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Shortage of Mathematics Teachers in Thai Basic Education Level

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Abstract
The objective of this study was to identify the reasons for shortage of Mathematics teachers at Thai Basic Education level. This research is both quantitative and qualitative in nature. For the purpose of study, survey was conducted with senior high school students, in order to find out their willingness to pursue mathematics in Bachelor of Education. Further, in-depth interviews was conducted with Teachers' Council personnel, The Institute for the Promotion of Teaching Science and Technology, Office of the Basic Education and other persons' who are in the position of Dean or Deputy Dean of higher educational institutions from both governmental and private institutions that have B.Ed. Mathematics programme. The sample was chosen from 4 regions of Thailand and it has been contributed to 400 samples. The descriptive statistics is used to identify the frequency. Based on the qualitative results, it is found that the shortage of mathematics teachers exists at both primary and secondary level. Further, substitutions were not made for retirements, and capable people were moved to administrative jobs; also those who work in both primary and secondary schools were not from mathematics background. Quantitative results revealed that the only 12.2% of the students are interested to pursue faculty of education, in that only 6.1% are willing to choose mathematics in bachelor of education. Majority of the students are interested to teach general science subjects after their graduation; and willing to teach in normal classes. And most of the students are willing to teach in Thai, after their graduation. The reasons behind the shortage of mathematics teachers are only few students' show interest to study mathematics due to the difficulty in mathematics, lack of good mathematicians, low pay, etc., hence proper motivation and guidance should be given to students. Finally, the guidelines were suggested based on in-depth interviews for producing mathematics teachers in 21st century. Conclusion and recommendations are presented for further study to address this issue.
Keywords: Senior high school students; shortage of Mathematics Teachers; reasons; guidelines.

1. Introduction

Mathematics is an important subject that develops human's thoughts and initiate ideas to think systematically and logically. It helps to analyze situations and hypothesize, plan and solve problems appropriately. It is the instrument that related to the study of science and technology too (Ministry of Education, 2009: 47). Mathematics is the subject that prepares a person to learn for future (Vannee Somprayoon, 1998: 15-16). Based on the various studies, even though Mathematics is an important subject, but the achievement of Mathematics learning and teaching is still low (Ministry of Education, 2005: 2).Students' concepts analysis skills at basic educational level also low (Sombat Karnjanarakpong (2006: 3-4). The reason is the Mathematics teachers were not graduated directly from Mathematics teaching field. Therefore, Mathematics teachers could not be able to manage for standard learning and teaching (The Sakon Nakhon Primary Educational Service Area, 3rd District, 2011: 25-27) which correspond to the Statistics of the Teaching Profession survey report that indicates quality education has relationship with teachers' criteria. (UNESCO-ILO, 2002 cited in Chanitta Rakpolmuang and Charoonsri Madilokkovit, 2004: 1). The situation that educational organizations and schools allow unqualified graduates to teach Mathematics or let Mathematics teachers that have lower qualification than standard criteria to teach Mathematics has created more disaster, than allowing teachers to handle more students in the classroom (Paulo Santiago, 2002 cited by Chanitta Rakpolmuang and Charoonsri Madilokkovit, 2004: 2).

Lack of Mathematics teachers' is the problem that happens all over the world. UNESCO research results (2002: 111) found that alliance members of 85 countries require 15 – 35 millions of additional teachers, and therefore the mission, "Education for All" originated to accomplish the goals in the year 2015, as in accordance with Dakar agreement 2000. The shortage of teachers in both Thailand and Overseas (United State of America, Australia, England, Canada, and Malaysia) are in the fields of Mathematics, Science and Technology (Chanitta Rakpolmuang and Charoonsri Madilokkovit, 2004: 28-30).

With respect to the shortage of Mathematics teacher as mentioned, Thailand has responded immediately to sort

out the problems throughout the years with various measurements, such as implementing the project of producing talented qualified teachers in Science and Mathematics for the 3 periods 2013-2018 continuously by providing scholarships to students who are graduated from senior high school and wish to extend their studies to Bachelor or Master Degrees (The Institute of the Promotion of Teaching Science and Technology, 2012). In order to be in accordance with UNESCO research guidelines (2002: 111), researcher agreed that in order to follow up, the study about the shortage of Mathematics teachers at present is very essential. Also to study about students willingness to register for mathematics course at Bachelor level and ambiguity in their decision for becoming a mathematics teacher. The study will be beneficial to solve the problem of lack of mathematics teachers and would facilitate in planning and propose appropriate guidelines for producing mathematics teachers for 21st century.

