

Reading Strategies and Reading comprehension in English among ESL school students in Dubai, UAE – A Moderated Mediation Regression Model

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Abstract: The purpose of the study was to find out the relationship between reading strategies and the Lexile score of the online reading comprehension program ‘Literacy Pro’. It was hypothesized that the reading strategies adopted by students and the same recommended by the teachers have a positive intervening effect on the Lexile scores. The findings of the study were not completely supportive as hypothesized. The moderated mediation regression results are not reflecting any significant improvement in the Lexile score of students through the intervention of reading strategies adopted by the students and the training imparted to that effect by the teachers. The technology oriented ‘Literacy Pro’ is a multi-component reading skill development program. Reading comprehension is the product of multiple skills and knowledge sources, and the struggling readers often experience difficulty in multiple reading skills. The foundational skills such as word identification, vocabulary knowledge, and reading fluency in addition to strategies are necessary to construct meaning of the text and reading comprehension. Teachers must promote text discussions in the classroom, provide online quiz competitions to improve vocabulary, grammar, and construction of the sentences of a given text in the online reading program. An attractive and motivating software application shall be developed and integrated to ‘Literacy Pro’ for individual learning practices and reading comprehension.

Keywords: ESL, Literacy pro, Moderated Mediation, Online Reading, Reading comprehension.

1. INTRODUCTION

All schools in the United Arab Emirates (U.A.E) are expected to show progress and attainment with respect to student achievement as mandated by the U.A.E Vision 2021 National Agenda Parameters in Education. The Agenda emphasizes the development of a first-rate education system. According to Richmond (1980), reading Literacy programs are considered as crucial to survival both at the individual and national level, so is the case in the U.A.E too. According to U.A.E’s National Agenda for 2021, U.A.E is working towards earning itself a position among the highest performing countries in PISA (The Programme for International Student Assessment) and among the highest performing countries in the world for TIMSS (Trends in International Mathematics and Science). It has been ascertained that reading comprehension plays a big role in student performance. Hence, schools have been advised to institute reading programs to ensure students’ progress in benchmark examinations. Reading Literacy is also closely scrutinized during school audits. In addition to traditional paper-based reading programs, many schools have experimented with online reading literacy programs as a solution to effectively implement inclusive reading programs for all. Intervention might be easier when using an online reading program as all students in a particular grade or at a particular age may not be at the same reading level.

2. LITERATURE REVIEW

Reading Literacy is a skill, which is the foundation of almost all processes of learning and is necessary for students not only to acquire languages and study literature, but also to learn other subjects (Geske & Ozola, 2009). Mullis, Kennedy, Martin, and Sainsbury (2004) have defined 'Reading Literacy' as "the ability to understand and use those written language forms required by society and/or valued by the individuals"(p.3). It has been surmised in a study by Lea and Jones (2011) that, reading has an integral role with respect to the choices that students make with the textual resources available to them. This idea is further reinforced by Calhoun (2005) in his study; "Reading ability is a fundamental skill on which academic success, secure employment and personal autonomy depend"(p.424). Reutzel and Cooter (2004) too contend that the primary goal of any comprehensive reading program ought to be to transform students into independent and fluent readers who continue to fine-tune their literacy skills throughout their schooling. Research by Kern (1989) says that reading in any language is cognitively demanding and reading in a second language tends to put greater stress on the reader. It has been surmised that students who are exposed to a variety of reading texts are seen to develop critical reading skills; eventually, they also develop "independent thinking and skills in analysis and judgement" (White, 2004)(p.42).

Strategies for teaching reading comprehension

Strategies for teaching reading are the processes used for transferring knowledge in order to get good reading comprehension and understanding of a text to achieve the goals of the learning process (Muslaini, 2017). SQ3R is a strategy that focuses on surveying prior reading, generating questions, reading to answer those questions, reciting and reviewing information (Huber, 2004). SQ4R is a strategy that employs surveying, questioning, reading, recording, reciting and reviewing of information during a reading comprehension exercise (Yakupoglu, 2012). PQ4R is a revised form of the SQ4R strategy where-in the process of reading involves previewing, questioning, reading, reflecting, reciting and reviewing (Sarimanah, 2016).

Strategies for effective reading

The reading level of a reader depends a great deal on the strategies that one adopts for reading with respect to his own competency in reading in the second language (Cziko, 2006). Besides, researchers like (Kern, 1989) claim that fluency in reading is the result of substantial amount of practice over a long period of time. A study by Rashotte and Torgesen (1985) showed that readers' comprehension was better with respect to passages that had words known to them. Faulkner and Levy (1999) advocate the repeated reading of passages that share words was mandatory. Grabe (2009), and Zhang (2012) suggest that a reader constructs meaning by virtue of his linguistic knowledge. There is hard work involved in improving one's ability to read. Thus, Dagostino and Carifio (1994), emphasize the interplay of strategies in place to retain, organize and evaluate information that is being read.

Role of vocabulary in effective reading

Research states that there is a strong relationship between one's knowledge of vocabulary and his ability to read. Stanovich and Cunningham (1992) contend that good knowledge of vocabulary has a strong link to reading comprehension. Hart and Risley (2003) reinforce this idea in their study by stating that, vocabulary building endeavors in early childhood are significant indicators of performance through the schooling years. Zwaan and Rapp (2006) suggest that lexical as well grammatical items serve as cues in establishing coherence across areas of reading. Additionally, researchers like Michael F. Graves and Watts-Taffe (2008) have suggested that "word consciousness" or "word awareness" might be an important factor in promoting vocabulary. Michael F Graves (2000) has listed four main features of a curriculum to teach vocabulary which he claims will contribute towards enhancing their vocabulary and ultimately their reading comprehension skills: teaching of individual words, encouraging extensive reading, teaching word-learning strategies and promoting word consciousness. Researchers claim that students can be trained with the use of appropriate instructions to use contextual clues to delineate meaning effectively (Fukink & de Glopper, 1998). Subsequently, some have quantified a threshold level of knowledge of vocabulary to categorize readers' ability to read (Zhang, 2012). Furthermore, reasonable and unassisted reading comprehension is measured on the basis of a reader's awareness of a certain percentage of words in a given text (Nation, 2006). Hence, one may agree with Grabe (2009) that reading plays a significant role in the acquisition of a second language and a fairly good grasp of vocabulary must be ensured.

