FOSTERING CRITICAL THINKING SKILLS IN ESL READING COMPREHENSION THROUGH SOLO QUESTIONS

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Abstract- Malaysian students lacked the necessary skills to analyze reading texts to attain deep understanding as they became accustomed to recalling and recognizing skills only. Thus, the goal of this research is to examine the feasibility of SOLO (Structured of Observed Learning Outcomes) Taxonomy as the framework for designing questions that could foster higher order thinking skills in English as Second Language (ESL) reading comprehension. The methods comprised of pretests and posttests and concept maps. The results recorded students' improved performance in utilizing the reading comprehension strategies that demonstrated their abilities to think more critically. It was also discovered that the students needed more support to progress from multistructural level of thinking to relational level as they were inclined to remain consistent than reaching closure in providing their responses to SOLO questions. Thus, the major implication of this study is the need to maximize multistructural level by getting students to familiarize themselves with the process of generating ideas and exploring them. It was implied that lower level thinking responses might serve as early positive signs of critical thinking skills.

Key Words- SOLO, Unistructural, Multistructural, Relational, Extended Abstract, ESL

I. INTRODUCTION

Hiew (2012) claimed that secondary school students in Sabah, Malaysia, still struggled in English language reading comprehension. This problem is more severe in the rural area as the students in the area had the most difficulty in gaining improvement in reading skills. They also displayed limited ability in critical thinking skills. Fah (2010) studied the level of thinking skills of Form 4 students from 18 classes randomly selected from nine secondary school in the four districts of the interior division of Sabah (Keningau, Nabawan, Tenom and Tambunan) and found that majority of the students had lower ability of thinking skills. It can be deduced that students in Sabah especially those in the rural area lack the skills needed to critically read and understand English language reading texts. This study focused specifically on students of Keningau Vocational College located in Keningau who also experienced show similar difficulties in demonstrating critical thinking skills to attain deeper understanding of what they read. Acknowledging the disadvantages that the students might be facing on various factors like lack of infrastructure, limited exposure to outside world, little access to resources, low socioeconomic backgrounds and geographical barriers since the school is located in the rural area of the most isolated and least developed state of Malaysia, this study focused on the most frequent yet underrated tool used by teachers in every classroom and that is questions. Question is the most common tool that teachers use in class to elicit responses and stimulate interaction. Black, Harrison, Lee, Marshall, & Wiliam (2003) highlighted the role of questioning technique as a pedagogical tool not just to get students to demonstrate their understanding but also to deepen their understanding. Sardareh, Mohd Saad, Othman, and Che Me (2014) pointed out that Malaysian school teachers have not mastered effective questioning techniques. Malaysian English language teachers tend to utilize only lower order questions and this was attributed to their lack of skills in using questions that were more challenging. Hence, this study focused one examining the potential use of questions which were designed and structured according to SOLO (Structured of Observed Learning Outcomes) taxonomy in enhancing students' critical reading skills in English language lessons. Malaysian teachers use questions frequently in their class but the most pivotal question that we would like to address is "are we asking the right question to get our students into the right learning?"

II. SOLO TAXONOMY

SOLO taxonomy is a model which describes level of increasing complexity in a student's understanding of a subject which consists of five stages, and it can be applied in any subject (Biggs & Tang, 2009). The taxonomy consists of five major levels: pre-structural, unistructural, multistructural, relational and extended abstract (Potter & Kustra, 2012).

Table 1: Levels of SOLO Taxonomy

1st Level	2nd Level	3rd Level	4th Level	5th Level
Pre-structural	Unistructural	Multistructural	Relational	Extended Abstract
Students do not understand the particular topic, problem or issue and there is no organization of information and no understanding of these alienated pieces of information.	Students learn one relevant aspect of the whole by focusing on one single aspect with little clarity, meaning and connection.	Students learn about several relevant yet independent aspects of the whole without making significant connections and adequate organization of information.	Students learn to integrate several different aspects into a structure by making significant connections where understanding and application of the ideas have been attained.	Students can generalize what they learn into a new area of knowledge such as predicting and creating. They can apply knowledge in other contexts learned beyond the original context.

