

QUALITY OF TEACHING AND LEARNING INTERACTION FOR MATHEMATICS TEACHERS: A CASE STUDY

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Abstract

This paper attempts to find out a correlation among known variables in relation to the development and improvement of the quality of teaching and learning interaction for mathematics teachers. By applying the statistical computation on the correlation of the variables such as *teachers' educational level, teaching experience, teachers' training* as predicting variables and *professional attitude, and quality of teaching and learning interaction* as intervening variables while *mathematics* was used as a dependent (criterion) variable, it was found out that there is a significant correlation of the variables of *teachers' educational level, teaching experience, and professional attitude* with *the quality of the teaching and leaning interaction*. The findings suggest that mathematics teachers should improve their knowledge about the course, other related institutions should be involved in supervising the interaction, cooperation with institutions producing teacher graduates should be developed, and the training programs should be reevaluated in terms of efficiency, effectiveness and investment.

INTRODUCTION

The latest issue in the quality of human resources in Indonesia has led to a debate over the nature of education and its implications for society. Education in its broadest sense presupposes a better understanding of teaching and learning. On one side, teachers are supposed to be able to impart their knowledge through the many approaches, methods and techniques at their disposal. Teaching mathematics, for instance, requires a basic skill in explaining abstract mathematical concepts. Abstract thinking is one of the skills to be introduced to students at an early stage of learning this science. In Indonesia, however, mathematics has often been cited as a "monster" that troubles the students' progress in learning for a higher level of education. On the other, students particularly those who will continue their studies to a tertiary level are confronted with the various problems of life. They lack books, especially the translated texts, and other learning aids. Unlike in advanced countries, the students in Indonesia

entirely depend on the explanation given by their teachers. This is especially true of learning mathematics as the basic science to further their studies.

In reality, there is a big chasm between teachers and students. Teachers believe that they can produce a change of behavior, as is defined in the process of learning, after explaining everything about mathematical concepts. Students, on the other hand, feel that they have not learned enough from their teachers. As a result, there is a kind of “tug of war” between the two parties. The question is which party should be given more treatment, the teachers or the students.

For the feasible purposes, teachers should be given more training and knowledge on how to teach mathematics. Part of the solution is that the teachers should change their perception about their students. Students are no longer “containers to be filled”, instead they are curious people with much potential to learn anything new. What is needed today is the cooperation between teachers and students in finding solutions to the problems of teaching and learning mathematics. Both parties must realize the importance of sharing and exchanging experiences. Mathematics must be a very interesting course that can help the students solve the many problems they face. In the United States, mathematics is first taught by relating it to the reality of life before going on with the advanced concepts such as in calculus. Teachers can no longer boast of their overt knowledge of mathematics. Students can be expected to contribute to the understanding of this science. The old saying “ a teacher knows better” is no longer applicable.

This fact raises a question about the quality of teaching and learning interaction in class. The interaction, if it is properly performed, will produce desired results such as a better understanding and appreciation of mathematics in everyday life. Students will be motivated to learn it when their teachers also show some kind of professionalism and positive attitude in doing their job. A mathematics teacher does many things to improve his or her professionalism. The Indonesian government has launched improvement programs in the form of workshops, seminars, symposium and other educationally related activities. The knowledge and skills they received from such events can be used to make their teaching performance much better. Professionalism grows from within, that is, they will appreciate their work after reaching a level of satisfaction in the job.

The quality of teaching and learning interaction becomes relevant to the problems faced by Indonesia in improving the teachers' performance. This issue gains more attention of experts in this country due to a staggering fact about mathematics development in this region. For instance, the Third International Mathematics and Science Report found out that Indonesia is far behind the other Southeast Asian countries in the quality of teaching mathematics. Of the 38 countries surveyed by the institution, Indonesia is placed at the 34th level, which means that this country is the worst in providing teaching service in popularizing mathematics. South Korea holds the top position and a leading country in the education of mathematics.

