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# The 4th International Conference on Research, Implementation, and Education of Mathematics and Science (4th ICRIEMS)

## Research and Education for Developing Scientific Attitude in Sciences and Mathematics


**Yogyakarta, Indonesia**
15–16 May 2017

**Editors**
Cahyorini Kusumawardani, Agus Maman Abadi, Slamet Suyanto, Warsono and Insih Wilujeng

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# Pre-service Mathematics Teachers' Attitudes towards Learning English: A case study in Yogyakarta

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**Abstract.** This study investigated attitudes of pre-service mathematics teachers towards English as one of the subject at the university. It is a qualitative study in which questionnaire and face-to-face interview were employed to collect the data. The participants of this study were sixty students of mathematics education department at one of the university in Yogyakarta. The main research question was concern with how pre-service mathematics teachers perceive the importance of learning English. This study found that most of the participants perceive English as an important language that should be acquired by mathematics teachers. Their beliefs about the importance of English were mostly due to instrumental orientation rather than integrative orientation, such as getting a good job, getting a scholarship and understanding learning sources that are written in English. The data also revealed some obstacles faced by pre-service mathematics teachers in learning English as an additional language for them. The main obstacles were related to the differences between English for mathematics and English in daily life including its vocabulary and structure. Most of the participants argued that several mathematics vocabularies had precise meaning and different from daily English. In addition, they found difficult to understand some sentences used in the paper journal due to its structure. This study therefore, provided an insight into the pre-service mathematics teachers' perception and obstacles when learning English that could be use in improving pre-service teachers' education.

## INTRODUCTION

English is an additional language for Indonesian. Pre-service mathematics teachers at several university should take English courses as part of their training. Nowadays, there is a need to gain proficiency in English for non-native speakers [1]. Some schools in non-native English countries such as South Afrika, Filipina, Malaysia and Indonesia use English as medium of instruction for mathematics and science. Moreover, some resources of teaching and learning are written in English. Therefore, there is the necessity for mathematics teachers and pre-service teachers to be proficient in English. However, previous research on English proficiency of Indonesian students show that the English procifiency of the Indonesian students are low and they are leaving from high schools or graduating from university without sufficient communicative skills [2,3].

Attitudes play crucial role in learning language [4]. Gardner [5] found that attitudes have an impact on motivation and learning achievement. Using a socio-educational model, Gardner identifies two types of motivational orientation namely integrative and instrumental. Integrative orientation related to awareness or interest in knowing native English speakers and their culture. Meanwhile, instrumental orientation refers to the potential practical advantages in relation to language proficiency. This two types of orientation have positive correlation to learning achievement [6]. Philipp [7] defined attitude as one's opinion towards certain things that manifested into acting, feeling, or thinking. Attitudes may involve positive or negative feelings "of moderate intensity and reasonable stability" [8].

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Many studies have been conducted in the field of pre-service mathematics teachers attitudes towards mathematics such as van Zoest, Jones, and Thornton [9], Amato [10], Uusimaki and Nason [11], White, Perry, Way and Southwell [12], Maasepp and Bobis [13], and Cooke [14]. There are also many studies on the perception of pre-service mathematics teachers in relation to pedagogical knowledge [15,16,17]. However, less attention has been focused on the mathematics pre-service teachers' attitudes towards learning English. Pre-service teachers should be prepared not only in terms of knowledge and skills in their subject area but also the competence in the language of instruction.

This study therefore, explores the attitudes pre-service mathematics teachers towads learning English with regard to their integrative and instrumental orientation, that initialy proposed by Gardner [5]. The attitudes explored in this study more focus on motivation of learning English as a language because motivation and attitudes are similar, there is no clear distinction between attitudes and motivation in the areas of second language acquisition [18]. This study also investigates obstacles that they faced when learning English. Knowing pre-service teachers' attitudes and obstacles could be beneficial for policy maker and teacher-training institution to formulate a better approach on teaching and learning processes to improve the attitudes and minimize the obstacles.