Questioning is considered as one of the essential instructional practices. It is stated that if teachers can design and utilize questions well, students will be more engaged in higher-level learning. However, the majority of teachers ask lower order thinking questions which only require recall and facts (Airasian, 1991). If teachers implement teacher-directed higher order thinking questioning methods based on the basic understanding, the learning can be better enhanced (Black, Harrison, Lee, Marshall, & Wiliam, 2003). SOLO taxonomy offers a systematic and sequential way for teachers to construct questions based on SOLO levels that can help the students to develop their thinking skills as they respond to each of the question systematically and hierarchically (Hattie & Brown, 2004; Brabrand & Dahl, 2009). As students respond to these four steps of questions built upon a specific content knowledge that links all of the questions, they proceed from surface understanding to deeper understanding (Potter & Kustra, 2004).

Unlike how the other taxonomies promote understanding and thinking skills, SOLO taxonomy focuses on the development of surface understanding to deep understanding which emphasizes the continuum of complexity of ideas across the hierarchy of its levels of understanding. Thus, the acquisition and development of understanding has to be consistent, interrelated, organized, and it is progressive from concreteness to abstraction with increasing cognitive capacity of students (Potter & Kustra, 2012). As implied by Potter and Kustra (2012), Bloom's taxonomy, Marzano's taxonomy and Fink's taxonomy do not demonstrate solid and clear hierarchy of interrelated and consistent levels in their models and it lacks central focus of what actual concept is being taught. On the other hand, SOLO taxonomy provides a clear and linear progression of understanding and content knowledge remains as the central focus of learning. This enables teachers to design questions that initially start with recognizing a single idea and gradually and systematically challenge students to gather more information, explore possibilities, establish meaningful connections and eventually move beyond the given context. Hattie and Brown (2004) illustrated an ideal example of a set of four open-question which were designed according to SOLO levels. These SOLO questions were based on the short story "Goldilocks and the Three Bears":

The First Question: "Whose house did Goldilocks go into?"

This question is classified as unistructural. This is a basic task that involves lower level skills such as recalling and recognizing.

The Second Question: "What are three aspects about the way the bears live that tell us that the story is not a real life situation?"

This is a multistructural question that requires listing of several factors that portray anthropomorphisation of animals in the story where the bears show human traits.

The Third Question: "Goldilocks eats the baby bear's food, breaks his chair, and sleeps in his bed. What does this tell us about the kind of person she is"?

The next question is categorized as relational. It demands the identification of meaningful connection in the given information.

The Fourth Question: "Why do nursery tales allow wild animals to act in human fashion?"

The extended abstract question demands skills to identify a pattern across a wider context that is not given in the Goldilocks story itself. The answer needs to extend beyond the basic ideas to include other tales other than the given one.

These four questions were designed in a way that the next question was built upon the previous one as it familiarized students with the basic information before challenging them to analyze and evaluate it further. The questions can be designed according to learning verbs in each level (Potter & Kustra, 2012).

Table 2: Learning Verbs of SOLO Levels

Unistructural	Multistructural	Relational	Extended Abstract
paraphrase, define, identify, count, name, recite, follow simple instructions, calculate, reproduce, arrange, recognize, find, note, seek, sketch, and pick.	combine, classify, structure, describe, enumerate, list, do algorithm, apply method, account for, execute, formulate, solve, conduct, prove, complete, illustrate, express, and characterize.	analyze, compare, contrast, integrate, relate, explain causes, apply theory (to its domain), argue, implement, plan, summarize, construct, design, interpret (some senses), structure, conclude, substantiate, exemplify, derive, and adapt	theorize, generalize, hypothesize, predict, judge, transfer theory (to new domain), assess, evaluate, interpret (some senses), critically reflect, predict, criticize, and reason.

