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RESEARCH PAPER

Impact of Science Process Skill on English Reading Comprehension of Learners

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ABSTRACT

This study investigates how science process skills can be used to enhance the literary practices of reading comprehension skills in the English language. Students read the textbooks, read various directions for conducting the experiments, and formulate their reports based on observations. The research conducted here is survey research in which the population consisted of all the science and English teachers teaching middle grades at the English medium schools of Karachi. Through the convenience sampling method, 200 Science and English teachers were selected from the English medium schools in the North Nazimabad area. A questionnaire was used as a research tool which consisted of 11 proposed scenarios about the basic science process skills and reading comprehension skills and was evaluated on the basis a of five-point Likert scale. The percentage method was used to analyze the responses and the null hypothesis was rejected. Findings revealed that reading skills in the English language can be developed through science process skills. The results further indicate that science process skills can be made a part of other subjects and their integration with reading skills can develop a perceptive effect on students' learning. It is recommended that the integration of science process skills in different subjects can help save time and enhance students' learning at the same time.

KEYWORDS Basic Science Process Skills, English, ESL Reading Comprehension Skills

Introduction

Silent reading rates of most of the students far exceed their oral reading rates in any subject. Recent studies have shown that basic science process skills and communication skills of reading are interrelated with each other for two major reasons: Firstly, nowadays there is a dire need to make instruction more meaningful (Ansari, Panhwar, & Umrani, 2016) and following the real world of students. Secondly, as reading involves many skills, instruction in one area must reinforce the instruction in another area, so that more than one subject content can be taught in the same amount of time (Umrani, 2016; Lashari & Umrani, 2023). It appears that the optimum utilization of science textbooks as a learning tool depends on selecting the proper text for the class and help from the teacher for the students to read the text through a proper introduction of concepts, and vocabulary and follow up of the reading by discussion and enrichment (Ahmed, Lashari & Golo, 2023).

Teaching reading is a difficult task which depends upon both awareness and assumptions (Pang et al., 2003). Further, proficiency in reading depends upon phonemic

awareness, the presence of fluency, enhancement in vocabulary, and comprehension of the text (National Reading Panel, 2000). Reading comprehension is a sophisticated cognitive process that requires the reader to actively and proactively connect with the text (Multu, 2020). Strategies that helped in the development of reading skills could be subdivided into pre-reading, during-reading, and post-reading activities (Umrani, 2016; Lashari et al., 2023b). Those skills described as pre-reading helped to increase reading comprehension in students. Predicting, previewing, and using a learner's prior knowledge are some of the pre-reading tactics that can be used to intensify reading comprehension (Kentucky Department of Education, 2012). In all these activities the learner made use of their previous knowledge and experiences about the topic and then constructed new knowledge on its basis (Samejo, Lashari & Mahar, 2023). These strategies support the interactive constructivist view of learning and cognitive development. According to Lashari and Umrani (2023), it is a theory of learning that enables students to develop and come up with their interpretation of the idea based on their prior knowledge, convictions, and experiences in connection to new information presented in the classroom (Miller, 2000).

Constructivist View of Developing Reading Skills

Strategies that helped in the development of reading skills could be subdivided into pre-reading, during-reading, and post-reading activities. Pre-reading activities help to increase reading comprehension in students (Magsi, et al., 2023). Predicting, previewing, and using a learner's prior knowledge are some of the pre-reading schemes that can be cast off to enhance reading comprehension skills in students (Kentucky Department of Education, Reading Strategies in Action, 2002). In all these activities the learner made use of their previous knowledge and experiences about the topic and then constructed new knowledge on its basis. These strategies also support the interactive constructivist view of learning and cognitive development which allows the students to improve and build their understanding of a concept based on their acquaintance, beliefs, and practices about the fresh knowledge given in the classroom (Miller, 2000). In the interactive constructivist's view of learning, apart from other learning styles, an individual's learning style is the most dominant method of learning reading.

Constructivist View, Science a Process Approach (SAPA) and Communication Skills of Reading

The constructivist view is further supported by the curriculum project: Science a Process Approach (SAPA), which defines the science process skills as a large group of transferable skills which are highly reflective of scientific behaviour and can be utilized in various science disciplines (Lashari, Umrani & Buriro, 2021). According to SAPA, process skills can be divided into two types: basic and integrated. The integrated skills were listed as observing, inferring, measuring, communicating, classifying, and predicting (Padilla, 1990; Umrani, 2016).

