communication mathematically students can organize and consolidate their mathematical thinking both orally and in writing, in addition to the renegotiation of responses between students can occur in the learning process. In the end it can bring students to a deep understanding of the mathematical concepts that have been learned. In the book Mathematics: Applications and Connections mentioned one of the goals to be achieved in mathematics learning is to provide the widest opportunity to develop and integrate communication Ability through oral and written, modelling, speaking, writing, talking, drawing and presenting what has been learned [3]. The same thing was stated in the objectives formulated by the National Council of Teachers of Mathematics (2000) and 2004 Curriculum [4].

The purpose of this study was to determine differences in the improvement of mathematical communication Ability between students who learned by using PQTH compared to those who learned by using OL in terms of (1) the whole student, (2) the mathematical ability of students (high, medium, low).
2. Methods
The method used in this research is the experimental method. Experimental research is a research that aims to see the causal relationship, where the treatment we do towards the independent variable is seen by the results in the dependent variable [5]. This study, using one experimental class, is a class with a hypnoteaching (PQTH) based Quantum Teaching approach and a control class with an ordinary learning approach (OL). The use of the experimental method is expected after analysing the results it can be seen to what extent a treatment in this case the Quantum Teaching approach based on hypnoteaching on students has an impact on student communication Ability.

| Table 2. Two-way Anava design |
|-----------------------------|
| Early Mathematical Ability  | PMQH (A) | OL (B) |
| High (T)                    | KMAT     | KMBT   |
| Average (S)                 | KMAS     | KMBS   |
| Low (R)                     | KMAR     | KMBR   |

The population in this study were seventh semester students of the Primary School Teacher Education (PSTE) in Open University at UT Serang. The samples that will be used in this study are 7th semester students (pokjar) in Tangerang city. This research was carried out in the Tangerang study group (Pokjar). The data used in this study are (1) the grade of the subjects of Mathematics Education 1, Mathematics Education 2, and Education Statistics as the students’ early mathematical ability data, (2) the results of tests done by students and (3) Results of observations and interviews of student activities during mathematics learning activities. The instrument has fulfilled the requirements of validity, and the reliability coefficient is 0.829 and 0.835 respectively for mathematical communication Ability. Data analysis was carried out with t-test and two-way ANOVA.

3. Result and Discussion
An overview of improved mathematical communication Ability using the Quantum Teaching learning approach based on hypnoteaching (PQTH) and the usual learning approach (OL) are presented in Table 3, while in the form of bar charts are presented in Figure 1, Figure 2.

| Table 3. Mean Gain Student Mathematics Communication Ability Experimental and Control Groups based on Student Mathematical Ability |
|---------------------------------------------|
| Early Mathematical Ability | Mathematical Communication Ability | Std. | Min | Max |
| Experiment (24)             |                                     |      |     |     |
| High (5)                    | 76.65                                | 5.23 | 65  | 85  |
| Average (13)                | 65.45                                | 4.8  | 51  | 77  |
| Low (6)                     | 63.27                                | 6.33 | 52  | 69  |
| Total (24)                  | 68.46                                | 5.45 | 56  | 77  |
| Control (26)                |                                     |      |     |     |
| High (8)                    | 75.73                                | 4.46 | 66  | 81  |
| Average (12)                | 61.42                                | 4.95 | 47  | 73  |
| Low (6)                     | 57.28                                | 4.62 | 49  | 63  |
| Total (26)                  | 64.81                                | 4.68 | 54  | 72  |
| Total (50)                  |                                     |      |     |     |
| High (13)                   | 76.19                                | 4.85 | 65  | 85  |
| Average (25)                | 63.435                               | 4.88 | 47  | 77  |
| Low (12)                    | 60.275                               | 5.48 | 49  | 69  |
| Total (50)                  | 66.63                                | 5.07 | 54  | 77  |

Note: Maximum score for mathematical communication Ability is 100
Descriptively there are several conclusions regarding mathematical communication Ability that can be revealed from Table 3, Figure 1, Figure 2, namely:

a. The mean gain of students' mathematical communication Ability whose learning is based on PQTH looks higher compared to learning based on OL or PQTH> OL.

b. For students with high, medium, and low ability, the average gain of students' mathematical communication Ability whose learning is based on PQTH looks higher compared to students whose learning is based on OL or PQTH> OL.

c. The difference in mean gain in mathematical communication Ability between students taught through PQTH and OL, respectively, was the highest for low-ability students of 5.99, medium 4.03, and high 0.92.

