






Effectiveness of the Reading Strategies Used by Undergraduate Engineering Students
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Effectiveness of the Reading Strategies Used by Engineering Students at the Undergraduate Level

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Abstract

Communication skills consist of four primary skills namely listening, speaking, reading, and writing skills. This study tries to investigate the effectiveness of the reading strategies used by undergraduate technical students with diverse backgrounds at the intermediate level of learning English. A total of 371 Tamil-speaking Indian students of second-year and third-year of an engineering institute in South India participated in this study. They were provided with a list of questions that were five-point Likert scale closed-ended. The survey was conducted in the presence of the researchers for effective collection of data. To measure the reliability of the data collected, the Cronbach alpha test was conducted and the coefficients were derived. IBM SPSS and the data analysis tools of MS Excel were used for data analysis. The items presented in the questionnaire were divided into three sub-scales and the effectiveness of the same was interpreted. The results showed that the global understanding strategy is predominantly used by the participants followed by problem-solving strategy and supporting strategy. This lays the scope for the enhancement of the items clubbed under the problem-solving strategy and supporting strategy. The study also suggests training the instructors and the students to evaluate the effectiveness of their strategies and compare them with their peers' strategies for better investigation and learning experience.

Keywords: reading strategies, global understanding strategy, problem-solving strategy, supporting strategy.

Introduction

English is a professional language and mastering it broadens job opportunities across the world (Nunan, 2018). Communication skills are essential not only for our professional life but also for our personal and social life. Communication skills namely listening (L), speaking (S), reading (R), and writing (W) or LSRW have become a part and parcel of our routine. Though every skill is crucial in its way, the reading skill is in want of more critical thinking. There are varied purposes for reading a text (Marzuki, 2020). Some read to get the summary, some for the main ideas, some for specific information; some for details; and some read between the lines and draw inferences. Reading as a process is more interesting and the intensity of reading results in multiple perspectives. This study aims to find out the preferred strategy by the students of an engineering institute in South India from the varied strategies meant for specific purposes.

Literature Review

While reading textbooks students find it difficult to perform critical reading as the term itself strikes its complexities. Nevertheless, Nguyen (2020) opines that textbooks rarely offer informative clues to decode unfamiliar words correctly to improve critical reading. Though Kosimov (2021a) was not able to propose a clear definition for critical reading, he still believed and propagated the idea that students with intense critical reading skills could perform better because it helps in assessing the subject matter (Kosimov 2022). In support of this, Shokirova (2020) identifies it to be active reading which facilitates the interpretation of the ideas. This, in turn, helps the students score better in their examinations. Reading intensity is directly proportional to academic performance (Usmanova, 2020). Further, he explains that comprehending the ideas, enriching the vocabulary and intensifying the speed of reading are essentials of effective critical reading.

Haydarova (2021) points out that students often read superficially without getting to the depth of the context. In addition, Umarova (2022) realizes that students who do not read critically cannot comprehend ideas confidently. Kosimov (2021b & 2021c) also states that students with the habit of critical reading have shown improved fluency, general knowledge, and academic grades. Shavkatovna & Madolimovich (2021) suggest that intense readers not only understand the ideas but also critically analyse the correlation between the text and the meaning that supports them in making their judgement about the characters and situations.

Learning becomes less effective without the intervention of instructors as those are the people who can make the environment conducive for learning where students can share their ideas and resources (Duan, 2020). It becomes essential for the instructors to devise strategies to build up students' vocabulary depending on their study skills especially those pertaining to reading (Long & Zhou, 2019). While formulating the strategies, teachers should consider learning inclination, target, readiness, gender, available resources, and access to resources that may contribute to learning (Lin, 2019). Nevertheless, one cannot escape from the influence of cybernation, the evolution of technology, personal problems, mindset, and attitude, on the learning strategy (Alfiras & Bojiah, 2020; Sari et al., 2019). An instructor assigns a task, sees that the task is accomplished to assure optimal performance and applies an assessment rubric to examine the quality of the task completion (Bedir & Dursun, 2020; Teng, 2019). This limits the instructors' participation in designing the strategy of reading for each student. Hence, the need for the students to propose their own method to handle reading activities rises.

