

# SPECIAL TUTORIAL CLASSES TO UPGRADE LEARNING ACHIEVEMENT OF STUDENTS ENROLLED IN MATHEMATICS FOR SOCIAL SCIENCE AT STOU

Sakorn Boondao (laasbsak@stou.ac.th, sboondao@gmail.com)  
Sukhothai Thammathirat Open University, Thailand

## ABSTRACT

*Unlike distance education institutions in developed countries Sukhothai Thammathirat Open University makes very limited use of assignments in its teaching programs. The main means of interaction between tutors and students consists of free face-to-face tutorials conducted three times per semester in provincial centers throughout the country. In courses with low enrolments (less than 1000 students) such tutorials have recently been deemed not to be cost effective. Alternative regional or central intensive programs have been developed. These involve 20 hours of tutorial classes and assignment work over two weekends in the final month of the semester and count for 30% of the assessment. A small charge is made for registration. The Mathematics for Social Science course was affected by this change. Since mathematics is a difficult subject for students, (only about 30% normally passed the course) the special tutorial program was used to help students in the second semester of 2006. Students were more interested in this approach than in the regular face-to-face tutorials. After the project was advertised, 98 students applied. While this was more than three times the number who had attended the free tutorials in the previous semester, it was not sufficient to justify tutorials in the four regions. Instead, three classes were conducted in Bangkok. Only 71 of the original applicants attended. During the program the better students were asked to assist those who needed help. Student questionnaires indicated that more than half identified themselves as weak in mathematics, most had completed year 12 and just over three-quarters had never attended regular face-to-face tutorials. They were asked to rank items about the classes on a five-level scale. The availability of up to 30% of the marks for the course was the major attraction. Most indicated that they were pleased with the classes, and gained more knowledge; while assignments, as well as the solutions given after submission, helped them understand the contents. Having classmates help them with learning also encouraged them with their study. They felt that they needed more time to study and do assignment work, and would like more marks to be allocated for the assignments. It was found that the achievement of students who attended the special tutorial classes was significantly higher than that of those who did not. The pass rate in this semester dramatically increased compared to the previous semester, 50.72% and 30.34% respectively. But when comparing students' final exam scores for both groups, it was found that there was no significant difference in the scores. However students were satisfied with these special tutorial classes.*

*Keywords: exam scores, mathematics, special tutorial.*

Sukhothai Thammathirat Open University (STOU) has been provided distance education since 1978. As with many open universities in the world, printed materials are the main media and supplements by others. While tutor-marked assignments are a key component of distance education in western countries, this strategy is economically impossible in STOU due to the number of students, as is happen in other developing countries. As an alternative, face-to-face tutorial classes were provided for students from the outset of the university. The program was intended to provide students with the opportunity to meet their tutors as a mean of two way communication. The students were expected to read textbooks in advance to identify areas where they needed more enhancements or to identify problems that tutors could help solve. The tutorials were provided mainly for the basic or difficult courses, which were optional for students. Five-hour sessions were conducted on two or three weekends per semester. On average, less than 30% of the students attended these classes.

Later, in 2002, limited use of assignments was introduced in some courses. This contributed about 20% of the final mark. The purpose of the assignments was to encourage students to work and to help them study. It was hoped that students doing assignments would be more successful in their studies, get higher mark, and less likely to drop out. A set of assignments was sent to students. They were asked to submit the assignments within the second month of the semester. The number of students who submitted assignments was similar to the number who attended the tutorial classes in the past.

In 2003, another supportive approach was initiated to help students which were special tutorial classes with assignments for submission contributing 30% in the final mark, while the remaining 70% coming from the final exam. This was introduced to assist students to gain more knowledge and skills (STOU, 2006). In courses where lecturers chose to use this new system, the students would not have access to other support systems such as regular face-to-face tutorial classes, 20% contributed assignments, or intensive classes that were conducted for students who had failed the course more than twice and had no more than three courses left before graduation. The program consists of four five-hour sessions conducted at four regional centers over two weekends, usually during the final month of the semester. Students are charged a small fee, partly to offset the cost of the program, but mainly to encourage commitment to attend the program. During the first semester of 2006, there were five courses in which this system was used. About 20% of the eligible students attended the classes, and nearly all of them (98.47%) passed the courses (STOU, 2006).

