การศึกษาปัญหาในการเรียนวิชาแคลคูลัสและเรขาคณิต 1

The study of problems in learning the Calculus and Geometry 1

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Abstract

The purposes of this study were to study the problems in learning the Calculus and Geometry 1 course and to propose the suggestions to solve the problems. The qualitative method was used as a research design in this study. The informants were 8, students who failed and reenrolled in Calculus and Geometry 1 more than 1 time, and 3 Mathematics lecturers. The research instrument used in data gathering was semi-structured interview. The data obtained were analyzed through coding technique. The results revealed that there were two main problems: 1) one was derived from the students themselves including the background knowledgeof students, the lack of ability to apply the knowledge, the frequently absences, the lack of attention in learning, the negative attitudes towards Mathematics and calculation learning, and the lack of intention do practice, and 2) the other was from the Mathematics itself which there were a lot of formula and content to remember, and the difficulty of the subject. However, suggestions revealed that there should be the Mathematics remedial course for students to give them the necessary basic knowledge before studying the Calculus and Geometry 1 course, the suitable learning environment should be created to promote the effective Mathematics learning such as comfortable classroom facility and the numbers of student in classroom.

Keywords: Geometry, Calculus, Mathematics, Problems, Calculus and Geometry

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บทคัดย่อ

วัตถุประสงค์ของการศึกษาในครั้งนี้ คือ เพื่อศึกษาปัญหาในการเรียนวิชา แคลคูลัสและเรขาคณิตวิเคราะห์ 1 และเพื่อเสนอแนะแนวทางในการแก้ปัญหาการศึกษาในครั้งนี้เป็นการวิจัยเชิงคุณภาพ กลุ่มตัวอย่างในการศึกษาครั้งนี้ คือ นักศึกษาที่ลงทะเบียนเรียนซ้ำวิชา แคลคูลัสและเรขาคณิตวิเคราะห์ 1 และอาจารย์ผู้สอนวิชา แคลคูลัสและเรขาคณิตวิเคราะห์ 1 เครื่องมือที่ใช้ในการเก็บรวบรวมข้อในการศึกษาครั้งนี้ คือ แบบสัมภาษณ์แบบกึ่งโครงสร้าง ข้อมูลถูกวิเคราะห์โดยใช้เทคนิคการถอดรหัส (Coding) ผลการศึกษาเชิงปริมาณพบว่า มีปัญหาในการเรียนอยู่ 2 ประเภท คือ 1) ปัญหาที่เกิดจากตัวนักศึกษาเอง ซึ่งประกอบไปด้วย ความรู้เดิมของนักเรียน การไม่สามารถประยุกต์ใช้ความรู้ การขาดเรียนบ่อย การไม่สนใจเรียน การที่ไม่ชอบวิชาคณิตศาสตร์ การไม่ชอบการคำนวณ และการไม่ฝึกทำแบบฝึกหัดและ 2) ปัญหาที่เกิดจากตัวรายวิชาเอง ซึ่งประกอบไปด้วย สูตรเยอะเกินไป เนื้อหามากเกินไป และความยากของรายวิชา ผลจากการศึกษาข้อเสนอแนะในการแก้ปัญหาแสดงให้เห็นว่า ควรมีการจัดการสอนเสริมเพื่อเสริมสร้างความรู้พื้นฐานเพื่อการเรียนในรายวิชาแคลคูลัสและเรขาคณิตวิเคราะห์ 1 ควรมีการจัดบรรยากาศในชั้นเรียนให้เหมาะสมพร้อมด้วยสิ่งอำนวยความสะดวกเพื่อในการเรียนวิชาคณิตศาสตร์ที่มีประสิทธิภาพ และควรมีการกำหนดจำนวนนักศึกษาในแต่ละห้องให้เหมาะสม