Haukas (2018) proposes metacognitive knowledge to be "the knowledge one has about one's own learning" keeping which in mind the learners should develop the further missed out skills accordingly (Azizoglu & Okur, 2020). Each student should identify the strategy depending on their metacognitive knowledge and the target as it may vary from person to person (Gül, 2020). Oflaz (2019)'s research study proclaims that female students are proven to be masters in devising and utilizing more as well as effective strategies to enhance impactful reading. However, it is worth noting that not much research has been carried out to understand the instructors' perspectives when it comes to challenges in reading comprehension (Indriyani & Pertiwi, 2021; Fitrianti & Susanti, 2021).

There have been various studies focussing on the use of metacognitive strategies in terms of how these strategies are employed based on a set of variables (Aziz et al., 2019; Deliany & Cahyono,

2020). A few other researchers attempted to find a significant relationship between the strategy and the quality of critical reading carried out by the students (Dardjito, 2019; Mohseni et al., 2020) that justify the (Rianto, 2021)'s idea that the metacognitive strategies play a pivotal role in understanding the concept that contributes critically to academic reading. Learners usually read, find meanings of unfamiliar words, clarify ideas, collaborate with peers, skim, scan and infer in reading activities (Oxford & Gkonou, 2018). Schema theory brings into light the variation that happens when a reader reads, knows, and seeks meanings. An able one will derive the information the moment he or she gets into the schemata (Li et al., 2020). These studies throw light on the importance of applying a strategy to enhance effective reading. This research pursuit intends to find out the adopted strategy by the students of an engineering institute in South India, with respect to reading. Further, it tries to find out whether they devise strategies to skim for overall understanding, scan for specific information, and infer the hidden meaning of the context.

Research Methodology

Participants in this study were randomly selected from a total of about 1,000 second-year and third-year students of an engineering institute in South India. All the participants have completed two courses with 3 and 4 credits successfully prior to taking this survey. So, it is concluded that they possess intermediate level of language ability. 371 students were invited to respond to the questionnaire comprising of closed-ended questions with responses pertaining to a five-point Likert scale; most of them responded with valid responses. The questionnaire was prepared from the revised MARSIS (Metacognitive Awareness of Reading Strategies Inventory). Words in the questionnaire were modified to make them concise and simple for the respondents. Among the respondents, 173 were female students, and 198 were male students. The students are from the branches of B.E. Computer Science and Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Mechanical Engineering, and B. Tech. Information Technology. The distinctions were made with the medium of study and the number of years they studied in English medium schools. For the analysis of data, IBM SPSS and the data analysis tool of MS Excel were used.

Research Design

The instrument to collect data used in this research was a questionnaire (see Appendix A). It was adopted from MARSIS (Metacognitive Awareness of Reading Strategies Inventory) especially the one revised (MARSIS-R) by (Mokhtari et al., 2018). MARSIS-R consists of 15 items that describe the strategies or actions used when reading academic-related materials such as book chapters, journal articles, and stories. This study is based on the factor analysis of the MARSIS instrument devised by (Mokhtari et al., 2018). Based on the perceived learning ability of students, some criteria were selected keeping mostly academic purposes in mind. The items are divided into three parameters: global reading strategies (represented by 3 items), problem-solving strategies (represented by 15 items), and support reading strategies (represented by 7 items). The internal consistency of the revised SORS for the study was proven to be acceptable. The internal reliability coefficients (Cronbach's Alpha) for the three strategy categories were as follows: GLOB ($\alpha = .999$), PROB ($\alpha =$

.990), and SUP ($\alpha = .997$). The overall reliability coefficient ($\alpha = .85$) ensured the general reliability of the study (Estévez-Pedraza, 2022). The intentional, carefully planned techniques by which learners monitor or manage their reading were taken into consideration. Having the purpose in mind, 3 items of Global Understanding strategies, 15 items of Problem-solving strategies (PROB), and 7 items of Support strategies (SUP) were evaluated (Do & Phan, 2021).