# RESEARCH METHODS

## Participants

The participants were sixty students or pre-service mathematics teachers in one of the teacher-training institution in Yogyakarta district, Indonesia. This study was qualitative in nature hence limiting the number of participants is not aimed to generalize but clarify the idea [19]. They were purposively selected for the study because they were enrolled in English for mathematics education course in second semester of the academic year 2016/2017. They were aged between 19 and 22 years old, among them twentysix students are male and the rest thirtyfour students are female. In terms English background, a majority of the participants have been learnt English or about six to eight years as English is one of subject learnt at secondary school. The demographic information of the participants is summarized in table 1.

**TABLE 1.** Participants detail information

| Gender | | Age (years old) | | | Learn English for (years) | | |
|---|---|---|---|---|---|---|---|
| Male | Female | < 18 | 19 –20 | >21 | 1–5 | 6–8 | >8 |
| 26 | 34 | 0 | 56 | 4 | 6 | 37 | 17 |

## Instruments

This qualitative study employed questionnaire survey and interviews as the tools to gather data. The questionnaire consisted of three sections. The first section focused on general demographic information included age, gender, English background, and their ethnicity. The second section aimed to uncover students' attitudes towards learning English. It presented 25 statement with Likert-type that modified from Attitude/Motivation Test Battery (AMTB) developed by Gardner [5] and Vizconde [1]. This section was divided into two sub-construct of attitudes: integrative orientation (14 items) and motivational orientation (11 items). In relation to reliability of the questionnaire, the Cronbach alpha's value was 0.76 and the reliability value for all statement items was 0.86 which can be considered as good [20].

In the last section, students were presented with three open-ended questions related to the obstacles they faced when learning English more specifically English for mathematics education. The original survey was written in Bahasa Indonesia and the participants could answer it either in English or Bahasa Indonesia. It was administered anonymously and required approximately 30 minutes to complete.

A semi-structured interview was employed as it allows the researcher to clarify and probe deeper into the answers of the participants. There were twentyone intervewees who represent participants who hold positive and negative attitudes towards learning English. All interviews were done voluntarily and they could use Bahasa Indonesia or English in expressing their answers or opinions. The participants were informed that the exchanges

were to be tape-recorded. The interviews lasted for a minimum of twenty to forty minutes per participants and they were assured of the confidentiality of their answers.

## Data Analysis

Data from the three different sections of the questionnaire were examined separately. Data from section one were analysed descriptively in order to provide additional information for the results of sections two and three. Meanwhile, data obtained from section two that involving ratings scales were analyzed using SPSS statistical software to calculate descriptive statistics, frequencies, and percents. This section measured pre-service mathematics teachers' attitudes towards learning English that utilized a five-point Likert scale that included "Strongly Disagree" (1), "Disagree" (2), "Unsure" (3), "Agree" (4), and "Strongly Agree" (5). Score 5 (SA) was the most supportive or favorable result that implied positive attitudes and 1 (SD) was the least supportive or least favorable response implied negative attitudes, 3 (U) was considered the midpoint that indicated neutral position. The scores for negative statements in the questionnaire are vice versa. "Strongly Disagree" (5), "Disagree" (4), "Unsure" (3), "Agree" (2), and "Strongly Agree" (1). There were forteen positive statemens and eleven negative statements in the questionnaire.

The data obtained from section three were analysed using the content analysis. Content analysis is a method of analyzing documents systematically and objectively in order to describe and quantify phenomena [21,22,23,24]. This method attempts to examine meaning and identify pattern of the data in their context [25,26]. It was aimed to provide an insight about pre-service mathematics teachers' obstacles when learning English by analyzing data into several categories of obstacles. The sixty students' answers on the three open-ended questions survey items were placed into three conceptual categories or themes: obstacles to understand mathematical text, to comprehend mathematical vocabulary and to clearly articulate their ideas in English.

