Pre-service mathematics teachers’ metaphors about mathematics teacher concept

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Abstract

In recent years, metaphors became the subject and center of the increasing interests in educational sciences, including the mathematics education. According to this interest, pre-service mathematics teachers’ views about their own professional area are important to reveal. In this study, the purpose is to determine metaphorical thoughts of pre-service mathematics teachers about the mathematics. With the convenience sampling, 140 pre-service mathematics teachers participated to this study in department of secondary school mathematics education. Participants completed the question “Mathematics teacher is like…, because….” by writing what mathematics teachers’ means for the participants and why. With content analysis method, the data will be analyzed according to participants’ responses to this prompt. 40 metaphors and 9 categories appeared about the concept of mathematics teachers.

Keywords: metaphor; mathematics; pre-service mathematics teachers

1. Introduction

One of the most important components in education is the teacher. For effective education activities, teachers have great responsibilities. Some of the responsibilities that teachers have include organizing teaching environment in classroom, preparing the activities, choosing the necessary materials and teaching methods and their use. Teachers who fulfill these functions play crucial role in classroom and positively influence students’ learning and individual behaviors during the time students stay at school (Cerit, 2008). In addition to transferring the knowledge content to students and doing the teaching profession, teachers also influence students’ personalities (Çetin, 2001). From this perspective, it is important to determine how students perceive teachers who play effective role on building students’ behaviors and who leave traces of their lives.

In recent years, there were many studies conducted to investigate the metaphors that pre-service teachers’ have about “teaching”, “learning” and “teacher” concepts (Yob, 2003; Inbar, 1996; Carlson, 2001; Guerrero & Villamil, 2002; Saban, 2004; Saban, Kocebeke & Saban, 2006; Saban, 2009). This is because metaphors are one of the strongest cognitive structures which restructure, direct and control our thoughts about the formation and process of the events or happenings. In fact, “if a picture is worth 1000 words, a metaphor is worth 1000 pictures; because although a picture provides only a static image, a metaphor provides a cognitive framework in order to think about a phenomenon”. (Shuell, 1990:102, cited in Saban, 2004) This statement introduces metaphor’s importance in humans’ lives in general and especially its power on understanding educators’ own applications and explanations effectively (Saban, 2004).
The aim of this study is to put forth pre-service mathematics’ teachers’ cognitive images about the concept of mathematics teacher with the help of metaphors. Under this general aim, answers to questions below were investigated.

(1) What are the metaphors (or cognitive images) that pre-service mathematics’ teachers have about the concept of mathematics teacher?

(2) Under what conceptual categories can these metaphors be put in terms of common features?

2. Method

In this study, content analysis method, one of the qualitative research designs, was used in the analysis of the data. The research sample was composed of 140 pre-service mathematics teachers who were studying in the department of secondary school mathematics education in the Kazım Karabekir Faculty of Education in Atatürk University.

To uncover pre-service mathematics teachers’ cognitive images about the concept of mathematics teacher, they were asked to complete the sentence as “Mathematics teacher is like….., because……..”. This study was conducted in one class hour in the fifth week of the fall semester in 2010 – 2011 academic years.

At the beginning of the study, 140 pre-service mathematics teachers participated to the study. However, only (132) pre-service mathematics teachers’ valid and single metaphors were included in the analysis of the study. Then, the metaphors built by pre-service teachers were tabulated with the help of the number of teachers (f) who developed the metaphors and their percentages (%). First of all, the valid metaphors were ordered and numbered alphabetically. The empty answers and the answers with more than one metaphor were excluded from the study. In the second step, the subject of valid metaphors, their referring ideas and their sources were analyzed by classifying in terms of their common features. In the last step, researchers compared the metaphors with peer review and put under the categories according to their common features. After the consensus among the researchers, the last versions of the categories were developed.

3. Results and Interpretations

After analyzing the metaphors that students develop about the “mathematics teacher” concept, there were 40 different metaphors appeared. These metaphors were as follows.