Simkus (2022) suggests that a pilot study can play a pivotal role in the enhancement of data collection. Therefore, it was decided that the first version of the questionnaire be pilot-tested with a group of 10 students from the same population pool but in a different class. The purpose was to check the clarity and comprehensibility of the items. In addition, the amount of time needed to answer the questions was calculated. Some modifications to the questionnaire were made in response to problems arising from the pilot test. Later, the revised questionnaire was re-piloted to the same students to further minimize the possibility of misinterpreting the questions. Eventually, the finalized questionnaire was administered to 392 students in five branches of Engineering. The administration was conducted at the end of non-credited classes on Soft Skills. Students were informed of the purposes and requirements of the survey and were asked to provide honest responses. Most students were able to finish the questionnaire within 10 minutes. Later, all the completed questionnaires were examined; and after discarding 21 unnamed or incomplete ones, only 371 valid questionnaires were used for statistical analysis.

Results & Discussion

Methodologically, the present study is quantitative in nature. It helps to measure the extent of students' awareness of reading strategies through an examination of the frequencies and variances of strategies in use. Therefore, the collected data were analyzed quantitatively to obtain descriptive statistics using IBM SPSS and the data analysis tool of MS Excel. Table.1 below shows the number of students participating in the survey from 5 branches of Engineering. Participation of students comes mostly from Electrical and Electronics Engineering and Information Technology followed by the students of Computer Science Engineering, Mechanical Engineering and Electronics and Communication Engineering. Among all the branches, 297 students are from the II year of study and the remaining 74 students are from the III year of study. 199 Male students and 172 female students participated in the survey.

S. No	Branch of Study	No. of Students	Percentage
1	Computer Science Engineering	65	17.5
2	Electrical and Electronics Engineering	116	31.3
3	Electronics and Communication Engineering	34	9.7
4	Information Technology	117	31.5
5	Mechanical Engineering	37	10

Table 1. No. of students participated from 5 branches of Engineering

198 male students participated in the survey with a mean of 3.55 and 173 female students participated with a mean of 3.81. From the observation, it was clear that female students from all the branches are performing better in using the reading strategies. All the other parameters are within the limit as shown in Table 2.

Gender	N	df	Mean	Sd
Male	198	370	3.5551	0.18
Female	173		3.8133	0.22

Table 2. Gender-wise participation from all branches

Out of 371 participants, 341 studied in the English medium stream for more than 12 years, 13 studied in the English medium stream for more than 10 years, 15 studied in the regional medium stream for more than 12 years and 2 studied in the regional medium for less than 10 years.

From the analysis, it has been observed that most of the participants had a clearcut idea of the purpose of reading comprehension irrespective of the branch of study and gender (Nadea et al., 2021). A few participants read without a purpose. Most of them are aware of the purpose while reading comprehension. Except for the 7 % of students, most of them try to get the gist of the comprehension passage. It is seen that prior knowledge of the vocabulary plays an important role in understanding (Amini et al., 2018). The habit of marking the tough words (Thongwichit & Buripakdi, 2021) are not found in 24 % of the participants but the studious ones have developed this habit and they try to nurture it.

Most of the participants try to guess the content beforehand so that they can understand and confirm when they read the later part of the passage. Most of them reconfirm the guesses while reading the comprehension (Kazemi, 2021). 60% of the participants critically analyzed the information in the passage. Whenever they do not comprehend properly, they have slowed down to read (Yi & Hongyuan, 2022). Most of them adjusted their reading speed to understand the text better and paused while reading the passage for reflection. 85 % created a mind map of the reading passage and 90% of the participants reread the passage for specific areas to understand the content better and got back on track after losing their concentration of the reading.

