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ELS for NNS in Mathematics Teaching-Learning Process at Tertiary Levels – ELS Instructor's Perspectives – A Study from West Indies

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Abstract

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In this paper, the focus is on the need and minimum requirement of English Language Skills for both Mathematics Instructors and students who hail from Non-Native Speaking countries and are actively involved in mathematics teaching-learning process at tertiary levels.

Several studies have been made in this regard. All the findings show that the lack of resources to provide intensive training for students and teachers in the use of specifically Mathematical English results in poor performance. Further, there were few language-based materials or activities in mathematics classrooms, and fewer opportunities for language arts teachers to become involved in educating these students and teachers. Cooperation between Language Instructors and Content Instructors (Mathematics Instructors) will help implement strategies for increasing teacher-student and student-student interaction in the classroom.

This study reveals the importance of the communication skills in acquiring concepts. In addition, Mathematics Instructors can and must make every effort to reach out to these students to create a class that is both positive and rewarding.

Key Words

Mathematical English, Content Instructor, Socratic Method, Language Sensitivity, Language switching.

Introduction

In this interdependent Global Village of our times, we need the ability to function in more than one language. A person is received well when his/her communication skills show common sense, experience and research. Communication skills range from active communication skill of speaking to passive communication skill of listening including creative communication skills of writing. In addition, it has become a reality that proficiency in only one language is not enough for economic, social and educational success.

Language Skills and Learning of Subjects

Language skills are regarded as an instrument of communication to present a certain field of variations depending on numerous contextual aspects, focusing on the role of the speaker and listener.

These skills are conditioned by many factors such as time, place and subject matter of what is being transmitted from the addressor (speaker) to the addressee (listener) in a particular situation. The context could be academic such as a class room or some public talk like in social awareness programmes.

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Within the academic context, it is obvious that lack of proficiency in the language skills has harmful effects on the teaching-learning process and thereby such a lack greatly affects students' ability in moulding their own future. These arguments are valid even to the teaching and learning of mathematics tertiary levels in NNS countries where medium of instruction is English.

In ordinary situations, we express our thoughts by outward figures, and thereby mark the objects of ideas, their properties and relations. In like manner, mathematicians have adopted figures to mark different quantities to express their properties and relations. We read mathematically, when we represent by our thoughts through linguistic signs in words. We speak mathematically, when we make use of other types of signs in the investigations and demonstration of theorems and in the solutions of problems, thereby fixing the principles and rules for learning this science, and succeed in absorbing and using concepts as efficiently as possible.

Mathematics in Curriculum and Classrooms

Mathematics is about *ideas*. The Greek word *mathemas*, from which we derive the word *mathematics*. Mathematics embodies the notions of knowledge, cognition, understanding, and perception. The mathematics learned in college will include concepts which cannot be expressed using just equations and formulas. If a mathematics teacher or learner wants to understand and contribute to the greater body of mathematical knowledge, she/he must be able to communicate ideas in a way which is comprehensible to others.

Mathematics at the Undergraduate Level

In general, undergraduate students, during the course of bachelor programmes in their first year classes, are required to pass an English course exam in NNS countries. It is a fact that most students come from secondary schools where General English is taught and there is little space for introducing technical terminology in English in this course. These students with limited exposure to mathematical concepts and signs in English need opportunities to develop their English Language skills of listening, speaking, reading and writing in the context of mathematics they will now be learning at the undergraduate level. Moreover, bilinguals usually think about mathematical operations in the language through which they were first taught these operations. Thus, we notice a disconnect between the achievement of General English class at the secondary school level and the requirements of mathematics teaching and learning at the undergraduate level. This disconnect introduces delay in fully understanding and mastering the concepts taught in the undergraduate level.

Delay in Mastering the Language of Mathematics

Delay caused by language switching may be the main impediment in the teaching and learning process of mathematics class. During the lecture in the mathematics class which introduces the description and operations of mathematical elements, students listen to the “speaking language”

of the instructor and they need to translate and transfer the same content to their “thinking language”. Students in NNS countries usually receive and think about mathematical operations in their local tongue. A simple example is as follow:

If the instructor wants to explain "1.5 less than x", there may occur some pronunciation hazards, whereas, the same once written on the blackboard showing the symbol "<", then automatically students would identify what the instructor wants to explain in spite of the pronunciation problems.

