HOW TO LINK CONCEPT AND CONTEXT IN MATHEMATICS

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Abstract: Mathematics is a methodical application of matter. It is so said because the subject makes a man methodical or systematic. Mathematics makes our life orderly and prevents chaos. Certain qualities that are nurtured by mathematics are power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem-solving ability and even effective communication skills. But today, as in the past, many students struggle with mathematics and become disillusioned as they continually encounter obstacles to engagement. Therefore, to link concept and context in Mathematics is imperative so that subject can be made easier and enjoyable.

Index Terms **- Concept and context, methodical, problem-solving ability.**

I. INTRODUCTION

Contextual learning is a proven concept that incorporates much of the most recent research in cognitive science. According to contextual learning theory, learning occurs only when students (learners) process new information or knowledge in such a way that it makes sense to them in their own frames of reference (their own inner worlds of memory, experience, and response).
The majority of students are unable to make connections between what they are learning and how that knowledge will be used. This is because the way they process information and their motivation for learning are not touched by the traditional methods of classroom teaching. The students have a difficult time understanding academic concepts (such as math concepts) as they are commonly taught (that is, using an abstract, lecture method), but they desperately need to understand the concepts as they relate to the larger society in which they will live.

The purpose of the present study is to explore the ways to link concept and context in Mathematics so that subject can be made more interesting and coherent. So to bridge the gap between the concept and context it is essential to have an understanding of the parts of learning mathematics. There are three parts to learning mathematics: skills, concepts and context i.e. problem solving. It is fairly easy to understand why we teach the first two. Skills are essentially the tools of mathematics, such as learning how to add two numbers together to get a correct answer. Concepts are the ideas in mathematics (such as the concept of a triangle) which we need to understand before we can do mathematics. But Problem Solving is harder to explain. If you think of skills and concepts as what we need to know in mathematics, then problem-solving is the ability to apply mathematics we know in different situations. Problem solving is important because it requires us to combine skills and concepts in order to deal with specific mathematical situations—we call these problems. If you know your mathematics skills and concepts well, but can't put them together in a particular situation, then you can't do mathematics well. Skills, concepts, and problem solving used together in real situations lead to mathematical literacy. It's a package!

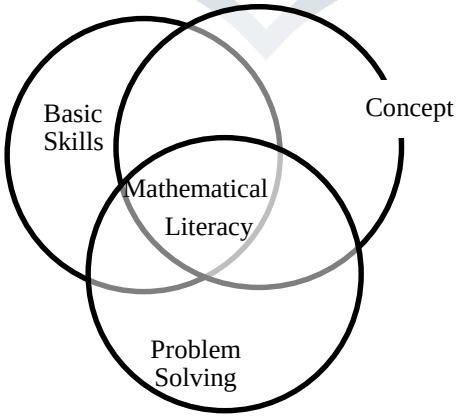

fig.1

A good problem presents you with a situation where you pause, ponder, and scratch your head before you can even put pencil to paper. And problems come in all sizes. Adding 243 + 169 is a small problem if you haven't learned the skill of addition.

On the other hand, something like global warming is a huge problem, one that will take many people scratching their heads for a long time to solve. Obviously, problem solving is important. Unfortunately, it is easier to teach skills and concepts, and much harder to teach problem solving. Many students leave school with a full mathematical tool kit of skills and concepts, but do not know how to put them together and because of that, are often fearful and avoid new and unfamiliar mathematics situations.
The Programme for International Student Assessment (PISA) 2012 (OECD 2013) has developed a diagrammatic conception of mathematical literacy which is based around the need to assess students' capacity to transfer and apply their maths knowledge and skills to problems that originate outside school-based learning contexts.

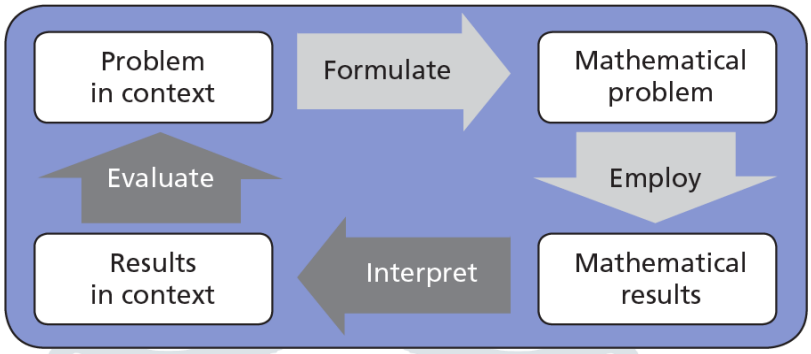

fig.2

This PISA process contrasts with the typical model highlighted above of:
1. Teach some maths
2. Practice some maths
3. Apply some maths

The process in the real world requires a set of different skills undertaken in the reverse order – starting with the initial ability to identify the maths in the context and formulate it as a mathematical problem. Then, the second step is to do the maths, and employ skills and knowledge. Students then need to interpret and evaluate the outcomes of the maths and reflect on how the maths result(s) applies and fits in with the real world. The first task in this PISA cycle is not something we normally address in our maths classes, yet it is possibly the most complex and difficult of all the processes. Most of the emphasis in a typical maths classroom is on the first two processes: teach some maths; practice some maths. If we have time we may then apply that maths often through a word problem. For the engaged and the disengaged student, and the competent and less competent student, the context can provide the challenge, the motivation and the purpose for understanding and using mathematics. However, in order for this to work in the classroom, we need to explicitly integrate the above PISA cycle of skills into teaching and learning.

II. RECOMMENDATIONS

To implement contextual learning in the classroom, teachers should use

- a problem solving, investigative, open-ended approach—use real texts and real situations—make connections between maths and the real world
- start from the real world—teach students how to identify and extract the maths from the messy, real-life situations that they are likely to face
- part of this is to make the maths explicit and then, when the need arises, or gaps in knowledge appear, teach the maths that is required
- new concepts should be presented in real-life (outside the classroom) situations and experiences that are familiar to the student
- examples and student exercises should cultivate an attitude that says, "I need to learn this"
- opportunities should be presented for students to gather and analyse their own data for enrichment and extension
- include those lessons and activities which encourage the student to apply concepts and information in useful contexts
- students should be expected to participate regularly in interactive groups where sharing, communicating, and responding to the important concepts and decision making occur

By such efforts, students discover meaningful relationship between abstract ideas and practical applications in the context of the real world; concepts are internalized through the process of discovering, reinforcing, and relating.

III. CONCLUSION

I hope that teachers will integrate authentic real-world contexts in their classrooms. These contexts are crucial for engaging students in mathematical modelling and for preparing students to use mathematics beyond the classroom. Keep in mind that the problem must be authentic *and* that the teacher must encourage students to draw on their real-world knowledge and experiences and approach the task authentically.

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