Future of reading literacy

There is definitely scope for planning and designing new reading literacy programs that are effectively facilitated through the use of technology. New trends in reading theory are to be analyzed to set appropriate reading literacy targets for individual students and to track progress through appropriate assessment. It is only possible to change the culture of reading by affecting some significant changes to the factors that shape this culture. This entails a change from many of the traditional methods of reading to new technology driven strategies in reading; a change that might take its time to produce visible results (Cortazzi & Jin, 2008). It is mandatory that curricular objectives that focus on reading literacy are instituted and teacher awareness about instructional strategies to raise reading literacy are stepped up (N. Hayes & Schrier, 2000). The focus of web-based programs must focus on the five core areas of literacy learning: Phonemic awareness, phonics, fluency, vocabulary and comprehension (Eunice Kennedy Shriver National Institute of Child Health and Human Development, 2001).

In their research Biancarosa and Snow (2004) acknowledge that technology can certainly enhance traditional modes of instruction; however, a careful needs analysis is to be conducted to align student skill to the capabilities provided by technology applications. Researchers like Carney (2010) have also pointed out that web-based programs ought not to attempt to oust the teacher from her role, must rather enhance the teacher's capability in individualizing learning for a learner. Sherman, Kleiman, and Peterson (2004) too supports the above view that technology supplements the role of a teacher.

Little research gives insight into which conditions actually improve comprehension. Besides, we must also look into what factors make some students more effective independent readers than others. Besides, there's little evidence that points in the direction of a particular type of knowledge, vocabulary or grammar that predominantly has an influence on reading comprehension skills of L2 readers (Zhang, 2012). As summarized by Lovell and Phillips (2009), in a study, there is much research that emphasizes the role of technology as bringing about disruption in the field of education; however, there is little research that points towards the effective programs to be used in an online environment. As stated by Hurt (2008), much research in this field is inconclusive in their comparison of the benefits of web-based reading programs as against traditional methods. Also, there is little research on second language readers and their level of proficiency in response to online reading (Foasberg, 2014). Thus, there is a growing sense of disillusionment among educators regarding web-based learning as its role in literacy achievement for students remains questionable. Hence, there is a need for further research to ascertain the effectiveness of web-based reading literacy programs and their impact on student achievement.

Research Hypotheses

The main outcome of the literature review is that students need to learn to use a variety of effective reading strategies to comprehend foreign language texts and that higher-proficiency students can use them most effectively. Most of these studies establish a close relationship between language proficiency, attitude to reading and the employment of reading strategies in the samples investigated (Habók & Magyar, 2019; Norouzian & Mehdizadeh, 2013). In the study of Norouzian and Mehdizadeh (2013), they classified strategies into three: pre-reading, while-reading, and post-reading. The same structure was used in this study to measure the reading strategies used by the students while improving the reading literacy through the online literacy program. Hence, the three hypotheses,

H01: *The online reading program is not significantly effective in developing a 'pre-reading strategy' for improving the reading comprehension skill of the students.*

Ha1: *The online reading program is significantly effective in developing a 'pre-reading strategy' for improving the reading comprehension skill of the students.*

H02: *The online reading program is not significantly effective in developing a 'while-reading' strategy for improving the reading comprehension skill of the students.*

Ha2: *The online reading program is significantly effective in developing a 'while-reading' strategy for improving the reading comprehension skill of the students.*

H03: *The online reading program is not significantly effective in developing a 'post-reading strategy' for improving the reading comprehension skill of the students.*

Ha3: *The online reading program is significantly effective in developing a 'post-reading strategy' for improving the reading comprehension skill of the students.*

The teachers are the mediators between the online literacy program and the students in their online training of the 'Literacy Pro', a program which was widely adopted in many international schools. The teachers' role is to promote a learning environment that allows students to work on their strategies, train them to identify these strategies and assist their autonomy (Oxford, 1990). Hence, the hypothesis H04-

H04: *The training provided by the teachers to assist the students to improve reading skills through the online reading program is not significantly effective in implementing the reading strategies and therefore could not enhance the reading comprehension skill of the students.*

Ha4: *The training provided by the teachers to assist the students to improve reading skills through the online reading program is significantly effective in implementing the reading strategies and therefore could not enhance the reading comprehension skill of the students.*

The ultimate impact of adopting suitable reading strategies by the students will lead to an improvement in their reading skill and the reading comprehension. Hence, the hypothesis-

H05: *The Reading strategies adopted by the students do not have significant impact on improving the reading skills or reading comprehension.*

Ha5: *The Reading strategies adopted by the students do have significant impact on improving the reading skills or reading comprehension.*

