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Investigating Metacognitive Strategies for overcoming Barriers to Reading Comprehension: Insights from a Pakistani Context

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Abstract

The main aim of this research was to investigate metacognitive strategies through reading comprehension practice by first year students of engineering departments. The students of four engineering departments were selected as the participants in this research work. The qualitative instrument based on focus group interview was used for collecting data from first year students of four engineering departments to know the perceptions and their needs to develop reading comprehension through metacognitive strategies. The researchers developed interview questions for this study. These questions were validated by two experts of faculty of cognitive science and human development at university Malaysia Sarawak. The researchers obtained permission from the chairmen of four departments at a university in Pakistan. Almost 8 groups consisting of 5 informants in each participated in this research. The data was documented by using audio-tape; NVivo software, version 8 was used to organize data for obtaining main themes of the study. This research generated the most important themes for the interpretation of the results. The study contributed the most promising results which revealed that more than half of these groups used metacognitive strategies in classroom reading practice while less than half of groups did not use strategies and remained poor in reading comprehension. This research suggested administrators, teachers, and curriculum designers to design and implement reading comprehension courses and syllabus for first year engineering students.

Key words: metacognition, reading strategies, reading comprehension barriers

Introduction

In Pakistan, higher education is persistently being reformed from primary to graduate levels. Similarly, the engineering students need more help to improve their comprehension proficiency by using different strategies. Metacognition is used to apply one's thinking about and regulating one's cognition for developing their reading approaches for evaluating and controlling their learning in an effective manner (Young & Fry, 2008). The studies (Maki, 1998; Commander & Stanwyck, 1997) reported that students having higher metacognitive knowledge performed better in their academic performances as compared to their peers having low and average metacognitive knowledge. Further, Kramarski and Mevarech (2003) declared that most of research in the field of metacognition for reading comprehension is done with the school students but did not investigate with that of undergraduate level. Therefore, this present study has investigated the cognitive or metacognitive strategies including scanning, summarizing, and questioning used by engineering students to develop their reading proficiency and comprehension and the impact of a metacognition on undergraduate students' awareness of strategies. This study also examined the differences in the reading performances of the students.

The metacognition concept

Metacognition can well be defined as the awareness of cognition and its processes and complete control over cognition and its processes (Flavell, 1979, 1981, 1987). Metacognition involves two main aspects including:

- 1) knowledge or awareness of cognitive processes, and
- 2) executive control over cognitive processes.

This concept has paved a way to work further in the area by following the metacognitive model (Brown, 1987; Otani & Widner, 2005) that included the knowledge and the processes of self-regulation. The knowledge of cognition or metacognition indicates about the awareness of individuals and their competencies, proficiencies, and their experiences at the time of their performances.

However, this metacognitive knowledge is based on three basic types that include declarative knowledge, procedural knowledge, and conditional knowledge of cognition or metacognition involving mental abilities and individual thoughts (Brown, 1987; Kuhn, 2000; Schraw, Crippen & Hartley, 2006; Cohen 1998). Similarly, declarative knowledge is used for the constant awareness of metacognition and related factors to control the performance of individuals; whereas, procedural knowledge indicates the way to use strategies in an effective manner to expedite the learning of individuals; while, conditional knowledge is

used to ask about the time, place, and reason to use metacognitive strategies and appropriate settings as discussed by (Schraw & Dennison, 1994) to develop individual knowledge.

Metacognition relates to thinking to control over the cognitive processes of students engage in learning how to read and comprehend the text. The strategies involve in metacognition are planning that means how to approach a reading text in terms of proper meaning, monitoring reading comprehension, and evaluating the progress of reading text. Salataci and Akyel (2002) proposed that metacognitive strategies consist of thinking around what students ensure when they have to read, to check the result of problem solving methods, to plan how to practice with effective strategies, to control the value of an action plan, to test, to revise, and to evaluate strategies. This study was conducted to determine which practices using metacognition strategies were to be the most effective tools for engineering students in developing their reading proficiency and comprehension needs.