A new regulation in 2006 stipulated that any course with less than 1,000 students enrolled would not be supported by regular tutorial classes as conducting tutorials for small groups of students in every province would not be cost effective. The Mathematics for Social Science course was in that category. Consequently, it was decided that the new special tutorial classes would be used as an alternative to support students, especially those who were weak in mathematics. Students who were taught face-to-face in classes would understand the contents better and gain more knowledge than when studying on their own. The final exam of this course contained 60 multiple-choice questions. For students who attended the special classes 70% of their assessment came from the final exam while for other students it was 100%.

The Mathematics for Social Science course contained fifteen units as required by the regulations of the university. They were 1) Basic Sets and Logic, 2) Number System, 3) Straight Line, 4) Relations, 5) Functions, 6) Types of Functions, 7) Permutations, Combinations and Sample Space, 8) Probability, 9) Matrices and Determinants, 10) Linear Programming, 11) Foundation of Mathematics of Finance, 12) Derivatives, 13) Integrations and Applications, 14) Applications of Derivatives and Differential Equations (first degree) and 15) Mathematics Applications (Foundation Graph Theories).

Two questions arise from the implementation of this special tutorial program. Firstly, "how did the performance of the special tutorial students compare with that of the other students in the examination?", and secondly, "how did the final scores of the two groups compared after scores from the assignments and tutorial participation were included. To answer these questions, a research was done with the following objectives: 1) to compare the achievements of students who attended the special tutorial classes and who did not; 2) to study students' points of view towards the special tutorial classes. For further analysis, some hypotheses were stated as follow.

1. Students who receive the special tutorial classes will have higher examination scores than those who do not at a level of .05.
2. Students who receive the special tutorial classes will have a higher final mark than those who do not at a level of .05.
3. Students who receive the special tutorial classes will be satisfied with the special tutorial classes.

### **THEORETICAL BACKGROUND**

Students in a distance education system study on their own. A support system is used in many different ways to help students learn efficiently. Face-to-face tutorials and assignments are used in many institutions as vital means for the teaching and learning.

#### **Face-to-face tutorials**

Moore and Kearsley (2005) said that "A common question that is examined is how students feel about distance learning relative to traditional classroom instruction. In many cases, students say they prefer traditional classroom learning even though they enjoyed their distance learning course and found it worthwhile." Most Thai students also prefer to be taught in a classroom. They enroll in distance education for a number of reasons. Some choose STOU because they cannot get a place in an on-campus course. Others are restricted by their work or location.

In South Africa face-to-face tutorial sessions are provided where students and tutors meet regularly at a common venue and at scheduled times to tackle problems involving their studies. The university of South Africa lists a number of advantages. It provides great opportunities for students to interact with tutors and other students and get a better understanding of the course content. It encourages them to actively participate in the tutorial sessions. And it also helps them to build relationships with other students (UNISA, 2007).

Deshpande (1995) commented that “Although “distance” thus appears to be an essential component, it has generally been concluded that “some personal contact of the teacher and qualities and personality” is essential for real learning to take place” (p. 68). He also mentioned that students in a group supported by two-way communication including limited face-to-face contact performed better than those who did not. He concluded that “the provision of optimum student support can lead to better performance and thus be a factor responsible for enhanced quality.” (p. 68)

Summer schools involving extensive face-to-face tutorials have long been an important part of the program of the UK Open University (The Open University, 2008). Compulsory on-campus seminars have also been a key component of many distance learning programs at the University of New England in Australia (University of new England, 2008).

It can be concluded that face-to-face tutorials can play an important role in teaching and learning for distance education students. The interaction between tutors and students fills the gaps of distance. Students have immediate feedback from the tutors and have motivation to learn.