คำสำคัญ: เรขาคณิต,แคลคูลัส, คณิตศาสตร์, ปัญหา, แคลคูลัสและเรขาคณิต

Background of the Study

Mathematics is the subject that recognized as the mother of all learning with other subjects deriving theirconcepts from it, in both arts and sciences (Ali, 2013). The importance of having a solid backgroundin mathematics is well recognized as it servesas a gateway to future professions in a varietyof fields (Tella, 2008). Mathematicsis very important in our daily lives since it dealswith real life situation in our daily activities (Ojose, 2011). It is also generally accepted that Mathematics is an important factor affecting human development in terms of creative, logical, and critical thinking. At its most basiclevel, mathematics is a requirement for science,computer technology and engineering courses.This is based on the fact that from homes to theworkplace, technological tools have become apart of our day-to-day life activities. Because ofthe importance of mathematics, already highlightedabove, schools must respond with effectiveteaching and learning of mathematics fromgradeone to university level.

There are many mathematics subjects have been provided for students to learn as a general education subject required by all curricular in both diploma and bachelor's degree such as Mathematics for Daily Life, Calculus, Calculus and Geometry 1, and so on. All students have to study and pass these Mathematics subjects as required

by the curriculum. Despite the importance of mathematics highlightedabove, the courses assessment of the Mathematics Program, Department of Sciences and Mathematics, the Faculty of Agro-Industrial Technology, Rajamangala University of Technology Isan, Kalasin Campus (Course Assessment of Mathemetics Program, 2013) revealed that many learners continue to fail the subject. Especially, the failure of students in the Calculus and Geometry 1 subject which was not satisfied. It showed that many students failed in this subject andmany of them reenrolled this subject for two or three times.

From the researchers' point of view, not muchresearch focusing on mathematics failurehave been conducted at Rajamangala University of Technology Isan, while the examination results continue to beunsatisfactoryin the mathematicswhichis a key subject for the country'sdevelopment.This inspired the researchers to investigate the problem in teaching Calculus and Geometry 1 subject and to find out the possible solutions as well.

The Purposes of the Study

1. To investigate the problem in learning Calculus and Geometry 1 subject.

2. To find out the possible solutions on teaching Calculus and Geometry 1 subject.

Scope of the Study

Research Design

The qualitative research method was employed in this study to investigate the problems and possible solution in teaching Calculus and Geometry 1 subject in the first semester of the 2013 academic year.

Populations and Informants

The populations in this study were 378 students of the Faculty of Agro-Industrial Technology, Rajamangala University of Technology Isan, Kalasin Campus who were studying the Calculus and Geometry 1 subjectin the first semester of the 2013 academic year. The informants were eleven students received from the purposive sampling method based on the times of enrolment in the Calculus and Geometry 1 subject and three Mathematics lecturers who teach the Calculus and Geometry 1 subject.

The Research Instrument

The research instrument employed to gather data in this study was interview protocol created by the researchers by adapting from Fonglam (2013).

Data Collection

As mentioned earlier that the qualitative research method was employed in this study, the data were gathered qualitatively through the in-depth interview techniques. For the validity of data obtained,

the triangulation of time in data collection was employed by gathering data from twodifferent times including before and after learning Calculus and Geometry 1 subject.

Data Analysis

According to the qualitative research method used in this study, the data obtained from two different times were analyzed qualitatively through the coding technique (Cresswell, 2002) including open coding, axial coding, and selective coding by doing the following steps:

1. The researchers carefully read through the answers from the in-depth interview regarding problems and possible solution on learning in Calculus and Geometry 1 subject.

2. Each answer which was consistent and proper in the present investigation was accordingly identified, and the codes were then given to such opinion (Open Coding). The researchers had to be very carefully at this step to ensure that every single reported answer was identified accurately and properly based on the purposes of this study.

3. The researchers started to find out the similarities and differences among the reported answer. It was found that the informants produced altogether 139 statements about problems and possible solution on learning in the Calculus and Geometry 1 subject. The researchers started to categorize these statements in the next step.

4. The researchers grouped these 139 statements according to the similarities of the context or situation in which the answers reported employing by informants (Axial Coding). The researchers tried the introductoryand there were 10 groups of statements.