The achievement of integrated science process skills is enhanced if they are taught in a meaningful context. To increase reading comprehension in elementary classrooms, science process skills and communication skills of reading can be integrated (Browers, n.d.; Lashari et al., 2023a). The science curriculum taught in most schools is based on an inquiry approach in which the use of science process skills is evident. Especially, those environments where students are given opportunities for hands-on- experiences surely provide meaningful context for learning.

For the improvement of reading ability, several studies could provide evidence as to how in-depth science instruction could serve as the foundation for reading ability

development. A yearlong study named CORI (Concept Oriented Reading Instruction), conducted on primary grade students of classes 3 and 5 revealed that CORI students as compared to traditional students showed a high level of conceptual learning and reading engagement than traditional students (Rehman, Lashari, & Abbas, 2023). The CORI model was based on the principles of conceptual theme, real-world interaction, self-expression, and coherence, and an integration of science and reading in the instruction was made. Another group of students of the same grades was given traditional instruction (Gutherie et.al., 1999; Fayaz et al., 2023b). In a report by the National Academy Press, How People Learn, the fundamentals of how science as a form of in-depth, content-area instruction could serve as the basis for the development of literacy (e.g. reading comprehension and writing) in elementary schools were given. This report further summarized a general agreement on research investigating specialist behaviour, expert knowledge, and skill as a united core concept for meaningful learning (Romance & Vitale, 2010; Lashari & Umrani, 2023). Hands-on activities or the use of an inquiry approach in science demanded the use of the learner's prior knowledge which served as a link between the development of the learner's comprehension skills and the new knowledge that was presented to the learner. This was also to the constructivist opinion of learning which supported the view that humans construct their knowledge based on previous knowledge and the new knowledge that was presented in a meaningful context (Lashari et al., 2023c). With this understanding in mind, due to the strong dependence on the learner's previous knowledge in meaningful learning, all those activities that helped in the development of in-depth science instructional understanding (e.g. hands-on activities, inquiry, journaling, etc.) could serve as the basis for the development of reading comprehension in students. A similar research study designates reading for understanding as the most important science process skill apart from other basic science process skills. According to this study, when young people are encouraged to learn science, they must be given education and skills that would help them to succeed (Metzenberg, 2000).

The Nexus between Scientific Literacy and English Reading Comprehension Skills

One of the research studies highlighted the correlation between scientific literacy and English reading comprehension skills by pointing out that the natural ability to inquire, search or determine the answers to different queries arises from curiosity in everyday experiences which means that the person had an innate ability to define, clarify and guess the natural phenomenon (Ahmed, Lahari & Golo, 2023). Scientific literacy demands the learners to be able to read and understand various articles related to science and to involve them in social conservation after validating the conclusions (Ebbers, 2002). By this definition, it is evident that the process of developing science process skills in students should be linked together with the literacy practices of reading.

This point of view was strongly related to the study conducted by Kintsch and colleagues (Vitale & Romance, 2007) which had been applied widely to reading comprehension. Kintsch's approach clarified the reading comprehension process by separating the reader's prior knowledge of the subject from the propositional structure (such as semantic meaning) of the text being read. In this instance, a combination of the learner's past knowledge of the subject and the propositional form of the text may produce extraordinarily high. If the text was not presented in a cohesive form, then in this situation the previous knowledge of the reader could provide no benefit for a coherent understanding of the topic which was to be read as there were various semantic gaps in understanding.

In an environment where science teaching is done based on activity-based programs, science process skills could complement reading skills because of the similarities between them as shown in the table below:

SCIENCE AND COMMUNICATION SKILLS		
Science	**Reading**	**Writing**
Classifying	Identifying main idea/ details	Outline Science Information
Experimenting	Sequencing	Write up a procedure to use
Drawing Conclusions	Drawing conclusions	Study experiment results and write up what you think happened based on the facts
Writing up experiment results	Expository writing	After conducting an experiment, write up the results
Observing / inferring	Distinguishing cause and effect	List causes and effects in a given experiment
Determining cause and effect	Determining cause and effect	List causes and effects in a given experiment
Comparing and contrasting	Comparing and contrasting	Prepare a chart that gives similarities and differences between two similar organisms

Note: Browers, P. (2000). *Reading and Writing in the Science Classroom*. Houghton Mifflin Company.