III. PROBLEM STATEMENT

The Form 4 students in Keningau Vocational school were unable to demonstrate adequate critical thinking skills as indicated by their weak academic performance including poor critical reading

comprehension skills. The analysis of meeting minutes from the teachers in English language unit showed that the students had problems with writing, speaking and reading. Reading was of great concern as students were mostly inclined to apply only lower order thinking skills in ESL reading and tasks which were related to reading. These Form 4 students' understanding of texts was usually limited to literal comprehension such as meaning of words and sentences. Their strategies in ESL reading were also confined to lower order thinking skills. This might be the results of lower order thinking questions which complemented reading passages in most exercise materials, textbooks, and exams. These questions did not encourage students to think critically as the questions only required them to perform basic skills of recognizing, matching and selecting. In addition, these students had poor techniques in responding to open-ended questions related to ESL reading tasks where they merely transferred information from a reading text to answer reading comprehension task verbatim. This technique is known as "copy and paste" among the teachers and the students in the school and across Malaysia. Thus, this study examined the feasibility of SOLO questions in enhancing students' critical reading strategies by focusing on four reading strategies: inferring, predicting, making connection and questioning.

3.0 Research Questions

1. Was there any significant difference in students' performance on the four reading comprehension strategies in ESL reading test as a result of the ESL reading comprehension questions which were developed based on SOLO levels?
2. How did the students develop and demonstrate their level of understanding of the reading texts in response to the SOLO questions in the ESL reading comprehension tasks?

IV. METHODOLOGY

The sample for this study involved two intact classes of 15 ESL students in each class. One of the classes was the experimental group while the other was the control group. The students involved in this study were Form Four students studying English as a Second Language (ESL) in public vocational school located in Sabah, Malaysia. The subjects were selected based on purposive sampling. Purposive sampling is a sampling technique that is known as non-probability and selective as the research determines the small sample according to their judgement.

The main justification of using purposive sampling is to narrow the research on a population that shares similar characteristics in order to answer the specific research questions (Fraenkel et al., 2012). This subjects for this research were selected because of their similarities in terms of backgrounds, location of school, English language proficiency, age, native language, nature of their study and past experience.

The data for this study was collected using pre and post-tests and concept mapping. The students' written responses were reconstructed as concept map in order to examine the progress of their understanding according to SOLO levels. Concept maps are visual organization and representation of knowledge that can illustrate the relationship between various ideas (Novak, 1991). Concepts maps consists of concepts (normally in circles) which are linked with arrows known as proposition. (Quinn, Mintzes, & Laws, 2004). The report of the test-retest reliability for the tests showed that the correlation coefficient for the pre-test was 0.706 and the post-test was 0.930. Thus, both the pre-test and post-test were considered reliable. A panel of experts who were well-versed in research methodology and the topic that was studied validated the concept maps by making sure the interpretation and analysis were done properly. (Seliger & Shohamy, 2009).

The treatment encompassed eight sessions of treatment conducted separately in eight weeks. In each week, students were given a reading comprehension task in which the questions and activities were based on SOLO levels that they needed to answer. The control group were given the same set of texts and they were required to answer questions which were conventionally used to familiarize students with these reading strategies. The study was conducted in 11 weeks on the experimental and control groups. The intervention encompassed four main treatments and each treatment focused on one reading strategy: making connection, questioning, inferring or predicting. This study utilized SOLO taxonomy to construct questions according to SOLO level in a specifically designed sequence of (Unistructural + Multistructural) – (Unistructural + Multistructural + Relational) – (Unistructural + Multistructual + Relational + Extended Abstract) for each reading strategy. Each set of reading comprehension questions were designed according to the hierarchical levels of SOLO taxonomy and its learning verbs. In this study, the learning verbs were preselected and structured in a hierarchical manner to meet specific reading strategy. Table 3 indicated the learning verbs in each SOLO level for every reading strategy.

Table 3: Learning verbs in each SOLO level for every reading strategy

Unistructural	Multistructural	Relational	Extended abstract	Reading Strategies
Identify	Describe	Classify	Generalize	Connect
Arrange	Characterize	Compare and contrast	Reflect	Question

Name	Define	Sequence	Hypothesize	Inference
Identify	Define	Cause-effect relationship	Predict	Predict

V. FINDINGS & DISCUSSIONS

The results from the test were used to address the first question in determining any significant difference in the students' performance in the test administered before and after the intervention. The students' written responses to the reading comprehension questions were transferred to concept maps in order to analyze how the students' processed the information and displayed their ideas. This was used to answer the second research questions.