Descriptive Statistics-Global Strategies						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Purpose formation	371	1	5	3.52	.056	1.076
Usage of purpose	371	1	5	3.68	.055	1.059
Global understanding of the text	371	1	5	3.94	.052	1.006
Average				3.71		
Valid N (listwise)	371					

Table 3. Global strategy

Three global strategies were used keeping in mind their earlier exposure to academic reading passages. The means of all the global strategies were above 3.5. And the overall mean of all the questions was 3.71. This result shows that all the students are using the global strategies frequently to get an overall idea of the reading passages as the participants aim for an overall understanding of the reading passages (Ng et al., 2020).

Descriptive Statistics –Problem-solving Strategies						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Use of prior knowledge of vocabulary	371	1	5	3.82	.055	1.065
Use of graphical representation	371	1	5	3.62	.060	1.162
Marking unknown words	371	1	5	3.41	.068	1.300
Revising the text for intensive reading	371	1	5	3.40	.065	1.247
Use of typographical features	371	1	5	3.41	.064	1.232
Checking understanding of the new ideas	371	1	5	3.75	.052	1.008
Predicting the content	371	1	5	4.04	.052	1.009
Pause to reflect	371	1	5	3.62	.057	1.089
Creating the mind map	371	1	5	3.71	.058	1.121
Rereading parts with focus	371	1	5	3.91	.055	1.058
Getting back to the areas of less concentration	371	1	5	3.89	.056	1.072
Paraphrasing the text	371	1	5	3.67	.057	1.095
Checking the coherence	371	1	5	3.74	.054	1.032
Translation of ideas into mother tongue	371	1	5	3.68	.066	1.264
Average				3.69		
Valid N (listwise)	371					

Table 4. Problem-solving strategy

There are 15 questions to determine the usage of problem-solving strategies as the researchers want to focus more on the awareness level of the participants who are in the second and third years of engineering studies. Among them intensive reading of the text is the least adopted (3.40) by the participants, followed by marking unknown words and using the typographical features of the texts for better understanding of the reading passages (Wallace & Wray, 2021). Predicting the content of the reading (Alavi et al., 2020) is the highly used strategy (4.04) among all the 15 strategies followed by rereading the part of the text with specific focus on some hard parts of the reading passage and getting back to the areas of less concentration while reading the text first (Trudell, 2019).

Descriptive Statistics-Support Strategy						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Use of graphical representation	371	1	5	3.62	.060	1.162
Marking unknown words	371	1	5	3.41	.068	1.300
Slowing down while reading tough parts	371	1	5	3.85	.053	1.023
Speed variation in reading tough words	371	1	5	3.95	.054	1.049
Noting down key expressions	371	1	5	3.47	.059	1.135
Reading aloud the tough words	371	1	5	3.38	.069	1.329
Using Dictionaries	371	1	5	3.57	.060	1.152
Average				3.60		
Valid N (listwise)	371					

Table 5. Support strategy

Seven questions were selected based on the kind of academic reading materials they have been exposed to in engineering and technology courses. Among the seven questions of supporting strategies used in reading passages, speed variation in reading tough words is the most used strategy followed by slowing down to read the tough words in the reading text (Ahmad et al., 2018). Reading aloud is the least-used strategy among the students followed by marking unknown words (Yapp et al., 2021). The average of the overall supporting strategy is 3.61.

Conclusion

From all the three categories like global understanding strategy, problem-solving strategy and support strategy, global understanding strategy with an average score of 3.71 is predominantly used by the participants followed by problem-solving strategy with an average score of 3.69 and supporting strategy with an average score of 3.60. This confirms that there is a lack of awareness amongst the students with respect to the availability and application of problem-solving strategy and supporting strategy or it can be interpreted as the lack of motivation to apply these. From this, it can be concluded that participants can be given training in using problem-solving strategies and supporting strategies while reading the texts for comprehension.