Conceptual Framework

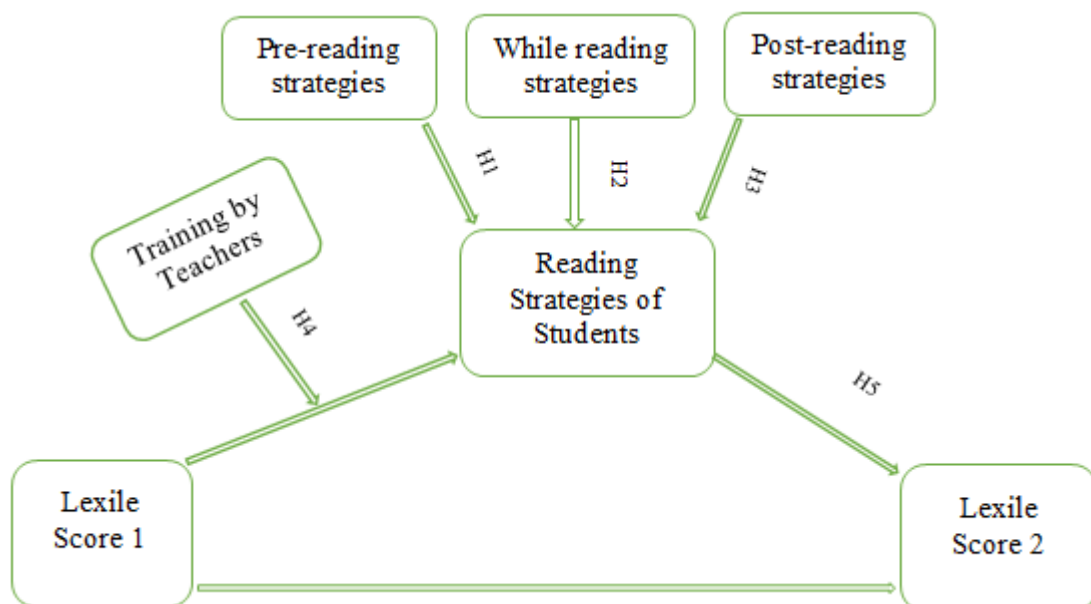


Figure 1: Conceptual Framework of the study

The Reading strategies adopted by students is a combination 3 sub-strategies (pre-reading, while reading, and post reading) and the training given by teachers to each one of these sub-strategies. The Lexile scores (the scores of Literacy Pro) are assigned to the students at the beginning (Lexile score 1) and at the end (Lexile score 2) by the online Reading program 'Literacy pro' exercise. There would be a gap of 6 months between the two scores. The students are undergoing the training and doing the exercises in the meantime. Therefore, it has been hypothesized that the students' Lexile score 2 depends on Students' reading strategies and the training imparted by teachers to that effect. Hence, 'reading strategies adopted by students' is a mediating variable and 'training given by teachers' has a moderating effect on the mediating variable (Figure 1).

3. RESEARCH DESIGN

The study was conducted in an Indian International School in Dubai. The online reading literacy program ‘Literacy Pro’ has been implemented in the school since 2019. Currently the students of Grades III, VI, IX are doing this program that they had begun in the last academic year. The study was conducted during the academic year 2020-21 in the first 6 months starting from October – March. A large majority of students belong to the same nationality and therefore a simple random sampling shall be used for getting a representative sample of the population. The effectiveness of the program was measured by two surveys- one was conducted among the students to measure the extent to which the reading strategies are adopted by the students for improving the reading comprehension skill and the other among the teachers to measure the strategies recommended to the students. The same survey instrument was used for both students and teachers with a difference in the wordings of the response scale.

Research Instrument

The survey was conducted through a validated research instrument of the previous study of Norouzian and Mehdizadeh (2013) which comprised of 4 parts- 1. General Reading Behavior (2 items), 2. Pre-Reading (7 items), While-Reading (15 items), and Post-Reading (8 items). In this study the first part of the questionnaire is not included. Hence, there are 30 items in total for the 3 variables under this study. The response from the students was received in a 5-point Likert scale which were worded as ‘Never or almost Never used’ (1), Generally not used (2), Sometimes used (3), Usually used (4), and Always or almost used (5)

The same instrument was used among the teachers to record the recommendations of the teachers regarding Reading strategies. Hence, the 5-point Likert scale had – Never or almost never recommended (1), Generally not recommended (2), Sometimes recommended (3), Usually recommended (4), and always or almost recommended (5).

In the survey instrument 3 items (Item No. 9, 17, and 19) are negative statements and therefore the scores of those items are reversed for mean and data analysis (Table 1).

Table 1: The Survey Instrument

I	Pre-Reading: Before reading a Text in English, I do the following					
1	I read the topic or heading of the text	1	2	3	4	5
2	I look at the pictures or graphs of the text					
3	I think about the reasons why I am reading the text					
4	I read the first sentence of the text					
5	I try to predict what the text will be about					
6	I ask myself about the author’s purpose for writing the text					
7	I read the provided questions (if any) before I read the text					
II	While reading a text in English, I do the following					
8	I read the whole text quickly to understand the main idea					
9	I translate the sentences into my native language for the main idea of the text					
10	I check my predictions about the text while reading					
11	I use the vocabulary and structure to help me understand the main idea of the text					
12	I must understand every word in the text in order to get the main idea					
13	I split up (break) sentences into phrases or words for my understanding of the text					
14	I take notes, highlight or underline the important points while I am reading the text					
15	I use my background (world) knowledge to help me understand the text					
16	I scan (read quickly) for the answers to some questions provided with the reading					
17	I skip words if I don’t know the meaning					
18	I guess the meaning of some words from the context clues					

19	I use a bi-lingual dictionary (translating from English to my native language) whenever I need to get the meaning of an unknown worked					
20	I use an English-English dictionary if I need to know the meaning of an unknown word					
21	I predict what is going to happen next while reading					
22	I read the text in detail					
III	Post-Reading (After reading), I do the following					
23	I make inferences after finishing reading the text					
24	I summarize the text after I finish reading it					
25	I discuss what I understand with my friends or teacher					
26	I go back to read the details of the text for the answers to understand questions on it					
27	I use a dictionary after I understand the main idea of the text					
28	I take notes on all new words and phrases for my vocabulary bank					
29	I apply the knowledge from some text in my everyday activities					
30	I give myself a reward when I have finished					

Population and Sample

In the academic year 2019 – 2020, students of Grades V and VIII were enrolled for the online reading program Literacy Pro from October through March. In the following academic year, 2020 – 2021 the same cohort of students moved to the next grades – Grades VI and IX. Currently, in the academic year 2021-2022, these students are in Grades VII and X respectively. Thus, the target population was a total of 1519 students spread across Grades VII and X. Grade VII has 23 sections with a strength of 35 - 38 students in each section and Grade X has 20 sections with a strength of 31 – 38 in each section. The sub population in each of the 2 Grades was: Grade VII – 823 and Grade X – 696. The sample size for effective research that is a fair representation of the target population was determined using the Krejcie and Morgan sample size as produced in Appendix A. The number of students from each Grade that participated in this study are given in the Table 2. It is a girls' school from Grades 5 upwards. The respondents are all Indian expat girl students studying in a school in Dubai, UAE that follows the Indian, CBSE curriculum. The medium of instruction is English and all students are second language users of the English language.

