



Students' Lived Experience Of Factors Affecting Difficulties In Learning Mathematics: A Phenomenological Study

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ABSTRACT

The present study aimed to investigate students' lived experience of factors affecting difficulties in learning mathematics. The sampling method was purposeful and the theoretical saturation of data was obtained after performing deep and semi-structured interviews with 18 students. The data were analyzed using Colaizzi's seven-step strategy and the findings were validated by attributing them to the participants. Deep analyses of the data resulted in 3 main themes (individual factors, teacher-based factors, and environmental factors) and 8 subthemes (math anxiety, students' previous poor knowledge, students' inadequate practice, lack of parental support, teacher's negative attitude toward mathematics, using inappropriate teaching methods, inconvenient teaching-learning environment, family and social factors). The results indicated various factors affecting difficulties in learning mathematics. These factors can challenge educational systems health and richness, especially in the field of mathematics.

KEYWORDS: Difficulties in Learning Mathematics, Phenomenology, Students' Lived Experience

INTRODUCTION

Mathematics has been one of important current issues in human life because the structure of knowledge in the field of science and technology is based on mathematics. Acquiring the basic math skills, especially in early childhood (primary school), has great effects on students' scientific and professional success (Clisens et al, 2009; Labinsky et al, 2014, Acharya, 2017) as well as their reading and science skills in the following academic years (Clisens et al, 2013).

One of the issues in minds of teachers, students and their families is that some students easily learn math while some learn it with difficulty. In other words, learning mathematical concepts in early years of education is satisfactory but some find it difficult, leading to a sharp drop in their education (Jordan & Levine, 2009). In this regard, the results of the latest Thames International Test (2015), which evaluates math academic achievement of students all over the world, indicated considerable difference in math performance of students of 49 countries of which some East Asian countries (such as Singapore, Hong Kong, South Korea, China, and Japan) showed a better performance than others (Mullis et al, 2012; Mullis et al, 2016).

According to what was said, studies have indicated that despite need to increasing math literacy in most countries, most students experience problems in studying mathematics (Sinay&Nahornick, 2016; Wathall, 2016; Rittle-Johnson & Schneider, 2015, National Center for Excellence in the Teaching of Mathematics, 2010; Hoffman & Brahier, 2008). The results of Thames test in mathematics over 6 periods of taking part the competition (1995, 1999, 2003, 2007, 2011, 2015) indicated poor performance of Iranian students (ZianejadShirazi&Ghaltash, 2018). Various studies investigated the reasons of poor math performance in three fields of class teaching, teaching plan, and educational research (Magidson, 2005). One of the problems is concerned with teaching method; in some educational systems, the main goal of learning mathematics is finding the correct answer through previous learned methods. To achieve this

goal, students are encouraged to use some limited methods. As a result, the learner has to memorize special problem-solving methods and use them automatically when necessary. While, one of the main fundamentals for solving a mathematical question is that the students need to gain a correct understanding about why and how to use mathematics in their life. Otherwise, learning mathematics undermines to practicing some learned problem-solving methods (Akhtar, 2018). Some studies have introduced different factors that affect students' math performance, such as anxiety and stress, mathematical self-concept, previous math performance, motivation to learn math, cognitive styles and understanding of classroom (Yayan&Berberoglu, 2004; Topcu et al, 2016; Guvendir, 2014; Muis& Franco, 2009; Muis, 2008; Liu &Koirala, 2009; Nielsen &Kreiner, 2017; Bagaka, 2011). On the other hand, some researchers believe that negative attitudes towards mathematics before attending the class is the main factor of problems in learning math. The results have indicated that the students who estimate their talent of learning math in a lower level do not have a good performance and are not interested in learning mathematics. In other words, such attitudes decrease math self-efficiency in these students (Akyuz, 2014; Topcu et al, 2016; Rowan-Kenyon et al, 2012; Usher &Pajares, 2009; DI Martino &Zan, 2011; Mata et al, 2012).

Moreover, other studies found the following factors that have great effects on learners' ability to understand the basic math concepts and skills: lack of attention by the staff to sufficient math education (Kiamanesh et al, 2016), low involvement of parents and their inner motivation to follow up and do tasks of their students' math learning (Pavalache-Ilie&Tirdia, 2015), the number and quality of competitions affecting parents and students' attitudes (Byun, Schofer& Kim, 2012), using private supplementary education, and cultural difference in terms of family involvement in education and their expectations of students' achievements (Lee, 2005 and 2007; Stevenson & Stigler, 1992), parents' education (Kus, 2015), absence of qualified and experienced subject teachers and lack of appropriate tools and applying ineffective teaching methods (Adino, 2015), teacher's preparedness (Naibei, Nakhanu& Catherine, 2017), lack of math thinking development and applying thinking processes such as generalization, abstraction, symbolization, making mathematical communication, classification, problem-solving, creativity, etc. (RezapourMirsaleh et al, 2016). Disregarding these factors will lead to poor understanding of mathematical concepts and achievement in students in mathematics. According to these factors, applying strategies by which students' math talent can be flourished is one of major responsibilities of the Education System. According to the importance of the issue and the problems students have in the education system in learning and teaching mathematics in Iran, it seems necessary to conducted research to investigate the current problems and strategies of increasing students' math skills, especially in primary schools.

