

# An Examination on the Success of Bilingual Science Teaching by Referring to its Context at Junior Secondary Level in Sri Lanka

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## ABSTRACT

The Bilingual Education Policy was introduced in Sri Lanka in 2002 with selected subjects including science. There are serious concerns as to whether the intended benefits are being achieved, especially in terms of students' performance. This study attempts to examine the reasons of introducing bilingual education in science subjects and to examine the impact of this change in the teaching learning process, manipulative skills, thinking skills and attitudes. Data is collected through a survey from five leading schools in the category of 1AB in Colombo. Accordingly, 150 students, 36 teachers of grades 7 and 8 in Bilingual classes and the principals are selected and interviewed. In addition, direct observations are also made on teaching learning process. Qualitative methods and descriptive statistics are used to analyze data. The Study finds that the bilingual program is not successful and major reasons include the use of poor policy framework, non-existence of proper plans for pre-service or in-service teacher training programs in parallel with the introduction of bilingual education, lack of teacher confidence, carrying out of poor and less number of practical sessions. English language competencies of students are also found to be poor. Further, the study reveals that the available training centers and resources are not effectively used to thus stressing the need for taking initiatives to streamline training programs. All in all the findings urge policy makers and stakeholders of the education system to revisit the bilingual education program in order bring the intended benefits and to enhance the quality of education in Sri Lanka.

Key Words: Bilingual Education, Teaching, Learning Process, Science, Quality of Education, Education Policy

## INTRODUCTION

English medium education was introduced to Sri Lanka during the British Rule but it was changed when Kannagara Reforms that were implemented in 1945. Subsequent changes in the political environment of the country in 1956 accelerated in implementing Sinhala as the medium of instruction in parallel to the change of the official language policy. Throughout the history of public schooling, general profile of education is being argued. Among them the popular idea is that the education system should produce employable citizens. However, many critics argue that education should create someone who is equipped with adequate knowledge, competencies and skills and disciplined with principles and ethics that harmonize with social values. Therefore, the objective should be much more than simply molding students into future workers or citizens. Including pioneers such as Maria Montessori and Rudolf Steiner, among others, all insisted that education should be understood as the art of cultivating the moral, emotional, physical, psychological and spiritual dimensions of developing a child. Science is a very live and practical based environmental related subject which can help achieving above skills to some extent as the core of science follows the basic rationale and nature.

On the other hand, English helps students to improve their communication skills effectively as that is now being widely used. As a result of prolonged discussions and suggestions; Bilingual Education Policy was introduced in Sri Lanka in 2002 with selected subjects to be taught in the English medium. However, the situation was more challenging when the science subject was introduced mainly due to the complexity of the content of the subject and inadequacy of training. Performance level in science subject is poor even in Sinhala medium and teaching science by existing Sinhala Medium, teacher with less training further brought the performance level down. On the other hand, students too started facing problems after starting learning science in English medium and this situation should not be ignored without having a proper examination. Therefore, the study raises the following questions with a view to explore the real courses for this from a policy making perspective.

- What were the real reasons for changing the medium of instruction in English?
- What is the impact of the change in the medium of instruction science subject on learning – teaching process and performance?
- Whether teaching in English medium improves manipulative skills, thinking skills and attitude

Primary data were collected from 150 students in grade 7 and 8 English medium classes from five leading 1AB schools in Colombo. 1AB School is a one which offers advanced level subjects in all three streams, namely Science, Commerce and Arts. Further, 30 teachers who teach science in English medium, 6 class teachers of English medium classes, and five principals of the selected schools were interviewed thus expanding the sample to represent wider perspective. In addition, direct observations were made at all the selected schools.

Both qualitative approach and quantitative techniques were used to assess performance and achievements of English medium students. For data collection purposes at the interviews, structured questionnaire was used. Qualitative methods and descriptive statistics were used to analyze data. Accordingly, the study describes the socio-historical background of English medium education in Sri Lanka, rationale of the study, research methodology, and bilingual education program in Sri Lanka, teaching-learning process of science at present today, definitions of terms and delimitations of the study.

There are nearly two hundred and fifty thousand candidates of Government Schools face the G.C.E (Ordinary Level) examination, while 10,000 candidates sit the English medium science question paper (according to the Evaluation Report issued by the Sri Lanka examination Department (2009 and 2011), science is a compulsory subject for all students in the curriculum. Therefore, from grade 6 – 11 all the students learn science in the classroom learning – teaching process in schools. Textbook designers and curriculum designers dealing with English medium education should be governed by the theories relating to content based instructions and the objectives of English medium Science education as stated in the National Education Commission (1997).

