GEOMETRY PROBLEM-SOLVING IN COLLABORATIVE SMALL GROUPS

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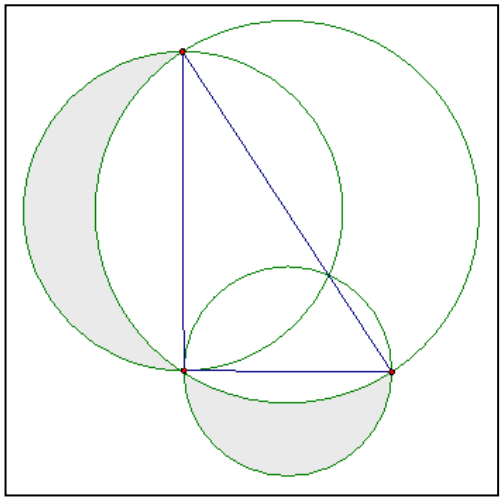
Extended abstract

The paper reports on a case study that was carried out in a township school. A small group of three students were observed while they were engaging in geometry problem-solving. It highlights the collaborative work, their interaction with one another and with the problem and their mathematical practices while they were doing geometry problem-solving.

Problem-solving is an important component of mathematics curricula and its importance has been emphasised in the Curriculum and Assessment Policy Statement (CAPS) (Department of Basic Education, 2011). Group work is also given prominence in the new curriculum. Polya (1957), in his seminal work, *How to solve it* explains his problem-solving process. Also, from 2008 to 2013 geometry has been excluded from the core mathematics syllabus for grade 12 and has been an optional topic tested in an optional paper (Mathematics Paper 3). Geometry has been reintroduced into the grade 11 core mathematics syllabus in 2013 and will be in the core mathematics syllabus for grade 12 in 2014. This had prompted me to pursue a study on geometry problem-solving in collaborative small groups.

The research question which the study sought to respond to was: What is the structure of the problem-solving process while students are engaged in geometry problem-solving in a small group setting?

The paper explains the problem-solving process advocated by Polya as well as Schoenfeld's definition of a mathematical problem. It also distinguishes between collaborative and cooperative group work. The problem that was given to the students satisfied the criterion that the students did not have a readily accessible means by which to find a solution to the problem (Schoenfeld, 1985).



The following problem was given to the students:

Circles are drawn with the sides of a right triangle as diameters. If the area of the triangle is 36cm², find the total area of the shaded regions.

(Source: Daily problem, AMESA Congress, 29 June 2009)

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Data were collected by means of audio and video recordings and through interviews with the students. The data analysis included the analysis of field notes, audio and video transcripts and students' written work. The data were analysed in terms of Pickering's theoretical notion of "a mangle of practice".

This study found that during collaborative group work, instances of bridging, transcription and filling, as given by Pickering's theory, could be identified. The cyclical nature of these processes also came to the fore, thus highlighting that the processes involved in collaborative problem-solving in geometry parallels scientific practice as a post-humanist activity. Viewing problem-solving within this framework as it occurs in real time, helped us to understand the process of students' geometrical problem-solving in small groups. Recognition of the nature of resistances in geometry problem-solving will enable teachers to facilitate the learning of geometry by asking appropriate questions to students or by designing appropriate scaffolding approaches.

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