Teaching And Learning Of Mathematics

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VISER, RICUM
Why we teach mathematics?

- We organize an educational system and decide what should be taught to students in order to keep the society going for one more generation.
- We are guided by our estimate of what the society will need in order to function.
- Our decisions will determinate not only whether the society and the students will survive, but also the directions in which the society will change.
- Our own society, the most rapidly changing in history, so it is very difficult to prepare students for world which we can only vaguely predict.
Why we teach mathematics?

The most valuable things which we can pass on to students are the tools and the motivation for lifelong learning (LLL).

The motivation should be both external and internal: students should see how they can apply what they learn to obtain rewards they can appreciate, and they should find learning fascinating for their own sake.

The later is of great practical importance, since a student should must learn many things for which the payoff may be in distant future, or may be too difficult to understand.
Why we teach mathematics?

- **Mathematics is a human activity which arises from experiences and becomes an integral part of culture and society, of everyday work and life.**

- **Teaching Mathematics is very complex and hard. Teacher must prepare itself that sometimes the students found Mathematics as a boring subject.**
Why we teach mathematics?

- Preparing for these problems and trying to be flexible and creative enough to achieve your objectives and goals is main thing.
- One of the important things is knowing lots of methods in teaching mathematical subject in order to be more effective and more creative in the process of learning.
METHODS OF TEACHING MATHEMATICS

- MODEL METHOD
- SOCRATIC METHOD
  - Classic Socratic Method
  - Modern Socratic Method
- KUMON METHOD
- LECTURE METHOD
- DEDUCTIVE METHOD
- INDUCTIVE METHOD
- PROJECT METHOD
This technique of model building is a visual way of picturing a situation. Model building involves using blocks or boxes to solve the problem instead of forming simultaneous equations and solving for the variables.

The power of using models can be best illustrated by problems, often involving fractions, ratios or percentages, which appear difficult but if models can be drawn to show the situation, the solution becomes clearer, sometimes even obvious.
Advantages:

- pictorial representation of abstract relationships,
- fewer (and less abstract) rules to learn,
- intuitive, easy to understand by students,
- flexible, applying in many situations,
- giving students a way to visualize equations.

Disadvantages:

- pictorial approach may not be intuitive to some students
- may not work in every situation
- takes plenty of practice to learn to use well
Teaching by asking instead by telling.
Involves asking a series of questions until a contradiction emerges invalidating the initial assumption.
Socratic irony is the position that the inquisitor takes that he knows nothing while leading the questioning.
Just asking a lot of questions does not automatically constitute a use of the Socratic Method.
The oldest, and still the most powerful, teaching tactic for fostering critical thinking.
Focus is on giving students questions, not answers.
Socratic questioning is a highly disciplined process.
The Classic Socratic Method is freestyle because, due to the nature of the questions, it cannot predict the responses to questions, anticipate the flow of the conversation or even know if a satisfactory answer is possible.

The Modern Socratic Method is often constrained to a predesigned set of questions that are known to generate a range of predictable answers and elicit knowable facts. This method can be used to good effect for leading a person to work out their own understanding of static knowledge such as mathematics.
SOCRATIC METHOD

Socratic questioner should:

- keep the discussion focused,
- keep the discussion intellectually responsible,
- stimulate the discussion with probing questions,
- periodically summarize what has and what has not been dealt with and/or resolved,
- draw as many students as possible into the discussion.
Advantages

- The Socratic Method of teaching has been used by schools and teachers for many generations. However, it is often more used in higher education, which comes as a disadvantage to young students. Young students should be taught by the Socratic Method because it encourages critical thinking, in-class participation, and other social skills that students will need to succeed at any level of education.
- easy-to-understand principle
- involves discussion
- students can actively engage with their knowledge instead of simply memorizing or retaining it
- students can exchange opinions and ideas, develop excellent speaking and communication skills
- The Socratic Method is a fun yet educational way to teach your students how to make use of their knowledge. The Socratic Method also teaches students how to think critically, accept others' opinions or viewpoints, and apply their knowledge to the real world and to other forms of knowledge.
Disadvantages:

- Assume Everyone Knows Nothing.
- Difficult to Apply.
- It is Imperative to Know You Can Be Wrong.