Review of literature

A number of studies (Channa, Nordin, Siming, Chandio & Koondher, 2015; Channa & Nordin, 2015; Channa & Nordin, 2014; Tarricone, 2011; Huff & Nietfeld, 2009; Mevarech & Amrany, 2008; Boulware-Gooden, Carreker, Thornhill & Joshi, 2007; Wei, 2005; Flavell, 2004; Zelazo, 2004; Kramarski & Mevarech, 2003; Maki & McGuire, 2002; Schwartz & Perfect, 2002; Koutselini & Theofilides, 2001; Demetriou, 2000) suggested that the metacognition field can either be used in teaching or in learning to develop students' awareness of cognition and regulation of cognition in order to raise metacognitive efficiency for comprehension purposes. Similarly, Palincsar and Brown (1984) used meta-strategic in reading through reciprocal teaching method among middle standard students for at least 12 week training program. The findings revealed that metacognitive strategies including self-questioning, summarizing, making predictions, and debugging were considered to be significant. They suggested teachers to use the reciprocal teaching method for developing reading comprehension proficiency.

Moreover, Koch (2001) also taught metacognitive self-assessment strategy in reading comprehension of physics texts to 30 students of pre-university level. Findings of the study revealed that the experimental group beat the control group in reading the texts of physics subject and comprehension. Likewise, Kramarski and Mevarech (2003) examined the effects of metacognitive knowledge and mathematical reasoning by using different teaching techniques on 384 students. The findings revealed that the students using metacognitive strategies performed better with that of those who did not use strategies in reading and learning

mathematical and reasoning texts. Similarly, Mevarech and Amrany (2008) arranged training in the field of metacognition and selected 31 secondary school students to use the metacognitive strategies. The researcher divided these 31 students into two groups including the experimental group and the control group. The experimental group was completely guided and supported; whereas control group was not provided any help or guidance about metacognition. The results indicated that the experimental group performed better than the control group. Thus the study suggested teaching and learning metacognitive strategies for successful comprehension.

Recently, Shah, Yusof, Lip, Mahmood, Hamid and Hashim (2010) investigated the use of strategies through survey by comparing strategies in Malaysia. The results of the study indicated that differences were found among average and good readers. Sinthopruangchai (2011) investigated and assessed metacognition and use of reading strategies of students studying Bangkok Christian College, Thailand. Ballou (2012) conducted research on using explicit strategy instruction to improve reading comprehension. Students were analyzed through pre and post-assessment to determine the effectiveness and implications of explicit strategy instruction. Franco-Castillo (2013) investigated strategies through reading and comprehension of science text. This study focused on students' interaction through dialogue journals with their teachers in the class. Data was collected by using different measures. Findings of the study exposed better in terms of comprehension of engineering text.

Research gaps

Review of past research signified a variety of major issues in reading comprehension by using metacognitive strategies; at first, a little research is existed in line with the first year engineering students in Pakistan. At second, the curricula of engineering university are fixed; therefore, few studies have been undertaken for engineering students to enlarge their reading skills. At final, these elementary, science and technology students as well as primary and high school students get extra chances of reading texts; these students recurrently got opportunities in class room reading through strategies. Therefore, further investigation is needed in terms of first year engineering students' reading. The present study addresses these issues by investigating metacognitive strategies in reading comprehension. The following research question was framed for this research: What strategies do first year students of engineering departments use for developing their proficiency of reading texts at QUEST, Pakistan?

Research method

This study used focus group interview as the qualitative instrument for students of four engineering departments in Pakistan. A total of forty students from a university in Pakistan volunteered to participate in the study. There were eight focus group interviews for engineering students; each group consisted of five students. These interviews were recorded using audio tape and transcribed for analysis and results. The data was organized through NVivo software version 8. The researcher analyzed the qualitative data of this research by following Strauss and Corbin (1990) which generated the final themes as given in the results section.

Findings of the study

The informants of eight groups came to know about what potential metacognitive strategies were noted as beneficial to develop their comprehension in reading academic as well as general texts and their level of reading growth. Conversely, differences were investigated while using each and every metacognitive strategy among all groups who participated in this study. Similarly, the focus group interview data gathered was analyzed and the main themes generated for the interpretation of the results are discussed in table 1 of the study.

Tab 1: Presenting main themes of the study

Level One Code	Level Two Codes
Metacognitive Strategies (Planning, Monitoring, & Evaluating)	<ol style="list-style-type: none"> 1. Thinking through images of the texts 2. Selecting the Main ideas 3. Selecting the topic Sentences 4. Scanning of the texts 5. Summarizing of the texts 6. Questioning

