Development of Creative Competence Through Geometric Tasks

Nargiza Toshboeva
Lecturer at the Department of Methods of Teaching Mathematics and Geometry, Chirchik State Pedagogical Institute, Uzbekistan

Abstract: Geometry was not taught with creativity and diverse thinking in the past, especially in primary school. Students were simply given theorems and axioms based on geometric figures and were not allowed to discover them for themselves, resulting in the deductiveness of geometry not being invented. Because geometry was presented as a body of information that had to be acquired by rote in most situations, this not only hindered students' ability to understand geometric concepts, but also created a negative attitude toward geometry among students and teachers.

Keywords: Creative Thinking, Elementary Objects, Drawing-Writing Process, Alternative Definitions, Concept Image, Communication in Mathematics.

INTRODUCTION

Problem resolution must generate knowledge (Bereiter 1992:337-340). Creativity and divergent thinking are key components of a problem-based learning strategy. Using creativity and divergent thinking to learn geometry should result in a better knowledge of the concepts. The purpose of this study is to see how much various activities, such as offering rich learning experiences in the context of problem solving (problem-based approach), help students acquire geometry concepts. In this research, creativity and divergent thinking are tools for achieving a goal of conceptual understanding. [1]

The issues of motivating pupils in the teaching and learning process are frequently discussed. Some writers believe that allowing more room for students' creativity in the teaching and learning process is the answer. This is also the aim of contemporary pedagogical and humanistic education.[5, 6, 7, 8, 9, 19, 20, 21, 22]

Teachers need geometric thinking competencies, such as imaginative (modeling, guessing, determining), visual (observation, investigation), operational (reasoning, deduction), and reasoning (reasoning, deduction) to help students learn and understand geometry. Geometric thinking is related to the way people reason using properties of geometric shapes (images, forms) and spatial relations. Shape, space, and position should all be used to explain spatial connections. Students can acquire innovative problem solving and reasoning abilities by using this novel way to learning in geometry classrooms. These teaching competences will aid students in acquiring geometric content, i.e., students will be able to recognize and explain links

between the attributes of various shapes as they identify particular geometric objects. They can prove various geometry theorems by developing their logical arguments utilizing these definitions and axioms in a deductive manner. [2]

The goal of the research is to see how much emphasizing creativity and divergent thinking in geometry teaching and learning will aid in the acquisition of geometric ideas.

MAIN PART

A geometric concept must meet certain criteria in order to be described. The definition must express the main characteristics of the concept being described; it cannot be too wide or too narrow, and it cannot be negative. It must make a clear, concise, and relevant point and avoid metaphor. A descriptive or connotative sentence might be used to build the definition. A descriptive description establishes a notion based on its key properties and fulfills all essential and sufficient requirements. A geometric notion is defined in a connotative definition by identifying its group (genus) and distinguishing characteristic. As a rule, the word definition is more abstract than the definition of a concept by means of visual geometric pictures [2].

We will attempt to discuss the perspectives of different researchers on mathematical and geometrical creative thinking and its impact on the learning process in the following sections.

Creativity is seen as a key characteristic of contemporary life, resulting in more innovative improvements in a variety of areas (Pellegrino & Hilton, 2012). In the last 30 years, interest in the topic of creativity has grown, and its focus has shifted from genius to broader perspectives of inquiry—for example, creative behavior in everyday life (Hersh & John-Steiner, 2017; Kupers et al., 2019). Such considerations are equally relevant in the context of mathematics education; as a result, mathematical curricula have emphasized the development of creativity and critical thinking (Pitta-Pantazi et al., 2018). [4, 6, 9, 10, 11, 13, 12, 14, 15]

Although current research appears to focus more on the relationship between general and domain-specific creativity (here referring to mathematical creativity) than on analyzing the relationship between creativity and domain, there is still no consensus on whether creativity is a general cross-domain or domain-specific concept (Plucker&Zabelina, 2009). Hong and Milgram (2010), for example, proposed that general creativity is a requirement for the formation of mathematical creativity, despite the fact that general creativity is insufficient to explain mathematical creativity and its consequences on mathematical activity. Due to its domain specialization, Kattou et al. (2015) stated that mathematical creativity is not part of general creativity; yet, in empirical study, the framework or assessment of general creativity has been changed and adapted to mathematical creativity (e.g., Pitta-

Pantazi et al., 2018; Silver, 1997). Overall, it appears that scientifically analyzing the function of creativity in mathematics by referring to generic creativity techniques is required. [4]

For decades, it has been recognized that problem solving entails creative processes (Guilford, 1977), particularly when addressing problems that need divergent thinking (Haylock, 1987). Furthermore, two main components of geometric creativity are the generation of new information and the capacity to handle issues flexibly (Kwon et al., 2006), thus addressing non-standard or poorly organized problems can boost creativity (Chiu, 2009). [4, 16, 17, 18, 19]

The development of divergent and creative thinking is critical for excellent accomplishment while teaching geometry. Repetition of a solution with a different method encourages diverse and flexible thinking. Problem resolution, which is essentially creative, is dependent on deductive reasoning, according to Cangelosi (1996:159-160), and deductive reasoning is exactly done by the applicable problem. A four-step lesson is used to accomplish this:

- initial problem confrontation and analysis
- subsequent problem confrontation and analysis
- rule articulate, and
- extension and subsequent lessons (Cangelosi 1996:159) [3, 20, 21, 24].

Creative learners should have the following skills: to be able to create, to describe (e.g., acquire the practice of recording their ideas, results, conjectures, arguments, proofs, and views on the mathematics they do) to invent (to invent notation if ordinary language is too difficult, to invent mathematics for utilitarian purposes and for fun).

Conclusions

Based on the foregoing discussion, it can be stated that creative and divergent thinking are important in geometry lessons because they allow students to acquire problem-solving, critical and logical thinking abilities. Students' inventive attempts to recognize certain basic concept picture objects enable them to become more conscious and direct in their comprehension of geometric ideas' qualities and properties. This technique also offers a variety of ideas, methodologies, and more effective ways to develop geometric concepts in a variety of ways and using students' own language." [2]

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