Table 2: Sample size and Target Population

Grades	Population	Sample size
Grade VII	823	288
Grade X	696	249
Total	1519	537

The teachers are those who are engaged with the students selected in the sample for assisting them in their English reading comprehension through 'Literacy Pro', and their size is 58.

Descriptive Analysis of Student & Teacher survey data

The descriptive statistics tables for Grades VII and Grade X suggest that on a scale of 1-5, the mean score of all 'pre-reading strategies' for both grades is greater than 3; the students either 'always/almost' or 'usually' apply the pre-reading strategies before reading a text with a mean score of 4.08 for grade VII and 4.03 for grade X, which are almost similar. The highest score is for Item No. 1 (4.76 for Gr. VII and Gr. X) which indicates that almost all students read the title or heading of the text and try to understand the key idea of the text. The lowest score is for Item No. 6 (3.48 and 3.29 for Gr. VII and Gr. X respectively) which shows that the students have lower aptitude for self-evaluating the article.

The comparative figure (Figure 1) shows that the all the items in the pre-reading strategy for both grades VII and X show the same pattern of movement which describes that the students in the sample have of the same opinion regarding pre-reading strategies irrespective of their age group or the grade in which they study.

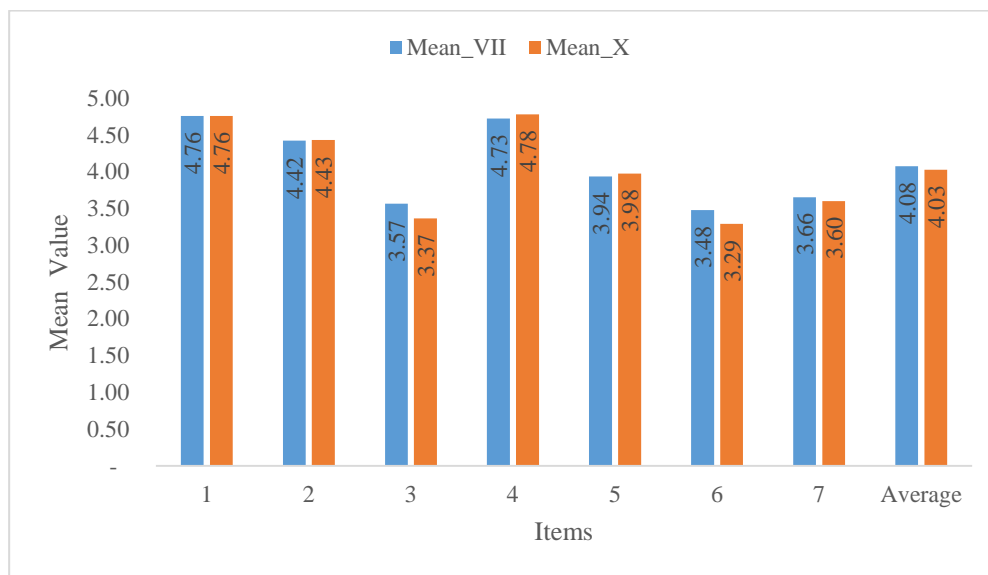


Figure 1: Comparison of Mean between Gr. VII and Gr. X – Pre-reading Strategy

The descriptive statistics tables for Grades VII and Grade X suggest that on a scale of 1-5, the mean score of ‘while reading strategies’ for both grades is greater than 3; the students ‘usually’ apply the ‘while reading strategies’ when reading a text. The mean score of items 9, 17 and 19 for Grade VII, which are negative statements (the scores were reversed for calculating the mean score of the variable while reading strategy) are as expected but it is not the same for Grade X for item No. 17. The highest score is for Item No. 22 (4.49 for both Gr. VII and Gr. X) which indicates that almost all students read the text in detail and comprehend the main idea of the text.

The comparative figure (Figure 2) shows that the all the items in the ‘while reading strategy’ for both grades VII and X show the same pattern of movement which describes that the students in the sample have of the same opinion regarding while reading strategies irrespective of their age group or the grade in which they study.