Socrates was called wise by the Oracle and others because he was wise enough to understand that even he knew nothing.
KUMON METHOD

- Founded in 1958 by senior high school math teacher Toru Kumon
- Individualized learning method.
- The starting point for each Kumon student is determined individually. Students start with the level where they can attain a perfect score by studying on their own.
- The worksheets have been designed in a way that allows students to figure out how to solve problems on their own. Kumon pursues the potential of each individual with the individualised, self-learning method.
- Based on individualised instruction and study at the “just right” level, Kumon seeks to improve the skills of each student and maximise their potential.
Kumon’s Mission

- By discovering the potential of each individual and developing his/her ability to the maximum, aim to foster sound, capable people and thus contribute to the global community.

Kumon’s Vision

- “World peace through education.”
- Kumon’s vision is really quite simple, and yet incredibly humanistic. The vision of world peace through education will be realized by the fostering of as many capable individuals as possible. Such individuals will progress the skills to overcome hardships and difficulties using their own innate abilities. By doing so, we believe that we can realize our vision, world peace, for a well-educated community made up of capable individuals will be a peaceful community.
Advantages:

- **Individual Learning**
  The path of study is tailored according to student’s abilities. The Starting Point, daily workload, projection, amount of repetition, rate of advancement, are all designed with each individual in mind.

- **Easy Starting Point**
  You may be surprised at the easy starting point set for students. The easy starting point is set so that students can begin their Kumon experience with success, attaining 100% with each set and starting to build confidence in mathematics. It is also important for other reasons.
KUMON METHOD

- **Daily Study**
  Kumon is a daily program. The students spend only 10-30 minutes a day to do the worksheets. This will instill in them good study habits and self discipline. Constancy and continuity are great assets for the future education as well as self development.

- **Repetition**
  Repetitions are one of the reasons for Kumon’s success. It gives students adequate time to consolidate and master each area covered in the Kumon program. So it is quite normal and natural for students to be asked to repeat worksheets that have already been completed.
• The teacher has a great responsibility to guide the thinking of the students and so he must make himself intelligible to them. Unlike other methods where motivations can come from subsequent activities, in the lecture, students interest depends largely on the teacher.
LECTURE METHOD

- Getting the attention.
- Comprehension by the class is the measure of success of the lecture to insure comprehension, two approaches may be used. The first is to have repetition or approach from another angle of thought. The second is to remove the causes of difficulty by using verbal and concrete illustrations.
PREPARING THE TEACHING LECTURE

- Planning: The following four steps are followed in the planning phase of preparation:
  - Establishing the objective and desired outcomes;
  - Researching the subject;
  - Organizing the material;
  - Planning productive classroom activities.

In all stages of preparing for the teaching lecture, the teacher should support any point to be covered with meaningful examples, comparison, statistics or testimony.

- Rehearsing: Teacher should rehearse the lecture to build self-confidence.
LECTURE METHOD

Advantages:
- Gives the teacher the chance to expose students to all kinds of material.
- Allows the teacher to precisely determine the aims, content, organization, pace and direction of a presentation.
- Can complete and clarify text material.
- Complements certain individual learning preferences.
- Facilitates large-class communication.

Disadvantages:
- Places student in a passive role.
- Encourages one-way communication.
DEDUCTIVE METHOD

- Process of thought starting from general going to particular.
- The deductive procedure starts with a rule that is applied to specific cases for the purpose of testing its validity, illustrating or further developing it, or solving the problem to which it applies.
Steps of the Deductive Method

- **Statement of the Problem.** The problem should be motivating and should arouse a desire to solve it. As much as possible, it should be related to a life situation, should be real, vital and within the ability and maturity of the student.