#### LITERATURE REVIEW

Theoretical bases formed for science – learning – teaching process for students who are compelled to change their medium were referred along with related research and further analyzed by referring to Sri Lankan context.

A colonial education policy with a particular reference to the British Education policy in its former colonies exposes one to the attitude of the colonial master in their subjects in the field of education. This is particularly significant because such a discussion traces the circumstances that led to the establishment of English as medium of instruction in education against the local languages (even where such languages could be used in education) in the former British Colonies. Accordingly, the findings from literature was used to investigate, briefly, the factors that hinder the reintroduction and thereby the development of local languages in education in countries that were subjected to British rule. After this an overview of the causes that led to the temporary relegation of English during the middle of the past century and its subsequent revival afterwards are explored. This is followed by a quick look back on the advent of English in Sri Lanka and its place in science education at present. A presentation of this nature helps to understand the causes that made people, especially, in the countries formerly ruled by Britain, consider English as the superior and the most used languages. For certain studies beyond a certain stage in education, it also helps one to critically examine elements that impede more use of local languages in education. It also creates a platform for one to get a good grasp of the percentage of people in a given context that can have access to education in English versus local languages. Furthermore, a presentation of this nature enables one to examine significant questions related to debates on “development” especially in the Sri

Lankan context after the instruction of local languages to teach science subjects in the secondary education circle. In order to get a better understanding of the different concept regarding this topic, a literature review was grouped into the following areas.

- Kannagara Report
- A brief historical overview of Science Education in Sri Lanka
- Nature of Science Education
- The importance of Science Education
- Education Reforms in 2007
- Bilingual Education programme in Sri Lanka
- Second Language Acquisition

### OBJECTIVES OF THE STUDY

The study tries to achieve following two objectives.

1. To examine the performance level of students in science at secondary level education
2. To examine the emphasis paid to develop thinking skills of students.
3. To examine the emphasis paid to develop manipulative skills of students.
4. To examine the emphasis paid to inculcate scientific attitudes in students.

### RESEARCH METHODOLOGY

The researcher has already paid direct attention to the methods used in science teaching – learning process in the English medium of junior Secondary Education. Furthermore, it examines the emphasis paid to develop thinking and manipulative skills of students in their learning – teaching process in the classroom. Introducing the science subject in the medium of English is very needy action and wise decision the government has taken in relation to make an active global citizen. Private sector complains the government sector that school leavers are not trainable, and not employable. Moreover, they are unable to communicate with the modern world as lack of competency in the English language. They do not have the ability to manage four language skills of English and usage of modern technology. Implementation of English medium science into the curriculum helps to solve the above mentioned issues to some extent. Although, English Medium education promotes competency in using English language of students, it is questionable whether manipulative skills and thinking skills in science are promoted or not. The researcher has already researched the above mentioned issues that should be addressed immediately for the betterment of science, English medium learning – teaching process in schools, in relation to produce an active global citizen. Qualitative approach and quantitative techniques were used to assess performances and achievements of English medium students. Primary data were gathered through direct observations of learning teaching process, interviews with teachers and students of English medium Science, principals and questionnaires to students of English medium and Teachers of English medium Science. For the analysis of data, qualitative methods and simple statistical methods were used where necessary. A sample of the study consists of 5 – 1AB Colombo schools which conduct Bilingual Education process in Colombo because it has the highest educational performance and also the most sophisticated facilities for learning and teaching process. Accordingly, the following constitutes are given as the components of the sample.

- Schools in the Colombo Zone
- Sample schools are limited to 5
- 5 – 1AB Schools.
- Sample number of English medium science teachers is 30
- Sample number of English medium students are 150
- Interview with 2 principals.
- Interview (structured) with 6 English medium science teachers
- Interview with 5 English medium class teachers
- Structured interview with 15 English medium students

### 1.1. Data Gathering Instruments

To evaluate the objectives of the study, data collection is considered to be important. The data were collected through the following instruments.

1. Survey of literature review.
2. Administered questionnaire.
3. Interviews.
4. Classroom observations

Summaries of major areas of concern in questionnaires given to both students and teachers are given in table 1 and table 2 respectively.

