The Mathematics Carnival: A Platform to Appreciate Mathematics

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Abstract Each year students spend hundreds of hours in schools to learn mathematics. Yet, many have negative views as they voiced out that mathematics is a dry subject, it is difficult to understand mathematical concepts or mathematical activities are meaningless. Not many students show that they appreciate the beauty of mathematics. In actual practice, the school mathematics curriculum are rigidly content oriented. Teachers have to teach strictly to syllybus and therefore has hardly any time to explore problems and activities beyond the school curriculumn. Realizing this unfortunate situation, with the help of student teachers, the Faculty of Education at Universiti Teknologi Malaysia have organized a few yearly mathematics carnival since 1999. The main aim of the carnival is to share the power of mathematics in different aspects. Various booths with different themes namely Mathematics and our environment, Applications of computers in mathematics, History of mathematics and many others provide interactive and hands on activities. School kids find that the main attractions of the carnival is being able to participate in meaningful activities related to mathematics. Consequently, they have fun as well as constructing new knowlrdge. The carnival is considered as a successful learning ground for both participants and facilitators to develope awareness of the beauty and fun with mathematics.

Introduction

For many years mathematics has been recognized as a core subject in the school curriculumn. Parents, students and teachers accept the fact that without mathematics ability, an individual future is less fortunate than the others. They will have difficulties to further studies at the universities and consequently being denied to the promising job markets. The most influential value that parents and teachers put in children's mind is mathematics learning is necessary for job security. The children take it seriously such that the only mathematics that they are concerned are with those that appear in the examinations. This narrow public image on mathematics of course contradicts to the national aim in education.

The Malaysian philosophy of education is stated as follows: Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally and physically balanced and harmonious, based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving high levels of personal well-being as well as being able to contribute to the harmony and betterment of the family, the society and the nation at large (Pusat Perkembangan Kurikulum (2000)). Parallel to the philosophy, according to the National Curriculumn, the goals for teaching mathematics are to develop the individual ability in logical, analytical systematic and critical thinking, to develop individual competency in problem solving with the ability to apply mathematical knowledge so that he will be able to function effectively with sense of responsibility in his daily life. In addition the individual student will be able to appreciate the usefulness and the beauty of mathematics (Pusat Perkembangan Kurikulum (2000)).

The intended curriculumn emphasizes on learning to appreciate mathematics which has been proven in numerous researches as a critical success factor in mathematics. Unlike the cognitive dimension of learning mathematics, appreciation of mathematics fall under the affective dimension is viewed as more difficult to be taught. In fact some teachers do not really know what to teach as far as inculculating values in mathematics is concerned. Therefore values teaching in mathematics seem to happen more implicitly than explicitly.
Some values that should be highlighted is that mathematics can provide pleasure and joy from

mathematical activities and games. Mathematical patterns, shapes and designs besides having aesthetical value have been recognized as an identity of a culture. The beauty of mathematics in nature can be seen through the relationship between natural form and fibonacci, the structure of snow crystals and in chaos. History and mathematics which describe how mathematics are developed is strongly associated with the history of the human race. (Orton, 1994). The Ministry of Education in her effort to ensure the teaching of mathematics appreciation in schools require textbooks to provide an historical setting, mathematics projects and enrichment activity related to the material of each chapter. From time to time on service teachers are trained on how to carry out the elements of education outlined in the curriculum . Yet, how far the vision is put on practice is questionable. Furthermore, since mathematics appreciation by its nature is concerned with values, little is known how much is being taught and learnt.

At Universiti Teknologi Malaysia , some of the students on the teaching program express their concern that the mathematics content for school is rather heavy and redundant in everyday life. They have difficulty to identify of the usefulness of algebra, geometry, functions, probability and other mathematical topis that they are going to teach in schools. This challenge the teacher educators in providing wider and richer experience for these student teachers who might perceive learning mathematics in schools are not so favorable. It is understood that normally inservice teachers resist changes while preservice teachers teaching styles and attitudes are similar to those of their own teachers (Lerman, 2001). It is critical that for their professional empowerment, these student teachers need to be aware and well equipped to take the responsibility to teach values in particular appreaciating mathematics. In order to fulfill this need it is thought that it is insufficient for them to gain knowledge and experience if they strictly involve only with classroom activities. They ought to do something to correct the school children and the public perception and feelings towards mathematics by educating them with mathematics beyond the school curriculumn. This is the rational for the mathematics carnival organized by the students with the support of the faculty. The carnival has involved student teachers of mathematics and science to achieve the following general objectives:

- To expose student teachers to participate in community work specifically organizing a carnival at the state level.
- To create awareness in the community involving the public, campus citizens, academic staf, university supporting staff, school pupils and university students the importance and beauty of mathematics.
- To provide knowledge to the community on current development in mathematics
- To create a learning environment for individuals at various levels and backgrounds.
- To train student teachers to apply pedagogical knowledge on educating and designing of learning materials and activities.
- To provide opportunities for outsiders to interact intellectually with Universiti Teknologi Malaysia students.
- To train student teachers to become quality leaders.
- To develope generic skills in student teachers : Ability to communicate mathematically, work in a team and solve problems.

