

HOW I MAKE MY MATH CLASS MORE NATURAL: COGNITION AND LEARNING

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ABSTRACT

Looking in Vygotsky's in cognition and learning, this paper analyzes some cognition theories found in the knowledge base of the Palestinian math classes. It also reflects on the influence of the theories on teachers' classroom practices and on the effect of these practices on students' cognition and learning.

INTRODUCTION

Why do our students find math difficult? I always ask myself. Is it because of the student? Because of the teacher, the text book, something else, or because of these all together? I believe that there are three factors that affect fostering math thinking and making math class more natural, and so easier. First, we have the student who should be not only a learner, but a thinker who can solve problem. Secondly, the teacher who should be more as a trainer and a facilitator to help the student think critically. And thirdly, we need an encouraging environment for thinking and learning.

AS a math teacher for 15 years and a math supervisor in my fifth year, I always think about the problems in our schools in the way math is taught. Most math classes are teacher focused instead of learner focused. Teachers usually teach students math formulas and solve problems as examples, and students do the same as them. Many teachers don't accept to change their way, simply because this is easier for them and that what they are used to. Most of the teachers focus on good students in the class and neglect the others, so shy and underperforming students are oppressed in these classes. These problems makes math difficult for students; students don't have the chance to think and ask questions, they only perform as their teachers want.

My Job

I believe that it's my responsibility towards my students to search deep in their minds for their intelligence. Help them to discover their capabilities and knowledge for themselves. In a recent article, "Is Algebra Necessary" published in New York Times, Hacker concludes that "making Mathematics mandatory prevents us from discovering and developing young talent. In the interest of maintaining rigor, we are depleting our pool of brainpower." If we just give students formulas and solve problems as examples, and students solve similar problems in the same way, our math classes will be boring and our students will gradually lose their ability to think well.

So our job as teachers to develop our methods of teaching so as to make it more suitable for the mind of the students. Moreover, we should help them train and live their experiences to make math class more natural and easier.

Teachers should encourage students to think critically. Encourage the students to discover formulas that they need to solve the problem, find other solutions and compare them, to

analyze complex problems. To increase their accuracy and skills. Encourage the students to create problems and suggest solutions. Teachers themselves should think and learn from their students' thoughts to encourage students to learn. Encourage the students to apply what they learned to real life problems. Help the students learn how to construct shapes and diagrams to explain a problem. Use critical thinking in their subject delivery, classroom discussions, assignments and tests.

Cognition and Learning (Vygotsky School)

I have learned about theories of Cognition and I have been impressed by Vygotsky's school, and the way he and Piaget think about human's mind. The ways that we have to develop our methods of teaching so as to make it more suitable for this mind. "Vygotsky never convinced of mind as expressing a logical calculus. Mind, rather, comprised process for endowing experience with meaning" (Bruner, Celebrating Divergence). In other words, meaning needs the language and the cultural context in which language is used. According to Vygotsky the most important question is how we to get from "outside" into our "inside" through social interaction.

In the view of learning and transfer Vygotsky's school defines learning as the process by which knowledge is increased or modified. While transfer is the process of applying knowledge in new situations. Moreover, Vygotsky's theory talks about motivation and engagement by effective learning which involves being strongly engaged in activities that captures the learner's interest because of their intrinsic qualities as well as participation in communities.

One way to motivate students is by drawing connections between today and students' previous knowledge by asking questions. Motivating students in my view is to look for initial knowledge that the students have. Then encourage them to ask general questions generalized from the teacher's studied activities connecting with the topic they are going to learn about.

On the other hand, Vygotsky's idea of the connection between the class and the student's life is important. In the article of "Modern of the Developing Child" by Vygotsky presents the "cultural historical child"; this child is thoroughly social, situated in specific historical context and within a culture that might or might not nature the mind through facilitating the processes of interpersonal scaffolding. Vygotsky's theories view children actively constructing their understanding as a result of their experiences. One implication is that language is important both as a way in which children develop their thinking and understanding and as means of sharing thoughts and understandings with others.