**Table 1: Distribution of Students' Questionnaire (Part I)**

Question No.	What is expected from Students
01,02,03,04 (i) (ii)	The difficulties students encounter in English medium
05,12	English medium science performance of students.
06,07,10,11,13,14,15	Students' point of view about teachers
08 (i) (ii)	Students' point of view about the textbooks
16 (1-16)	Students' point of view about using laboratory and practical sessions in the process of learning – teaching process of science in the medium of English.

**Table 2: Distribution of Teachers' Questionnaire**

Question No.	What is expected from the teacher
01 (i) (ii) (iii)	Academic background of the teacher
02,04,05,08,23	How teacher interact with students?
03,06,07,09,10,11	The techniques that teachers prefer to follow
20	Whether the teaches refer supplementary materials.
09,16,17,18,19,20,21,22	Teachers' preparation for the lesson
12,13,14,15,23	Physical and human resources for practical sessions in school. Especially for English medium science learning – teaching process.

All the data gathering instruments helped to evaluate following elements.

### 1.2. Content Learning

The objective of the level of performance of English medium Science students directly related how they understand the content of science subject. Questions (01, 02, 03, and 04) in the students' questionnaire were based on whether the students have the ability to express concepts and ideas on the subject of science in English medium.

Questions 06, 07, 08 (I) (II), 10 and 11 in the students' questionnaires were formed to find out students' opinion about the subject teachers' capability, willingness, and interest in the subject matter of science and her/his learning – teaching process.

### 1.3. Using Practical Based Learning (Activity Based Learning)

To achieve the objective 03 and 04 of the research, the researcher needs to collect information regarding the practical based learning – teaching process in the classroom. Questions 14, 15 and 16 in the students' questionnaire and questionnaire of the teachers who teach English medium science, were formed to find out

whether the English medium science teachers pay their attention to the practical based learning, teaching process and how they use science laboratories to promote manipulative skills of English medium students in the classroom and in the science laboratory.

#### **1.4. Teacher Competency**

The teachers should have the competency to teach the integrated skills through English medium science teaching learning process to promote bilingualism. Question number 06, 07, 10, 11, 15 in the students' questionnaire clearly reveals the students' point of view about teacher competency. The teachers' questionnaire, the set of facts in the classroom observation schedule focused, helped to identify teacher competency in relation to learning teaching process of English medium science. Furthermore, structured interviews highly assisted to collect relevant data to the research.

#### **1.5. Method of Teaching**

The purpose of formulating the questions in the questionnaire was to find whether the teachers use different methodologies, for successful learning. The teachers should use effective teaching aids and practical based activities. The Questionnaires were designed in order to find whether the different methods of teaching are used and more practical based learning, teaching process is used to promote manipulative skills, thinking skills and attitudes as well as bilingualism in students.

#### **1.6. Interaction**

Questionnaires were designed to find whether the teachers do activities and practical based sessions in the classroom which in turn encourages the students to interact. Further, to find whether the teachers select a wide variety of activities that would help students to interact.

#### **1.7. Cognitive Development**

Language and cognitive development are intermingled. Therefore, the researcher has designed the questions to investigate whether the teachers develop the students' cognitive skills by using different methodologies.

#### **1.8. Limitations of the study**

This study was chiefly meant for junior secondary English medium science students; hence only IAB schools could be included in the survey.

Questionnaire for students was prepared in both Sinhala and English medium to facilitate students and collect more accurate data. Furthermore, Teachers' questionnaire was very structured and it consists of "Yes" "No" answers motivate teachers to answer all questions in the questionnaire.

Interviews are carried out with great difficulty due to time constrains.

Lesson observations were very much natural at some schools since the researcher had the opportunity to observe four lessons without giving any prior notice as the respective teachers allowed doing so. However, the other lesson observations were done at other schools were pre-arranged and therefore, it could not be authentic.

A questionnaire was given to 150 students and only 140 questionnaires were received. Furthermore, some students have not answered or have not given any response to any questions in the questionnaire. Therefore, the researcher had to calculate the data analysis according to the number of students who have handed over the answers and could not maintain the consistency of sample size.

