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A Peer-led Workshop Experience in an Introductory Mathematics Class

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Abstract

In this paper the Instructor and the Peer Leaders share their experience with the Peer-Led Workshop embedded in an introductory Mathematics class at the New York City College of Technology in the spring 2012 semester.

Course and Workshop Description

MAT 1175-Fundamentals of Mathematics is a multi-section course with a departmental final exam. Topics include intermediate algebra, plane geometry and trigonometry of the right triangle. The class meets twice a week for 100 minutes, and the workshop is held once a week for one hour after class. Students worked on a module in each workshop meeting.

The modules are prepared by Professors Ghezzi (the instructor), Han, and Liou-Mark (PLTL practitioners). The modules combine and review several concepts that are covered in class. The problems progress from simple to more challenging ones. The 35 students in the class were divided into 5 groups. See the section below on methodology for further details.

Literature Review

William Perry (1970) found that college students go through a nine-stage progression in their cognitive and ethical development. The nine stages are grouped into four major categories (Rapaport, 2011).

Dualism- In the early stage of cognitive development, students display the belief that all problems have correct answers and authorities can provide these answers;

Multiplicity- Students learn that authorities are imperfect. Not including authority to serve as a judge, arguments appear to be only opinions and all appear to be equally valid;

Relativism- Recognition that important challenges have logical and illogical solutions rather than correct solutions. Students recognize that receiving knowledge requires hard work;

Commitments in Relativism- Education is alleged to be the opportunity to develop abilities and to understand when evidence is incomplete and practice the research skills required to fill in the gaps (Barker, 2011).

The workshop helps the student develop such skills.

Incentives

The following incentives were offered to students in this section of MAT 1175: they earned up to 3 points in each module (in lieu of more formal quizzes);they earned one point of extra-credit for every session they actively attended; they had extra help (from classmates and Peer Leaders) aside from the College tutoring services (which are often crowded, since they serve all students).

The following incentives were offered to the Peer Leaders: they gained teaching experience, they learned new methods to solve mathematics problems and they earned a stipend at the end of the semester.

Methodology

Different methodologies were used in the workshop. Students were divided into five groups. A module was given to each student, and it was collected by the Peer Leader at the end of class. Students were encouraged to discuss within their group first. This allowed them to brainstorm and to formulate the "right" questions, which was often a challenge.

The group then asked questions to the Peer Leader, who helped solve the problem strategically. The students gained confidence and developed the ability to reach new goals.

The Peer Leaders were not provided with an answer key, but the modules were sent to them in advance so that they could solve the problems before the workshop.

When appropriate the Peer Leaders explained more details or asked a student to present solutions on the board to the rest of the class. Students were encouraged to take good notes in class, which they could consult when working on the modules.

Challenges and Successes

The Peer Leaders at the New York City College of Technology have to take the Peer Leader Training class (MEDU 2901). They sometimes encountered difficulties in implementing the techniques discussed in the training class in an actual workshop. Some groups at the beginning did not develop into effective learning teams even with repeated messages to encourage collaboration. In some cases the peer leaders turned to traditional tutoring to help students who chose not to ask for help within their groups.

Each student had a different personality. Some students were shy, some were talkative, and some were not interested in sharing their thoughts. Communication was an issue for some students: they did not know what type of questions to ask the Peer Leaders or how to exchange thoughts with their classmates. Sometimes the students did not know how to use their class notes effectively.

In response to these challenges and to better prepare for future workshops, the Peer Leaders shared experiences and ideas through weekly online journal entries and during some of the training sessions. They participated in activities that helped them develop skills (role playing, mock workshops, etc.), and they read and discussed various learning/cognitive development theories (Vygotsky's Zone of Proximal Development and Scaffolding, Perry's Developmental Process, Argyris and Schon's Reflective Practice, Kolb and Felder's Learning Styles, etc.).

The Peer Leaders kept encouraging students to ask questions and to discuss with other group members. They used the pair problem-solving technique to guide students to answer their own questions. They regrouped students when appropriate after an evaluation of their performance in class and in the workshop as well as their personalities. They also collected feedback from the students.

As a result, as the semester progressed discussion among group members significantly improved, more students completed the modules with a solid mathematical understanding and several students volunteered to help their classmates. Students were motivated to review the modules since similar questions were on the exams. Test and module scores improved. Learning how to communicate with one another was a key to student's success.

Discussion

Mathematics majors have the advantage of learning Mathematics in a sequential order. This is done by understanding the language of Mathematics, by following the rules in a sequential order and by practicing (Kloss, 1994). Non-Mathematics majors appear to be in the dualistic stage (Perry, 1970); they are challenged to stimulate their learning about the problem and the concept behind it.

Students in the workshop started to understand that problems are based on concepts which have rules which they need to master. Encouraging students to consider alternate ways of approaching a problem helped them to realize that thinking is not based on memorizing the "right answer" but in analyzing the problem and the concepts to see the patterns.

Conclusion

The Peer-Led Workshop had a very positive impact on the class. It contributed to strengthening mathematics skills and to create an atmosphere of community. It improved interactions among students also outside the classroom.

References

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