In everyday English “any” is an ambiguous word; depending on context this word may hint at an existential quantifier or universal one. However, ‘any’ in mathematical communication could be replaced better by ‘each’ or ‘every’. When a mathematics instructor gives his or her oral description in the class, he or she may use ‘any’ several times. They may also use similar word and phrases taken from the ordinary language of the context outside the classroom. Such uses naturally creates confusing images and meanings in the minds of students and they may be automatically and unconsciously lost in rethinking and rejoining the relevant solutions in English. However, if the students are trained step by step in the type of language mathematical descriptions use, they may overcome such disjoints and pay less attention to translating word to word in comprehending and using information presented to them.

Content Literacy

Content literacy is very important to master language use in every scientific field. Richard Vacca (2002, p.7) defines content literacy as follows:

Content literacy is often defined as the level of reading and writing skill that learners need in an academic subject to comprehend and respond to ideas in text used for instructional purposes.

Non-native speakers of English may have a good knowledge of vocabulary and grammatical structures but still they may find it hard to manage their lessons in classroom situations especially in Mathematics teaching-learning process. For instance, a student may be well aware of the general structure of past tense of a sentence. When the same is used in solving a problem the student might get confused as less attention is paid to syntax, etc., in the spoken language of the instructor. Among other reasons, this happens because the instructor may focus more on the concepts and their relations in their presentations than on ordinary language use. Attention is expected only on the methods applicable to solve the problem given in such situations. Teachers and students may not have good control over traditional grammar rules, but their focus is on teaching and learning the mathematical elements and their relations. In other words, unconscious “language switching” takes place in the classroom.

English for Everyday Living and English for Critical Learning

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In NNS countries, just as elsewhere in most nations, learning English for everyday living and interpersonal communication differs from the mastery and use of formal and academic English. Moreover, expressing mathematical ideas is a difficult linguistic task, even for the native-born speaker of the English language.

Most of the time the algorithms used in Primary schools and Secondary schools have had their own mixing of pronunciations of the teacher's influence. From the Mathematics Instructor's point of view teaching mathematics at any level requires a high standard of proficiency with language, either the regional or the international working languages. It is an admitted fact and practice that the instructor must be able to understand pupils' doubts and questions and answer these in the common ordinary language (English spoken outside the classroom). In this, the accent and pronunciation play their own role in bridging the gap between instructor and student relationship.

The essential requirement is that the teacher needs to know the grammatical conventions and vocabulary of mathematical English as well as the informal English used by pupils. Students need to hear how their teachers use language for reflecting, reasoning and explaining.

Marie D'Arcangelo (2002, p.12) suggests:

Good Teachers realize that a major part of teaching is helping students understand themselves as learners and helping them begin to think like professionals in whatever discipline they are studying.

Mathematics Teaching, Learning at the Tertiary Level and Socratic Method

At tertiary levels the problem arises for the mathematics instructors whose first language is not English, and so oral communication in the classroom may be difficult. One of the ways that this problem can be overcome is through the adoption of Socratic Method in teaching and learning. Rational thinking and writing are now called for more than ever because of the complexity of content and the complexity of tools to be used. Socratic Method helps stimulate critical thinking skills. Hypothesis elimination is an important feature of this method.

Teachers' teaching should be so formulated as to increase critical thinking skills. Teachers should pose the questions at the right time and get their students really think and respond. Hypothesis formulation and elimination within the classroom should become a regular feature of the teaching method. Through graded examples, students get to know and master the method. While in the process they also acquire the specialist language and thinking needed for mathematics. The instructors need to present straightforward explanations which are proved to be often complex in mathematics classrooms. Further, carefully constructed language patterns are required to discuss the relationships between subject content and the language used by the instructors.

The universal truth is “Expressing Mathematical ideas is a difficult linguistic task, even for the native-born speaker”. However, the good news is that this difficult task can be achieved, given suitable changes in the curriculum and methods of teaching.

Conclusions

It is known that there are disadvantages for English as an Additional Language students in leaning in classrooms where English is the language of instruction. Elder (1993) and Graham(1987) estimate that the variability in academic performance due to English Language ability is up to 10 percent for university students, and that it is higher for humanities and Social Sciences subjects in comparison with Mathematics or Science subjects. However, Borton and Neville-Barton (2003) suggests that the disadvantage due to language may be just as high in mathematics as in other subjects.

To overcome this communication barrier, first of all, encourage teachers to develop as critical professionals reflecting on their practice, in particular, with respect to language issues in their classrooms. Both, teachers and students, should have clear understanding of how linguistic diversity affects their learning. Projects may be undertaken to examine the impact and nature of language factors in the learning of mathematics for English as an Additional Language students. Designing language support programmes and encouraging teachers with an interest in language and mathematics, based on researching the issues like the interaction of English language skills to Mathematics students at all levels, will be very helpful.

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