

Model of an Outstanding Mathematics Teachers

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Abstract: *This study explored the characteristics of the selected outstanding mathematics teachers in the Division of Valenzuela – Philippines and how cultural, social and school context contribute to being an outstanding mathematics teachers. Based on the six outstanding mathematics teachers’ beliefs, knowledge, and teaching practice were further investigated with the aim of probing common pedagogical practices of outstanding mathematics teachers. The constant comparative method was adopted for data analysis. It was found that model for outstanding mathematics teachers were developed based on two factors namely: teacher-related factors and external factors. The outstanding science teachers hold contemporary-constructivist oriented beliefs, and possess a wide and profound knowledge base. Their pedagogical practice is classified as fine effective instruction and systematically reflect on their teaching. Results indicated that the formula for model outstanding mathematics teachers is culturally bounded and the teaching of outstanding mathematics teachers is influenced by the social and cultural context and they demonstrate the ability to work against social and cultural constraints.*

Keywords: Outstanding Mathematics Teachers, Characteristics, Pedagogical Practices

1. Introduction

The education system needs qualified teachers to train qualified people who are able to adapt to speed of change, which increases by the new millennium (Jones, 2002). The school is of course the seat of trainings in producing equipped, capable and well-trained people. Somehow, the need for effective school and class management and outstanding, effective or excellent teachers is obvious. In terms of student achievement, the teacher is a more significant factor than any kind of school resources (Rowe, 2003)

Teachers’ quality plays a significant role in students’ learning. In fact, Moir et al. (2009) mentioned that teachers’ quality as the most important school-related factor in student learning outcomes, which “dwarfs every other school-related variable including class size, school size, and even the heterogeneity of prior achievement within a classroom”. Many other researchers, also commented that teachers’ quality is a major factor that influences the quality of education in general and students’ Mathematics achievement in particular. From this point of view, even though the relationship is complicated, it is reasonable to conjecture that mathematics teachers’ expertise is major factor affecting students’ achievement as teachers are key to students’ opportunities to learn mathematics (Even & Ball, 2009). Since teachers’ qualities might be a major factor in influencing students’ achievement, the questions of what it means to be an outstanding mathematics teacher and what characteristics an outstanding mathematics teacher possesses are central. Therefore, teaching excellence and the concept of outstanding teacher are not universal but culturally and contextually dependent. In view of this, the present study aimed to explore how an “outstanding mathematics teacher” is conceptualized in the context of Valenzuela City. Results of the study would be important for understanding what aspects count as an important part of mathematics teachers’ quality in this specific high-achieving education system.

2. Literature Review

Over the past years, several models or theories of teacher development were suggested, such as the development of teacher concerns. (Lian 2008) also developed a model of teaching expertise development from a psychological perspective. The differences between these two models are obvious, for example number of stages, teaching experience needed to achieve a certain stage, characteristics of every stage, and so on. However, one point in common is that they both view teaching excellence as a developmental process. In Lian’s (2008) model, teachers at the final stage were named as excellent teachers. The research on excellent teacher has its root in research on excellence in other domains such as physics. Unlike in the domains mentioned above whose problems given to subjects are specific and isolated from the social and cultural context, “excellent teachers have to be performers in problems situated in socially and culturally complex contexts” (Ropo, 2004). Due to the complexity of the working context, it is more difficult to identify excellent teachers than expert physics problem-solvers (Berliner, 2007).

According to Bond et al. (2000), excellence in teaching is difficult to be defined operationally and at the same time, to be assessed. Thus, what kind of teachers can be called excellent teachers seems to be open for investigation. Even so, some researchers still tried to define this in previous studies. Other researchers argued that excellent teachers are thought to be similar in many aspects (Ropo, 2004).