5.1 Performance in Test

Paired-samples t-test was used to analyze means of the pre-test and post-test scores of each of the group and unpaired samples t-test was used to compare the gain scores of the two groups (Seliger & Shohamy, 2009).

Table 1: Paired Samples T-test

Group	Paired Difference					T	df	Sig (2-tailed)
	Mean	Std. Deviation	Std. Error mean	95% confidence interval of difference				
				Lower	Upper			
Control	-0.57	1.22	0.309	-0.24	1.10	1.3849	13	0.1894
Experimental	3.21	2.22	0.817	-4.27	-0.73	3.0598	13	0.0091

The P value for the experimental group was lower than 0.05 (0.0091). The difference in means of scores is considered to be very statistically significant between the experimental group (M =4.2, SD = 2.22) and control group (M = - 0.57, SD = 1.22) on the pre-test and the post-test is considered to very statistically significant. This indicated the increase in the students' test scores was significant. However, the P value for the control group was higher than 0.05 (p = 0.1894) and this means that there was no significant difference in means of scores in pre-test and post-test of the group.

This was followed by independent samples t-test in order to compare the performance of the control group and the experimental group.

Table 2: Independent Samples T-test

Group	Mean	Std. Deviation	T	Df	Sig. (2-tailed)
Control	-0.57	1.22	5.5795	26	0.0001
Experimental	3.21	2.22			

The P value was less than 0.05 (P = 0.0001). This denotes that the difference in means of gain scores between control group and experimental group is considered to be statistically significant. There was a large margin between gain scores recorded by the experimental group (M = 3.21, SD = 2.22) in comparison with the control group that obtained negative means of gain scores (M = -0.57, SD = 1.22) conditions; t (26) = 5.58, p = 0.0001. This indicates that the experimental group had performed better than the control group and showed more improvement. Based on the findings of the paired and unpaired sample t-tests of the students' performance in each of the four reading strategies, the experiment group generally made significant improvement over the control group. This was evident from the significant difference in the means of gain scores by the experimental group (M = 3.1, SD = 2.22) and the control group (M = -0.57, SD = 1.22), conditions; t (26) = 5.58, p = 0.0001. There was a large margin between the two and means of gain scores attained by the control group was negative. The control group seemed to experience slight decline in their performance in the post test. This suggests that the integration of SOLO taxonomy into ESL reading enhances students' ability to think critically and displayed deeper understanding in their responses in the test. The use of SOLO taxonomy in the reading intervention had varying influences on the students' application of each reading strategy: prediction, inference, making connection and questioning.

5.2 Concept Maps

The written answers of 15 students were selected and turned into concepts maps (Seliger & Shohamy, 2009). In the final task for every reading comprehension strategy, the students had to answer four questions in which each was designed according to one of the four SOLO levels. The visual representation of their thoughts were analysed according to SOLO levels, learning verbs of SOLO taxonomy and its cognitive complexity. The answers and the concept maps were reviewed by two panels consisted of two teachers teaching in two schools that have been practising SOLO taxonomy in Australia

and New Zealand respectively. They interpreted and evaluated the responses based on the four complexity of SOLO taxonomy (Structure, Relationship, Consistency vs Closure, Capacity) as well as SOLO levels (Unistructural, Multistrucutral, Relational, Extended Abstract). When responding to the questions, the students had to decide either to remain consistent in their responses or choose to conclude their answers by having a closure. Consistency might indicate low level of understanding as students simply regurgitate facts from the text and formulate less or no opinion of their own. Closure signifies higher order thinking skills as students attempt to conclude their responses by formulating closure based on their own ideas related to the text (Potter & Kustra, 2012). Biggs and Tang (2009) described how more information is utilized to ensure consistency while less of it is needed if closure is the goal.