Silent reading rates of most of the students exceed their oral reading rates in any subject. In Pakistani English medium schools, children in middle grades are familiar with the English language as it is a compulsory subject from class 1 onwards. A common problem is that during examinations students are not able to comprehend the questions given in the paper. The medium of instruction is the English language in all English medium schools, so the question papers of most of the subjects are given in English. In my personal experience, I have seen that during science papers (as I am a science teacher), students ask me to read the paper aloud to them because they are not able to comprehend it. Furthermore, because of poor comprehension in reading the students were not able to understand the questions in the paper and gave wrong answers. All these problems pointed out one common problem i.e. students have weak reading skills in English.

Furthermore, in schools, teachers consider scientific literacy as a somewhat fixed and daunting body of knowledge. Scientific literacy is much more than reading about science (Lashari et al., 2023a). It is high time for teachers to realize the fact that our society demands young students to behave like young scientists which requires the development of scientific literacy in them. The most common problem observed in middle-grade students is an inability to establish an appropriate concept of reading, i.e. they have weak reading comprehension skills. In a recent study, high school pupils' reading comprehension abilities and science proficiency were examined, and a link has already been established between four out of six reading skills (Imam et. al., 2014; Memon, Umrani & Pathan, 2017). The goal of this study is to investigate how basic science process skills could be used to enhance English reading comprehension in middle-grade students. The current study specifically helps to understand whether the reading skills of English can be developed by using Science process skills.

The following hypothesis regarding the given problem is developed to prove the research.

Ho: Reading skills in English cannot be developed through basic science process skills.

Material and Methods

All middle school science and English teachers in Karachi's English-medium schools were involved in the study. This study is exclusively educational in nature because education is its main focus. This study uses descriptive research, which collects information to assess hypotheses. Because of its accessibility, the North Nazimabad neighbourhood of Karachi was selected using the convenience sample technique. Participants of the research included 200 science teachers. Among them, there were 160 (90%) female teachers and 40 (10%) male teachers. The teachers were selected from 20 schools in the North Nazimabad area. Among these schools, 4 (27%) were all boys schools, 1(6%) school was a girls' school and 15 (67%) were co-educational schools. About 70 (35%) teachers were teaching class VI, 60 (30%) teachers were teaching class VII, and 70 (35%) teachers were teaching class VIII. The academic qualification of teachers was BSc 50 (40%) and MSc 150 (60%). The highest professional qualification of teachers was reported as 80 (46%) B.Ed., 20 (7%) M.Ed., 50 (20%) diploma holders, and 50 (20%) having no professional qualification in the whole sample. While the sample cannot be considered representative of the entire population of interest, generalization of the results was not the main goal. The primary aim was to work in an accessible context. However, the effects evident in this study can be applied to other educational scenarios. The compatibility between science process skills and reading skills was evaluated using a five-point Likert scale questionnaire. To make the research tool valid, it was sent for the specialist opinion from the committee of researchers and educationists. To ensure the reliability of the instrument, the researcher applied Cronbach's Alpha coefficient was found to be 0.79.

The questionnaire consisted of 07 proposed scenarios which were evaluated based on strongly agree, agree, not sure, disagree, and strongly disagree. The scores were analyzed using the percentage method and reported. At the initial meeting, all the participants (the science teachers) were given informed consent to complete the questionnaire.

Results and Discussion

Table 1
Integration of Classifying (Science Process Skill) with identifying main area / details and outlining science information

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	06	06	0	4	4	200
Percentage	30%	30%	20%	20%	20%	100%

Table 2
Integration of Experimenting (Science Process Skill) with sequencing and writing up a procedure

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	70	80	30	10	10	200

Percentage	25%	35%	15%	5%	5%	100%

Table 3
Integration of drawing conclusions (Science Process Skill) with factual writing

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	90	90	0	10	10	200
Percentage	40%	40%	0	10%	10%	100%

Table 4
Integration of writing up experiment results with expository writing

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	60	60	50	30	0	200
Percentage	30%	30%	25%	15%		100%

Table 5
Integration of observing / inferring with distinguishing and listing cause and effect

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	70	40	0	90	0	200
Percentage	35%	20%	0	45%	0	100%

Table 6
Integration of determining cause and effect with listing cause and effects in experimentation

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	150	40	0	5	5	200
Percentage	75%	20%	0	2.5%	2.5%	100%

Table 7
Integration of comparing and contrasting with finding similarities and differences

Description	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree	Total
Number	70	70	0	40	20	200
Percentage	35%	35%	0	20%	10%	100%