Limitations

Although the study has revealed some interesting findings, it has some limitations. In connection with the research method adopted, the limitation is the reliability of the questionnaire responses.

Although students have reported the use of some strategies, it is difficult to know whether they are actually using these strategies. Another significant limitation is that there is quite a possibility to restrict the students from voicing out their novel and original strategies, if any, as the questionnaire had only closed-ended questions.

Future Research

Future research should aim at identifying ways to collect the data related to their actual uses of strategies. Further, research perspectives can be directed toward restructuring reading comprehension materials embedding ways to examine the problem-solving and supporting strategies they employ. Knowledge of knowledge, that is metacognition, has to be nurtured and developed with respect to reading for which extensive research is the need of the hour. The incorporation of explicit strategic training into the usual reading instruction procedures should be advocated implying that the instructors should be trained to “teach” the problem-solving strategies and supporting strategies while students try to answer questions of comprehension passages. They should train the students to evaluate the strategies they use while doing the exercises on comprehension passages. Students should be asked to reflect on the problem-solving strategies and supporting strategies they use and verbalize them. Gradually, they can develop a higher degree of autonomy in using these reading strategies in different contexts. Peer review in this regard can facilitate more mutual learning and enhance student participation.

Appendix-A

S. No.	Questions	GLOB/ PROB/ SUP	Scale 1 -5 (Strongly Disagree to Strongly Agree)				
			1	2	3	4	5
1	Do you have a purpose in mind when you are reading passages for comprehension?	GLOB	1	2	3	4	5
2	Do you keep in mind your purpose while reading texts?	GLOB	1	2	3	4	5
3	Do you read the texts for an overall understanding of the passage?	GLOB	1	2	3	4	5
4	Does your prior knowledge of vocabulary help you understand the passage?	PROB	1	2	3	4	5
5	Do you use graphical representation to understand the passage?	SUP	1	2	3	4	5
6	Do you underline or circle the unknown words/phrases while reading the text for the first time?	SUP	1	2	3	4	5
7	Do you revisit the texts for intensive reading to understand the underlined/circled words?	PROB	1	2	3	4	5
8	Do you use typographical features like boldface and italics to identify key information?	PROB	1	2	3	4	5
9	Do you check your understanding when you come across new ideas?	PROB	1	2	3	4	5
10	Do you try to predict/guess what the content of the text is about when you read?	PROB	1	2	3	4	5

11	Do you check to see if your guesses about the text are right or wrong?	PROB	1	2	3	4	5
12	Do you critically analyze and evaluate the information in the text or passively accept everything?	PROB	1	2	3	4	5
13	Do you read slowly and carefully to make sure you understand the text?	SUP	1	2	3	4	5
14	Do you adjust your reading speed according to the type of text?"	SUP	1	2	3	4	5
15	Do you pause for reflection while reading the text?	PROB	1	2	3	4	5
16	Do you visualize information to create mind map of the text?	PROB	1	2	3	4	5
17	Do you re-read the passage with focus on specific areas?	PROB	1	2	3	4	5
18	Do you try to get back on track when you lose concentration?	PROB	1	2	3	4	5
19	Do you ask questions about the relevance of your answer to the questions asked in the passage?	PROB	1	2	3	4	5
20	Do you take notes of the key expressions and ideas while reading the texts?	SUP	1	2	3	4	5
21	Do you read aloud the text when text becomes difficult?	SUP	1	2	3	4	5
22	Do you use reference materials (e.g., a dictionary) to help you understand text?	SUP	1	2	3	4	5
23	Do you paraphrase in your own words to better understand text?	PROB	1	2	3	4	5
24	Do you go back and forth in the text to find relationships among ideas in it?	PROB	1	2	3	4	5
25	Do you translate text from English into your mother tongue/primary language?	PROB	1	2	3	4	5

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