| Metaphors | Frequency (f) | Percentage (%) | Metaphors | Frequency (f) | Percentage (%) |
|-----------|---------------|----------------|-----------|---------------|----------------|
| Painter   | 10            | 7.58           | Scientist | 6             | 4.55           |
| Water     | 4             | 3.03           | Perfect Person | 1 | 0.76           |
| Basketball Coach | 4 | 3.03       | Patience | 2 | 1.52           |
| Encyclopedia | 4           | 3.03           | Me       | 3             | 2.27           |
| Maze      | 2             | 1.52           | Hero     | 2             | 1.52           |
| Model Person | 2               | 1.52           | Family   | 2             | 1.52           |
| Alien     | 2             | 1.52           | Rainbow  | 3             | 2.27           |
| Mathematics | 2                | 1.52           | Wind     | 2             | 1.52           |
| Civil Engineer | 2           | 1.52           | Computer | 4             | 3.03           |
| Guide     | 7             | 5.30           | Map      | 2             | 1.52           |
| My Mathematics Teacher (e. g. high school teacher) | 6 | 4.55       | Infinity | 4             | 3.03           |
| Philosopher | 4               | 3.03           | Lighthouse | 5 | 3.79           |
| Father & Son | 3               | 2.27           | Tree     | 2             | 1.52           |
| Flower    | 4             | 3.03           | Key      | 2             | 1.52           |
| Friend    | 6             | 4.55           | Boogeyman | 2 | 1.52           |
| Usual Teacher | 5               | 3.79           | Bee      | 4             | 3.03           |
| Precious Stone | 2           | 1.52           | Intelligence Cube | 2 | 1.52           |
| Compass   | 5             | 3.79           | Puzzle   | 2             | 1.52           |
| Sun       | 4             | 3.03           | Wizard   | 2             | 1.52           |
| Film Director | 1           | 0.76           | Soil     | 1             | 0.76           |
As it is seen in the Table 1, there were various metaphors for the concept of *Mathematics Teacher*. Most of the teachers used the metaphors like *Painter, Guide, My Mathematics Teacher, Scientist* (10, 7, 6, 6 persons, respectively). When the metaphor of *My Mathematics Teacher* and their explanations were considered, it can be inferred that pre-service mathematics teachers were influenced deeply from their teachers in previous education. They thought that a mathematics teacher should be as their mathematics teachers. In addition, the metaphors *Painter* and *Scientist* gave evidence about pre-service mathematics teachers thought about how mathematics teacher should be. They thought that mathematics teacher needs to have abilities to successfully organize the materials, subjects, things in the profession of mathematics teachers.

After gathering the metaphors, researchers categorized them. Participants’ metaphors were categorized by considering the pre-service teachers’ metaphors which represented the similar underlying concepts. After the agreements of peer comparisons of the categories and general consensus among researchers, the data revealed nine categories. Categories were presented in the table below with the frequency and percentages. The categories were written as Mathematics Teacher as …..

| Categories | Metaphors | Frequency (f) | Percentage (%) |
|------------|-----------|---------------|----------------|
| Advisor    | Sun, Lighthouse, Guider, Compass, Map, Model Person, Hero | 27 | 20,45 |
| A Familiar One | My Mathematics Teacher, Friend, Usual Teacher, Me | 20 | 15,15 |
| Stranger | Boogeyman, Alien | 4 | 3,03 |
| Hardworking | Bee, Soil | 5 | 3,79 |
| Organizer | Painter, Basketball Couch, Film Director, Civil Engineer, Wizard | 19 | 14,39 |
| Knowledge Provider | Scientist, Computer, Key, Philosopher, Encyclopedia | 20 | 15,15 |
| Complicated | Maze, Puzzle, Intelligence Cube | 6 | 4,55 |
| Infinity – Perfect | Water, Rainbow, Perfect Person, Infinity, Wind, Patience, Precious Stone | 18 | 13,64 |
| Integrative | Family, Tree, Mathematics, Father & Son, Flower | 13 | 9,85 |

As it is well know, teachers are generally perceived as knowledge provider in society. According to them, teachers’ responsibility or duty is to transfer knowledge to students. However, as it seen in the table 2, majority of the pre-service teachers think the role of the mathematics teachers as advisor, or a person to take advice from (31 persons – 23, 48 %). Therefore, main responsibility was perceived as a person to direct and help students as mentor. The pre-service teachers’ metaphors such as *Lighthouse* (5 persons – 2, 79 %), *Compass* (5 persons – 2, 79 %), *Map* (2 persons – 1, 52 %) indicated that they see the mathematics teacher as one to consult their issues, problems.