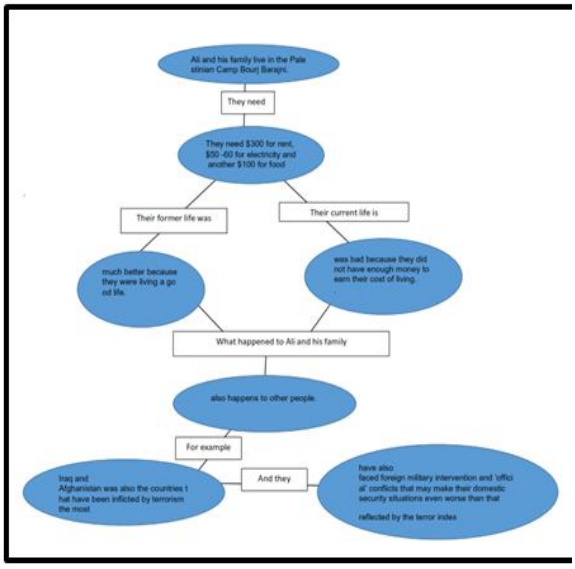

Figure 1: Concept map on inference strategy

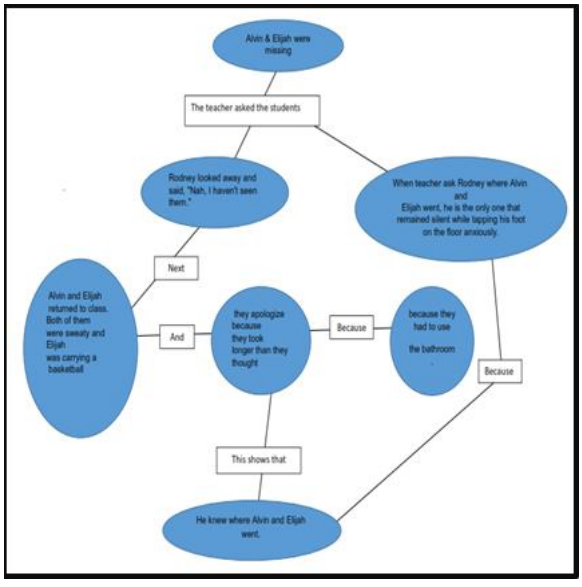

Figure 2: Concept map on prediction strategy

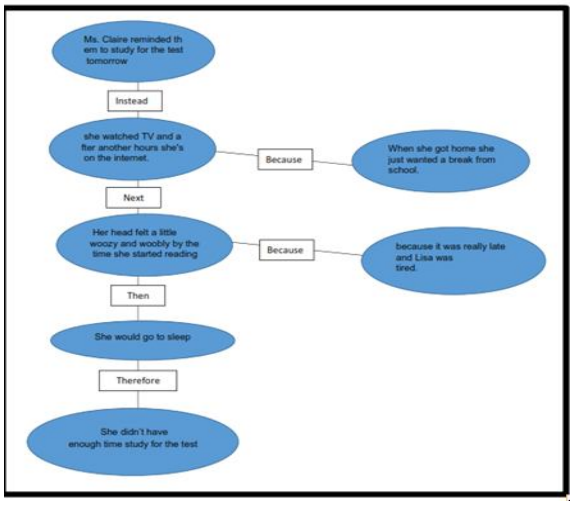

Figure 3: Concept map on making connection strategy

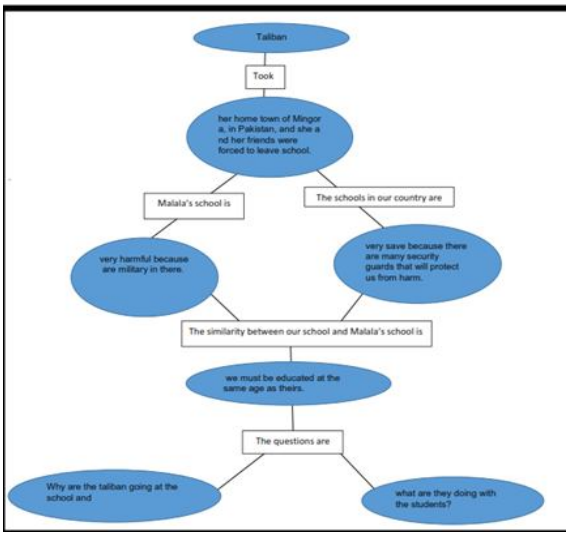

Figure 4: Concept map on questioning strategy

5.3 Consistency VS Closure

Based on the analysis of the concept maps, the students seemed to remain consistent in making predictions and inferences. When the students had to make predictions or inferences, they used a lot of information from the text in their answers. They sequenced the information and cited additional information from the text as evidence to their answers including the final stage of the task where they formulated their prediction or inference. Ankrum and Bean (2015) described that students display low level of engagement in reading when they feel that they possess less autonomy on how they would like to approach the reading comprehension questions. In making predictions and inferences, the students had to recall previous information that they encountered. This might have unintentionally discouraged them from exploring other ideas and alternatives. On the contrary, they made attempts to reach closure in questioning the text and making connection to it. As a result, they managed to construct questions related to

the text or cite specific real-life examples pertinent to it. However, it remained vague as to how why they came up with the ideas since they did not attempt to show how the information they took from the text led to that idea. HookED (2014) argued that such answer is risky since students might need to work on the explanation by going back to their earlier point to back up their conclusion instead of building up explanation that deliberately leads to the conclusion in a linear and logical manner.

The students struggled to find balance between consistency and closure and they normally choose consistency over closure as it was an easier and safer choice. They were more inclined to repeat the information from the text in their responses in order to prevent incorrect answers. This deterred them from reaching closure in their responses. Based on the analysis of the students' performance in answering the SOLO questions, the students' background knowledge influences their preference of either to remain consistent or seek closure in responding to SOLO questions. It is highly possible that the more they are able to link what they read with what they know, the likelier it is for them to choose closure over consistency. If they can barely make any connection between the text and their background knowledge, they may choose to remain consistent by merely utilizing information from the text at the expense of their own critically conceived ideas. In order for them to make progress in their critical reading skills, they need to take risk by reaching for closure without the fear for inconsistency. They will only be able to reach extended abstract level of thinking if they strive for closure.

5.4 Maximizing Multistructural Level