Discussion

The research aimed to analyze the integration of Basic Science Process Skills to Enhance Reading Comprehension Skills of English Language in Middle School Students". Children in middle grades are familiar with the English language but a common problem seen during examinations is the majority of students struggle to understand the questions given in the paper. One common problem observed among students is that they have weak reading skills in English. Some of the main reasons why reading problems exist in students are when they are not able to focus on the identification of words, cannot establish an appropriate concept of reading or there is a lack of strong intention to read. Most of the schools in our present education system are based on English medium but still, students

are not able to comprehend the English written text properly. Reading is mostly taught by skimming and scanning techniques (Ansari, Panhwar, & Umrani, 2016) and by these approaches, students are not able to comprehend the written text because their cognition level is not enhanced. Middle schoolers are accustomed to using the English language, but a common issue that arises during exams is that most pupils struggle to understand the questions on the paper. Sometimes the students are not able to understand the question and give wrong answers to the questions although they know the correct answers. All these problems point out one common problem among students i.e. weak reading skills in English. Reading problems in students are mostly because they are not able to focus on the identification of words have the inability to establish an appropriate concept of reading or have a lack of strong intention to read. An individual's preferred and prevailing manner of absorbing, processing, internalizing, and recalling information is referred to as their learning style in a research study. This method may be influenced by both hereditary traits and contextual factors (Whittington & Ravens, 1995). This view was highlighted in a further research study where those strategies that helped in the development of reading skills could be subdivided into pre-reading, during reading, and post-reading activities. Those activities described as pre-reading helped to increase reading comprehension in students. Predicting, previewing, and using a learner's prior knowledge are some of the pre-reading strategies that can be used to increase reading comprehension (Kentucky Department of Education, 2002). Another research confirms this by describing the preferred learning style of the brain functions in the form of a sequence i.e. by predicting how a process was done, making attempts, analyzing the attempts, making adjustments, and continuing the cycle until the attainment of an aim is achieved. Prediction provided a bridge between the learner's previous knowledge and the author's purposeful message. This was the core link for the development of reading comprehension (Tadlock and Stone, 2005).

Basic science process skills are utilized by science teachers to enhance the cognition level of students. This study is conducted to study the effect of basic science process skills in the enhancement of student performance in reading comprehension skills in English. Silent reading is beneficial to students when they can comprehend the text given to them. Among all reading, pre-reading strategies prediction provides a bridge between the learner's prior knowledge and reading comprehension. New research studies show that students' learning is increased when it is taught in a meaningful context. The subject of science, when taught through an inquiry approach provides a meaningful context to the learner. This situation could be very useful as the teacher uses it to enhance the reading skills of students. A review of the literature also shows science process skills and reading skills could be integrated when learning occurs in an environment that provides opportunities for hands-on experiences. In such activities, learners make use of their previous knowledge to construct new knowledge. This can also be related to the interactive constructivist's view of learning in which a learner constructs new knowledge by combining old and new experiences. According to the latest news reports reading for understanding is considered the most important skill in science (Cecan, 2012).

Conclusion

Following the data collection process utilizing the questionnaire, the researcher employed statistical approaches, including the Percentage Method, to examine the data. This method was used for the scientific proof of the hypothesis. According to the results, the null hypothesis was rejected, and it was confirmed that reading skills of English can be developed through basic science process skills. The research revealed that English reading comprehension skills can be enhanced through the application of basic science process skills among middle-grade students.

Teaching strategies for middle-grade students should be changed and integrated approaches must be used. Students should be taught to enhance their reading skills by using reading comprehension strategies in combination with other subjects apart from English only. Strategies using more questioning, visualizing, predicting/activating prior knowledge and monitoring, clarifying and fixing up, drawing inferences, and summarizing/retelling should be implemented by science teachers.

Science teachers must emphasize activities using the organizational structure of the text which helps to increase reading comprehension skills in English. Students must be guided through focused, high-quality discussions on the meaning of the text to enhance their reading comprehension skills. Science teachers must select the text purposefully so that it. When teachers are developing science process skills in students, their reading skills are enhanced at the same time.

Recommendations

The following recommendations are for science teachers:

1. Science teachers must establish an engaging and motivating context that supports reading comprehension development.
2. Teachers could use hands-on activities in science because both reading and hands-on activity-based learning is linked with intellectual processes.
3. Teachers should perform manipulation in different scientific scenarios which is the key to establishing a relationship between science and reading.
4. Teachers should involve children in contextual and structural situations which can help them in the development of new words and interpret data in the form of a paragraph.

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