The expected perception of pre-service teachers was also included in the categories. The second and third categories had same number of pre-service mathematics teachers’ metaphors. These categories were mathematics teacher as a *Familiar One* (20 persons – 15, 15 %) and as *Knowledge Provider* (20 persons – 15, 15 %). The second one was the general perception. They thought that they could find the necessary knowledge from mathematics teachers. To illustrate this perception, pre-service mathematics teachers used the metaphors such as *Computer* (4 persons – 3, 03 %), *Encyclopedia* (4 persons – 3, 03 %), *Key* (2 persons – 1, 52 %). The other category was mathematics teachers as a *Familiar One* (20 persons – 15, 15 %). Their thought indicated that a mathematics teacher could be one of the teachers among those in teaching profession (5 persons – 3, 79 %) or one of us among society. In addition, some of the pre-service teachers also felt that they are already mathematics teacher by indicating the metaphor as *Me* (3 persons – 2, 27 %). Moreover, pre-service teachers’ metaphor of *My Mathematics Teachers* (e.g. high/ elementary school teacher) (6 persons – 4, 55 %) could be attributed to both the category of mathematics teacher as a *Familiar One* and why they chose this department (mathematics education) as future profession.

Another category is mathematics teacher as Organizer (19 persons – 14, 69 %). To be a good mathematics teacher, pre-service mathematics teachers perceived that they should have ability to organize the teaching materials, to arrange the classroom and teaching directions etc… To indicate their thoughts they used the metaphors of *Painter* (10 persons – 7, 58 %) and *Basketball Couch* (4 persons – 3, 03 %) who consider every variable and decide accordingly. Therefore, they thought that mathematics teachers should know everything about their students, students’ needs, and teaching and learning materials available; then, organize the teaching and learning environment accordingly.
The following category is mathematics teacher as *Infinite – Perfect* (18 persons – 13, 64 %). According to pre-service mathematics teachers, metaphors about mathematics teacher were *Water* (4 persons – 3, 79 %), *Rainbow* (3 persons – 2, 27 %), *Perfect Person* (1 person – 0, 76 %), *Infinity* (4 persons – 3, 03 %), *Wind* (2 persons – 1, 52 %) etc… From their explanation of the metaphors used, mathematics teachers are like very knowledgeable, like a touchstone which is hard to reach, like a person who is out of any excuses or errors. These findings revealed that they gave very much value to mathematics teachers.

The category of mathematics teacher as *Integrative* (13 persons – 9, 85 %) is also important to consider. Pre-service teachers perceive the concept of mathematics teacher as they play an integrative role among students. They related the mathematics teacher and students with the relation between the *Father and Son* (3 persons – 2, 27 %). They thought that mathematics teachers should cover their students like a *Tree and Flower* (6 persons – 4, 55 %) and have an interdependent relation with their students like a *Family* (2 persons – 1, 52 %).

A few number of pre-service mathematics teachers used metaphors with the negative meaning. For example, two categories appeared after data analysis which could be considered as negative. These were mathematics teachers as *Complicated* (6 persons – 4, 55 %) and *Stranger* (4 persons – 3, 03 %). This finding could be attributed to such pre-service mathematics teachers’ feelings of comfortless of being in studying mathematics education.

A few of them also used metaphors of *Bee* (4 persons – 3, 03 %) and *Soil* (2 persons – 1, 52 %) which represented the category of *Hardworking* (5 persons – 3, 79 %) about the concept of Mathematics Teacher. Compared to mathematics teachers’ *Advisor, Organizer and Integrative* role, this category occupied a small portion. Therefore, their perception about mathematics teacher suggested that mathematics teacher does not necessitate being more hardworking.

4. Conclusion

According to the pre-service mathematics teachers’ metaphors used about the concept of mathematics teachers, many interpretations can be done. They imposed many roles to mathematics teachers. Unexpectedly, many of pre-service mathematics teachers saw the role of mathematics teacher as *Advisor*, instead of expected role which is *Knowledge Provider*. They did not see mathematics teacher who is simply transferring the knowledge to students. Instead, they expect a mathematics teacher to be one who they can consult, take advice and ask their issues, problems etc…

In addition, they perceived mathematics teacher as a *Familiar Person*, instead of *Stranger*. While many of them used the metaphors related to *Familiar One*, instead of metaphors related to *Stranger*. They thought that mathematics teacher should be one of us in society and those in teaching profession.

One interesting finding is, in addition to *Advisor and Knowledge Provider* role, that pre-service mathematics teachers perceived the mathematics teacher as *Organizer*. Organization ability of mathematics teacher was thought to be inevitable. According to the participants, to be good mathematics teachers, they should have ability to consider, collect and organize everything related to profession of teaching mathematics. One interesting finding was that they did not relate mathematics teachers with the role of *Hardworking*. Only a few of them, compared to the other categories, presented metaphors related to this category.

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