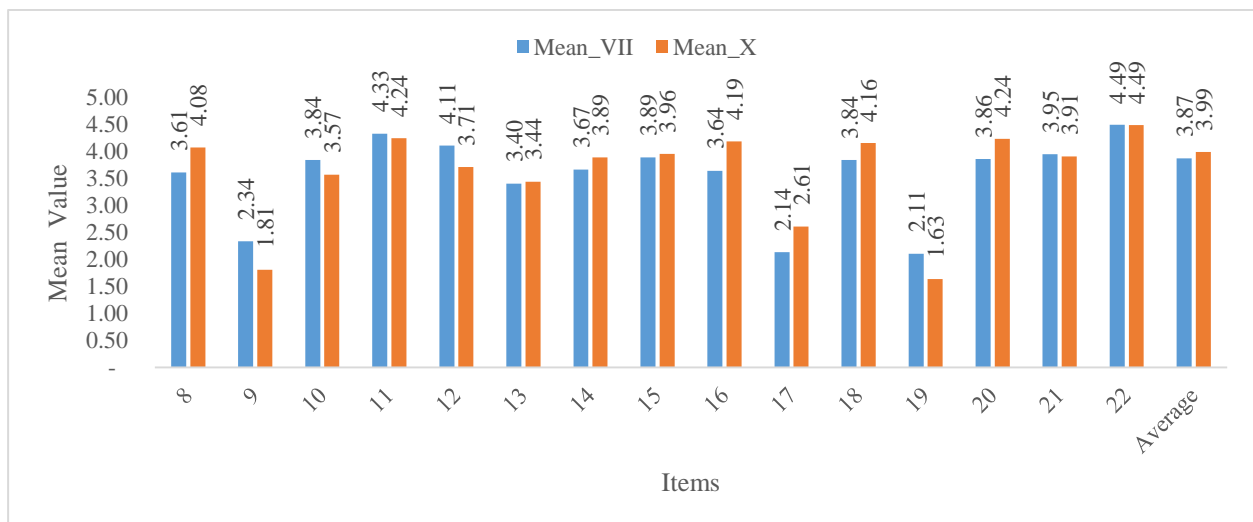


Figure 2: Comparison of Mean between Gr. VII and Gr. X – While Reading Strategy

The descriptive statistics tables for Grades VII and Grade X suggest that on a scale of 1-5, the mean score of ‘post-reading strategies’ for both grades is greater than 3; the students ‘usually’ apply the ‘post-reading strategies’ after reading a text in both grades with the mean score at 3.82 for Grade VII and 3.69 for Grade X. The highest score is for Item No. 26 (4.32 and 4.49 for Gr. VII and Gr. X respectively) which indicates that almost all students go back to read the text in detail to answer the questions on it. The lowest score is for Item No. 27 for Gr. VII (Mean=3.17) which indicates that the students ‘sometimes’ use dictionary to understand the main idea of the text. The lowest score is for Item No. 30 for Gr. X (Mean =2.73) which indicates that the students rarely give a reward for themselves once they finished reading the text.

The comparative figure (Figure 3) shows that the all the items in the ‘post-reading strategy’ for both grades VII and X show the same pattern of movement which describes that the students in the sample have of the same opinion regarding post reading strategies irrespective of their age group or the grade in which they study.

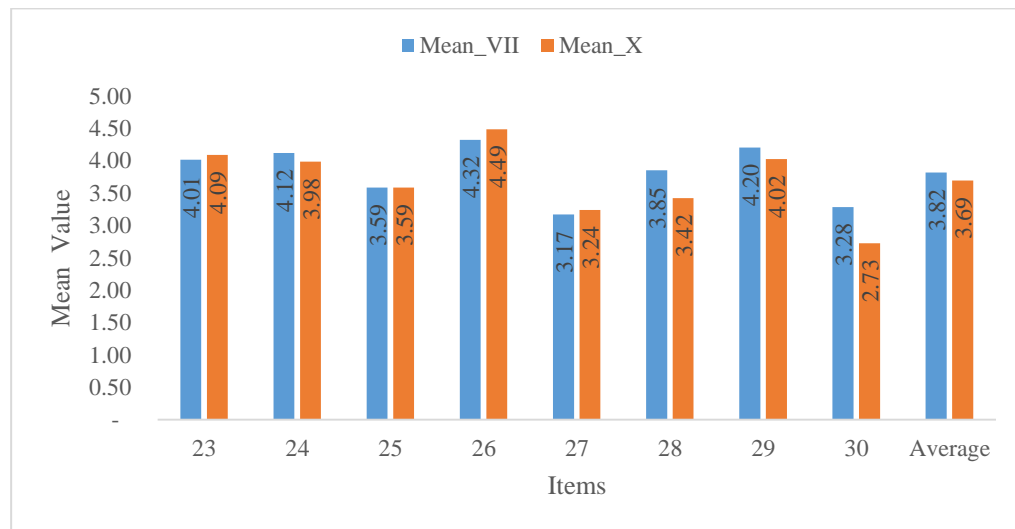


Figure 3: Comparison of Mean between Gr. VII and Gr. X – Post-reading Strategy

The descriptive statistics tables for teachers’ survey suggests that on a scale of 1-5, the mean score of all ‘pre-reading strategies’ for teachers is greater than 3; the teachers mean score of rating is 4.36 which suggests that teachers ‘always/almost always’ recommend that students use the pre-reading strategies before reading a text. However, student mean scores for rating are slightly lower at 4.06 suggesting that teachers must lay greater stress on the practice of most pre reading strategies.

On comparison of the mean values of Pre-reading strategies (Figure 4) adopted by students (Grade VII and X combined) with the corresponding items recommended by teachers shows that they are showing almost same pattern except for items 3, 5 and 6. The above said items of pre-reading strategies are specifically intended for enhancing the analytical capability of the students to understand the theme of the text systematically. The teachers have to give more attention on these items to improve the reading skill of the students since their values are much below the expectations of the teachers. However, the overall pre-reading strategies adopted by students and recommended by teachers are in the range of ‘usually’ and ‘almost/always’ respectively.

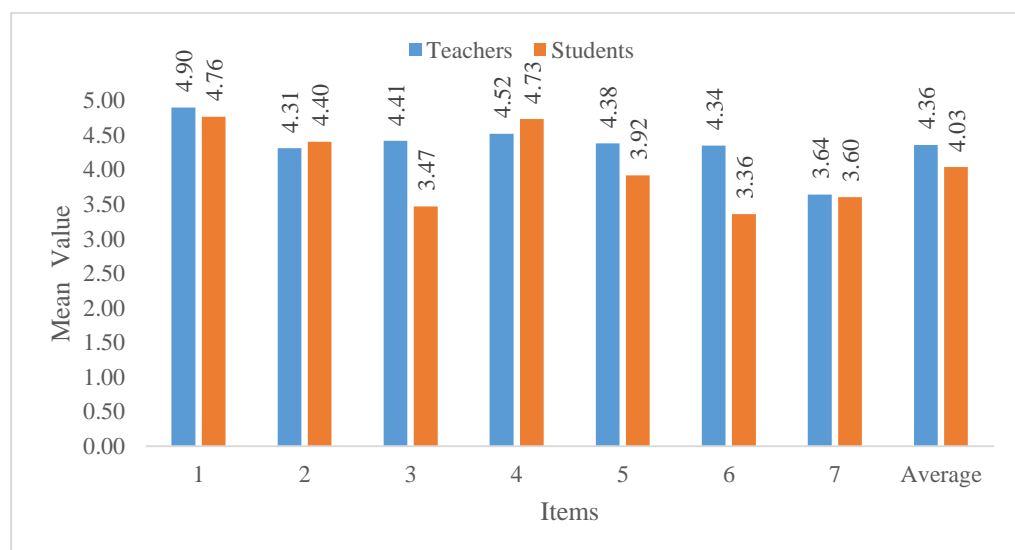


Figure 4: Comparison of Mean between Teachers and Students – Pre-reading Strategy

The descriptive statistics table for teachers' survey suggests that on a scale of 1-5, the mean score of all 'while reading strategies' for teachers is greater than 3; the teachers mean score of rating is 4.08 which is slightly higher than the mean score of rating given by the students. The mean score of items 9, 17 and 19, which are negative statements (the scores were reversed for calculating the mean score of the variable while reading strategy), are as expected.