### **DATA ANALYSIS AND DISCUSSION**

Obtained data in the study were analyzed by using different methods to realize the objectives of the study. This analysis was meant to understand the impact on manipulative skills, thinking skills and attitudes towards science, English medium learning, teaching process. Classroom observations helped to study the impact of the English medium instructions in the science learning and teaching process. Furthermore, it helped to investigate how the teachers used different methodologies and how teachers used student centered, competency based activity oriented science – learning – teaching process. The findings of the interviews and lesson observations were

discussed in detail in chapter 4 and significant cross check for the questionnaires were reported accordingly. It was found that there were no proper planned pre-service or in-service English medium science teacher training programs scheduled by the government to conduct the program effectively. The lack of teacher confidence in teaching science in the medium of English and very less practical sessions used in the learning - teaching process of science are the major problems identified. Furthermore, lack of English Language skills and lack of manipulative skills in English medium students are other main drawbacks. There are printing mistakes, unclear subject matters in English medium science text books. The textbooks have to be enriched with colorful illustrations and clear printings. Other major issues recognized are, there is no specific framework of bilingual policy and lack of monitoring mechanism in English medium science education at junior secondary level in Sri Lanka. English medium science education in Sri Lanka should be equipped with an on-going and fast evaluation program to have a better future. The course components of teacher training programs of science teacher trainees at the College of Education, teacher training center and other relevant training institutions should address all aspects of the science learning – teaching process. Teachers of English medium science, teaching at junior secondary level should be equipped with language competencies and professional skills that are necessary for students, being an active global citizen. In teacher – training programs, special attention should go to attitudinal change of English medium science teachers to promote to grab the maximum use of science laboratories in their learning – teaching process. Furthermore, promoting teachers to use more individual activities with group work is very important in their training programs. Although, the selected schools are well equipped, negative issues related to English medium learning teaching process can be seen.

#### FINDINGS OF THE STUDY

- Many teachers face difficulties in handling a large English medium classroom.
- Students were having a highly diverse level of understanding the subject in English medium mainly due to different levels of language competencies.
- Even in large national schools in Colombo, which are supposed to have high language competencies, teachers found difficulty in delivering.
- The majority of students was found to have been frustrated as they could not understand the subject properly
- Both teachers and students were found to have been comfortable to learn if customized teaching learning strategies were applied.
- However, it was not possible with a large class size and other administrative works assigned to teachers. Activity based learning was seen to have been proper and effective to improve manipulative skills and analytical skills of students.
- Low confidence of both students and teachers had made it difficult for them to achieve expected results
- Both teachers and students were found to have been comfortable to learn if customized teaching learning strategies were applied
- However, it was not possible with a large class size and other administrative works assigned to teachers, Activity based learning was seen to have been proper and effective to improve manipulative skills and analytical skills of students
- Low confidence of both students and teachers had made it difficult for them to achieve expected results
- Induction teaching, training programs were not adequate and not effective
- Students' performance was measured based on final examination results and no mechanism was in place to evaluate the effectiveness of the entire teaching learning process
- Some teachers were found not to have, not having a science major background, but they had some English language competence.

#### CONCLUSION

English medium science education in Sri Lanka should be equipped with an ongoing and a post evaluation program to have a better future.



The course components of teacher training programs of science teacher trainees at College of Education, teacher training centers, and other relevant training institutions should address all aspects of science learning – teaching process. Teachers of English medium science teaching at a Junior Secondary level should be equipped with language competencies and professional skills that are necessary to be an active global citizen. Lack of teacher confidence is one of the major problems identified

In teacher – training programs, special attention should go to attitudinal change of English medium science teachers to promote them to have the maximum use of science laboratories in their learning – teaching process. Furthermore, promoting teacher to use more individual activities with the group work is very important in their training programs.

Textbook designers and curriculum designers dealing with English medium education have been governed by theories relating to content based instructions and the objectives of English Medium Science Education as stated in the National Education Commission (1997).

Learning instructions can be both in L1 or L2. The language of instructions is also an important aspect in providing clear instructions; (According to the response from students for students' questionnaire)

As mentioned in the literature, the beginning level of English medium students does not have the English language (L2) proficiency in understanding the explanations in English. Therefore, it is advisable to use native English language for strategy instructions.

Another major issue recognized is there was no specific framework of bilingual policy stakeholders. They were not aware of the policy. Lack of monitoring mechanism is another significant finding obtained in the interviews with teachers and principals. During any pioneering exercise, monitoring mechanism is inevitable. If the English medium students are proficient enough to understand the explanations, teachers should use L2 only. In most of the schools in Sri Lanka the teachers and students can use mother language in an excellent manner. Therefore, using a combination of both native and target languages (English) is very fruitful. It will help English medium students to perform the expected standards. It was proved in this research, the researcher provided instructions in both languages.

The above factors should be taken into consideration in order to make the English medium program at junior secondary level successful in future in Sri Lanka.