### **Assignments**

Assignments are the key mechanism for establishing two-way communication between students and their tutors in Western distance education institutions. However, the management of assignment traffic and the marking of assignments also constitute a major expense. Given the huge numbers of students enrolled and budgetary limitations, the use of assignments in Asian distance education institutions has not followed the pattern established in Western countries. Dunbar (1998) mentioned that “Continuous, formal student feedback in the form of project, assignment, essay, and presentation is not normally a feature of Asian education, ...Assessment of student performance is almost invariably by way of examination.” While STOU was modeled on the UK Open University, assignments played no part in the instruction programs until recent times.

There are good reasons to change this pattern. The problems from the assignments help students to study the contents and learn more as Khan (1987) and Lockwood (1995) found. Khan (1987) said that assignments fill the vacuum caused by the absence of teacher in the system of distance education; and Lockwood (1995) said that some students regard tutor marked assignments as a mini examination.

The study of Bååth (1976) on European correspondence schools teaching at non-university levels found that they regarded assignments for submission as an extremely important element in their teaching. The Open University ranked the function of assignments for submission as essential. Similarly, Holmberg (1988) said the assignments served the vital purpose of establishing on-going interaction between the student and the tutor. This form of interaction was the key component in the establishment of his “Guided Didactic Conversation”. Again, Ganor (1988) commented that assignments played an important role in a distance system, constituting a dynamic tool for didactic dialogue with the students and providing a means of monitoring progress and assessing achievement.

It is not surprising to see how assignments greatly affect the way students learn. They help students to evaluate the progress of their study.

From the above information, it was found that face-to-face tutorials and assignments are extremely important in teaching and learning in distance education where students study mainly by themselves. Therefore, the special tutorial adopted both types of support. The availability of 30% of the final marks from the session and the interaction would encourage students to study. It was expected that students would have higher achievement in their final results and show satisfaction with the program.

**The objectives of the research were:**

1. To compare the achievements of students who attended the special tutorial classes and who did not.
2. To study students' points of view towards the special tutorial classes.

**Research was conducted based on the following hypotheses**

1. Students who receive the special tutorial classes will have higher examination scores than those who do not at a level of .05.
2. Students who receive the special tutorial classes will have a higher final mark than those who do not at a level of .05.

**METHODS**

The populations of the study were 441 students who enrolled in the Mathematics for Social Science course in the second semester of 2006. The samples were 71 students who attended the special tutorial classes. There were four sets of research instruments. 1) A set of assignment questions that covered the main objectives of the course. The questions covered fifteen units as in the textbooks. They ranged in type with various items for each unit. None were multiple choices. 2) Three manual booklets contained the concepts of contents, definitions, theories and rules, questions and exercises. 3) A set of assignment solutions. 4) A Questionnaire about students' backgrounds and their opinions about the special tutorial classes. All students throughout the country who enrolled in the Mathematics for Social Science course in the second semester of 2006 received a letter informing them about the special tutorial classes. Four classes, in the four regional centers of STOU, would be provided if there were at least 30 students in each center. Since the number of students who applied for the classes was insufficient to justify four regional classes students were asked to attend to classes in Bangkok instead. There were 98 initial applications but only 72 turned up on the first day. Of these 71 stayed to the end. Three classes were set up for two weekends, the first and third weeks in April 2006 for a total of 20 hours per class. Teaching and learning materials, a set of assignments and the manual booklets, were given to students in the classes. On the first day, three units from fifteen units were taught for five hours, they were mainly foundation knowledge. On the other three days, four units were taught on each day.

Students were asked whether they had read all the contents in the textbooks. Few of them had; not even those who had failed the course more than once before. Some had read through a few units. The tutor had to teach them more detail in some topics and often

provided the basic knowledge to fill the gaps before going on to the new knowledge. The teaching followed the manual booklets as a guideline. During the teaching students had a chance to practice individually and, at times, in teams of 2-4 where they could help each other. Teams were set up by asking the brighter students to help the poorer ones. They were allowed to ask tutors questions anytime during or after the classes.