In the previous studies on effective teacher, different researchers adopted different ways to choose participants. Smith and Strahan (2004) chose those who achieved National Board certification as expert teacher. Even though it has been pointed out that it was difficult to define and assess expertise in teaching (Bond et al., 2000), since 1980s, without much theoretical guidance (Berliner, 2004), there have been increasing interests in exploring expert teachers’ characteristics. Particularly, from the perspective of comparing expert teachers with novice teachers, many features of expert teachers have been identified. Some of

them may have already been mentioned in the model of pedagogy expertise development or in the prototypical models. As to the characteristics of expert teachers, based on his own and that of his colleagues' work, Berliner (2001) outlined several propositions about expert teachers: Expert teachers excel mainly in their own domain and in a particular context; expert teachers often develop automaticity and reutilization for the repetitive operations that are needed to accomplish their goals; expert teachers are more sensitive to the task demands and social situation when solving pedagogical problems; expert teachers are more opportunistic and flexible in their teaching than are novices; expert teachers represent problems in qualitatively different ways than do novices; expert teachers have faster and more accurate pattern-recognition capabilities; expert teachers perceive more meaningful patterns in the domain in which they are experienced; and expert teachers may begin to solve problems slower, they bring richer and more personal sources of information to bear on the problem that they are trying to solve.

Based on findings in previous studies, Ropo (2004) also summarized six propositions of expert teachers, which include: 1) expertise develops in a narrow field of knowledge and the knowledge base is bond to a specific context; 2) experts react to frequently recurring situations automatically; 3) with comparison to novice teachers, experts are more sensitive to individual students in both class situations and the characteristics of task situations; 4) compared to novice teachers, expert teachers are faster and more accurate in their observations; 5) expert teachers take longer to represent a problem, but they can end up with a better representation of the problem; and 6) compared with novice teachers, expert teachers' knowledge is wider concerning the levels of abstraction and more hierarchical. These characteristics summarized by those researchers suggest some common features of expert teachers, such as automaticity, flexibility, insight, sensitivity, wide knowledge base, deep interpretation of problems. Even though some characteristics summarized by these researchers were discovered under an experimental condition, some of them were actually found to be possessed by expert teachers in natural teaching settings.

Methods

This study employs a mixed method, combining the descriptive survey design with documentary analysis to adequately address the research questions. This study examined the conceptualization of outstanding mathematics teachers from the perspectives of 6 outstanding mathematics teachers, 6 school principals, 6 mathematics master teachers, and 6 head teachers of mathematics through semi-structured interviews. Fifty (50) students of each outstanding teacher – respondent accomplished a structured survey/questionnaire. Purposive sampling was used to select the 50 students. Each outstanding teacher had a regular load of 5 classes each day.

The questionnaire consists of twenty-four items on performance characteristics and seventeen personality characteristics, which were derived from the previously conducted studies designed to identify attributes of outstanding teachers and the international guidelines. All

items were verified and subjected to content validation by three experts in education. They were given copies of the questionnaire, purpose, and objectives of the study to evaluate the questionnaire on an individual basis. The instruments were distributed personally with an introductory cover letter to each panelist/reviewer. The completed instruments were returned to the researcher personally. This was done in order to ensure that there was a sufficient level of control for chance agreement and statistical justification especially concerning the newly added items. In addition, this was necessary in order for us to determine how well the new item additions were assimilated into the previously validated instrument and the ability to retain its usability. The questions pertaining to outstanding teachers' pedagogical practices provided an opportunity for the participants to identify attributes that encourage positive interactions in and out of the classroom that lead to teaching excellence. The quantitative data came from the response to the questionnaire of Mohaimeed (2012) that determine the characteristics that make/made an outstanding teacher. This 41-item questionnaire adequately addresses the research question on the characteristics of outstanding teachers.

3. Results and Discussion

1. What are the characteristics of the selected outstanding mathematics teachers in the Division of Valenzuela City as perceived by themselves, their principals, master teachers, head teachers and students?