Various studies investigated any of these factors. However, most were based on positivism paradigm using a quantitative method, which ignored a holistic view toward the factor affecting difficulties in learning mathematics. In order to solve the problems of a system, a system has to have a deep and general view. The present study sought to investigate and reflect the factors affecting difficulties in learning mathematics using an exploratory, holistic, and behavioral approach, and based on students' lived experience and perception. Therefore, the main questions was what are the factors affecting difficulties in learning mathematics for first high school students in the city of Dezful, based on students' lived experience and perception.

METHODOLOGY

The present study used a qualitative-interpretative method to describe the lived experiences and revelation of the meanings hidden in phenomena through examining the meanings and the relationship between knowledge and its grounds. Collaizzi's seven-step pattern was used to investigate the students' lived experiences of difficulties in learning mathematics. This method includes seven steps:

1. Exactly reading participants' all important descriptions and findings.

2. Identifying important phrases and sentences relevant to the phenomenon.
3. Conceptualizing the identified important sentences.
4. Clustering participants' descriptions and common concepts in specific themes.
5. Developing all extracted ideas to comprehensive and complete description.
6. Developing the descriptions of the phenomenon to a condensed and short real description.
7. Verifying

According to this pattern, the concept of the identified values were described in media and then the descriptions and readings of the issue under investigation were collected using semi-structured interviews.

Population and sampling method

In the present study, the population consisted of all first high school students in the city of Dezful, who were selected by using purpose-based sampling method. The purpose-based sampling method is targeted at events and experiences not individuals (Adib Haj Bagheri, 2006). The selection criteria were unsuccessful experiences in mathematics. To select the subjects, the criterion of "theoretical saturation" was used. Thus, 18 students were selected using purpose-based method, who were willing to participate in the study. The participants were asked to choose the place and time of interview as they wished.

Collecting data tool

The collecting data tool in this study was interviewing because it contributes to deeper evaluation of the participants' perceptions, attitudes, interests, and wishes (Sarmad et al, 2014). In addition, semi-structured interviews were used. Therefore, general questions were raised in relation with the issue under investigation, which included a kind of indicator of directing the search about each issue. Then, the interviewers asked other questions while listening to the respondents' answers and in line with their lived experiences. It was aimed to provide examples rather than expressing general issues.

Providing required explanations about the goals and the importance of the study, and the interview time with each participant was predetermined, which lasted between 30 and 45 minutes. The ethical considerations in this study included obtaining written informed consent forms to conduct the project and record the interviews, not including the names of the interviewees on the transcripts, observing the principle of confidentiality, and keeping the respondents' information confidential. All interviews were recorded by digital devices and the interviewees received a code based on the interview order and the related interviewer. The interviews started with a general question and in case of problem in describing the problem by the interviewee, the interviewer asked other questions to clarify the issue. In this study, the information saturation was obtained after 18 interviews.

Under exact examination of identified texts, independent ideas were identified in the forms of main and secondary themes and then codes were assigned to each interview. According to the consensus-based approach, final confirmation was obtained on identified themes. Four criteria, i.e. credibility (internal validity), transferability (external validity), confirmability (objectivity), dependability (reliability), were used to obtain reliability and validity of the results (Bagherifar&Salehi, 2016). Regarding credibility and in order to increase data accuracy, the participants were used in revising the results. Investigating and confirming the interpretations, credibility of the interpretations and the accuracy of data were assured. In order to increase

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transferability of findings, the researcher's multi-stratification strategy. In addition, confirmability of data was obtained through detailed descriptions of data collection and analysis processes. To achieve reliability and the goal that other researchers can study and review the study, all data were documented.