In Math, language is very important in problem solving. Some of the students can't answer the question or solve a problem because they do not understand the language of the problem. Teachers should concentrate on understanding the questions. One way of doing that is to collaborate with the language teachers in school and encourage students to understand and solve problems. More time is needed to teach students how to solve problems, and the teachers should encourage them to try to solve problems by themselves. In Palestine, particularly in our math classes, if we give students the opportunity to think of math knowledge with their own lives, then it will be more natural and easier. Students in math classes always find it hard to solve a problem of two or more processes; we can help them by activating school cantina. They always do that without linking it to these math problems.

In the article of “Cognition and Learning” Jamer G. Greeno & Allan M. Collines believe that “the main reason for schooling is the students should increase in what they know.” They believed that the nature of knowing underlie different priorities, values, technologies, and practices in educational activity. While speaking about knowledge in the three different schools (Behaviorist, Cognitive and Situative) I was attracted to situative perspective on knowing that focuses on the way knowledge is distributed in the world among individuals, the tools, artifacts, and books that they use, and the communities and practices in which they participate .

Vygotsky in my class

As a teacher, in one of my experiences as a teacher, and while I was teaching my students (Volumes and Areas), I gave the opportunity to the sixth grade learners to do tasks exposing them to enrichment activities and different questions to help them develop and improve their critical and creative thinking. For example, why? What's wrong? What do we do if? Suggested another way to resolve? What happens when you change certain data? What do you think? Give example of.....? Etc. Then, I asked them to solve a problem by using the rules discussed before. At first it was difficult for them, then through their activities to work in homogeneous groups, discuss the results of questions and then view the answers for each group to other groups and make an assessment by the students themselves. I have been monitoring students working in these activities in collaboration with and recording observations about the evolution in the thinking of the students and how they answer and build questions. In this experiment I was able to notice the development of my students' thinking through their work and questions and of course through making their own model and participating the asses. For example the students they were able to calculate the cost of repairing broken things (window, door...) in their environment using the rules of volumes and areas.

Another example of math lesson about Geometry. Using good environment (school yard) for thinking and learning. I used to take my students to the yard , asking them to look for the tallest tree or wall, giving me their thoughts about the reason for heir coming. After that, students shared their thoughts together as groups, then each group (4 students) tried to find the length of the tree or the wall by using the formula of (Similarity of Triangles) discussed before. At the end, students measured the length of any one of the group (they can exchange), the length of His shadow, and the length of the tree shadow. As an assessment I encouraged students to evaluate their work and I made a formative one (an exam). And to know the effect of my new method of teaching, I made a performance assessment in which each student (better be in pairs) calculated the length of his (their) house. I believe that this way helps to build good self esteem.

As a supervisor attending math classes, I usually ask the students some questions about their current and previous lessons in order to motivate them to share their ideas. In ordinary classes, a few students usually participate while the teacher is explaining the lesson. When I asked the students and encouraged them to participate, most of the students did. Their teacher was surprised, as some of those students have never participated before and now they were able to answer my questions

Can teachers learn from students?

To encourage students to think, teachers themselves need to think and learn from their students. John Holt in "Teachers talk too much", talks about his experiment in teaching a fifth grade math class and was very much pleased with himself because, instead of 'telling' or 'showing a youngster, He was 'making her think' by asking questions. But she didn't answer. He followed each question with another that was easier and more pointed. Still no answer. He looked hard to his silent student and discovered that she didn't even look puzzled. Just patient. Then it dawned on him: She was just waiting for that really pointed question – the one that would give her the right answer.

Teachers can learn a lot from students' thoughts by listening to their comments, notes and questions. Allowing them to criticize the teacher and the students in the solution and that of the other students. Meier also speaks about listening and learning. In her article "Learning in the Company of Adults" She writes: "One teaches best by listening and learns best by telling"(Meier, 2002). So if we listen more to our students in the classroom, this enables us to be good teachers for our learners. By listening, and being genuine we will be able to know the initial knowledge of our students and basically depend on it to go for further knowledge.

