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Why Reading Skills for STEM Students

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Abstract:

The high levels of communication and reading skills required in the field of STEM education is understood by one and all. Teachers and students pay certain attention towards the development of communication skills, spoken and written. But adequate emphasis is not often given to Reading as a skill. STEM students often neglect extra reading. They concentrate on reading their specific texts and often say that they have no time to read other materials. This is detrimental to their overall development of reading skills because it curtails their access to the ocean of knowledge that is available to them in the form of different text materials. Hence, I feel that we have to raise their awareness of why they need to improve their READING SKILLS. This paper attempts to do just that. It highlights the need to improve digital literacy as a part of science education at all levels, from school to university and research too. It also stresses the fact that Reading has to be specifically taught as a skill. It should not be taken for granted.

Keywords: Reading, digital literacy, STEM students, effective readers.

Introduction

The global scenario in the 21st century is one that calls for high levels of communication and critical thinking in all fields of education and especially in the field of STEM education. Large industries and corporations are on the lookout for a workforce that is skilled in communicating their work to others on a national and international level. Most of the time students are being equipped with writing skills and the basic reading skills are neglected. The STEM students are so involved in their own specializations that they fail to make time for extra reading that would help them navigate their way through the ocean of knowledge that is available in the world of technology and science. This becomes a major handicap for them. Hence, in this paper, I wish to

review the importance of READING for all higher education levels and particularly in the field of SCIENCE. A connection has to be made. Digital literacy is an important component for students of science. In order to access this, they need to be effective readers who understand the importance of critical reading. For this, READING skills should be given priority on par with other skills such as WRITING, LISTENING, and SPEAKING.

Undoubtedly, reading is the key to improving communication skills since students meet with a variety of vocabulary, syntactical structures and information while engaging in the reading process. The process of Reading is the process of constructing meaning from a text using both ‘bottom-up’ and ‘top-down’ approaches. Top-down approach involves using background knowledge to process or understand a text. The reader moves from larger concepts to smaller details. On the other hand, the bottom-up approach begins with the smaller details and works its way upwards. That means the reader initially focuses on individual words and then tries to connect them into patterns of understanding.

According to Ur, Penny, (1996) “Decoding and understanding words and sentences together with our previous expectations and knowledge” results in Reading. The word ‘understanding’ has also been used by Dewey (1938) because he felt that ‘knowledge’ is static as it deals with “information” that most of the time is “static”, whereas, “understanding” is more dynamic as it supports construction of meaning by an individual reader (pg 48). This is how ‘Reading’ should be defined and its significance be understood as a skill that has to be learned through practice and exposure to different kinds of texts (non-literary and literary). Reading is the capability to extract meaning out of what is read and this then becomes the base for understanding the given text. Many students think that speed reading will help them but what is really needed is ‘effective reading’ or ‘critical reading’ or ‘deep reading’. In other words, one has to become an active and extensive reader and such kind of reading involves a variety of approaches.

The **first** one being, clear thinking as it helps in identifying the underlying patterns and structures so as to decipher the explicit and the implicit meaning of the text. **Second**, the reader should be able to distinguish between ‘facts and values’. The world is made up of a variety of people who have their own individual perspective. Each person constructs his or her own understanding of the reality h/she sees and reads about. There is no single interpretation to anything we read. Hence, both ends of the spectrum are to be taken into consideration. **Third**, is the reader’s

observation and theory or ‘scientific approach’ to understanding the material that has been read. Scientific approach is not connected with science, but it involves, answering the question “why” and “how” while reading. This is also called as close reading. In other words, reading between and beyond the lines. Meaning within the text and meaning between texts need to be comprehended. Thus, the reader begins to observe and frame different theories of how the reading text should or should not be interpreted. There will never be a single ‘correct’ or ‘incorrect’ answer. It paves the way for the most important principle of clear thinking and helps the readers to keep the ideas and thoughts of the writer in their respective contexts. Interpretation can then be done based on the context in which the ideas have been used, and the readers are well on their way to becoming effective readers.

How to become effective readers

Effective readers look beyond words, they read with focused concentration and explore all the avenues and shades of meaning that could be hidden within the words. They use both top-down and bottom-up approaches that help them unravel conclusions from the reading material.

