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STUDENTS IN A MATHEMATICS WORKSHOP CAN BE MOTIVATED TO RAISE THEIR EXPECTATIONS OF THEIR PERFORMANCE

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In the Fall 2012 semester, I was a first-time Peer Leader in the first credit-bearing mathematics course, College Algebra and Geometry, at New York City College of Technology, CUNY. From the beginning of the semester my workshop group of nine students was divided into three sub-groups. Each sub-group included students at different levels of mathematical skills, where one received below 70 on the first exam, one between 70-80, and one between 80-90. Is there a way to help students to become more motivated and get higher level grades (from B to A)? This paper discusses how the Peer Leader can motivate and challenge students to become more interested in math by posing harder questions that lead to better discussions, increasing their interest, competence, and autonomy. Having students work in the sub-groups helps them with relatedness. In trying to solve problems that are challenging, the students who have grasped certain concepts help those who have not yet understood the concept and through discussion the group members will try their best to find the solution to the problem. This helps reinforce the material for both the more and less skilled students, and increases students' motivation, which will also increase their interest in mathematics and lead to higher grades.

Literature Review

Self-Determination Theory (SDT) is a theory of motivation developed by Edward Deci and Richard Ryan (Richard, 2012**)**. SDT is concerned with supporting our natural or intrinsic tendencies to behave in effective and healthy ways. Positive psychology defines the needs and motivations of individuals from the angles of the growth and integration of the personality. SDT has two sub-theories: Cognitive Evaluation Theory (CET) and Organismic Integration Theory (OIT).

Cognitive Evaluation Theory (CET) suggests that people have three intrinsic motivations: *Autonomy* is the universal urge to be causal agents of one's own life and act in harmony with one's integrated self. Cameron (2001) found that the *autonomy* of students' goals predicted grade point average, high intrinsic motivation, low extrinsic motivation, and improvement in social and emotional adjustment over time. Challenges, rewards and incentives may destroy students' intrinsic motivation to perform activities in groups. *Competence* seeks to control the outcome and

experience mastery. *Relatedness* can be described as making authentic attempts to be there for someone, or being prepared to invest one's attention in another (Richard, 2012).

Organismic Integration Theory (OIT) describes external motivators which can be integrated into a person. Motivation has often been grouped into two main types: *extrinsic* and *intrinsic* (Conti, 2000). *Extrinsic* motivation is when a person tends to do a task or activity mainly because doing so will yield some kind of reward or benefit upon completion. *Intrinsic* motivation, in contrast, is characterized by doing something purely because of enjoyment or fun (Deci, 1999).

Observations

On their first exam, the students in my workshop said they were satisfied with 80 as a "good grade," and did not want to make further effort to achieve a 90 or above. I reminded students that they were in workshop to help them "get an A" and their responses were that they were satisfied with a "B" grade, especially in math classes. I decided to:

1) group the students (3*3 subgroups), with different levels of ability;
2) give a difficult question which includes new knowledge (Fig. 1 left).

A student, who had received a high grade on the first exam, proposed the wrong solution (Fig. 2 right).

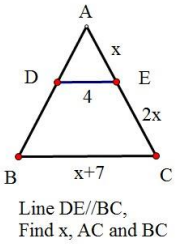

Figure 1. Triangle ABC, line DE//BC, if AE=x, EC=2x and BC=x+7. Find x, AC and BC.

DE/BC = AE/AC
4*2x=x(x+7)
8*x=x^(2)+7X
0=x^(2)-x
x(x-1)=0
X=1, x=0

Figure 2. Line DE/BC = Line AE/AC as 4/(x+7) = x/2x.

The Peer Leader gave a hint that Triangle ADE is similar to Triangle ABC (Figure 3, left). Two other students (also with first exam high grades) drew the two similar triangles and explained that line AC equals x+2x but not 2x. (Figure 4, right).

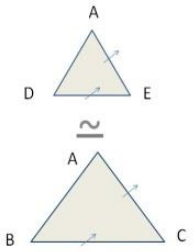

Figure 3.Triangle ADE similar to Triangle ABC

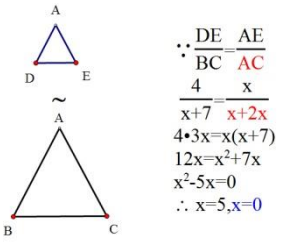

Figure 4. Triangle ADE similar to Triangle ABC; Line DE/BC = Line AE/AC as 4/(x+7) = x/(x+2x).

The result was that students in each group and each level became interested in the discussion and took notes, even though the workshop ending time had already passed by 15 minutes. No one wanted to leave.

Discussion

By posing a harder question to encourage students to think, students' sense of autonomy to perform activities was enhanced (Deci and Ryan, 1991). Because students were actively discussing the problem with each other and thus involved in the group activity, demonstrating relatedness, they became more competent, leading to more autonomy.

"Allowing the voice of students' autonomy to speak" (Richard, 2012): The benefit was not only to the skilled students' sense of autonomy and competence to point out their opinions but also for the unskilled students to try to follow the solution and answer the question actively. In this way, the students' expectations of their performance are rising.

Conclusions

Motivation and challenges can help students be more interested in math. The Peer Leader should separate students into smaller groups of three and have skilled and unskilled students together to motivate them, helping them with relatedness. The Peer Leader can challenge students extrinsically with harder questions which will lead into better discussions, increasing their interest, competence, and autonomy. No matter if it is the skilled or unskilled students, each will try their best to find the solution to the problem which will increase their motivation. With their motivation increasing it will also increase their interest in mathematics which will lead to higher grades.

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