Data from the interviews were transcribed carefully using non-verbatim approach. The transcribed data were then analysed using content analysis approach. Answers were categorized into three main classifications: positive, neutral and negative attitudes towards the language. Results were reviewed and analyzed thoroughly using NVivo software. The data were then summarized and interpreted.

# RESULTS AND DISCUSSION

## Attitudes towards English as a Language

Data from questionnaire revealed that more than half of the participants (55%) have positive attitudes towards English (Table 2). In the contrary, 15% of the participants hold negative attitudes towards English. Meanwhile, the rest 30% stayed neutral.

**TABLE 2**. attitudes of pre-service mathematics teachers towards learning English

| Attitude | Number of participants | Percentage |
|---|---|---|
| Positive | 33 | 55% |
| Neutral | 18 | 30% |
| Negative | 9 | 15% |

The interviews aimed to discover the reason participant hold certain attitudes. Most of the participants who have positive attitude believed that English is an important language in the globalization era where there is no barrier among the coutries around the world (as sumarised in Table 3). The result is consistent with the findings of the previous studies that state English has a prestigious place in Asia [27,28,29,30] involving Indonesia [31,32]. This finding also support the argument that English is a way to see the broader world, in other world, it is "a window to the world" [33].

**TABLE 3**. Reason for having Positive Attitudes

| Reason | Percentage |
|---|---|
| Learning English support learning mathematics | 64% |
| Pursuing study | 21% |
| Participating in academic events (international conference, guest lecturer, etc) | 15% |

On the other hand, pre-service teachers who have negative attitudes argued that it is not a compulsory for pre-service mathematics teachers to be proficient in English. They believed that mastering subject matter, in this case mathematics, is more important than mastering English as a language. Some others claimed there are limited number of school that use English as the language of instruction in Indonesia thus they prefer and plan to teach in regular school where the language of instruction is Bahasa Indonesia.

The participans who stayed neutral stated that they just follow the curriculum. They believed that English important language but it did not an obligatory for mathematics teachers to acquire English proficiency. Therefore, their orientation of learning English was pass the course.

**TABLE 4**. Attitudes towards learning English by gender

| Attitude | Male | Female | Total |
|---|---|---|---|
| Positive | 9 | 24 | 33 |
| Neutral | 10 | 8 | 18 |
| Negative | 7 | 2 | 9 |

Table 4 shows the attitudes differences with regards to gender. Female tend to have positive attitude towards learning English compared to male. Among the participant who hold positive attitude, around 73% are female. On the other hand, more than 78% of the negative attitudes are male. This finding support the claim that female have positive attitudes towards learning language [34,35,36]. Previous studies show that female tend to learn language better than their counterpart [37]. This might explain this phenomenon. Another possibility explanation is that the fact that the number of female participant is bigger than the female one. However, there is no clear-cut explanation about this attitude tendency as shown in the previous studies [38,39].

## Integrative versus Instrumental Orientation

Integrative orientation in this study defined as a desire to learn a language in order to know the identity, culture or way of life of the target language and people who speak it. The items in the questionnaire uncover pre-service teachers' perspective when learning English, including: learning English to communicate with other people from native English speakers, learning English to know their way of life and to know the culture. Meanwhile, the instrumental orientation refers to desire to learn a language due to the utility of the target language such as getting a job, being high skilled people, being professional teachers and understanding teaching and learning resources.

Data from the questionnaire revealed that pre-service mathematics teachers in this study more focus on the instrumental orientation rather than intergrative one. It can be seen from the mean score between the two categories of orientation (Table 5).

**TABLE 5**. Mean score for each orientation category

| Orientation | Mean score |
|---|---|
| Integrative orientation | 2.98 |
| Instrumental orientation | 4.37 |

Tabel 5 shows that instrumental orientation has relatively higher mean score tha integrative one in the case of learning English for pre-service mathematics teachers. They interested to learn English in order to be prepare their future for example to be skilled and pofesional teachers to compete in globalization era, to communicate when traveling aborad, and to help them mastering mathematics concepts since there many good mathematics resources written in English. From the data thus it can be conclude that pre-service teachers share common similarity that is empashing on the value of English as an international language. This finding in line with Krikpatrick [40] and Bradford [41] which found learner more focus on the utilitarian of English is a lingua franca. Moreover, pre-service mathematics teachers did not have strong desire to know the cultures or lifestyle of the people speaking the target language.