FINDINGS

Analysis of data resulted in 3 main themes (individual factors, teacher-based factors, and environmental factors) and 8 subthemes (math anxiety, students' previous poor knowledge, students' inadequate practice, lack of parental support, teacher's negative attitude toward mathematics, using inappropriate teaching methods, inconvenient teaching-learning environment, family and social factors), which showed the participants' experiences. Table 1 summarized the main themes and subthemes identified in the study, each of which were explained in detail in the following:

Main theme	Subtheme
Individual factors	Math anxiety Poor previous knowledge Inadequate practice lack of parental support
Teacher-related factors	Teacher's negative attitudes toward mathematics Applying inappropriate teaching methods
Environmental factors	Inconvenient learning-teaching environment Family and social factors

1) The main theme of individual factors

Individual factors are one of the most important variables resulting in success or failure in mathematics, which have important role in leaning mathematics. In fact, students' achievement in this field has direct relation with their interest, performance, and their effort.

Subtheme: math anxiety

Math anxiety is one of important individual factors in learning mathematics. Math anxiety is the negative feeling toward learning mathematics. It is formed when students find mathematics difficult to learn. Students experience tension, stress, or fear of math performance. It causes forgetfulness and decreases students' self-confidence in learning math lessons. One of identified themes that was frequently repeated was fear of mathematics due to negative descriptions by teachers, parents, or others. In the following, each of the students' ideas are explained.

Participant #4 stated that "mathematics is for smart students. It is difficult for me. Talented students can solve math questions. I am weak in mathematics. Last year, our teacher always told us that math is a difficult subject and we have to study a lot to get a good grade. I was really afraid of this subject. I don't like math because I'm really afraid of it".

Participant #12: "my brother always tell me that math has many formulas and if I am to learn it well, I have to learn the formulas. But, learning these formulas is very hard. Because of these formulas, math has been always a difficult subject to me. I am afraid of math, I don't like it. I wish we didn't have to study it".

Participant#8: "our math teachers always tell us that we have to learn many formulas. As many students can't learn these formulas, they are afraid if their math teacher asks them to solve math questions. Most students in our class believe that mathematics is a subject that can't be

understood. When I have to do my math homework, I am nervous because I don't like it. I am always waiting to end the class soon".

Participant #5: "I think math is difficult. I'll never study a major with math courses in university".

Participant #1: "math is difficult and only smart people can understand it. I can't understand the usefulness of math. I don't like it at all because I can't understand it". Other participants had similar opinions.

Second subtheme: students' poor previous knowledge

Another theme identified from students' experiences was their poor previous knowledge about the content of math. Students' basic knowledge is one of determining factors of students' good or poor performance in math. The students with insufficient knowledge about math cannot achieve success in math especially in higher level. Based on what was said, students' poor previous knowledge can be considered as a main factor of students' failure in higher levels of education.

Participant #7: "in my idea, if we can't learn math in early years of school, we face many problems in the following years. As all math topics are interrelated, for example if you don't learn multiplication, fraction, and division well, you can't solve problems".

Participant #6: "most of the time, our math teacher asks us math questions to control if we can solve it or not, but all students are silent and no one can answer because no one knows anything".

Participant #11: "most of students are silent in math class because they are afraid or shy. If someone answers incorrectly, all laugh at him".

Participant #2: "I always have problems with math because I even don't know the simple information that I should learn in early years of my education. I have problems every year because of my insufficient information and find it more difficult to learn than the year before".

Participant #9: "our math books don't include enough information to understand math. Students don't have enough information about this subject and always have problems in learning it".

Participant #3: "every year, math becomes more difficult than the year before. This subject and its problems has nothing to do with our life. I mean we learn it to take a test because it is not useful in our life".

Participant #12: "I think we find math difficult because we can't solve the new problems with what we have learned. This makes it more difficult." Other participants had similar opinions.

Third subtheme: inadequate practice

Another subtheme was students' inadequate practice in math.

Participant #1: "we have to practice a lot, but most students do everything except doing practices teacher asks us to do".

Participant #3: "I force myself to do my math homework. Our teacher asks us to do much homework but I don't like it at all".

Participant #6: I even memorize some of the formulas to have a good score in tests. I know it is wrong but I don't like math at all".

Participant #10: "most students study math to get a passing score. No one takes the time for math and solving the exercises".

Participant #4: "I study 1 hour for math test. To be honest, I force myself to study".

Participant #7: "to take math test, you just need sample questions and try to memorize the answers. No need to practice lots of exercises".

Participant #9: "I prefer the lessons that must be memorize to math because I can get a good score when I study them, even a little".

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Other participants had similar opinions.

Fourth subtheme: lack of parental support

Another subtheme was lack of appropriate parental support, which almost all students considered it as a factor that made learning math more difficult.

Participant #5: "My parents have many problems especially economic problems. They don't have time to help me with math, I have to try to learn it by myself".

Participant #2: "It'll be very nice if there be someone at home, who helps me with math. But unfortunately my parents can't help me with this subject. I need extra classes if I have problems".