Students Participation in The Carnival.

The students in groups of six are required to research and develop materials for a topic that are assigned to them. There are about 30 topics among which are history of mathematics, stastistics in everyday lives, mathematics in economics, what is mathematics, algebra, geometry and how to learn mathematics effectively. They are given about a month to search and study on related materials so that they can come out with a complete report. In the report they have to explain about the role and significant of the topic to be part of the carnival, what exhibits and activities

they plan for the carnival, how much money they need to spend, plan on how to arrange their stuffs on tables with the area of four feet by six feet and two display boards each of 3 feet by 6 feet. On the process of writing the report, they got plenty of help and advices from respective lecturers. From the time the report is completed, they are then given three more weeks to develop and refine their exhibits and materials that could be in the form of posters, portfolios, computer presentations, models, manipulatives, real, concrete objects, problems, games, teaching module, softwares and numerous others. Their activities are required to be hands on and are designed to be rich with interactions so that to create an active learning environment. That is why the event is named a carnival and not an exhibition whereby participants passively look at posters. Since the participants of the carnival come from diversified background, where necessarty they have to make preparations for three different levels: introductory, intermediate and advance. Each group are also responsible to provide a set of questions and activities for the mathematics treasure hunt, design for registered school children. The treasure hunt with its generous prizes is intended for school children to participate seriously because they are representing their schools. The groups presenting each topic are also judged by a few of experienced math lecturers on criteria of their knowledge, contribution, creativity, presentation and display. Since the carnival is to fulfill the requirement for a math education subject, the marks from the judges are counted for their grades. Two topics that are part of the program will be described here to give a clear er picture what the students teachers have done in their course to develop mathematics awareness in the community.

Mathematics with Computers

The group working on this topic recognize that computers play a significant role in the development of mathematical knowledge. In education, computer software act as a tutorial system, a programming tool and problem solving tool. Due to many constraints, although the ministry encourage teachers to teach with computers, many of the powerful capability of various software are not being used. The most widely use of computers are for presenting teaching materials which are considered necessary for many teachers with the new practice on teaching science and mathematics in English. The use of computers for problem solving tool like graphical tools, geometrical tool and LOGO programming are unknown to many teachers and school children. For the purpose of the carnival, the student teachers need to explore the capability of these software and then teach them through hands on to the participants during the carnival. They try to make them see that this is new way of doing and understanding mathematics. In LOGO programming, they try to make them understand that doing programming involve applying mathematical knowledge. Besides that, doing programming means that you are in command of the computers and not users of computers as they normally do when playing computer games or doing word processing. They are able to see that with the change of a variable or parameter, the graphic on the screen changes. By guiding the learners to make these changes, they will be fascinated with the graphics and design that they can create. Interested learners are observed to be brave in making exploration in the unthreatening situation. It is hoped from their short encounter with this software, they will take the initiative to proceed with the exploring and learning.

It is beyond the scope of this paper to describe the experiences from some other groups. However , the table here will give a general picture on the kind of knowledge they teach the community.

Conclusion

Schools situated near and far from the university have great interest in The Mathematics Carnival. They are willing to send many students to participate and representing their schools since the state education department encourage schools to be actively involve in extra curricular

Groups	***Knowledge teach to the community***
History of mathematics	Contributions of mathematicians from various civilizations. How people do mathematics in the olden days?
Fractals	What is fractals. The basic ideas on fractals. Some algorithms on fractals. Current and future works on fractals.
Etnomathematics	Mathematics and the Malaysian culture. Mathematics in fabric design, architecture. How much mathematics do Malaysian use?
Stastistics Around Us	Realistic data on traffic accidents, population and others. How to interpret certain sets of data. Samples of misuse stastistics. Collection of data from the community.
Recreational Mathematics	Mathematical games, mazes, problems and fun activities with numbers.
What is mathematics?	Mathematics as a language. Mathematics as the queen of science. Public image on mathematics. Values in mathematics.
Mathematics in Islam	The use of mathematics in the life of Muslims: Pilgrimage ,zakat, prayers, law on inheritance, Quranic verses, Islamic calender, Determine fasting month and prayer time.
Mathematics in Our Environment	Population growth, analyzing soil, soil sampling, enviromental pollution, fibonacci numbers in nature, music, symmetry in nature.

activities of this nature. Our simple survey also indicate that school teachers are in favour of the program because they believe this is one way for school children to learn to be aware and consequently appreciate the value of mathematics. Eventhough the carnival last for 3 days, normally the school children stay for about three hours for the activities. In this case, the exposure they experience might be sufficient for them to further investigate the mathematics of their interest on their own or with their teachers' guidance. From the students teachers perspective, the carnival provide them with a unique, significant experience they never encounter before. Acting as facilitators, they have substantially researched and studied new materials, they learn tremendously more when they communicate about mathematics through their interactions with various members of the community and more important is that they enjoy the excitement of sharing their knowledge with others. They believe no classroom activities can provide the rich and exciting experience besides being able to educate the community about mathematics. In some cases, when the teachers left Universiti Teknologi Malaysia, they initiate their schools to organize mathematics fair the way they have learnt in this valuable program.

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