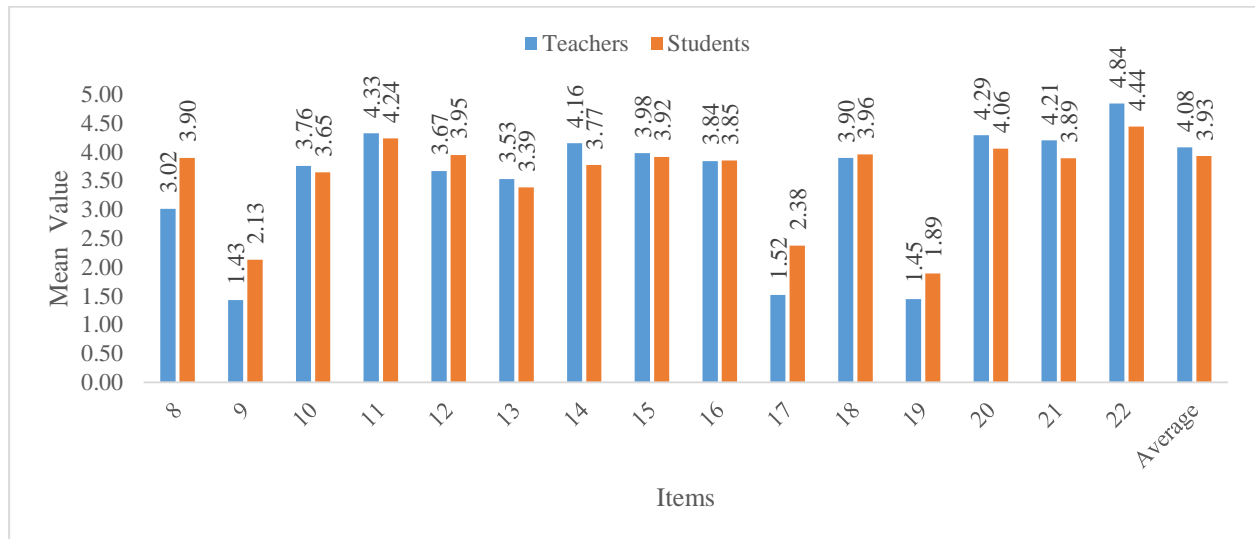


Figure 5: Comparison of Mean between Teachers and Students – While Reading Strategy

On comparison of the mean values of While Reading strategies (Figure 5) adopted by students (Grade VII and X combined) with the corresponding items recommended by teachers shows that they are showing almost same pattern except for items 8, 9 and 17. The teachers have to give more attention on these items to improve the reading skill of the students since their values are much different from the expectations of the teachers. However, the overall while reading strategies adopted by students and recommended by teachers are in the same range of 'usually'.

The descriptive statistics tables for teachers' survey suggests that on a scale of 1-5, the mean score of all 'post reading strategies' for teachers is greater than 3; the teachers mean score of rating is 4.30 which is significantly higher than the mean score of rating given by the students and suggests that teachers 'always' recommend that students use the post reading strategies when they read a text.

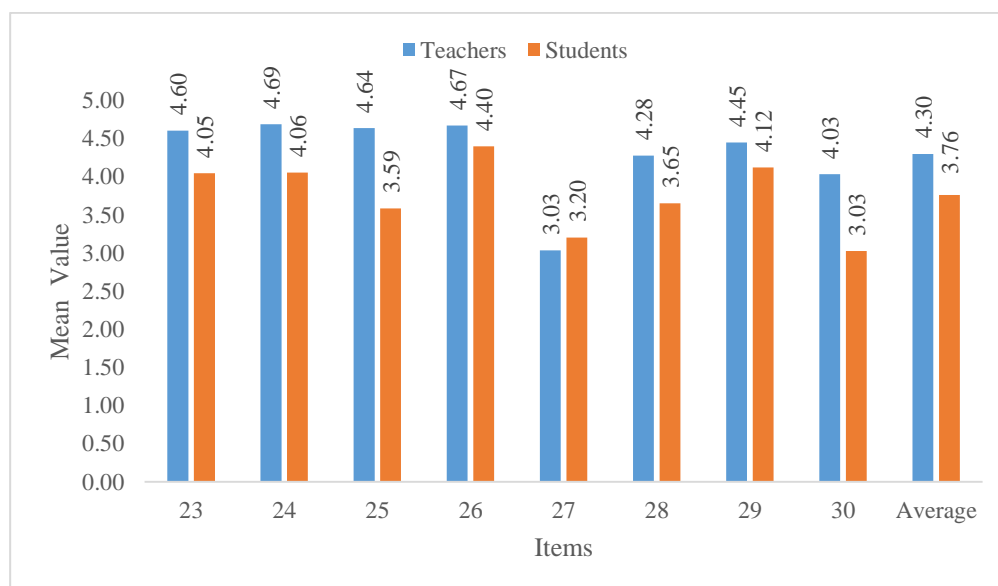


Figure 6: Comparison of Mean between Teachers and Students – Post Reading Strategy

On comparison of the mean values of Post Reading strategies (Figure 6) adopted by students (Grade VII and X combined) with the corresponding items recommended by teachers shows that they are showing a wide difference except for item number 26. The teachers have to give more attention on these items to improve the reading skill of the students since

their values are much different from the expectations of the teachers. The overall post reading strategies adopted by students and recommended by teachers are not in the same range which is 'almost/always' for teachers and 'Usually' for students.