1.1 Research Objectives

1. To study the shortage of Mathematics Teachers at Thai basic educational level.
2. To understand the willingness of students' to choose Mathematics at Bachelor level, in order to become a teacher at Thai basic educational level.
3. To understand the uncertainty in students' decision to become Mathematics teacher at Thai basic educational level.
4. To suggest the guidelines for producing mathematics teachers in Thai basic education level in 21st century.

2. Research Methodology

This research is both quantitative and qualitative in nature.

1. The shortage of Mathematics teachers' has been studied qualitatively by using documents, in-depth interview with Teachers' Council personnel, The Institute for the Promotion of Teaching Science and Technology and Office of the Basic Education. The sampling method adopted for this study is snowball sampling, total 45 respondents' were approached, in which 32 respondents provided major and valid information for the study.

2. The study would be extended to understand the willingness of students to pursue Faculty of Education-Mathematics and to study ambiguity of the students' decision to become mathematics teachers. In order to study this, quantitative methodology was adopted. The study is conducted with senior high school students of both government and private schools from 4 regions of Thailand. 100 samples were chosen randomly from each region and on the whole the study consisted of 400 students.

3. In order to suggest the guidelines for producing Mathematics teachers, qualitative research has been conducted, which involves verifying to documents, in-depth interview with Teachers' Council personnel, The Institute for the Promotion of Teaching Science and Technology, Office of the Basic Education and other persons' who are in the position of Dean or Deputy Dean of higher educational institutions from both governmental and private institutions that have B.Ed. Mathematics programme. Snowball sampling method was adopted for the study, out of 60 respondents, 43 respondents provided valid information for the study.

The tools used in collecting primary and secondary data were documents, interviews, surveys, recorder and researcher himself. The information received has undergone Triangulation check and then the information was analyzed. The statistical tools used for the study were descriptive statistics to measure the frequency. Researcher has collected data from the month of November 2014 – January 2016.

3. Data Analysis and Interpretation

1. Shortage of Mathematics teachers' at Thai basic educational level

From the study it is found that:

1.1 The shortage of Mathematics teachers exists at both primary and high school levels.
1.2 The manpower rate of mathematics teachers is inadequate at the basic educational level. There is increased number of retirements of mathematics teachers, whereas the substitution rates are less in number.
1.3 Most of the Mathematics teachers who teach in primary education level were not graduated from Mathematics field, especially in governmental schools.
1.4 And most of the capable mathematics graduates have entered into administrative jobs, few are promoted as administrators and few are resigned to do their own private business such as, tutors, thus, it affects in increasing the number of good Mathematics teachers.

2. Students' willingness to study mathematics at Bachelor level, in order to become mathematics teachers

Table No. 1 Shows the students' willingness to extend their study in Bachelor level (N=400)

Faculty wise interest	Total	Percentage
Faculty of Humanities and Social Sciences	162	40.5
Faculty of Science	86	21.5
Faculty of Engineering	103	25.8
Faculty of Education	49	12.2
Total	400	100.0

From the table 1, it is found that senior high school students, who are about to complete their schooling are interested to pursue Bachelor programmes. The students' willingness towards various faculties at bachelor level is given in the table. The results revealed that 40.5% of the respondents are interested in faculty of humanities and social sciences, followed by 25.8% of the respondents interested in faculty of engineering, 21.5% are interested to pursue in Faculty of Science and 12.2% are interested to pursue in Faculty of Education respectively. The most interested faculty is humanities and social sciences and the least interested is education.

Table No. 2 Students' Interests towards various major in Faculty of Education (N=49).