Students were instructed to submit the assignments in the next class. After the classes, some students grouped together to help each other and those who did not understand or to discuss the assignments. One student did not attend on the second day. In the afternoon of the second day the students submitted their assignments and were then given assignment solutions. Students were asked to fill in the questionnaire. On the last weekend of April, students took the final exam. The exam contained 60 items with five multiple choices for each item. This applied to all students who enrolled in the course.

The data from the questionnaire were analysed by using frequencies, percentages, mean and content analysis. The final exam and the marks from the classes were analysed by using mean, standard deviation and t test. The mean scores with regard to students' opinions about organizing the special tutorial classes were classified as follows: less than 1.50 means strongly disagree, 1.50–2.50 means disagree, 2.51–3.50 means moderately agree, 3.51–4.50 means agree and more than 4.50 means strongly agree. The criterion for satisfaction: "Satisfied" means "more than 75% of students agreed with the statements"

## **RESULTS AND DISCUSSION**

The results of the study were classified into three topics, 1) students' backgrounds, 2) students' points of view on the special tutorial classes and 3) students' achievements. While the discussion part was divided into two groups according to the objectives: 1) to compare the achievements of students who attended the special tutorial classes and who did not, and 2) to study students' points of view towards the special tutorial classes.

### **Students' Backgrounds**

The data show that there were more female than male students (59% and 41% respectively). Nearly half of the students (44%) were 30–39 years old with an average of 36.86 years. They mainly studied in the School of Economics (60%) followed by The School of Management Sciences (39). More than a half the students (60%) held secondary high school certificates before attending STOU. Most (36%) left school less than five years before enrolling at STOU followed by between 11–20 years (29%). 40% enrolled in the course two to three times followed by four to five times (27%) with the maximum up to six to seven times (13%). Only 20% enrolled in the course for the first time. More than a half of them (53%) evaluated themselves as poor in mathematics. Details about characteristics of students shows in Table 1.

Table 1. Percentages and Means of General Information about Students

Item	N	%	Mean
Sex	71	100	
Male	29	41	
Female	42	59	
Age	70	100	36.86
≤ 29 years	17	24	
30 – 39 years	31	44	
40 – 49 years	16	23	
≥ 50 years	6	9	
School of	70	100	
Economics	42	60	
Management Sciences	27	39	
Others	1	1	
Educational qualification before attending STOU	70	100	
High school certificate or equivalent	42	60	
Vocational diploma	9	12	
Bachelor degree	7	10	
Higher than bachelor degree	6	9	
Others	6	9	
Number of years left school before attending STOU	66	100	11.14
< 5 years	24	36	
5 – 10 years	13	20	
11 – 20 years	19	29	
> 20 years	10	15	
Number of times enrolled in this course	70	100	3.24
First time	14	20	
2 – 3 times	28	40	
4 – 5 times	19	27	
6 – 7 times	9	13	
Your mathematical knowledge	70	100	
Very good	0	0	
Good	2	3	
Moderate	20	28	
Poor	37	53	
Very poor	11	16	

When students were asked about the main problems that caused them to fail the course, there were 53 students who responded. Table 2 shows that students' reasons for failing the course were mainly (52%) that they did not understand the contents and found that the contents were difficult to understand. They lacked basic mathematical knowledge (25%) and 23% or did not pay enough attention to the course.

There were also 29 students who did not attend the exam which caused them to fail. The reasons they gave for not attending the exam were that they did not understand the contents (27%), or they were not ready for the exam (24%), and some were also mentioned work commitment as another reason (21%). Details of the answer are shown in Table 3.

Table 2. Students' Reasons for Failing the Course

Item	N	%
Did not understand the contents./ Too much content and it was difficult	28	52
Lack of basic mathematical knowledge	13	25
Did not concentrate on the contents/ did not study/ did not do exercises	12	23
Total	53	100

Table 3. Student's Main Reasons for Not Attending the Exam

Item	N	%
Did not understand the contents	8	27
Work commitment	6	21
Not ready for the exam/did not study	7	24
The contents were too difficult/ weak in mathematics	4	14
The exam time table overlapped with another course	4	14
Total	29	100

### Students' points of view on the special tutorial classes

Students were asked about the classes' management whether they agreed or disagreed. The data are shown in Table 4.

