



Learning and teaching in clinical practice

## “My math and me”: Nursing students' previous experiences in learning mathematics



Kari Røykenes\*

Betanien University College, Vestlundveien 19, 5145 Fyllingsdalen, Norway

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## ABSTRACT

In this paper, 11 narratives about former experiences in learning of mathematics written by nursing students are thematically analyzed. Most students had a positive relationship with the subject in primary school, when they found mathematics fun and were able to master the subject. For some, a change occurred in the transition to lower secondary school. The reasons for this change was found in the subject (increased difficulty), the teachers (movement of teachers, numerous substitute teachers), the class environment and size (many pupils, noise), and the student him- or herself (silent and anonymous pupil). This change was also found in the transition from lower to higher secondary school. By contrast, some students had experienced changes that were positive, and their mathematics teacher was a significant factor in this positive change. The paper emphasizes the importance of previous experiences in learning mathematics to nursing students when learning about drug calculation.

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## Introduction

Persons who seem to be similar think and feel differently, and thus act differently in almost identical situations and contexts. Several factors can cause various perceptions, but previous experiences are known to be significant contributors. They influence present experiences and can in line affect future experiences (Dewey, 1938). Therefore, a history of success and failure can influence a person's present perception. This is also the case in learning mathematics (Pajares and Miller, 1994); that is, a student's previous experiences are likely to contribute to his or her present perceptions about mathematics.

A student's perceptions can also influence other similar constructs—for example, test anxiety (Hembree, 1988)—and differences in test anxiety have been reported at both lower (Putwain et al., 2012) and higher (Naveh-Benjamin et al., 1997) educational levels. Some students look forward to tests or examinations because they want to demonstrate their skills and knowledge, which could be a facilitating aspect of test anxiety (Alpert and Haber, 1960). Others find the same situation so threatening and anxiety provoking that they wish to avoid or leave the situation and

this could be a debilitating aspect of test anxiety (Alpert and Haber, 1960). The latter is the situation for 10–35 percent of college students identified as highly test anxious in international studies (Naveh-Benjamin et al., 1997; Zeidner, 1998) and for 10 percent of Norwegian students in higher education (Nedregård and Olsen, 2011). Test anxiety can cause poor test performance (e.g., Embse and Hasson, 2012; Eysenck et al., 2007) and specifically in mathematics (e.g., Putwain, Connors and Symes, 2010a). Many nursing students display low self-concept and high test anxiety in this domain (Røykenes et al., 2014). Hence, previous learning experiences that have contributed to a student's perceptions are important to investigate because they are likely to be significant factors affecting the student's receptiveness to learning. Previous learning experiences are therefore important for planning and delivering subjects that involve mathematical skills and knowledge in nursing education; such as drug calculation.

The aim of this paper is to examine nursing students' previous experiences in learning mathematics to identify what these experiences tell about nursing students' current perception of low mathematical self-concept and high test anxiety. The research question is as follows.

- What can be learned about nursing students' present perceptions of mathematics from their narratives about previous experiences in learning mathematics?

\* Tel.: +47 93459113; fax: +47 55 50 73 01.  
E-mail address: [Kari.Roykenes@betanien.no](mailto:Kari.Roykenes@betanien.no).

## Theory

The narratives were written by nursing students with low self-concept and high test anxiety in the domain of mathematics. These constructs form the theoretical lens of the study presented in this article and influenced the analysis and discussion of the findings. The topic of the current article is the nursing students' previous experiences with mathematics, and the theoretical basis is the theory of experience.

### Experience

To examine the nursing students' previous experiences, it is important to understand the environment in which the experiences took place. According to Dewey (1938), there is a dual relationship between a person and his or her environment; i.e., a person's actions cause environmental changes that affect the person (Dewey, 1938). This interaction between the person and the environment provides experiences. Experiences are therefore seen as a transaction between the person and environment.

According to Dewey (1938) experiences have two perspectives; one in which the quality of an experience is instantly evaluated and one where the quality is evaluated retrospective. In this lies the continuum of experiences and that former experiences have consequences and affects present and future experiences (Dewey, 1938).