The degree of having the performance characteristics of outstanding mathematics teachers is very high according to the outstanding mathematics teachers, principals, master teachers, head teachers and students. The top three and the lowest mean among the characteristics were item No.1: "Expert on the subject matter," with a mean of 4.97, item No.5: "Understands role of teachers" is second with a mean of 4.96 and item No.19: "Good role model" is third with a mean of 4.93. Item No.3: "Understand relate to students," comes at the end of the list having the lowest mean of 4.51. The average mean of personality characteristics of outstanding mathematics teachers is 4.67, which indicates that the personality characteristics of outstanding mathematics teachers are very high. The statements with the top three and the lowest mean among the personal characteristics were item No.4:" Honest," with a mean of 4.96; item No.2 and 12: "Helpful" and "Open minded" with a mean of 4.90 and item No.7: "Friendly," with a mean of 4.88. Item No.13: "Not strict/shows leniency," comes at the end of the list having the lowest mean of 4.1. The mean scores of the two main characteristics of outstanding mathematics teachers with performance characteristics obtained the highest mean of 4.76 while personality characteristics yielded 4.67.

2. What are the pedagogical practices of outstanding mathematics teachers of the Division of Valenzuela City?

Based from the qualitative results of the study the theme "Outstanding Teachers Design Effective Instruction" emerged as the pedagogical practices of the six outstanding mathematics teachers. The respondents used terms, such as

“knowledgeable, subject matter expert, differentiated instruction, and varied instructional strategies,” when they described pedagogical practices of outstanding teachers related to effective instruction. A thorough understanding by the outstanding mathematics teachers of content knowledge, explained how understanding of pedagogy encourages the implementation of varied instructional approaches.

3. How do cultural, social and school context contribute to being outstanding mathematics teachers?

Factors at cultural, social, school and classroom levels were found to influence the six outstanding mathematics teachers. However, findings of the six teachers’ teaching practice suggest that sometimes they can work against contextual and cultural constraints to a certain degree. They developed contemporary-constructivist oriented beliefs at a time when mathematics teaching was described as teacher-centered and knowledge-centered. Despite large class sizes, they provide chances for students to discuss in groups, carry out hands-on activities, and explore on their own. They link teaching content with real life situation rather than teaching mathematics only “within mathematics itself”.

4. Based on the study, what model of outstanding mathematics teachers can be developed?

Teaching excellence in mathematics for basic education may be explained by a factor paradigm consisting of inputs, process and product. The input refers to variables that influence a mathematics teacher. The process refers to transactions or operations which influence the teacher from the start of his career as mathematics teacher. The product is the result of the input and the process variables.

4. Conclusions and Recommendations

Based from findings, the following are the conclusions in this study:

- 1) The performance and personal characteristics of outstanding mathematics teachers indicate that the degree of having these characteristics is very high and a very common practice among the outstanding mathematics teachers.
- 2) Outstanding mathematics teachers attribute their being outstanding to their pedagogical practices which include designing effective and learner-centered instruction.
- 3) The socio-cultural and school contexts identified in the study contribute to the teaching excellence of the outstanding mathematics teachers.
- 4) Teacher-related and external factors contribute the emergence of a model of an outstanding mathematics teacher.

Recommendations

- 1) Faculty development programs may be designed in the light of the pedagogical practices and model of an outstanding teacher as identified in the study.
- 2) Outstanding mathematics teachers may be tapped as resource speakers, demonstration teachers, or mentors of

new teachers. Such instructional improvement functions may be assigned equivalent teaching loads.

- 3) While outstanding mathematics teachers are still connected with the academe, their classroom teaching should be documented whether through ethnography or videotaping with written transcriptions. These records of excellent teaching should be preserved in learning resource centers for the use of teachers and be made available for resource sharing among schools.
- 4) A replication of the study may be undertaken in other levels. The results especially the tangible products of such studies (videotapes, etc.) will be invaluable resources for future studies.

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