Inferential Statistics

One Sample t-test was conducted using the survey data received from 537 students and 58 teachers to determine trends in the use of pre-reading, while-reading, and post-reading strategies by studying if the mean of the responses is equal to 3 or not. It was found that in all three cases, both the students and teachers are significantly on the same page as the mean values are greater than 3 indicating that for all parameters on the survey both groups had marked a score greater than 3 on the scale of 1-5. However, a significant variation has been identified in the responses of students and teachers to statements under post-reading strategies. Teachers' expectation from students regarding post-reading strategies is quite high, which is definitely desirable. However, the mean of student responses suggests that students do not take post reading strategies too seriously either because: 1) teachers do not insist on them practicing the post-reading strategies or, 2) students do not have sufficient time at the end of a reading session to practice post reading

Table 3: Descriptive Statistics - Students & Teachers

Groups	Reading Strategies	N	Mean	Std. Deviation	Std. Error Mean
Students	Pre Reading	537	4.056	0.522	0.023
	While Reading	537	3.925	0.445	0.019
	Post Reading	537	3.761	0.683	0.029
Teachers	Pre Reading	58	4.357	0.435	0.057
	While Reading	58	4.076	0.439	0.058
	Post Reading	58	4.300	0.513	0.067

Table 4: Results of One sample t-test (test value = 3)

Groups	Reading Strategies	T	df	Sig. (2-tailed)	Mean Difference
Students	Pre Reading	46.87	536	0.000	1.056
	While Reading	48.19	536	0.000	0.925
	Post Reading	25.84	536	0.000	0.761
Teachers	Pre Reading	23.76	57	0.000	1.357
	While Reading	18.65	57	0.000	1.076
	Post Reading	19.29	57	0.000	1.300

strategies or, 3) Student awareness about the significance of post-reading strategies is significantly low.

The results of the one sample t-test (Table 4) suggest that for both teachers and students, the respective scores are significantly higher than 3. The results suggest that the mean value of pre-reading strategies for students ($t(536) = 46.87$, $p\text{-value} < 0.01$) and teachers ($t(57) = 23.76$, $p\text{-value} < 0.01$) is different from 3, or in other words, the mean value is significantly higher than 3 for both students and teachers. Hence, the hypothesis (H01) 'the online reading program 'Literacy Pro' is not significantly effective in developing a 'pre-reading strategy' for improving the reading comprehension skill of the students' is **not accepted**. Conversely, the online reading program 'Literacy Pro' is significantly effective in developing pre-reading strategies.

The results suggest that the mean value of while reading strategies for students ($t(536) = 48.19$, $p\text{-value} < 0.01$) and teachers ($t(57) = 18.65$, $p\text{-value} < 0.01$) is different from 3, or in other words, the mean value is significantly higher than 3 for both students and teachers. Hence, the hypothesis (H02) 'the online reading program 'Literacy Pro' is not significantly effective in developing a 'while reading strategy' for improving the reading comprehension skill of the students' is **not accepted**. Conversely, the online reading program 'Literacy Pro' is significantly effective in developing while reading strategies.

The results suggest that the mean value of post-reading strategies for students ($t(536) = 25.84$, $p\text{-value} < 0.01$) and teachers ($t(57) = 19.29$, $p\text{-value} < 0.01$) is different from 3, or in other words, the mean value is significantly higher than 3 for both students and teachers. Hence, the hypothesis (H03) 'the online reading program 'Literacy Pro' is not significantly effective in developing a 'post-reading strategy' for improving the reading comprehension skill of the students' is **not accepted**. Conversely, the online reading program 'Literacy Pro' is significantly effective in developing post-reading strategies.

A Moderated Mediation Regression Model

Statistical mediation and moderation analysis are applied to prove hypotheses H04 and H05. Increasingly, these methods are being integrated in the form of ‘moderated mediation’ or ‘mediated moderation’ or what Hayes and Preacher called ‘conditional process modelling’ (A. F. Hayes, 2012). The goal of mediation analysis is to establish the extent to which some commonly recognized causal variable influences some outcome variable through one or more moderator variables. Such a model allows the direct and/or indirect effects of an independent variable (X) on a dependent (Y) through one or more mediators (M) to be moderated (W). Such a process is often called moderated mediation. The proposed model gets its output through the application developed by A. F. Hayes (2012), called ‘PROCESSv3.4’, which could be integrated in IBMSPSS. The Model number 7 in ‘PROCESSv3.4’ is selected for the data analysis. The notations and their corresponding variables used in the model are - Independent variable (X) is ‘Lexile Score 1’, Moderating variable (W) is ‘Teachers’ Training on Reading Strategies’, Mediating variable (M) is ‘Students’ Adoption of Reading Strategies’, and Dependent Variable (Y) is ‘Lexile Score 2’.

In statistical form, this model is represented with two linear models, one with M (Mediating Variable) as the outcome and other with Y (Dependent variable) as the outcome:

$$M = \alpha_M + b_1X + b_2W + b_3XW + e_M \text{----- (1)}$$

$$Y = \alpha_Y + c_1X + c_2M + e_Y \text{----- (2)}$$

Where, in equation (1), α_M is the constant, b_1 , b_2 , and b_3 , are coefficients of X, W, and XW respectively, and e_M is the error term. Where, in equation (2), α_Y is the constant, c_1 , and c_2 are coefficients of X, and M respectively, and e_Y is the error term.

Regression Results and Hypothesis Testing

The moderated regression results corresponding to equation (1) are tabulated in Table 5. The results are to prove or disprove the hypotheses H04 and H05. The model is proved as significant at 5 percent level since the F-value (3, 533) is 2.62, $p = 0.05$. The explanatory power of the model is very low ($R\text{-sq}=0.0145$) and there is a positive correlation ($R = 0.12$) between Students’ Reading Strategies (M) and the independent variables.