Major Field of interests	Total	Percentage
Chemistry	4	8.2
Physics	4	8.2
Biology	27	55.1
Computer and Technology	11	22.4
Mathematics	3	6.1
Total	49	100.0

From the Table 1& 2, it is found that the senior high school students those are interested in faculty of education is 12.2%. Out of this 12.2% (49 Students), majority 55.1% are interested to become biology teacher, followed by 22.4% as computer & technology teacher, 8.2% of the respondents interested in chemistry & physics and 6.1% of the respondents are interested in mathematics. Most of the respondents' are interested in the field of biology and the least interested is mathematics subject.

Table No. 3 Subjects interested to teach after Graduating in Bachelor level (N=49)

Subjects interested to teach	Total	Percentage
General Science	34	69.5
Physics	3	6.1
Mathematics	3	6.1
Biology	3	6.1
Chemistry	3	6.1
Computer	3	6.1
Total	49	100.0

From the table 3, it is found, that the majority (69.5%) of the high school students interested to teach General Science subject, and the percentage rate is equally distributed to (6.1%) for other subjects i.e. Mathematics, Biology, Chemistry and Computer, which the students interested to teach after completing their Bachelor level.

Table No. 4 Students willingness to teach in class after their Graduation in Bachelor level (N=49)

Classes able to teach	Total	Percentage
Science-Mathematics class	4	8.2
International Program class (EP)	4	8.2
Classrooms that teach in English (MEP)	4	8.2
Normal Class	37	75.4
Total	49	100.0

From the table 4, it is found that the majority of the senior high school students (75.4%) are interested to teach in normal classes, after their Graduation in Faculty of Education and 8.2% are equally distributed to other classes, such as, Science-Mathematics class, International Program class (EP), Classrooms that teach in English (MEP).

Table No. 5. Language expected to use by students after Bachelor degree (N=49)

Language expected to use by students after Bachelor degree	Total	Percentage
Thai language	41	83.7
English language	8	16.3
Total	49	100.0

From the table 5, it is found that 83.7% of the senior high school students expect to use Thai language for teaching after the completion of Bachelor of education and 16.3% are expected to use English after the completion of Bachelor degree.

3. The uncertainty of being Mathematics teachers in Thai basic educational level

Reasons that causing uncertainty to become Mathematics teachers for senior high school students that are about to graduate are shown in Table No. 6.

Table No. 6. Shows the reasons for uncertainty in students' decision to become Mathematics teacher (N=400)

Uncertainty Reasons	Mean	S.D.	Level
Lack of good Mathematics teachers	4.350	.4621	Strongly Agree
The difficulty of Mathematics subject	4.294	.5908	Strongly Agree
The difficulty of knowledge transfer	4.370	.5194	Strongly Agree
Lower compensation than the difficulty of works	4.315	.6149	Strongly Agree
Overall level of the Uncertainty	4.332	.4235	Strongly Agree

From the Table 6, it is found that most of the senior high school students are not interested to graduate in Bachelor of education especially in Mathematics subject, in overall view the uncertainty level is very high. Thus when considering each aspect, it is found that the difficulty in knowledge transfer (4.370), Lack of good Mathematics teachers (4.350), the lower compensation than the difficulty of works (4.315) and the difficulty of Mathematics subject (4.294) are at high level respectively. Hence students are not certain to choose mathematics at their Bachelor level.

4. Guidelines for producing Mathematics teachers in Thai basic educational level in 21st century

Even though teacher education reform is a priority in order to raise the quality of teachers to an international standard, the country remains faced with a shortage of teachers, particularly in the small rural schools, and in the fields of science, mathematics, English Language, and technology; and professionals with knowledge and skills in these areas are seriously lacking in many sectors and many regions of the country. The creation of knowledge, skills and expertise, along with technological development to replace manpower shortages is essential to better respond to the lives and livelihoods of the population and to help to drive the economic and social development of the country, in order to compete successfully in the global society of the 21st Century, (The Thai National Commission for UNESCO, Ministry of Education, 2015). The projects for resolving the shortage of manpower

issues are already exist in the pace.

The guidelines for producing mathematics teachers in 21st century are given below:

4.1 Scholarships could be provided for talented persons in mathematics, for enrolling themselves in mathematics course at Bachelor level to become teachers. And they should be given provision to work in their domiciles after graduation.

4.2 Scholarships could be provided from Bachelor level to the Doctorate level for those talented in Mathematics and have secured outstanding results; also have high English proficiencies who can teach Mathematics in English.