Participant #8: "I have to go to my mother's cousin's house to learn math. She helps me with math because my parents are low-literate. This is very sad for me because if I could solve my problems, they wouldn't be collected and bother me".

Participant #4: "It is nice if there is someone at home, who can help me with math. Although my parents are educated, they are too busy to help me".

Participant #11: "my mother has diploma but she can't help me with math at all because, in her words, the books are changed and she learned different math topics. My father come home from work too tired and exhausted, who dares to talk to him".

Participant #12: "I have to help with chores at home. I don't have enough time to practice and study".

Other participants had similar opinions.

1. The main theme of teacher-related factors

Teacher-related factors were another main theme, which was identified and named in the analysis. This theme included teacher's negative attitudes toward math and failure to motivate students due to inappropriate teaching methods.

Subtheme: teacher's negative attitude toward math

Most participants mentioned teacher's negative attitude toward math as one of the main causes for their lack of interest and success in this subject. Some of students' ideas are mentioned in the following:

Participant #9: "when our math teacher hates math, what should we say".

Participant #1: "our math teacher always tells us that math isn't useful, and suggests us to do freelance jobs like hairdressing instead of studying majors like math in university".

Participant #7: "math is boring to me. When you're listening to the teacher while teaching math, you're fed up with life. He is, as if, forced to teach, he is not interested in math and doesn't motivate us".

Participant #3: "90% of my math teachers were unsatisfied with the major they studied in university. They told us math is not useful. I think they had to study math because they couldn't study a different major".

Participant #4: "when we ask our math teacher why we have to study math and what good is math to us, he had a knock-down answer: nothing".

Participant #10: "I wished our math teacher had made us more interested in math. Unfortunately, most of our math teachers are not interested in math. They teach and leave the class. Teachers can make students interested in this subject".

Participant #6: "our math teachers always tell us to learn math very well if we like to be accepted in engineering majors in university. They themselves know those majors have a brighter future than math, and of course of higher prestige".

Other participants had similar opinions.

Subtheme: inappropriate teaching methods

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Most students believed that appropriate teaching method is one of factors affecting the quality of math teaching.

Participant #5: "our math teacher's teaching method is not flexible. I'm always waiting the class to end because we have to listen to our teacher for one hour and a half".

Participant #2: "I wished our math teachers had learned a different method than talking. We get tired to listen".

Participant #8: "other teachers' teaching methods are more interesting than the math teacher's. For example, we work in teams in science class. But in math class, we have to sit silent and just listen to the teacher".

Participant #11: "the problems asked in the math class are not interested to me. So I don't like to solve them".

Participant #3: "our math teacher's teaching method is not good. We protested for many time, but there was no change. I can't understand what the teacher asks us. Or sometimes I feel the topics taught in the class are higher than our level. All of these make me uninterested in math".

Participant #12: "I feel I won't be successful in math because I can't understand what the teacher explains. I don't know if the problem is with me or the teacher".

Participant #2: "there is no interaction in math class. Perhaps the subject needs to interaction. The math classes have always been boring and tiring".

Other participants had similar opinions.

Main theme of environmental factors

This main theme included convenient class environment to learn math, as well as family and social factors.

3.1. Subtheme: inconvenient learning-teaching environment

Most students believed that inconvenient math learning environment affects their failure and difficulties in learning this subject.

Participant #6: "the number of students is too many to understand what the teacher is talking about. If the number of students was less, it would be better".

Participant #1: "you know, there are 36 students in a class. If each of us asks a questions, we have to be in the class for a long time, maybe till night. We have to practice by ourselves".

Participant #10: "our class is not located in good place. There is noise and crowds. To learn math, the place must be quiet. When we focus to listen, suddenly there is noise and all of the students look out to see what happened. Our class is as if in the middle of a market".

Participant #4: "all facilities in our school are too old. We don't have even a simple tool to use in math class, let alone the projector and so on. There are projectors in our school but they are broken. Most of the time, the remote control doesn't work or turn on".

Participant #7: "We can see everything on the board except the teacher's notes. I mean, the manager doesn't even buy a new and clean board".

Participant #9: "our class is too small to move along the desks. I am really uncomfortable on these desks. I prefer to sit on an old carpet".

Other participants had similar opinions.

3.2. Subtheme: family and social factors

Another subtheme mentioned by most students was the important role of family factors in academic achievement.

Some of the students' opinions are mentioned as follows:

Participant #4: "my home is not peaceful and my parents are always quarreling, from morning to night".

Participant #3: "Our economic condition is not good. My mother is always cleaning vegetables and making tomato paste to sell. Poor her, she has no time to help with me".