Table 4 Students' Opinions about Organizing the Special Tutorial Classes

The next special tutorial classes (N)	Agreed (N,%)	Disagreed (N,%)
Assignments should be sent to students before the classes (69)	58 (84)	11 (16)
Students should have a pretest before the classes (69)	46 (67)	23 (33)
The time between the first and the second weekend of the classes should be longer than it was. (69)	29 (42)	40 (57)
The easy unit contents should be skipped. (70)	6 (9)	64 (91)
The difficult unit contents should not be taught but emphasis placed on the easy ones. (70)	6 (9)	64 (91)
Every unit should be taught. (71)	71 (100)	0 (0)

The data in Table 4 show that the majority of students (84%) preferred assignments to be sent to students in advance. About two-thirds (67%) of them would like a pretest before the class. Most (91%) disagreed with the tutors skipping either the easy or the difficult units. All of them wanted the tutors teach every unit in the textbooks.

Students were asked about their opinions on and satisfaction with the special tutorial classes. The details are shown in Table 5.

The data in Table 5 show students agreed to all items. They decided to attend the classes because of the 30% marks. They were satisfied with the classes. They found that the assignments and solutions were helpful. Their attitude towards the tutors was highly positive. Studying with friends satisfied them.



Table 5. Students Opinions and Satisfaction with the Special Tutorial Classes

Item	Mean	Interpret
Did the 30% mark allocation make you decide to attend the classes. (71)	3.73	agree
Satisfied with the classes	4.00	agree
You gained more knowledge from the classes. (71)	4.1	agree
You are satisfied with the teaching and the learning from the classes (71)	4.18	agree
After the classes you had more confidence that you would pass the course. (70)	3.71	agree
You studied hard on this course. (71)	4.00	agree
Assignments and solutions are helpful and appropriate.	3.94	agree
The assignments helped you understand the contents. (71)	4.00	agree
The number of assignments in each unit were appropriate. (69)	3.77	agree
Assignments can help you do the final exam. (70)	3.94	agree
The given solutions of assignments help you understand the contents. (68)	4.01	agree
The solutions were appropriate. (67)	4.00	agree
Attitude towards tutors	4.44	agree
The tutors' teaching was appropriate. (71)	4.39	agree
The tutors looked after the students. (71)	4.48	agree
Studied with friends	4.08	agree
Studying with friends in the classes helps your study. (71)	4.04	agree
Having friends in the classes encouraged and motivated you study. (71)	4.11	agree

### Students' achievements

The achievements of students who attended the classes and those who did not were compared. The final exam scores (60 marks) were used to compare the two groups. The data were shown in Table 6.

Table 6. Comparison of the Mean Scores of Final Exam of the Two Groups

	N	Mean	SD.	F	t	p
Students attended the classes	71	23.11	10.20	4.965	.365	.715
Students who did not attend the classes	205	23.66	12.56			

The data in Table 6 show that both groups had average scores on the final exam scores lower than a half of the full score (60). It was found that there was no significant difference at a level of .05 between the means of the final exam scores." Therefore the hypothesis that "Students who receive the special tutorial classes will have higher examination scores than those who do not at a level of .05" was rejected.

The marks of the assignments (30%) were added to the final exam scores adjusted to 70% for each of the students who attended the classes and compared to the final exam scores of 60 marks adjusted to 100% for those who did not attend the classes. The data are shown in table 7.

Table 7. Comparison of the Mean Scores of Final Results of the Two Groups

	N	Mean	SD.	F	t	p
Students attended the classes	71	56.97	11.89	22.657	-8.629	.000
Students who did not attend the classes	205	39.43	20.93			

The data in Table 7 show that after adjusting the marks for the inclusion of the assignment marks there was a significant difference at a level of .05. The mean scores of the students who attended the special classes were higher than those who did not which corresponded to the hypothesis: "Students who receive the special tutorial classes will have a higher final mark than those who do not at a level of .05."