Table 5: Moderated Regression Results (Hayes- Model No.7)

N = 537				R = 0.1205
F (3, 533) = 2.62				R-sq=0.0145
p = 0.0502				MSE=1.9466
Students' Reading Strategies (M)	Coeff.	S.Er.	t-value	p-value
Constant	12.7361	2.041	6.24	0.000
Lexile Score 1 (X)	0.0007	0.0023	0.295	0.768
Teachers' Training on Reading Strategies (W)	(0.1009)	0.16	(0.630)	0.529
Interaction (XW)	0.0000	0.0002	(0.142)	0.887

The predictor variable ‘Lexile score 1’ (X) has **no** significant direct influence on the predicted variable ‘Students’ Reading Strategies’ ($b\text{-value} = 0.0007$, $p=0.768$) at 5 percent level, similarly, the moderating variable ‘Teachers’ Training on Reading Strategies’ (W) has **no** significant direct influence on the predicted variable ‘Students’ Reading Strategies’ ($b\text{-value} = -0.1009$, $p=0.529$) at 5 percent level. Hence, the null hypothesis H04 is accepted (*The training provided by the teachers to assist the students to improve reading skills through the online reading program ‘Literacy Pro’ is not significantly effective in implementing the reading strategies*). The interactive effect of ‘Lexile score 1 by ‘Teachers’ training on reading strategies’ (XW) has no significant influence on the predicted variable ‘Students’ reading strategies’ ($b\text{-value}=0.000$, $p=0.887$), and hence, the null hypothesis H04 is accepted at 5 percent level for the target population. Hence, the indirect effect of Teachers’ training on reading strategies is not present on the students’ reading adoption strategies.

The mediating regression results corresponding to equation (2) are tabulated in Table 6. The results are to prove or disprove the hypotheses H05. The model is proved as significant at less than 1 percent level since the F-value (2, 534) is 4428.69, $p < 0.01$. The explanatory power of the

Table 6: Mediated Regression Results (Hayes- Model No.7)

N = 537				R = 0.9712
F (2, 534) = 4428.69				R-sq=0.9431
p = 0.0000				MSE=5532.91
Lexile Score 2 (Y)	Coeff.	S.Er.	t-value	p-value
Constant	19.11	27.88	0.6855	0.493
Lexile Score 1 (X)	0.9942	0.0106	93.78	0.000
Students' Reading Strategies (M)	0.8968	2.2998	0.390	0.697

model is 94.31 percent (R-sq=0.9431) and there is high degree of positive correlation (R = 0.97) between Lexile Score 2 (Y) and the independent variables. The predictor variable 'Lexile Score 1' (X) has significant direct influence on the predicted variable 'Lexile score 2' (b-value = 0.9942, p=0.000) at less than 1 percent level, and, the mediating variable 'Students' reading strategies' (M) has **no** significant direct influence on the predicted variable 'Lexile score 2' (b-value= 0.8968, p=0.697) at less than 5 percent level. Hence, the indirect effect of 'Lexile score 1'(X) is not significant on 'Lexile score 2' through the mediating variable 'Students' reading strategies' (M). Hence, the null hypotheses H05 is accepted (*The Reading strategies adopted by the students do not have significant impact on improving the reading skills or reading comprehension.*).

4. DISCUSSION

Using a simple random sample data from one school and two grades (Grade VII and X) it was hypothesized that the reading strategies interventions have a significant role in improving the reading comprehension of L2 students of English. The hypotheses were partially supported. The survey results in a 5-point scale describe that the students have a high positive attitude towards adopting the reading strategies (Average score 3.9) and the teachers' recommendations (average score 4.2) for the same were highly positive. There is no mismatch between the strategies adopted by students and those were recommended by the concerned teachers, or in other words the students' uptake of strategy was not negative in any of the cases as contrary to the findings of Norouzian and Mehdizadeh (2013) in their study. However, the moderated mediation regression results are not reflecting any significant improvement in the Lexile score of students through the intervention of reading strategies adopted by the students and the training imparted to that effect by the teachers. Lexile score2 is exclusively a dependent variable of Lexile score1 and the intervention of reading strategies adopted by students and the training to that effect by teachers are insignificant as the data analysis proved. The paired t-statistic of Lexile score1 and Lexile score2 is statistically significant at less than one percent level with a mean difference score of 24.87 (SD 74.27) between Lexile1 and Lexile2. The moderated mediation regression results show that there is only direct effect of Lexile1 on Lexile2 and the beta coefficient is 0.9942 and it is statistically significant at < 0.01 level. Hence, it could be inferred that there are some other intervening causes for the increase in the Lexile scores of students. Among the three reading strategies students give least priority for post-reading strategies and most priority for pre-reading strategies and while reading strategies stands in between the two. This might have a serious implication on the reading comprehension score of the students. The technology oriented 'Literacy Pro' is a multi-component reading skill development program. Reading comprehension is the product of multiple skills and knowledge sources, and the struggling readers often experience difficulty in multiple reading skills. The foundational skills such as word identification, vocabulary knowledge, and reading fluency in addition to strategies are necessary to construct meaning of the text and reading comprehension. This study concludes that, as it was rightly pointed out in the study of Swanson et al. (2014), standardized instructions mediated through electronic media can create additional learning opportunities to the students, and teachers were expected to act as facilitators by monitoring students, promoting text discussions, prompting and clarifying student responses, providing real-time vocabulary instructions, and extending students' understanding.

Implications of the study

Teachers could effectively train the students various reading strategies by dragonizing the shortcomings in their effective usage by the students. Teachers must promote text discussions in the classroom, provide online quiz competitions to improve vocabulary, grammar, and construction of the sentences of a given text in the online reading program. An attractive and motivating software application shall be developed and integrated to 'Literacy Pro' for individual learning practices and reading comprehension.

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Appendix – A : Krejcie & Morgan Table for determining sample size of a Known Population

Table 3.1									
<i>Table for Determining Sample Size of a Known Population</i>									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	100000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

Source: <https://qhaireenizzati.wordpress.com/2017/10/05/sample-size-determination-using-krejcie-and-morgan-table/>