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Development of Geometry Courses in The University Level in UPM and UKM

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ABSTRACT

This study aims at identifying the knowledge level of UPM and UKM students in geometry. Apart from the said objective, the study would like to determine the existence of a significant relation between students' mathematical knowledge in geometry and the students' interest in geometry. Besides that, the study also focuses on identifying problems encountered by students in the learning mathematics courses which have relation with geometry. This survey – based research involves 100 students of UPM and UKM as well as three lecturers for the interview. The research instrument used is Pearson Correlation Test comprising 20 multiple-choice items. In this research, there are two factors that been tested. The two factors are students' and lecturer mathematical knowledge in geometry and the level of students' interest in geometry. The research finding indicated that students' comprehensive on geometric knowledge and their interest in geometry are moderate. The students' level on geometric knowledge recorded a mean of 37.08 and the standard deviation is 4.664 while their interest in geometry recorded a mean of 36.85 and the standard deviation is 6.293. Based on the correlation, there is strong significant relationship ($r=0.637$ and $p=0.000$) between students' mathematical knowledge in geometry and their interest in geometry and such relationship is significant at 0.05. Some problem that students face in having average level of knowledge in geometry are less exposure about the geometry in higher educational level and unaware of the ability to connect the geometric concept with other mathematical fields. The implication of this study is the instrument could be used to assist university to reform new course in basic geometry which then can produce new develop researcher for the nation and thus helped increase the performance of one university and nation.

Keywords: Geometry courses, geometric knowledge and interest, higher education, geometric concept.

INTRODUCTION

Mathematics was a subject which is the basic for all other subjects especially in science and technology including arts and language. Mathematics was placed in between metaphysics and physics (science and technology) knowledge. According to Mat Rofa Ismail (2004), mathematics

was a basic knowledge or medium knowledge for various purposes of knowledge and daily life. Strong mathematical knowledge could increase the high chances in career choices and for strong self-advancement (Stanic& Reyes, 1988). Besides that, to give a great contribution for society that was in twenty first century and centuries after that, a person should achieve a good understanding in mathematics (Christiansen et al. 1986).In higher education, such as universities, we need to see an opportunity to expand our knowledge in different field of mathematics. Nowadays, in every university around the world, they induce two type of area in mathematic study which mainly from the pure mathematics and applied mathematics.

Based on Subahan (1996), the main factor to determine the students' ability or performance was by holding a strong and enough basic concepts. In Mohd Radhi (1981) research, he stated that, before a student upgrading or learning a new concept in mathematical learning, student should understand and master every step that involve in the learning. This is because the mathematics content has a structured and hierarchy's concepts.

One of mathematical fields that involved in this study was geometry. From Frank J. S. and Liew S. T. (1988), geometry is a research about space, things in space and the relationship between one and others. Geometry topic have three main objective which is identifying and interpretation different shape and figure with their concepts, measurement of a field of a shape to find the perimeter and boundaries and interpretation and shape construction by using mathematical instrument.

PROBLEM STATEMENT

Geometry is very important in mathematical educational program because it gives early contacts in mathematical thinking development. National Council of Teacher of Mathematics (1981) stated that there are two main purposes for teaching geometry which is to develop the logical thinking and to develop the spatial intuitions about the reality of life. According to Shaharir Mohamad Zain (1992), one of the aspect in science mathematics that has always been forgotten (always unrecognized) is the part which is "not theorem, definition, calculation, analysis, technique, method part" like identification part, construction, the origin of problems, model construction, the origin of definition, historical issues, philosophies and humanism from the science mathematics' topics.Students have a hard time to illustrate the mathematical into figures when given assignment. For such that the less exposure about that mathematical field. Such problem had been felt by the United State before since they did not give any concern in geometry. Directed with the unhappy state of geometry in the college curriculum. There was a time when a student had acquired some degree of maturity in geometry by the time he entered a Junior or Senior course in the subject, but this is no longer the case in general. (Report on a Conference on Undergraduate Mathematics Curricula held at Hunter College on October 12-13, 1956).

Latest issue on Malaysian student is that most students have no interest in Mathematics and science subject since they have no understanding and feel that that subject is a difficult subject. 5th postulate of Euclidean geometry has been proven wrong by the mathematician. Since there is no specific geometry concept, so it is hard to organize geometry in one course only. Student have problem when assign with figure assignment with other mathematical fields. Geometry is a part of mathematics aesthetic which we can say that it does not give out the beauty on proving only but the structure and relation with nature was one of its strength.

LITERATURE REVIEW

Development of Geometry Courses in Different Countries

Research in developing geometry courses are mostly been done on the teacher that will teach the students in school. This shows how crucial it is to develop the geometry. We need to make such research for the higher university student also because the student will then become the leader to one country latter. We need the development of geometry course due to our lack in university curricular structure. Since there was a study on developing geometry courses in United State of America years back ago, where AnnitaTuller (1967), stated that she had written in an attempt to aid in the resetting of geometry in the curriculum due to the problem and issues in the Euclidean geometry. The development of geometry courses is kept on going till recently. Umit Kull (2011), investigates the professional development (PD) course based on the use of dynamic geometry affects the beliefs of school teachers. The PD course was designed to provide six teachers with a better theoretical and practical understanding of mathematics teaching and learning through interacting with computer-based mathematical activities that were consistent with the constructivist paradigm and such result transform teachers' beliefs to some extent in favour of the constructivist view. Hannes Kaufmann, Karin Steinbügl, Andreas Dünser, and Judith Glück (2005), had make development of a system that uses collaborative augmented reality as a medium for teaching, and uses 3D dynamic geometry to facilitate mathematics and geometry education. This contributes the description of evaluation design including the test instruments, learning tasks and practical experiences with using our system for actual training.