- **Generalization.** Too or more generalizations may be recalled. One of these will be the solution to the problem.

- **Inference.** This is choosing from among the generalizations the one that will fit the problem.

- **Verification.** This is trying out and securing the successful generalization.
DEDUCTIVE METHOD

Advantages:
- Students think logically and scientifically.
- What is learned is retained longer and is better understood.
- Students are trained in problem solving and are able to solve similar problems later.

Disadvantages:
- It does not fit all subject matter areas.
- It requires more time and is mentally taxing for slow learners.
INDUCTIVE METHOD

- Solving a problem from the particular to the general.
- Through the inductive procedure, one way arrive at a fact, a principle, truth, or generalized.
INDUCTIVE METHOD

- Helps students to discover important rules or truths for themselves through careful observation of among specific examples that will support the generalization, it makes meanings, explanations, and relationship of ideas clean to students and enable them to carry investigations for themselves independent of the teacher, through the master of the inductive procedure.
INDUCTIVE METHOD

- Presentation – specific cases or instances are presented to the class. There should be enough cases from which to draw a generalization. It is better to have more rather than too few cases. Otherwise, students may get into the habit of drawing conclusions from very few instances.

- Comparison and Abstraction – it is in this step that the common element among the specific cases is delivered. Each case should be gone over as this is the step that prepares the student to state the generalization.
INDUCTIVE METHOD

- Generalization – the common fact deduced from the specific instances is stated as a generalization, a rule, a definition, principle, or formula. The students ability to state the rule by themselves is the test of the success of the lesson.

- Application – this step test students understand of the rule or generalization just developed. They should be able to apply it to other problems or exercises, if they understood it.
INDUCTIVE METHOD

Advantages:

- It makes the students think logically and scientifically.
- What is learned is retained longer and is better understood.
- The students are trained in problem solving and are able to solve similar problems later.

Disadvantages:

- It does not fit all subject matter areas.
- It requires more time and is mentally taxing for slow learners.
- Lack of available resources for the proper performance of activities.
This methods aims to bring practically designed experience into the classroom. Often conducted over a period of three to six months, the projects give students an opportunity to work in a team environment and apply theory learned in the classroom. There are some parts of the curriculum in which students are necessarily dependent on the teacher and others in which they can work more independently.
- Project work is more likely to continue the more informal part of the program, the part where they have greater autonomy in the development of their work than when involved in teacher directed instruction.
In mathematics, as in no other science, is great distance between school content and current research. Contents of school mathematics almost does not change, and what is constantly changing is the intensity of their processing. Therefore, the problem is not on emphasized for complete adoption of such content. The problem is in the didactic development of this materials.

Liberal Arts, Birmingham Museum of Art, Birmingham, Alabama
CONCLUSION

- Teaching in elementary and secondary schools, including mathematics, is a completely decentralized system which is controlled by the administrative bodies at various levels (national or local). As a result of this situation, there are no standard models that could serve as an undeniable model for teaching mathematics. In such condition everyone finds their best model.
- Mathematics - „tool subject“?
Let reference to Plato’s Socrates. He was asked whether or not it would make sense for youngsters to learn how to fight in full armor. His answer: Before all we have to deliberate what that skill may be good for?

This is the crucial question of curriculum theory and development up to our days. Before talking about subjects, topics, themes, before talking about subject matter we should look for an answer to the question: What is it good for? And, after all, what could ‘good for’ mean?
CONCLUSION

For good lessons it is necessary to choose or combine different methods for teaching mathematics which is very difficult.

- To find out the best method of teaching, to develop effective rationales of lesson-planning, and even to theoretically model the teaching-learning process in an adequate way.
CONCLUSION

- Selection of methods depends on subject, level of student knowledge, number of students in group, technical possibilities, working environment, etc.
- Teachers and students both have to try to do their best for reaching the main goal – knowledge.
THANK YOU FOR ATTENTION!