The findings indicated that it is essential to familiarize students with strategies that help them to expand their thinking processes and explore more ideas, possibilities and alternatives so their responses would not be limited to texts only. The main reason why students normally choose to be consistent is because they have difficulties in putting the pieces of information together (Potter & Kustra, 2012). When they think they cannot integrate the information, they resort to utilizing more information from the text instead of producing meaningful ideas of their own based on the information they acquire.

The discoveries made in this study would have a major implication on the design of questions in reading comprehension that there is a need to increase the number or complexity of multistructural questions. This study demonstrated the importance of giving more emphasis on multistructural level before the students are expected to progress to relational level. The study revealed how students were inclined to remain consistent by utilizing information that they could get from the text and tended to avoid any attempt of reaching closure. Consequently, it prevented them from reaching higher order thinking level as they were reluctant to explore any ideas that are not explicitly stated in the text verbatim. This implies that they first need to be comfortable and competent in identifying ideas from texts, generate multiple ideas and explore them in many ways with certain strategies so they can see numerous possibilities and perspectives of how the information and ideas are connected. Once they become familiar and comfortable with the process of generating ideas and exploring them, the learning process can move to the next level of learning, relational level, where they connect the ideas to create meaningful interpretation.

El Farra and Rashid (2013) recommended the use of concept mapping and graphic organizers at multistructural level. This is consistent with the tools proposed by Hook and Casse (2002) known as SOLO visual maps that reduce cognitive load when the students learn something new so they can process information better and attain clear outcomes. There are several sets of SOLO visuals maps recommended for each SOLO levels which encompasses define map, describe map, sequence map, classify map, compare and contrast map, explain map, analyze map, analogy map, generalize map, predict map and evaluate map. Thinking School International also recommended a set of thinking tools for schools in the UK and other countries to adopt and those tools include Thinking Maps, Six Thinking Hats, Q-Matrix, CoRT (Cognitive Research Trust), DATT (Directed Attention Thinking Tools) and KWL (What is a Thinking School, 2012). The visual maps enable students to demonstrate different processes of thinking (Hook & Casse, 2002). Q-Matrix aids students in forming different levels of questions so they seek to find answers for these (Wiederhold, 1993). Six Thinking Hats encourages students to look at different viewpoints of a particular topic or subject matter (De Bono, 2009). These tools can be used to get students to practice on production and exploration of ideas from multiple perspectives to prepare for the next level of understanding where they are expected to fully establish meaningful connection. Thus, it helps students from simply regurgitating information from the text as their answers and remain consistent but rather formulates ideas of their own to form closure in their responses.