Lowther and Shene (2001) say that computing with geometry is a rapidly evolving interdisciplinary field involving computer science, engineering and mathematics. They suggested a possible remedy by designing a comprehensive, intermediate level interdisciplinary computing with geometry course for student in computer science, engineering and mathematics. Which then provide a place for mathematics students to use their geometric knowledge and learn "algorithmic" and "computational" aspects that would enhance their understanding. We then so far should also reform our mathematic curricular for inducing the correct path in geometry.

METHODOLOGY

Research Design

The study aims to develop geometry courses in the university level in UPM and UKM. For this purpose, a descriptive research design would be used for this study. Descriptive research refers to the type of research questions, design and data analyses that will be applied to a given study. In this study, the survey approach using questionnaires is used for quantitative data collection. For this study, structured interviews would be used too. Interviews are widely used for research purposes. It would be favourable to use it in this study as it will attempt to gather data on opinions, beliefs and feelings of the subjects about the situation in their own words (Ary, Jacobs, Razavieh and Sorensen, 2006).

The Sample of Study

The study was conducted at Selangor area around Serdang and Bangi. Therefore the public university chosen for the study was UPM and UKM. The study was participated by 100 universities' students and 3 lectures were used for interview purposes. The interview was also given to 2 of the students selected from the 100 participants. Among these 100 participants from two universities, they were chosen randomly, hence the amount of students from each universities were varies. The criteria for selection of participants for both quantitative and qualitative of this study were based on all Mathematics field.

Instrumentation

This study will use a directly administered questionnaire (Appendix 1) as the main instrument for data collection. The questionnaire is divided into three parts. The first part of the questionnaire will gather information on the students' demographic profile. This section comprises of general questions like participants' gender, age, races, university and courses taken. The second part and of the questionnaires enquires on student mathematical knowledge in geometry while the third part enquires on students' interest in geometry. All items use the 5-point Likert scale instrument in this study will be ranging from (1) Strongly Disagree, (2) Disagree, (3) Partially agree, (4) Agree, (5) Strongly agree. Both part can be categorize in three score level which is the higher level $(38 \leq x \leq 50\ (75\% \leq x \leq 100\%))$, average level $(24 \leq x < 38\ \ (47\% \leq x < 75\%))$ and low level $(10 \leq x < 24\ (20\% \leq x < 47\%))$.

Interviews were designed to gather detailed information about their knowledge and interest in geometry. Participants are also asked on their experience in learning geometry, doubt and problems that regard on geometry.

Procedure

The questionnaire would be the first to be administered. Participants are asked to give their opinions as frankly as they could. Interviews would be conducted with only 3 lectures and 2 students after questionnaires have been analyzed. A pilot test was carried out for this study to ensure items had the desired qualities of measurement and without any discrimination.

RESULTS

Student Mathematical Knowledge in Geometry

The following findings have been summarized and generated by using SPSS in order to analyze the level of Students' Mathematical Knowledge in Geometry. The total mean of students' mathematical knowledge in geometry is 37.08 and the standard deviation is 4.664. This shows that the students' knowledge in geometry is in average level. If the finding was to be said average, we can say that students' are in moderate level of knowledge in geometry. Among the items, the highest mean 4.28 with standard deviation 0.780 is recorded from B2 (Geometry is one of the mathematics areas). While the lowest mean is 2.52 with standard deviation 1.132 is recorded from B6 (I have never heard about fractal and never knew that it could be classify as one branches of geometry).

Students' Interest in Geometry

The following findings have been summarized and generated by using SPSS in order to analyze the level of Students' Interest in Geometry. The total mean of students' interest in geometry is 36.85 and the standard deviation is 6.293. This shows that the students' interest in geometry is in average level. Among the items, the highest mean 3.81 with standard deviation 0.800 is recorded from C1 (To know more about geometry since it could make me understand better about mathematics). While the lowest mean is 3.48 with standard deviation 0.948 is recorded from C5 (In knowing and learn about the geometry and graphics by using computer such as Maple or Wolfram which could create a similar pattern like below).

The Relationship between Students' Knowledge and Students' Interest in Geometry

The relationship between students' mathematical knowledge in geometry and students' interest in geometry is analyze by using Pearson Correlation statistic. The result shows that $p = 0.000$ and $r = 0.637$. This shows that there is a significant relationship between mathematical knowledge and students' interest in geometry. This is due to the significant value obtained is $p < 0.05$.

Students and Lecturers Point of View in Geometry from the Interview

Most students commented that the meaning of geometry is something that can be seen and related to points, lines and shape and also graph. Their knowledge about geometry was taken from what they had learned in schools only. Some students had stated that they had problem when dealing with the object created from the function given in class. All they knew was that the function of geometry was not at all related to any image. Most of the students are aware with the importance of geometry and suggested that they are willing and interested in learning geometry for higher education level.

The lecturers had stated that geometry was the study of properties of figures and relationship of sets of point. They had also stated that geometry was one of the main mathematical fields which used for proving. Most of the lecturers aware with the importance of geometry and some suggest that university should induce the geometry courses to have a large view in mathematics. One of them suggested that in higher education, we need to have the true

and real geometry courses because since if we know that Euclid geometry had some issue on the fifth postulate, therefore it means that there are true knowledge on geometry that have not yet been discover.

CONCLUSION

Conclusion: It is generally accepted that the students' mathematical knowledge in geometry is in average which supposedly in higher education, this should not happen. The students' interest in geometry is also in average level. But accordingly, the students and lecturer are aware with the importance of geometry in learning mathematics. There is a significant relationship between the students' knowledge and interest. Students were said to have an average interest in geometry because due to the average level of knowledge they had in geometry.

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