

Share the Experience! Problem-Solving is No Longer a Problem.

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Introduction

Students are an integral part of the school community and yet teachers and school administrators rarely try to take into account students views and perceptions with respect to the learning opportunities provided for them in school. The National Council of Teachers of Mathematics has encouraged educators to allow students to play a more integral role in their own learning processes (NCTM, 2000). Listening to students' perspectives may lead us to modify how we approach curriculum and instruction in school. The purpose of this paper is to describe a case at Al-Rabih School in which the teachers are working to heed the calls for involving students more in their own learning in mathematics. We will share our experience gained from teaching and trying to change a preconceived idea formed by both teachers and students that "problem-solving is really a problem." During the presentation a book entitled, "Student to Student," prepared by the students themselves will be displayed and distributed to the audience.

About the School

Al-Rabih School (nursery through grade9) was established in 1999 in the heart of Kabrshmoun, on a quiet hillside in one of the most extraordinary beautiful spots in Lebanon. Our school is a non-profit school, dedicated to helping middle class students and parents of minimum and average financial income. The school team emphasizes on developing the traditional approaches in teaching mathematics, for this purpose they picked 3 well-trained elementary math teachers and allotted to each 7 math periods per week to cover the Lebanese curriculum using American math books chosen by the teachers for the broad and balanced program that these books provide and which fulfills the requirements and meets the goals and objectives of the Lebanese program and the abilities of the students.

Based on our belief that the innovative methods of teaching prepare students to become effective thinkers able to engage successfully in rich learning tasks, our school eagerly participated in MARAL project (Mathematics Reform for All in Lebanon) which was launched at the American University of Beirut to study Lebanese elementary mathematics classroom teaching and help teachers by providing them with valuable feedback and professional development.

Our Project: Students Views on Problem Solving

At the outset of each year, we ask our students about their favorite domain in mathematics. Very few and sometimes no students choose problem-solving as a favorite domain. Because of our belief in the importance of problem solving, we found these results to be problematic. If not solved we felt that our students' lack of interest in problem solving in school might someday prevent them from solving their own personal problems in life. Taking this into account we (coordinator, teachers and students) decided together not to give up easily and to put forward a very efficient plan for attacking this problem. Mirroring the classic general problem-solving heuristic, our description is divided into 5 sections: 1) Understand the problem; 2) Plan; 3) Solve or Carry Out the Plan; 4) Observe and Reflect; and 5) Conclusion.

Understand the problem

A questionnaire was handed out to students during the English session and not the math, in order for students to feel free to be honest and feel less pressure to please their math teachers. Data collection encompassed students from grade (2) till grade (6). Students were asked a series of questions about their opinions regarding different topics in mathematics and the reasons why they liked or disliked various topics.

The results show that 68% of the students hate math because they hate problem-solving. These results were announced in front of the students and together with the coordinator and teachers we became aware that this problem should be solved urgently.

Plan

The coordinator and teachers met to discuss the results of the survey. After some discussion, they set down 2 goals to be achieved during the academic year. One of the goals was common among all teachers and focused on the issue of problem-solving. We agreed on strategies to focus more positively on problem solving in the classroom and we also devised a plan for collecting evidence about whether our strategies worked. To follow up the students' improvement and our achievement we decided to test students using a brief performance assessment. We decided to give the same complex problems to be

solved once in November 2004 and the second time in May 2005. The results of the two administrations were then compared.

Solve or Carry Out the Plan

From November till May, we followed a certain procedure which will be summarized in 12 points:

- a. More time was given to problem-solving.
- b. Students were encouraged to read the problems given to them in class and to restate problems in their own words.
- c. While students worked most often in pairs, we as teachers were circulating among the students, listening carefully to their discussions, encouraging them to reflect on what is going on in their mind, encouraging students to persevere through challenges, and rejecting "I don't know" answers.
- d. Teachers interfered sometimes by asking students appropriate questions to help them clarify the direction they are using in solving the problem.
- e. Early finishers were encouraged to solve the problem in another way then share their ideas with other students.
- f. At the end of the assigned time for each problem, we were accustomed to displaying the multiple solutions for each pair.
- g. Students who did not finish were encouraged to express their opinion on why they did not reach the final answer.
- h. Teachers focused on the strategy the students followed and not on final answers or number sentences.
- i. Teachers displayed on cardboards the perfect answers and the mistakes.
- j. We asked our students in what way the problem was similar to or different from problems they solved previously.
- k. At the end of each problem-solving session, students were asked to write their own problem, which can be solved following a specific strategy.
- l. Teachers collected the problems written by the students.

Observation and Reflection

After comparing the results for the problems solved in November and May, we noted the following improvements over time:

- i. Students seemed to have a more organized way of thinking.
- ii. Organized work helped students work faster.
- iii. Students were able to solve the same problem using multiple strategies more than in the fall.
- iv. Students expressed increasingly more of their own ideas.
- v. Problem-solving became an interesting domain in math for students.

The positive results above encouraged us to go a step further. We decided to create something called a "Student to Student" book of problems. All the students in upper elementary classes wrote at least 2 problems without help from any teacher. Even low ability students participated eagerly. We tried our best to avoid the repetition of problems. The book was decorated by the students' drawings.

In October 2005 the book was sent to students from other schools in order to test the theory:

"Problems written by the students themselves are more enjoyable than problems written by teachers".

Conclusion

The "*Student to Student*" book was a great reward to teachers because we discovered the quality of problems students like to deal with, such as problems that are stated using short and simple language. Real-life situation problems were also more preferable to students. Moreover teachers discovered that students having difficulty in solving problems can't manage to solve their own personal problems. This confirmed for us that problem-solving is really something beyond mathematics.

We hope that our experience will contribute in developing problem-solving skills.

GOOD-LUCK and always remember: "You are not alone in the battle field"