This setback can be fixed by analyzing the elements of interaction that is related to teaching performance in general. Theories of education and psychological views on teaching and learning interaction can be applied to find out the quality of the interaction. Lingren (1976:127) argues that experience is an

important basis for organizing information into concepts. Thus, when teachers are given sufficient training, they will be able to apply their knowledge to carry out the performance. Bruner (1982:17) supports this view. In learning processes, there is a transfer of training which is needed for the improvement of interaction. Also, there is a transfer of principles and attitude. These variables can be used as one of the indicators for the quality of interaction.

It is this problem that should be analyzed in this study. Other variables related to interaction can be included in the analysis.

Case Study

For the purpose of finding out the quality of interaction, the concepts must be applied in a research. One of the possible ways is to conduct a case study. In this study, the population of the research was all the 34 mathematics teachers at Dairi Regency, North Sumatra, Indonesia. In this study, five variables are used such as *teachers' educational level*, *teaching experience*, *teachers' training* as predicting variables and *professional attitude*, and *quality of teaching and learning interaction* as intervening variables. *Mathematics* was used as a dependent (criterion) variable.

For the data collection of predicting and intervening variables, a structured questionnaire was applied. The data for the dependent variable were obtained through class observations with observation sheets. All the data were analyzed and tabulated to test the hypothesis by applying the product-moment correlation formula (Knocke,1982:383). It should be noted that before the path analysis was conducted, the assumption on normality and linearity of data was tested. If the path coefficient was smaller than 0.005, then, the correlation was not significant (Sujana, 1983:185).

Findings and Discussion

Before applying the statistical formula for confirmation, the data were tested for their normality and linearity. The computation showed that all the variables of *teachers' educational level*, *teaching experience*, *professional attitude*, *teachers' training* and *teaching and learning interaction* had normal distribution. The test of linearity indicated that values of F-observation (F_o) were smaller than those of F-nadir (F_t). Therefore, all predicting variables had the linear correlation with the dependent variable. The findings made it possible to apply parametric statistics for hypothesis testing.

The findings based on analysis of product-moment coefficient correlation were:

1. There was a significant linear correlation between teachers' educational level and professional attitude.
2. There is an insignificant linear correlation between teaching experience and professional attitude.
3. There was an insignificant linear correlation between teachers' training and professional attitude.

4. There was a significant linear correlation between teachers' educational level and quality of teaching and learning interaction.
5. There was a significant linear correlation between teaching experience and quality of teaching and learning interaction.
6. There was a significant linear correlation between teaching experience and teaching and learning interaction.
7. There was a significant linear correlation between professional attitude and quality of teaching and learning interaction. (see Table 1 of inter-correlation variables).

Table 1. Inter-correlation of Variables (N = 34)

	X ₁	X ₂	X ₃	X ₄	Y
X ₁	1.00	0.31	0.05	0.47*	0.35*
X ₂		1.00	0.56	0.16	0.58*
X ₃			1.00	0.03	0.41*
X ₄				1.00	0.36*
Y					1.00
Mean	3.765	12.588	3.088	28.765	0.589
SD	0.889	7.699	1.975	0.889	0.553
Variance	0.791	59.281	3.901	0.791	0.306

* Level of significance $p < 0.05$

- Notes:
- X₁ = Teachers' educational level
 - X₂ = Teachers' teaching experience.
 - X₃ = Teachers' training.
 - X₄ = Teachers' professional attitude
 - Y = Quality of teaching and learning interaction

