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Exposing the Fun Side of Mathematics via Mathematics Camp

Mohd Salmi Md Noorani^{a,*}, Eddie Shahril Ismail^b, Abdul Razak Salleh^c, Azmin Sham Rambely^d, Nur Jumaadzan Zaleha Mamat^e, Nora Muda^f, Ishak Hashim^g, Noriza Majid^h

^{a,b,c,d,e,f,g,h}*School of Mathematical Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia*

Abstract

In this paper we share our experience of conducting a mathematics camp to a group of 16-years-old school students. This camp is special since throughout their learning history, the students, like most school students in Malaysia, are only exposed to the academic side of mathematics. By this we mean the emphasis given by the school is only on academic achievement measured by the string of A's in the examination results. Of course in order to achieve this, the preferred mode of teaching and learning is geared towards drill and practice. None of the students from this group have experienced 'outdoor' mathematics as to be given in this camp. The camp which consisted of several hands-on activities and done in small groups was conducted outdoors in a very relaxed and light-hearted atmosphere. The activities aimed at introducing several areas of mathematics such as group theory and number theory and their relevance to our everyday live. One niche activity which is considered as ethno-centric was also conducted. Indeed it exposed to the students the mathematical elements in the Malay culture. At the end of the camp questionnaires were distributed to the students to gauge their reaction to this mode of learning. A chi-squared test conducted showed that there was no relationship between students' understanding on the mathematics camp's module with their streams, hence the modules are applicable to both pure science and social science stream. In all, students were satisfied with the overall conduct of the mathematics camp, where they felt that this camp was very useful and helped improve their mathematical skills and knowledge.

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1. Introduction

Many students in schools learn mathematics merely for passing examinations and to get into higher institution of learning. This is particularly true for students in Malaysia. They are not exposed to the beauty or the applications of mathematics in real life. As a result, most students picture mathematics as a dry subject void of real world applications; a major misconception about mathematics that needs an urgent change. Students' motivation in learning mathematics always comes from how mathematics is taught to them. Thus, they must be given a right approach so that mathematics can be more appreciated.

Also in our increasingly quantitatively and technologically oriented society, as an individual's level of mathematics understanding can affect his or her ability to function effectively as a consumer and as a citizen

* Corresponding author.

E-mail address: msn@ukm.edu.my

(Frost & Wiest 2007). As a continual effort, we from the School of Mathematical Sciences Universiti Kebangsaan Malaysia have taken the initiatives to bridge the mathematical theories and real life via an outreach program. A group of secondary school students with a diverse academic background was selected to participate in this program, called *Mathematics is alive*. The objectives of the program are to help improve students' mathematical skills and knowledge, and also appreciate the beauty of mathematics and its applications. It's interesting to note that the students have not been exposed to this aspect of learning mathematics. Thus this camp is special since throughout their learning history, the students, like most school students in Malaysia, are only exposed to the academic side of mathematics. As a starting stage, related modules of three main chosen mathematical areas, abstract algebra, ethno-mathematics and cryptology, were developed.

The main focus behind the abstract algebra-related module is to bring home the point that abstraction, which is an integral part of higher mathematics, has it uses and not a boring, dry and esoteric subject as thought by many students. In this module two motivating situations, one dealing with the repositioning of tires on a car and the other is to do with the flipping of a mattress were considered. In both cases, the objective is to determine if there is a simple rule when repeated over time will cover all possible cases and thus extend the life of the respective tires and mattress. In the end, the students will discover that group theory in the form of symmetric groups is the key in finding this so-called simple rule.

One niche module which is considered as ethno-centric was also conducted. Indeed it exposed to the students the mathematical elements in the Malay culture. A civilised race has its own units of measurement. The Malays are no exception. They have had measurement system different from those used today. The units of measurement were based on their daily experience, the environment, human body etc such as *sepelaung*, *sepenanak nasi* for distance and time; *jengkal*, *hasta* and *depa* for length; *sekelip mata*, *sekejap*, *sepekan*, and *sepernama* for time; and *saga*, *mayam*, *koyan* and *pikul* for weight. Most of the units of measurement are not being used anymore. Surely youngsters in this era do not realise that this measurement system had existed and had been used by their ancestors once before. In this project we will discuss this measurement system, which is divided into length and breadth, distance, depth, and size. At the end of each section we will include an activity for the students to perform in a group in order to understand the concepts that have been discussed.

The third module is called basic cryptology which is a science of protecting and revealing. We introduce this area to the students for them to appreciate the beauty of mathematics and its applications since most of the students think of mathematics as just manipulation of numbers and symbols.

In section two we briefly describe the activities. The response of the students is discussed in section 3. Section 4 gives a summary of this paper .

2. Describing The Activities

2.1. Abstract Algebra

The first module introduced was called the *Power of Abstraction* whereby students are exposed to the idea of abstraction through the concept of a group. In particular, the students are given a firsthand experience to the idea of a symmetric group through the symmetries of two objects via two activities. The first activity is to do with the changing of tires of a car and the second is related to the ways of flipping of a mattress. The main objective is to see if there is a simple rule in each situation so that it will be advantages to a forgetful person being asked to perform the task overtime (Hayes 2008). Before the students were asked to look deeply into the tire and mattress problem, they were first introduced to the symmetries of a polygon. In particular students were asked to identify and label the symmetries of those polygons, and to construct the multiplication table based on the labels. Students were also supervised in determining some characteristics of the multiplication table. Next the students were asked to determine the symmetries related to the tire and mattress problem. In particular the related multiplication tables are to be found. The existence and non-existence of the illusive simple rule is then related to the difference in structure of the two multiplication tables.

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