Taking into the gender differences, the pattern of the participants' responses show that female have higher instrumental orientation towards English than male. This result remains consistent when comparing integrative orientation between male and female. These findings differ from previous studies that conducted in pre-service teachers whose major is language. One of the possibility is that pre-service teachers whose major in mathematics more interested in mastering the subject matter, that is mathematics, rather than learning language. On the other hand, pre-service language teachers are expected to master the subject matter, English, and knowing the culture, the people and all aspects related to English. However, it should be noted that the number of participants of this study might not sufficient to represent the general of view of pre-service mathematics teachers.

## Obstacles in Learning English

This study was also aimed to investigate obstacles pre-service mathematics teachers faced when learing English as a course at the University level. Analysing pre-service teachers' responses on the open questions in the third section of the questionnaire, reveals two categories of obstacle namely obstacles in the written English and obstacle in the spoken English. The first category includes obstacles pre-service faced when reading learning sources that are written in English and writing academic assignments. The later category involves obstacles that they experienced during understanding the explanations from lecturer or guest lecturer (either native or non-native English speakers) and understanding learning resources (either audio or audio visual) in English.

Obstacles in the first category that found in this study are the differences in terms of language style in academic writing such as different vocabularies and sentence structures. Pre-service mathematics teachers argued that the language used in academic writing and others learning resources are more complicated than the language they learnt at high schools. In relation to the vocabulary differences, the interviews reveal that mathematical vocabularies are the main source of difficulties because the meaning of the mathematical vocabularies are differed to the everyday English and some others are only used in mathematics. It is need time for pre-service mathematics teachers to familiarized with the mathematical vocabularies. They also found more difficult when reading academic papers that are written by native English speaker as they argued that the native English speakers tend to use precise vocabularies that are unfamiliar for them. This result consistent with the findings of Moschkovich [42] and Lager [43] that point out the characteristic diffrences between mathematical language and everyday English as the source of problems for non-native English speakers.

In relation to obstacles in understanding spoken English, pre-service mathematics teachers experienced some problems when they have to understand what native English teachers said in the video or tape. They argued that some pronouciation are different from those that they have learnt. In addition, the differences between American English, British English and others put more tension for the pre-service teachers. This difference lead to differences on the accent and the vocabulary they used. This finding support Carlo [44] argument that states the divergences between English used in America, Great Britian and others places could be one of source of confusion. It is interesting that pre-service teachers could spot the differences between American and British English, since Indonesian are more familiar with American English. However, more studies are needed to explore the obstacles they faced for an example looking more detail on the difficult vocabularies they found.

## CONCLUSION

The positive attitude held by most of the pre-service mathematics teachers is an impotant aspect in achieving language proficiency. Based on the attitudes orientations identified in this study, it gives an insight that the pre-service teachers aware of the necessity of English such as employment and social and academic advancement. This study also discovers the similarity of obstacles experienced by other non-native English speakers such as understanding the accents, vocabularies and sentence structures in both written and spoken English. Although the study was limited to sixty participants from one institution, there is a great possibility that pre-service mathematics teachers to equip their own with subject matter as weel as language of instruction even though some obstcales identified. Implication for teaching English for pre-service mathematics teachers is that the lecturers should more aware of the variability of attitudes, its various factors, orientations and obstacles behind them and thus the findings of this study could as an input to plan an effective and efficient teaching practice. However, this study is insufficient to draw meaningful conclusions about pre-service mathematics teachers' attitudes towards English across such a large and diverse country. Further studies can be undertaken using respondents in other teacher-training institutions across the country for more conclusive databases.

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