### **Comparison of the achievements of students who attended the special tutorial classes and who did not**

The final exam scores of the students who attended the special tutorial classes were not higher than those who did not. While this is initially disappointing there may be some mitigating circumstances. While all students were invited to participate those who decided to take part may have done so because they were weaker in mathematics than the general population were. There is some evidence for this in that in their self evaluation of their mathematical ability most regarded themselves as weak. Also, 80% had failed the course before. It might be that students who chose not attend the classes had less difficulty compared to those who attended the classes.

When comparing the adjusted scores, it was found that students who attended the special classes had significant higher scores than those who did not attend the classes. It was shown that the marks from attending the classes as well as from the assignments helped them to gain higher scores. As documents from the Registration and Evaluation Department dated July 4, 2007 reported, that the pass rate for this course for semester 2/2006 was 50.72%. This was a jump from 30.34% in semester 1/2006 in which there were no special tutorial classes. It corresponded to Deshpande (1995) who indicated that the provision of optimum student support can lead to better performance and thus be a factor responsible for enhanced quality. It was obvious that awarding up to 30% of the marks from the special tutorial classes had made a big difference. From the results, it was found that the special face-to-face tutorial classes are meaningful to students. They gain more marks and have a better chance to pass the course.

The results did not correspond to most of Angsuchot and Wipassilp's (2007) findings. They evaluated students who submitted assignments on 39 courses at STOU. They found that students from 29 courses who submitted assignments had final exam scores significantly higher than those who did not. The correlations between the assignments scores and the final exam scores were low to moderate. There was a positive impact on students who submitted assignments, students had chance to study from textbooks and had motivation to succeed in their education which reduced the dropout rate. The results also did not correspond to Boondao (2006) who found that students who submitted assignments in the Mathematics for Social Science course in semester 2/2005 had significantly higher scores than those who did not. The students in the current study had less time to study and to do assignments compared to the previous studies. Students who submitted the assignments without attending the classes had about two months to study but the special class students had only a week or less. This may have affected the final scores.

### **Students' points of view towards the special tutorial classes**

It was found that students were satisfied with the special tutorial classes. It might be, as they said, that the tutors looked after them and used appropriate methods of teaching and learning. Observation from the tutors indicated that students understood the concepts of the contents but were hampered by a lack of foundation knowledge especially about real number operations such as subtraction of negative numbers, fractions, fractions and exponential numbers. The tutors had to revise the background of mathematics when it was found that students did not understand. They also worked very slowly in the classes when they were asked to solve problems. Tutors and friends had to explain to the ones who could not do the work. As the students reported, they understood more than when they studied on their own.

The students also said that they had help, encouragement and motivation from friends. Assignments made them understand the contents and encouraged them to study. The given solutions were useful for them and they learned from the solutions. The interaction between the tutors and students and between students helped them learning and feeling good. As Holmberg (1988) mentioned the stronger the characteristics of guided didactic conversation, the stronger the students' feelings of personal relationship between them and the supporting organization. This is similar to Keegan's (1980) suggestion that effective two-way communication between tutors and students was a vital part of distance education. He maintained that there were strong indications that a tutor who really tried to help his students, and who constantly treated his students in a friendly way as individual human beings could strongly encourage students to successfully complete their study programs. Tutors should contact new students very early in the course to introduce themselves and encourage the students to begin working.

### **CONCLUSION**

The special tutorial classes helped the students who attended. They had higher scores on the final results when the assignment marks were taken into account, and gained more knowledge even though their final exam scores were not significantly different from those of students who did not attend the special tutorial classes. The students were very satisfied with all aspects of the program including the teaching from the tutors, doing the assignments, receiving the assignment solutions and working together with fellow students.

While this program was a step in the right direction, the university should constantly explore ways to increase the interaction between tutors and students and among the students themselves. Consideration should be given to increasing the number of special classes and holding the first one earlier in the semester. This could encourage students to start working and improve both student results and the retention rate. Other strategies could include various Internet-based communication systems and CD-based audio-visual tutorials.

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