5. The researchers considered these answers according to the problems and possible solution in learning in the Calculus and Geometry 1 subject. As a result, the researchers had to read very carefully every statement to make sure these reported statements in each group shared the similar characteristics in the context. Finally, based on the 139 statements, 10 main groups occurred.

6. The researchers did a revision andmade discussion with colleagues. At this step, the working on definition for the present study was also taken into consideration when classifying the occurrence problems and possible solutions (Selective Coding). Reclassifying the introductory reported problems and possible solutions creates the three main categories of opinions which were presented in the results art below.

Results

After the data were analyzed qualitatively through the coding technique (Cresswell, 2002), there were four main categories of opinions on learning Calculus and Geometry 1 subject including: a) the

students themselves, b) the difficulty of the subject itself, and c) providing remedial courses in basic Mathematics respectively. The results were discussed in the following part.

Discussion

The results revealed that there were three problems in learning Calculus and Geometry 1 subject including the students themselves, and the difficulty of the subject itself. However, this study also presented one recommendation for the improvement of mathematics learning which is providing the remedial course for preparing the students. They were discussed below:

1. Based on the problems in learning Calculus and Geometry 1 subject, the results from both students and teacher correspondently revealed the students' personality could cause the failure in mathematics learning. It made the students do not like to attend class, do not like to do the assignments, and do not pay attention in learning. This corresponds with the study of Tachie and Chireshe (2013) who state that the internal factorsincluded negative attitudes towards the subject,laziness and not attending mathematics lessons.They also mentioned that one cannot perform well in a subject he or sheis not interested in. Laziness and lack of interestresults in the learner are not putting any effort.Themotivation for the subject will obviously below.It may be

inferred from the finding oninternal factors that learners who succeed inmathematics learningmay put more effortinthe subject. Acknowledgingfailure due to lackofinterest, laziness and absenteeism helps thelearnersbelieve that they can succeed if theydevelopan interest in the subject and alwaysattendlessons next time. Thissense of controlisa key variable for learners' success in studying (Boruchovich, 2004).

2. The other problem was the students believed that mathematics is a difficult subject. It is generally recognized that mathematics is one of many difficult subjects. A lot of students in every educational level have been facing the failure in studying mathematics. This is correspond with the study of Tachie and Chireshe (2013) who state that students from this study also attributed theirfailure to the belief that mathematics is naturallydifficult. Thisimplies that the studentsbelievedthat mathematics was by nature difficult. Thenaturallydifficultynatureof the subject wassupposedlybeyond their control. Similar findingswere found by Cao and Bishop (2001) whoestablishedthat Australianstudents attributedtheirfailure in mathematics to task difficulty.Studentsare most likely not to put any effortbecauseof the belief that the subject is difficult.The finding that students'belief in their failure in mathematics learning might be related to thedifficulty of the subject itself confirmed by earlier studies on students'

attribution of successor failure such as studies of Addiba (2004), Chiresheet al. (2009), Ojo and Wale (2011), and Mkumbo and Amani(2012).

3. The results from the informants reported that providing the remedial courses in basic Mathematics and improving learning atmosphere are the possible solution of the problems in learning Calculus and Geometry 1 subject. Regarding the problem of Mathematics background of the students mentioned above, the first possible solution for this problem is to provide students the Mathematics remedial courses that are the basic for studying in the Calculus and Geometry 1 subject to help students pass it. This was supported by the study of Fonglam (2010) who studies the problem of Mathematics learning of the first year students of the private universities in Bangkok. The results revealed that there should be the Mathematics remedial course for students at least once a week.

Conclusion

This study aimed at investigating the problems and possible solutions for the students learning Calculus and Geometry 1 subject at Rajamangala University of Technology Isan, Kalasin Campus through the qualitative research method. The informants reported twomail problems in learning Calculus and Geometry 1 subject which are 1) the of students themselves, and 2) the difficulty of the subject itself. However, the results of this study revealed the possible solutions including providing the remedial courses in basic to prepare students to be ready to learn Mathematics successfully.

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