Three important phases, such as, Pre-reading, while-reading and post-reading prove to be very useful. Following these stages activates our prior knowledge as we look for key words and phrases, thus gaining an overall understanding through skimming, and later on deeper reading such as ‘scanning’. Skimming and Scanning can be amalgamated by using the two prominent techniques, the SQ3R and a variant, the SQ4R. These methods include surveying, questioning, reading, reciting, reviewing and recording. In other words, an effective reader is also a ‘smart reader’. Of course, we cannot have any one correct method of reading, but we develop a suitable technique which will help enhance our comprehension and retention capacity. Isaac Disraeli, the literary father of Prime Minister Benjamin, pointed out that reading effectively is a skill to be developed much as learning to think and to write effectively, he wrote, ‘There is an art of reading, as well as an art of thinking, and an art of writing’ (Disraeli, cited in The Oxford Dictionary of Quotations, 1981). Anderson, Hiebert, Scott, & Wilkinson (1985), opine that reading is a basic life skill. It is the keystone for a student’s success in school and at later stages of higher education. In spite of its relevance, reading is one of the skills that is not adequately developed in schools. However, in the 21st century, there is a dramatic rise in the demand for a high level of literacy, especially, in our technologically developing world. This is endorsed by Snow, Burns, & Griffin,

(1998). With all the recent development in the fields of science and technology, and the urgent need for students to read extensively and intensively, especially, in courses of STEM, the need to broaden and deepen our READING SKILLS, has come to the forefront once again. Hence, the need to bridge the gap between Literacy and Science.

Students pursuing an education in science are in dire need to develop their individual reading potential and skill. STEM themes are to be included in the reading texts given to students, wherein, they learn to read and interact with text (what is written, how it is written and why). This active interaction with the words on the page will propel the readers into the realm of effectiveness and they will be urged to develop more scientific dispositions towards their learning. “Meaning” ensconced within the text becomes more alive to them (Pearson, Moje, & Greenleaf, 2010). It is further supported by Palincsar & Magnusson, (2001) who mention that if students are exposed to complex disciplinary texts, then they will have the chance to increase their vocabulary, and knowledge of how different reading materials are structured. This understanding will help them develop their cognitive and metacognitive skills. Such skills form the core of their higher education in all fields of study. Additionally, according to (Cervetti, Barber, et al., 2012; Cervetti, Bravo, et al., 2009), high quality STEM reading material can optimize a student’s “involvement in inquiry experiences, grasp of science concepts, and understanding the nature of science.

Consequently, the bigger picture begins to emerge, that is, the “SCIENCE-LITERACY” connection, as stated by (Cervetti, Pearson, Bravo, & Barber, 2006, p.3; Pearson, Moje, & Greenleaf, 2010), which is “the acquisition of the knowledge, skills and dispositions of science as the end, and language and literacy as part of the array of means that can help students achieve that end.” STEM is concerned with different scientific subjects that have their own content with their own vocabulary. The language involved is unique to each subject and when we try to integrate it with other areas of literature, there can be a vast difference in the way language needs to be used and understood by the reader. Every field of study included in STEM has to be contextual and domain specific. The language skills required are varied and the literacy skills necessary to comprehend them are unique and domain specific. In addition, the student needs general literacy too as this involves reading, writing, classifying, inferring, communicating, etc. Hence, both, literary and non-literary texts should be used to improve the students’ comprehension capacity to deal with general and scientific texts. Here, we can suggest the use of informational texts along

with fictional texts. Padilla et al., 1991, and Graesser, 2002 assert that “whether conducting science experiments or reading assigned science texts” students are using both their cognitive and metacognitive skills, such as reading and thinking beyond the literal meaning of words and structures used on a page. They try to decode the explicit and implicit meanings hidden at different levels of any given text. Metacognition begins to play a major role in enhancing their reading and comprehending capacity. Now, the students are on their way to becoming effective readers. According to Zolman, (2012) STEM literacy includes the fulfillment of societal development. He firmly states that literacy in science students will enable them in the communication of complex ideas to the expert and the lay audience. STEM students need to be motivated, and self-confident while disseminating their work, hence, their cognitive and meta-cognitive skills should be developed along with their individual STEM content and knowledge. And the best way to achieve this is through improving their ‘Reading Skills’.

Conclusion

The above discussion clearly asserts that language skills predominantly affect the comprehension of scientific literature and studies. Language is an essential part of dissemination of knowledge in academic circles. As English is widely used in the instruction of STEM subjects, the students need to develop higher order analytical skills and also be able to communicate their findings or learning to the academic world of experts and laymen as well. Thus, the enhancement of reading skills will be the first step towards success in their individual scientific domains. The horizons of knowledge are expanded when we know HOW to read. Extensive and Intensive reading is the “mantra” that expels the fear of being unable to communicate. Deep and critical reading provides us with the ammunition of vocabulary we need to express our ideas. Many STEM students face the challenge of communicating their thoughts in simple and clear language; hence, trying to improve their language skills through READING could be a remedy. The methods of SQ3R and SQ4R can be actively used to the benefit of the STEM students, in their individual domain of study and for general communication of information gained through their studies. Finally, it can be said that literary and non-literary texts ought to be provided so that students are compelled to use their cognitive and meta cognitive skills to unravel the vast extent of meaning embedded in their reading texts, thus, making the STEM students understand the immense value

of improving their READING skills that would give them the cutting edge in an ever-growing world of technology and science.

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