One may agree or disagree whether an experience influences the person in a positive or negative way, but either way, the present experience influences future experiences and are significant for the person's perceptions of him- or herself (Dewey, 1938). Present experiences will therefore influence a person's future thoughts, feelings, and actions. Some experiences do not contribute to growth, positive development, or self-concept. In an educational context, these experiences are defined as "miseducative" because they have the "effect of arresting or distorting the growth of future experiences" (Dewey, 1938, p. 25). Moreover, some of the experiences can be characterized as critical incidents. A critical incident is an incident that challenged and changed the storyteller's experiences and understanding, and contributed to his or her future understanding and behavior (Webster and Mertova, 2007). A critical incident can be both positive and negative, but it cannot be planned, and whether an incident is critical, can be determined only retrospectively (Tripp, 1993).

### Math self-concept

Self-concept refers to a person's perceptions of him- or herself (Shavelson et al., 1976). Previous experiences and the interaction with the environment are significant in determining how a person perceives him- or herself; for example, in the domain of mathematics. Evaluation from significant others is an important environmental factor for the development of self-concept and plays an essential role in how a person assesses and evaluates his or her ability in mathematics. Significant others are persons who have great influence over one's behavior and self-esteem. Parents and teachers are examples of significant others. The development of self-concept is strongly influenced by the way a person reacts to appraisal from significant others. Appraisal from significant others is likely to play a more important role in a context that is important (for example, a high-stakes test situation) than in a less-important context (Abston-Coleman and Levy, 2010). Shavelson et al. (1976) emphasized the reciprocal relationship between people's perceptions of themselves and their actions. Hence, the environment and its actors may be significant for the development of a person's perception and consequently affect his or her actions.

### Test anxiety

Test anxiety correlates with self-concept in the domain of mathematics (Bong et al., 2012; Zhou and Urhahne, 2013), and there is a reciprocal relationship between mathematical self-concept and anxiety about mathematics (Ahmed, Minnaert, Kuyper and van der Werf, 2012).<sup>1</sup> Test anxiety is a form of evaluation anxiety. Several theories have been developed in recent decades, although there is some consensus that the construct has two components that influence the test-anxious person's actions. One of these constructs is characterized by disturbing thoughts during preparation, under the examination and when waiting for the result. If the person experiences failure, the anxiety and disturbing thoughts are likely to affect further similar evaluation-related situations, and increase test anxiety further. Hence, the cognitive attention is split between disturbing thoughts and learning. Thus, the cognitive component of test anxiety affects performance and high test-anxious students perform worse than low test-anxious students do, and they achieve less than their performance potential (Zeidner, 1998). The other component of test anxiety is the affective component, which is activated immediately before and during the test or examination, but is not active after the test. Symptoms involving the autonomous nervous system—for example, trembling, increased heart rate, and perspiration characterize this component (Zeidner, 1998).

High test anxiety causes various actions. Some high test-anxious persons want to leave the situation that causes the anxiety, and do so by, for example, submitting a sick leave form. Others avoid test anxiety-producing situations and do not choose study programs with many tests or examinations. Test-anxious persons are not a homogeneous group in terms of personalities, traits, and gender. Some tend, for example, to accept failure and think that the result is going to be poor no matter how much effort they put into it. Others have the tendency to strive for perfectionism and focus on the subject, but think that their performance will never be good enough. Test anxiety can also be attributed to inadequate study and test skills or to learned helplessness (Zeidner, 1998). Consequently, persons who appear to seem alike according to skills and talent, can act very differently when facing an evaluation situation. How persons perceive themselves is therefore essential to understanding the concept of test anxiety.

In every classroom one can find two parallel pathways that students may shift between, one where competence is the goal and another where the goal is to maintain self-image (Boekaerts, 2007). Students, not having sufficient resources to meet the challenge a high stake drug calculation test requires (eg. because of former negative experiences with mathematics), might be on the pathway where maintaining the self-image is the goal, or shift pathway from competence to self-image maintenance. The focus on self-image and not on competence is critical in order to in-depth learning of drug calculation. Factors that hinder nursing students' in-depth learning are important to reveal in order to design educational programs that take the challenges students face into account. Moreover, educational programs that contribute to competence goal are important for patients' safety and students' performance of correct drug calculation as qualified nurses.

## Method

To investigate previous learning experiences, a narrative method was chosen. The narrative method is characterized as a qualitative method (Riessman, 2008). One reason for using a

<sup>1</sup> In this study, mathematical test anxiety forms a part of mathematical anxiety.

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