5.5 Making Thinking Process Explicit

Thinking commonly occurs at a state considered as invisible and this can best represented when people are inclined to omit explaining thoughts behind a particular conclusion. This is referred to as missed thinking opportunities rather than poor thinking skills ((Perkins, Tishman, Ritchhart, Donis, & Andrade, 2000). This is coherent with the findings of this study which showed how almost all of the students reached the conclusion without providing reasonable explanation based on facts and ideas that they acquired at earlier level. SOLO taxonomy is a hierarchical interrelated levels of thinking that is built upon one piece of information that develops as more ideas and facts are generated and connected to

eventually reach the highest level of understanding. Hence, it is fundamental for the students to be aware of how they process information and connect ideas to demonstrate the depth of their understanding. Ritchhart, Church and Morrison (2011) argued that students are unable to reach deeper understanding not because they are not able to think critically but due to them not noticing the opportunity to think or their lack the attitude to take notice of such need. Hence, the combination of abilities and attitudes is pivotal in making thinking visible. They proposed visible thinking routines to help students to gain realization on how they think so they can also develop the attitude and alertness to take into account various possibilities and perspectives. There are several visible thinking routines like "See/Think/Wonder" and "Think/Puzzle/Explore" that build students' curiosity and sets a series of inquiry. Another routine "Color/Symbol/Image" takes a different approach to stimulate students' thinking by getting them to use visuals to represent their thoughts and imagination. One of the routines known as "Generate/Sort/Connect/Elaborate" seems to ideally represent the SOLO levels as the routine encourages students to generate ideas, sort the ideas according to how relevant they are, connect the ideas by looking at their commonalities and subsequently elaborate on these linked ideas with possible addition of more ideas. The use of these routines enable students to notice their own thinking process on how they build their ideas from the elemental information and connect them in a logical and meaningful way. This might help them provide solid explanation of they how they reach the closure or conclusion in their answers.

5.6 Integrating Inquiry-Based Learning

Since this study has established the importance of background knowledge and how access to information can aid students' understanding of text, the role of inquiry-based learning in developing students' critical reading skills based on SOLO taxonomy should be studied. The findings from the study showed how students might have difficulties reaching relational level if they do not have sufficient background knowledge. Hence, they need support, skills and resources in locating, accessing and evaluating information that they need to deepen their understanding as they acquire more relevant information that might not be available in the given text. Inquiry-based learning can complement SOLO Taxonomy and probably extend its application in reading comprehension so students can attain relational and ultimately, extended abstract level of thinking. Inquiry-based learning is a process of "investigation, exploration, search, quest, research, pursuit, and study" (Kuhlthau, Maniotes, & Caspari, 2015). The students do not just search for answers but continuously evaluate and revise their answers (McCready,2015).

CONCLUSION

Unlike the conventional practice where teachers expect students to move immediately from one level of thinking to the next one so they can quickly reach higher level of thinking. This study offers a different perspective on how the learning process should be approached by giving students more time to produce, practice and experiment with many ideas at lower level of thinking using a variety of tools and strategies. Instead of seeing lower order thinking responses as indicators of failure that teachers need to avoid, they should be treated as early and positive signs of thinking that should be maximized so teachers can properly nurture students' thinking abilities to reach higher level of understanding. Hence, teachers need to properly understand how SOLO levels can be effectively adopted and adapted into reading comprehension task in English language classes by designing questions that stimulate students' learning systematically and fosters their thinking skills in a way that helps them attain higher level of thinking abilities.

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