Participant #8: "My father's income is not so much. I buy most of my stationeries after quarreling and talking to him and explaining to him why I need them".

Participant #11: "most of the students in our class are depressed. When we talk to each other, we see that we can't buy the things we need. I hate my parents because of such difficult conditions".

Participant #2: "my mother always says me to get my diploma degree. I can't continue my studying. So, why should I study? My family don't support me at all".

Participant #12: "all of my cousins finished studying at first high school. Then, they got married. They are not happy in their marital life. My mother and aunt always tell me that studying is not useful and I have to think to something different, like my cousins. This is my life".

Participant #1: "My parents do not know about my education at all. They came to my school for few times".

Participant #5: "most students in my school talk more about the satellite films, new songs, and new hairstyles and fashions. Of course, there are few smart and studious students who have no hubby like satellite or Instagram in their families".

Other participants had similar opinions.

Conclusion and Suggestions

The present study aimed to investigate students' lived experience of factors affecting difficulties in learning math, and is considered as the first one in this field. Therefore, there could be found no study with direct relation in this regard; however, the results found in this study were in line with findings of other studies. The results of the present study showed that students' experiences can be categorized in 3 main themes. The first theme was individual factors that are normally associated with students' individual characteristics in the learning process of mental processing, motivation, and attitude. The findings of the present study and those of other studies such as MandiaMetason (2019), Vari (2015), Acharya (201), Baker (2014), Shen&Pedulla (2010), Mensah et al (2013), Johnson & Wilson (2007), Nuruddin et al (2008), Tachie&Chireshe (2013), and Li (2012) found greater effect of individual factors on math progress rather than family and school factors. In general, the findings of these studies indicated that individual factors can, to some extent, be associated with and predict difficulties in learning math. For example, Shen (2004) showed that among four predictors of math progress, educational desire that is an individual factor could most effectively predict math progress. He found a positive and significant relationship between progress in math and this factor. Joshua investigated the factor affecting students' math progress in Nigeria and found that attitude and self-efficacy are individual factors that can predict students' academic achievement. Johnson and Wilson (2007) concluded that some individual characteristics, including curiosity, being active and hard-working, initiating behavior and creating ideas, learning through experience and making sense of experiences, and efficacy in what is important to the person, have significant effects on students' academic achievement, and they will be potentially flourished if the learner is in an appropriate and convenient educational environment.

Another theme was teacher-related factors. Students' experience showed that teacher's negative attitude toward math and inappropriate teaching methods exacerbate the students' difficulties in learning math. Other researchers confirmed that teacher-related factors have important role in students' achievement or failure in math. Some of the researchers found results in line with the findings of the present study include Clark & Latshaw (2012), Yetkin (2006), O'connor (2011), Pape& Wang (2003), Boekaerts (2009), Pintrich&Schunk (2008), Deci& Ryan (1996), Fuladchang (2005), Schunk (1983), Fathinia (2006), and Organization of Education (2008).

All directly or indirectly emphasized the effects of teacher-related factors on math progress. For example, Yetkin (2006) showed that the proportion of homework to learner's ability cause the feeling of satisfaction because it makes opportunities for learners to experienced success.

Pintrich&Schunk (2015) emphasized clarification and specialization of lesson plans, as well as accessibility of these plans for students because it is believed that students can effectively manage the plans through clarified and specialized plans. Clarified and accessible plans affect academic self-efficacy, thereby have indirect effects on math progress. Moreover, the results of this study indicated that environmental factors such as inconvenient learning-teaching environment, as well as family and social factors affect difficulties in learning math. According to most of the participants in this study, appropriate atmosphere of class, number of students, internal space, facilities, lighting, etc. had considerable influence on students' learning. These experiences are consistent with the results found by Ngoboka& Schultz (2002), Gleason (2010), and Jarvis (2000). On the other hand, students' experience showed that family factors such as quality of parent-children relationship, parenting, parental supervision and their expectations affect students' math achievement.

Some studies emphasizing the determining role of family factors include studies by Kumar (2014), Hind (2004), Koutsoulis& Campbell (2001), O'connor (2011), and Martin (2012). These studies indicated the effects of factors such as family's economic and social status, parents' perception of math, role of mother, mother's occupation, and parents' education on math achievement.

Generally, it can be concluded that the above-mentioned factors play roles in activities related to learning math, which need to be seriously considered. Therefore, the problems of individual, teacher-based and environmental factors should be resolved rather than focusing on studying behavior for further achievement in math. It is suggested to study different samples of both genders in order to gain a holistic view toward factors affecting difficulties in learning mathematics.

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