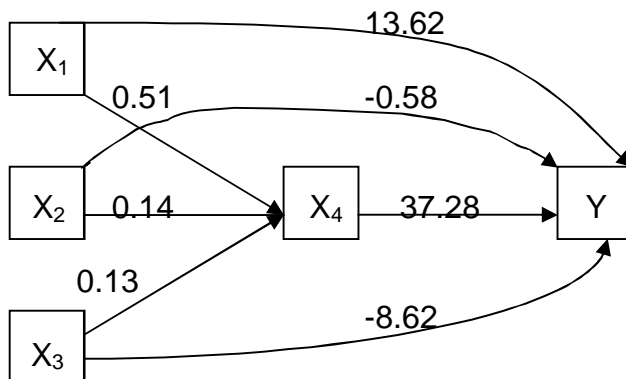


Fig.1 Path Diagram of Predicting Variables over Dependent (Criterion) Variable

It was found out that the quality of teaching and learning interaction at Dairi Regency was still low. The teachers' interaction was dominated by the teachers in a continuum (78%) or with the score of 0.43 for the quality of interaction. This finding has been confirmed by Sadia (1983:137) in his study on techniques of asking questions by physics teachers of Senior High Schools in Bali. The low quality of the interaction was probably caused by lack of teaching experience, training and professional attitude which are far from the required standard. The finding on the correlation of teachers' educational level, teaching experience and professional attitude with the quality of teaching and learning interaction has been supported by other experts such as Naga, Arikunto, Mardapi and Budiono in their study on the improvement of teachers' knowledge of interaction. They suggested that for the purpose of developing such a skill, other people concerned should be involved. For instance, principals of schools may function as motivators for professional attitude. Also, by holding seminars, workshops and training courses, and mathematics competition among schools, teachers may gain confidence and positive attitude in teaching. Appreciation should be given to those who have been successful in performing the best interaction. Mathematics teachers should be motivated to continue their studies to a higher level such as the post-graduate programs.

The results of the path analysis suggest that the variables such as teaching experience and teachers' training have no direct correlation with the improvement of the quality of interaction. This should be explored for further discussion. Some of the mathematics teachers at Dairi Regency might not show interests in their job. Just as required by the training that teachers should show additional skills, then the information about the needs of mathematics teachers must be provided. This information is later organized into a special program. The aim of training, for instance, is to develop a professional attitude and knowledge about the subject. This is obvious because, as found in this study, there is a significant correlation between the professional attitude and the quality of teaching and learning interaction.

Conclusion

The analysis of the data produces the following conclusion (see Fig.1):

- 1) There is a significant linear correlation between teachers' educational level and professional attitude, This is shown by the correlation index of 0.47 which is greater than that in the table at the level of significance of 5% which is 0.34.
- 2) There is a insignificant linear correlation of teaching experience, teachers' training and professional attitude. This is shown by the correlation index of 0.16 and 0.03 which are smaller than the tabulated critical values at the level of significance (5%).
- 3) There is a significant linear correlation of teachers' educational level, teaching experience, and professional attitude with the quality of teaching and learning interaction. This is shown by the correlation index of 0.35, 0.58 and 0.41 which are greater than the critical values.

- 4) The variable of teachers' educational level has a direct effect over the quality of teaching and learning interaction, however, the effect will be greater if it is correlated with a better professional attitude.
- 5) The variables of teaching experience and teachers' training have no direct effect over the quality of teaching and learning interaction, however, the two variables will be more significant if they are correlated with a positive professional attitude.

Suggestions

From the findings above, it can be suggested that :

- 1) Every mathematics teacher should study independently to improve his knowledge especially in analyzing the teaching and learning interaction. It will be better to contact the Department of Education to provide the resources.
- 2) Class supervision should be intensified by giving advice and recommendations to the teachers for the improvement of the teaching and learning interaction. This is essential for inexperienced teachers as they are not incapable of analyzing their behavior and their students' reaction in class.
- 3) Cooperation should be established with the Institute of Teacher Training for the development and efforts to find solutions to such a problem in the field by conducting seminars, discussion, symposium and inter-group discussion.
- 4) Efficiency, and effectiveness of the investment in this area should be revised and reviewed. For teachers' training, the teachers' comments and recommendations should be well taken.

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