4.3 Scholarships could be provided for qualified and talented Mathematics teachers to extend their studies to Master or Doctorate levels; after having gaining 3-5 years of experience in Mathematics teaching.

4.4 In order to develop Mathematics teachers' teaching capabilities continually; the abilities of Mathematicians, teaching techniques and the way to use teaching media including the using of English as media of communication in learning and teaching must be increased. This will create expertise in mathematics.

4.5 The Ministry of Education must encourage, train and support small schools to big schools in order to achieve international standard, by meeting the standard criteria of key competencies for 21st century.

4. Discussion

The shortage of Mathematics teachers exists in both primary and high school level classes. There are an increased number of retirements, but replacements/substitutions were not made. Many graduates especially working in government schools were not from mathematics background. Potential mathematics graduates have moved into administration job. Hence there is lack of potential and capable mathematics teachers for teaching Thai basic educational level.

The descriptive statistics indicates that the willingness of students to pursue in faculty of education contributed to 12.2%. It is low when compared to other faculties like humanities, social sciences, sciences and engineering. Further, those who are interested to study mathematics subject in faculty of education is 6.1%, which is equally distributed with other subjects. And majority 69.5% of the respondents was interested to teach general science subjects after graduating in faculty of education. Also compared to other classes most of the high school students are interested to teach in normal classes i.e. (75.4%), after completing their Bachelor level. Moreover 83.7% of the students expect to use Thai language after completion of Bachelor degree, whereas remaining respondents expect to use English. Hence, it is clear that, only small group of students prefer to choose faculty of education and very few are interested to study mathematics.

In overall students about to graduate from senior high school are uncertain to choose their career as Mathematics teachers. Because, they agree that there are lots of difficulties i.e. difficulty in knowledge transfer, lack of good mathematics teachers to teach them at present, difficulty in mathematics subject and lower compensation rather difficulty in works. The respondents highly agree to the above aspects and hence they are uncertain to choose the mathematics subject to become as teachers.

The guidelines has been composed based on document referrals, in-depth interviews with Teachers' Council personnel, The Institute for the Promotion of Teaching Science and Technology, Office of the Basic Education and other persons' who are in the position of Dean or Deputy Dean of higher educational institutions from both governmental and private institutions that have B.Ed. Mathematics programme. The implementation guidelines for producing mathematics teachers in 21st century state that good motivation is very much essential to bring talents in mathematics. However, it could be started from the Bachelor level, scholarships could be provided for capable/talented persons in mathematics, one who enroll themselves to pursue mathematics subject in education program. Once after their completion of study, they shall be posted in their domiciles. Scholarships could be provided throughout Master's and Doctoral studies to the outstanding students, one who is capable to teach mathematics in English too. Further scholarships shall be granted to teachers with 3-5 years of experience for extending their studies to master or doctorate level. Mathematicians' capabilities could be increased continually by guiding them to improve their ability by updating time to time, using appropriate teaching media and ability to use English in teaching learning process creates expertise in Mathematics.

5. Conclusion

It is obvious from the study results that there is a shortage of Mathematics teachers, due to various reasons like difficulty in mathematics, lack of availability of good mathematics teachers, low compensation for mathematics teachers, when compared with work and difficulties in knowledge transfer. For the above mentioned reasons students are uncertain about their career decision to become mathematics teachers. Only few students are interested to pursue mathematics subject in faculty of education. These are the shortage for mathematics teachers in primary and high school. Hence, this issue needs to be sorted out by providing proper motivation and scholarships to the potential candidates for increasing the experts in the domain.

6. Recommendations

The educational administrators should pay crucial attention to resolve the issue. They need to make replacements for the short term and in the mean time proper planning should be made for long term, because mathematics plays a crucial role in the development of national science and technology. Only few students expressed their interest to pursue mathematics in faculty of education, therefore, the educational institutions including policy organizations must cooperate each other to take proactive measures in public relations towards senior high school students in order to build positive attitudes towards mathematics subjects and motivate them to become a mathematics teacher. And also they can follow the implementation guidelines by Ministry of Education for producing mathematics teachers in 21st century. Further the study could be extended more quantitatively to find out the relationship between implementation of strategies and confidence in the minds of students to resolve the problem.

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