Thinking through images of the texts

The first item of the level-two theme is the thinking through images of the text in which most of the groups reported that thinking and making images of the text is the most important strategy for understanding of the text but they did not use this strategy frequently because using mental image leads thinking about the passages take lot of time. Three of these groups informed that they used this strategy in predicting and linking text with their thoughts and form meaning at the time of difficult text. Most of the groups considered this strategy as the most beneficial to develop reading and comprehension. Three more groups thought that they used this strategy when they find text as difficult to comprehend. They

presume the content of the passages and to link with their thoughts. Interestingly two of the groups stated that they used this strategy when they read the passages and practice on reading activities. They brainstorm the text before reading and tried to grasp the information bit by bit for the growth of their comprehension. These groups observed:

"We start reading directly....and we never waste our time in thinking and image making of the text. Sometimes...we used thinking about text when we find difficult text in the article.....but thinking is important...." [Group Two]

"...we find information through guesstimating of the text, then slowly and gradually continue reading.....it is very hard for predicting and linking text with our thoughts and forming its meaning through our images of the text. Reading passages by following images in our mind about text is necessary to understand the meaning of the text". [Group One]

"Firstly....students should read text without making imagery of the text. Second...we should not make images by thinking and brainstorming to save our time....because we cannot interlink text with thoughts in mind..." [Group Three]

Conversely, three of these groups believed that this strategy is very essential to make mental images for the titles and subtitles and can form imagery of the material from that of titles before reading. Three of the groups stated that mental images can help students to guess what is going on in class activities. Three of them reported:

"We believe that this strategy [thinking] is very essential to make mental images for the titles and subtitles....so we form imagery of the material in the passage and involve our thoughts and our brainstorms...." [Group Five]

"....the images making through thinking can connect mental links of the text with that of personal thoughts. This strategy can help readers to understand written text...and to develop reading." [Group Six]

Interestingly, two of these groups informed that they make use of this strategy regularly and believed that this strategy lead them to comprehend the meaning of text easily. These groups stated that they often linked texts with that of their mental thoughts to evaluate their understandings of the text. These two groups noted:

"Firstly...reader should find headings and sub headings of the text to apprehend its meaning completely. Secondly....they should go through the world of imagination

about the text for better comprehension in depth. Finally...we can interlink our thoughts with our reading to reach exact meaning of the texts..." [Group Seven]

"When we read...we try to imagine about all the key information used and connect our thoughts....and imagination with that of text. We think this strategy [thinking] would help us to understand the text in a better way...and students can perform independently...." [Group Eight]

Selecting the main ideas

The second item of the level-two theme is selecting main ideas of the text. Most groups reported that they selected the main ideas from the text. These groups gave great importance to this strategy. They believed that the main ideas help them to comprehend the important concepts in the text as they read the text. They practice a lot on this activity by finding out the main details of the text. Three of the groups informed that searching the main ideas of a passage seemed very important in reading to enable them to comprehend the key details of the text easily and quickly. This strategy had developed their reading proficiency and had paved a way for them to practice a lot with complete comprehension of the passages. Conversely, three of the groups informed that they do not know how to find and where to find the main idea in the passage of the article. Additionally, they had little practice and knowledge in searching out the key details or main ideas within the text. This strategy seemed very difficult for them to follow. Some of the examples are given here:

"....selecting main ideas are the important strategy for students to understand passages of the article. We should find the main ideas either in the first sentence or in the last sentences of a paragraph in the text....finding main ideas can develop our level of comprehension of the text....." [Group Three]

"To us...this strategy is very essential to follow....so, we depend on reading the text again and again to comprehend it with the help of main ideas and supporting details. Selecting the main ideas can clarify about text and showed the involvement of readers...." [Group Two]

"....students should focus on reading passages again and again till they find the main ideas in the text. This strategy would make us clear in understanding the meaning of a text...." [Group One]

Importantly, three of these groups stated that they did not pay attention to select main ideas in the text. For them, this strategy took a lot of their time in finding out the main ideas. Three of these groups observed:

"We do not pay attention....to select the main ideas in the text. We think...this strategy took a lot of time in finding out the main ideas. We have little knowledge and very little practice on selecting key ideas...." [Group Four]

"Students should read text slowly and gradually for comprehension purposes....and they should underline the main ideas to support their level of understanding. We believe the main idea as significant to cognize the article...." [Group Six]

"...yes...selecting the main idea is very important for understanding the text. Weak students do not select the main ideas from the text as they do not know how to find and where to find and what to select....this is because of their little practice on reading...." [Group Five]

Most interestingly, two of these groups stated that they believed the main ideas can help them to comprehend the important concepts of the text. If they would read the text a lot, they would practice much to find out the main details of the text. These groups noted:

"While reading...we focus on the key concepts in the texts and try to find the main themes of all passages in the text. We think...the main ideas indicate what the passages is about....and helps us to understand the meaning of the text in reading tasks...." [Group Eight]

".....while reading...we see the different traits and features of the text...and find the main theme either in the first sentence or in the last sentence. We think...without looking main details is just like wasting of time. This strategy is beneficial for developing comprehension...." [Group Seven]

Selecting topic sentences

The third item of the level-two theme is selecting the topic sentences from the text in which some of the groups reported that they try to read the first sentence of each passage in terms of determining the topic sentences. They just went to pick up the most important information of the article through reading the whole text. Moreover, these respondents indicated that their teachers taught them to look at the first sentence of a paragraph because the topic sentence can easily be obtained from the very first sentence of each paragraph. Most of these groups informed that some time they fail to find the topic sentences because of lack of knowledge and poor practice of reading text. So, when they could not determine the topic sentence in the passage, they continued reading again and again and tried to understand the passages. These groups noted:

“...the first sentence in each paragraph has topic sentence...this first sentences tell us the main concept of the article. Students who have lot of reading practice can easily identify...and those who do not practice on reading activities...cannot identify topic sentences and would face difficulties in perception of the meaning of the text....” [Group Two]

“...the topic sentence is important for understanding the context of text...this [topic sentence] guides us to develop our thoughts. We should practice on reading as we should know what the topic sentence is....and how to select topic sentence from paragraph.” [Group Three]

“...whenever, we find topic sentences...we get the main idea of the text that helps us to understand the text properly. So, we read the main sentence with great importance in order to find the meaning of the text....” [Group One]

Similarly, three of the groups reported that they used to find topic sentence in the first attempt in order to comprehend the meaning of the sentences. Sometimes, they fail to find topic sentences and continue reading practice until they become successful in finding key concepts of the text. These groups considered this strategy as the most beneficial for quick understanding of the text. These groups stated:

“We should search topic sentence before starting our reading. Our teachers have guided us that the topic sentence remains hidden in the first sentence....the topic sentence helps us to understand the text quickly....” [Group Four]

“...as we know that the topic sentence is the most beneficial for speed in reading....this strategy [topic sentence] makes quick understanding of the text. We know....our teachers guided that topic sentences remain in the first sentences of the paragraphs....” [Group Five]

Interestingly, two of these groups informed that they looked for the main sentences in the very first attempt. If they fail to search the main sentences in the beginning of the passage then they find either in the mid or in the last of the text. These groups described:

“We know...the topic sentence is given in beginning of each paragraph of the article. It [the topic sentence] is the most essential sentence within the passage of the article. The topic sentence helps us to know what would lay hidden in the sentence....it [the topic sentence] increase our comprehension and tells us about supporting details....” [Group Eight]

".....while reading a paragraph....we should find the topic sentences....because the main sentence is very important and it remains hidden in the first sentence. The topic sentence informs us about the complete detail of the text." [Group Seven]

Text scanning

In this fourth item of level-two, most of the groups informed that scanning is very important strategy for reading and comprehension. These groups reported that soon after scanning text, they start reading to obtain the central ideas of the text. This strategy helped them to increase their interest in reading. These groups commented:

"....we read to know the main aim of a paragraph and what kind of information is discussed in the text....then we scan the text for key information..." [Group Three]
"We used to scan paragraph wise to evaluate...what does it inform about....and what purpose it would serve? Afterwards, we continue reading passages slowly and gradually to obtain complete meaning of the text. If we do not understand...we do read again and again the written text." [Group One]

"Scanning helps readers to know the main purpose of the article and get the first-hand knowledge of the text....scanning strategy makes students aware of the most important knowledge in the passage. If they fail to get the key information of the text...they continue reading till they understand...." [Group Two]

Similarly, two of the groups reported that they used their background knowledge in predicting the headings of the text. These two groups noted:

"Before start reading in detail...scanning strategy should be used to get overview of all passages. They should underline difficult words or unfamiliar phrases...this strategy would help readers to increase their reading speed with quick information...." [Group Seven]

"...before reading article in detail.....we use scanning strategy to find important words or sentences. One important point is that.....we scan text to find supporting detail and headings or titles within the passages. Hmm...we know that every first sentence of the passage tells clearly about the main titles. So...we focus on the text to find information which we need...." [Group Eight]

Summarizing of the texts

Text summarizing is the fifth item of level-two in metacognitive strategies. Most of the groups indicated that they summarized the text after completion of reading activity. Three of these groups stated that text summarizing is very

beneficial strategy that enables them to practice more independently. These groups said:

"After the end of reading passages....we should summarize the text. We mostly review paragraphs for obtaining enough information...in terms of difficult sentences and unfamiliar words in the text...." [Group Three]

"...we can summarize the text after reading comprehension tasks complete....as we find difficult terms, problematic sentences, and confused parts of the text. If sometimes...we firstly reread the text three times....then would summarize the passages to develop our knowledge for understanding." [Group One]

"...summarizing is very beneficial strategy. This strategy can enable us to practice more independently on the text. This strategy can help us to groom our reading proficiency...." [Group Two]

Further, two of these groups indicated that they always used this strategy after reading to verify their proficiency. Two of these groups indicated:

"...we first read....then scan the whole concept....and select important ideas of the text. After the end of third time reading....we summarize the paragraph...." [Group Five]

"We summarize the main points of the passage. If we do not understand something in the text....we reread to know the exact meaning of the texts...." [Group Seven]

Questioning

Questioning strategy in level-two of metacognitive strategies is the sixth item. Most of the groups reported that they used this strategy to ask questions to develop their reading and to find answers in terms of the texts. These groups stated that they used this strategy at the difficult parts of the texts to enhance their understanding of the text. These groups noted:

".....self-questioning strategy is beneficial....and we should ask different self-questions in beginning, during, and after reading comprehension activity. We also use self-questions to clarify the text when we found the passages with difficult language...." [Group Two]

"...we ask questions either in the beginning or after the end of my reading to confirm my understandings of the texts. Self-questioning strategy makes my reading very easy to know the meaning of the text..." [Group One]

“...we did not use this strategy [self-questioning]...when the text in reading tasks is simple. We use self-questions at the difficult parts of the texts to make our understanding clear to practice...” [Group Four]

Interestingly, two of these groups reported that this strategy can help them to understand the text easily and draws their attention towards paragraphs. These groups avoided all confused parts of the texts. Two of these groups stated:

“...we should use self-questioning strategy in pre reading, during reading, and after reading. Before starting to read...we should ask various questions about the problems discussed in the text. During reading activity...we should question to confirm our hypotheses. After reading...we should ask to verify our proficiency level...” [Group Six]

“...self-questioning strategy is important for us to know the answers of the problems in the text. We use questions to analyses our learning progress in classroom activities...” [Group Eight]

Conclusion

The main aim of this study was to investigate the use of metacognitive strategies by first year engineering students in classroom reading practice. Flavell's (1979, 1981, 1987 & 2004) theory was followed by many researchers who then divided metacognition into three way aspects that include planning, monitoring and evaluating. Similarly, Salataci and Akyel (2002) proposed that metacognitive strategies consist of thinking around what students ensure when they have to read, to check the result of problem solving methods, to plan how to practice with effective strategies, to control the value of an action plan, to test, to revise, and to evaluate strategies. Theoretical gaps for this research were based on metacognition theory of Flavell's (1979, 1981, 1987, & 2004). This theory suggested that the implementation of metacognitive practices support often for developing comprehension proficiency of students. The researchers of the study followed Flavell's theory of metacognition and in results, theoretical contribution in line of metacognition strategies including planning, monitoring, and evaluating were contributed to develop comprehension of engineering students in Pakistan.

The data of this study generated thinking through images of the texts, selecting the main ideas, selecting the topic sentences, scanning of the texts, summarizing of the texts, and questioning strategy to develop reading proficiency of students and their comprehension performance. The past studies suggested knowing the perception of students in line of planning, monitoring, and evaluating as the metacognitive strategies. The results of the present study indicated that the

students used thinking through images of the text and questioning strategies as their planning; applied strategies including selecting the main ideas, selecting the topic sentences, and scanning of the texts as the evaluating; and practiced through summarizing of the texts as their evaluating strategy. Although less than half of the groups showed slightly lower interest in using strategies while practicing on reading comprehension as they had little metacognitive knowledge.

The findings of this study reported that metacognitive strategies including many among thinking, text scanning, text summarizing, and self-questioning strategy were considered as the most essential for effective comprehension and learning how to read with complete meaning of the texts. To conclude, the findings of this study significantly validated the studies of (Franco-Castillo, 2013; Salataci & Akyel, 2002; Shah, et al. 2010) that investigated multiple strategies for students to plan, monitor, and evaluate their comprehension performances and ability to handle written texts. In short, this study has provided the substantiations that engineering students can develop their reading comprehension ability through metacognitive strategies.

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