### SUGGESTIONS

- Teachers should be equipped with skills and competencies related to teaching learning process in the medium of English.
- English medium science teachers of junior secondary should be equipped with the right attitudes. They need regular guidance through training sessions.
- Well-designed in-service training program should be implemented.
- Comprehensive and clear national policy on bilingualism is much needed.
- Organized science related English language proficiency courses to improve bilingual competency (to promote science – learning teaching process) should be included to the training sessions and teacher education programs.
- Bilingual education starts from grade 6 in government schools. The schools, especially should give more attention to improve proficiency of English language in the primary section.
- Lack of English language skills in English medium students is one of the main drawbacks the researcher identified in this study. They are highly demotivated as they have little English knowledge. Therefore a continuous language improvement program should be included in the school timetable than learning English as a subject for one period.
- Lack of practical skills in English medium students is another major issue the researcher found out. Motivate teachers to do more practical sessions through special practical based continuous training programs.
- Enhancing the teacher quality





- Language competence which includes fluency and accuracy is a must for a teacher to teach English medium science successfully. Selecting and deploying teachers teach in English medium classes should be more formal and systematic.
- English medium teachers should be tested on
  - a) Speaking ability
  - b) Presentation skills in teaching English medium science
  - c) Classroom management skills

According to the findings and Analysis of this research, it is very clear that the teachers' speaking competency is a must in giving instructions, explanations, illustrations and elaborating and establishing concepts in the learner.

- The teacher's ability to read and understand is also important for them to refer to various sources in the process of retrieving information to enrich pupils.

Therefore, well designed short course to improve 4 language skills of English medium teachers should be included in their in-service training programs. These special training sessions should be conducted during the school vacations or weekends. This is the matter that should be addressed by the authorities.

Furthermore, Teachers of English medium science are reluctant to use internet and modern technology as they are incapable of using them for learning teaching process.

English medium science teachers should be facilitated by the new technology. The government can give modern equipments to teachers with fair prizes and arrange a very reasonable loan system for teachers to purchase modern teaching aids. Moreover, Government schools should be facilitated with modern teaching aids, and organizing awareness programs how to use modern technology in the classroom.

Teachers' teaching methodology highly affects on students' performance. It is important in the classroom in three (03) ways.

- To have maximum learner involvement in the classroom
- To motivate the learner reducing learner anxiety.
- To make competent active global citizen

Therefore long term training courses should aim at improving the teachers' teaching competency.

- Sharing Resources

Some IAB schools have many human and physical resources. Researcher suggests teacher exchange programs among schools. Then students get more opportunities to learn with competent English medium teachers. Furthermore, organizing inter school activities, subject camps, quiz clubs, quality circles and science practical exhibitions are suggested to improve activity oriented learning – teaching process. Furthermore, young inventors should be promoted in school in order to share their innovations.

- Improving quality of Text Books

According to the data analysis of this research, the researcher would like to suggest the following.

It was pointed that the English medium text book designers should be aware of the second language theories. This lack of awareness on the part of the curriculum designers and text book designers is a hindrance to achieve the aims and objectives of English medium science education.

Pages of English medium science books which make reading an interesting is a must.

The present layout of the textbooks has to be altered. The textbooks have to be enriched with colorful illustrations and clear printing will motivate students.

### SUGGESTIONS FOR FUTURE RESEARCH

The limited English background and students from various age limits and social environment would bring important insights into the English Medium Education in Sri Lanka. This researcher has brought out various dimensions of the issue of change of medium of education in English and the problems encountered by the English medium students at junior secondary level in their learning teaching process of Science. As this is a new concept, researches should be conducted for the betterment and the smooth functioning of the English medium education system. So far, there had been no research carried out on English medium Science teaching learning process. Two researches had been carried out by the ministry were to find out the preferences for changing of the





medium in the A/L classes, conducted by the ministry of Education (De Mel, 2001; Ministry Circular 200/05) and the impact evaluation of the 1997 education reforms in teaching Science at the GCE Advanced Level. (Karunaratne, 2003) Another study had been carried a study on bilingual policy in relation to the issue of changing the medium of instruction at the Junior Secondary Level (Parasivam, 2004). In addition to research on English medium Science teacher expertise for integrating strategies into classroom instruction for science teaching (for English Medium Teachers of science) would be an immense support for the practitioners of the English Medium Science Teaching training field.

#### RESEARCH OUTCOME

Overall research outcome finds that the bilingual education in Science in Sri Lanka has not produced the intended results mainly due to implementation of the program before the teaching learning environment was ready for its implementation

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