How to deal with Obstacles

Some teachers think that the lack of equipment is an obstacle which prevents them from carrying out activities. Of course, this is wrong because I believe that any teacher can be positive and activate his students without need to any external equipment. For example, the math teacher can use the classroom environment to do some measurements. The school, trees and balls can be used to solve problems with numbers, Probabilities and Geometry. He can use any available stuff. If he believes in that, his class will be better and then it will.

Any small change can affect students in the class. In math classes I hope I can find active groups in which every student talks, tries, listens to his colleague and gives his opinion. This will enable students to ask all their questions. This was one of the procedures Mr. Jones did with his students in teaching electricity. He let each student think, write his thoughts and share them with his colleagues in his group, then he gave them the opportunity to try and investigate their thoughts to answer their questions, (Minstrel, Simpson (1996)). Math teachers can also do this by being genuine and letting their students solve problems. Each group can have the opportunity to solve problems driven from their own life such as: buying, selling, calculating, some fixing or financing problems at their schools or houses. Trying to do this enables them to use math formulas in a reasonable way which activates students a lot and makes them feel the reality of mathematics.

Other way teachers can strengthen the long term memory of their students by making the concepts of math relevant to something they know by using models. They can engage students in problem solving and to know by using programming with Logo, Geogebra. Programming in these illustrates conceptuality in different ways to learn mathematics using computers. This is similar to Vygotsky in putting the students in the real problem with something they love (computer), they can be problem solvers. For example, they can use these programs to draw some functions or to recognize different angles (How?)

CONCLUSION

As teachers, we should be facilitators for our students to make them thinkers and not only learners merely passively listening to the teacher. We should encourage them to think critically by creating a motivating environment that helps them to think and so to learn better regardless the obstacles that may face us. So we should teach Math to improve the Critical Thinking skills of all the students, those who need Math and those who do not. Students can forget all the formulas we learn and most of us do, but the critical thinking skill if learned well and practiced, will be forever with them.

Many schools talk about cognition and learning, especially Vygotsky School that focused more on the human mind and the process for endowing experience with meaning. There are many things that teacher can do to teach students to think. They can help them to discover their capabilities and knowledge for themselves; they can connect the class with their life by encouraging the students to apply what they learned to real life problems, and their previous knowledge. Teachers can use different ways to transfer knowledge to their students such as using models, computer programs or asking different questions and importantly listening to their students.

Finally, to make classes more natural, teachers should focus more on: reaching each student, listening with care, being a learner, being genuine and being positive.

REFERENCES

- Bruner, J.S. (1996). Celebrating divergence: Piaget and Vygotsky. Paper presented at the second Conference for Sociocultural Research, and The Growing Mind, Geneva, 15 September, 1996. *Human Development*, 40:63-73 (1997).
- Greeno, J.G., Collins, A. & Resnick, L.B. (1996). Cognition and Learning. In D.C. Berliner & R.C. Calfee (Eds.), *Handbook of educational psychology* (pp. 15-46). New York: MacMillan.
- Nelson. (2007). *Young Minds in Social Worlds*, Chapter 2. Cambridge, MA: Harvard University Press.
- Hacker, A. (2012). Is Algebra Necessary. *New York Times*. Opinion. *American Journal of Education*.
- Holt, J. (1969). *Teachers Talk Too Much. The Under-Achieving School*. New York: Pitman Publishing Corporation.
- Minstrel, J. & Stimpson, V. (1996). A classroom Environment for Learning: Guiding students' Reconstruction of Understanding and Reasoning, In Schauble, L. & Glaser, R. (Eds) *Innovations of learning : New Environments for Education* (pp.175-202). Mahwah, NJ :Lawrence Erlbaum Associates, Inc.,
- Meier, D. (2002). *Learning in the Company of Adults*. In *schools we trust*. Boston: Beacon Press.