Data group pairs have homogeneous variance and each data is normally distributed so as to determine the significance of the interaction of learning factors (PQTH and OL) and the mathematical ability factor of students (high, medium, low) in improving mathematical communication ability used two-way ANOVA test. The calculation results are presented in Table 4.
Table 4. The Summary of ANOVA Test Two Pathways on the Interaction of Mathematical Communication Ability Based on Learning Factors and Early Mathematical Ability of Students.

| Source                               | Type III Sum of Squares | Df  | Mean Square | F         | Sig.  |
|--------------------------------------|-------------------------|-----|-------------|-----------|-------|
| Corrected Model                     | 4641,329(a)             | 5   | 928,266     | 36,363    | 0.000 |
| Intercept                           | 473180,790              | 1   | 473180,790  | 18536,160 | 0.000 |
| Learning Models                     | 372,028                 | 1   | 372,028     | 14,574    | 0.000 |
| Early Math Ability                  | 3869,944                | 2   | 1934,972    | 75,800    | 0.000 |
| Learning * Early Math Ability       | 89,929                  | 2   | 44,965      | 1,761     | 0.175 |
| Error                               | 4339,666                | 170 | 25,527      |           |       |
| Total                               | 767081,000              | 176 |             |           |       |
| Corrected Total                     | 8980,994                | 175 |             |           |       |

a R Squared = .517 (Adjusted R Squared = .503)

H₀: No interaction between learning factor and early mathematical ability

Based on Table 4 shows that the value of F for the interaction of learning and mathematics ability of students is 1.761 with a significant value of 0.175. This significant value is greater than the significance level of 0.05, so it can be concluded that the null hypothesis which states that there is no interaction between learning factors (PQTH and OL) with the early mathematical ability factor of students (high, medium, low) can be accepted. This means that the difference in the mean score of early mathematical abilities of students with high, medium, and low mathematical abilities taught through PQTH is not significantly different from students taught through OL.

Learning with PQTH is suitable for all levels of students' early mathematical abilities (high, medium, and low) in improving mathematical communication Ability. This can be seen from the mean score of mathematical communication Ability of students taught through learning with PQTH higher than OL. From the picture above also indicates that students with low early mathematical abilities obtain the greatest benefits in learning based on PQTH when compared to students with moderate and high early math abilities. This can be shown through the difference in mean gain scores of mathematical communication Ability between students taught through PQTH and OL in low-early ability (5.99), moderate (4.03), and high (0.92) students.

From Table 4 it can be seen that the results of the calculation of the F value for the learning factor is 14.574, with a significance level of 0.000. This significance value is smaller than the significance level of 0.05, so it can be concluded that the null hypothesis which states that there is no difference in the improvement of mathematical communication Ability based on learning factors is rejected. In other words, there are significant differences in mathematical communication Ability between students who have different learning approaches.

Other results indicate that the factors of students' early mathematical abilities can have a significant influence on improving mathematical communication Ability. This can be seen from the calculation of F value of 75,800 with a significant value of 0.000 smaller than the significance level of 0.05. This means that there is a significant difference in the improvement of mathematical communication Ability between groups of students with different levels of early mathematical ability. Furthermore, to find out the difference in influence between learning approaches used based on the level of early mathematical ability students will use t test. The calculation results are presented in Table 5 below.

Table 5. The Summary of t-Test Results on the Effect of Learning Based on Students' Early Mathematical Ability to Mathematical Communication Ability.

| Early Math Ability | Gain Communication Ability | Mean Comparison | t    | P    | H₀    |
|--------------------|-----------------------------|-----------------|------|------|-------|
| High               | 76.65~75.73                 | 0.518           | 0.609|      | Accepted |
| Average            | 65.45~61.42                 | 4.734           | 0.000|      | Rejected |
| Low                | 63.27~57.28                 | 2.678           | 0.013|      | Rejected |

H₀: There is no difference between mathematics learning Ability between learning models used based on students' mathematical abilities.
Based on Table 5 it can be seen that the results of the calculation of the t value for the group of average and low students' mathematical abilities are respectively 4.734 and 2.678 with p values of 0.000 and 0.013 respectively. This p value is smaller than the significance level of 0.05, so it can be concluded that the null hypothesis which states that there is no difference between mathematics learning Ability between learning models used based on students' mathematical abilities are rejected. In other words, the PQTH approach is significantly better in improving students' mathematical communication ability compared to ordinary mathematical approaches (OL) for students with average and low math abilities. Whereas for students with high math abilities obtained t value of 0.518 with p value of 0.609. This p value is greater than the significance level of 0.05, so it can be concluded that the null hypothetical states that there is no difference between mathematics learning Ability between learning models used based on students’ mathematical abilities used. In other words, the mathematics communication Ability of students with high math abilities taught based on PQTH are not significantly different compared to students with the same early mathematical abilities but are taught based on the ordinary mathematical approach (OL).

4. Conclusion
QTH learning has a better mathematical communication ability than student with OL. Based on the level of mathematical ability (high, medium, and low), medium and low-ability students show significant differences, but not for high-ability students. Based on the response shown through the test, students with QTH showed activity, and better ability compared to OL.

5. References
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