

**SOLO Taxonomy in a Visible Learning School:  
A Quasi-Experimental Design to Study the Effect of SOLO  
Taxonomy on Student Metacognitive Ability  
SOLO Taxonomy as a Framework of Designing  
Comprehension Strategies**

أثر التدريس بإستخدام تصنيف سولو في تنمية مهارات ماوراء المعرفة لدي  
الطلاب

by

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**Dissertation submitted in fulfilment  
of the requirements for the degree of  
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## **Abstract**

Perspectives on the components of effective literacy learning have moved far from reading alone; however, effective literacy instructions address students' growth through linguistic, cognitive, and text-specific processes (Conner et al., 2014). This study highlights the issue of how metacognitive thinking skills has become a strong foundation in literacy learning transformation where the goal is to prepare students to be able to function effectively in the real world as effective thinkers, problem-solvers and decision makers. However, there are several limitations to the implementation of metacognitive thinking skills in education that can hamper the effort of transforming the education. Therefore, this study seeks to identify a better approach in teaching thinking skills specifically in reading by exploring the feasibility of SOLO taxonomy as a questioning method which can facilitate students' development of metacognitive thinking skills in ESL reading.

In an American school in Sharjah, the central influence of this study is that it is the first to explicitly introduce a pioneering way consolidating the application of metacognitive thinking skills in the U.A.E schools. This study recommended the expansion of this approach to every school in the U.A.E where teachers and learners are obliged to focus on SOLO literacy instructions and recognize that learning has to occur at the surface, deep, and transfer levels (Fisher, Frey, & Hattie, 2016). This indicates the importance this study that seeks to identify a better approach in teaching thinking skills specifically in reading by exploring the feasibility of SOLO taxonomy as a questioning method which can facilitate students' development of metacognitive thinking skills in ESL reading.

## ARABIC ABSTRACT

### المخلص

لقد ابتعدت وجهات النظر حول مكونات التعلم الفعال للقراءة والكتابة عن القراءة وحدها ؛ ومع ذلك ، فإن تعليمات محو الأمية الفعالة ، (2014). تسلط هذه الدراسة الضوء على Conner et al. تتناول نمو الطلاب من خلال العمليات اللغوية والمعرفية والخاصة بالنص ) مسألة كيف أصبحت مهارات التفكير ما وراء المعرفي أساساً قوياً في تحول تعلم القراءة والكتابة حيث الهدف هو إعداد الطلاب ليكونوا قادرين على العمل بفعالية في العالم الحقيقي كمفكرين فعالين وحل المشكلات وصناع القرار. ومع ذلك ، هناك العديد من القيود على تنفيذ مهارات التفكير ما وراء المعرفي في التعليم والتي يمكن أن تعرقل جهود تحويل التعليم. لذلك ، تسعى هذه الدراسة إلى تحديد نهج أفضل في تدريس مهارات التفكير على وجه التحديد في القراءة من خلال استكشاف جدوى التصنيف الفردي كطريقة لطرح الأسئلة التي يمكن أن تسهل تنمية الطلاب لمهارات التفكير ما وراء المعرفي في قراءة اللغة الإنجليزية كلغة ثانية.

في مدرسة أمريكية في الشارقة ، يتمثل التأثير المركزي لهذه الدراسة في أنها أول من قدم صراحة طريقة رائدة لتعزيز تطبيق مهارات التفكير ما وراء المعرفي في مدارس الإمارات العربية المتحدة. أوصت هذه الدراسة بتوسيع هذا النهج ليشمل كل مدرسة في الإمارات العربية المتحدة حيث يلتزم المعلمون والمتعلمون بالتركيز على تعليمات محو الأمية المنفردة وإدراك أن التعلم يجب أن يحدث على المستويات السطحية والعميقة والانتقالية (فيشر ، فراي ، هاتي ، 2016). يشير هذا إلى أهمية هذه الدراسة التي تسعى إلى تحديد نهج أفضل في تدريس مهارات التفكير على وجه التحديد في القراءة من خلال استكشاف جدوى التصنيف الفردي كطريقة لطرح الأسئلة التي يمكن أن تسهل تطوير الطلاب لمهارات التفكير ما وراء المعرفي في قراءة اللغة الإنجليزية كلغة ثانية.

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## II. Definitions of Terms

Term	Definitions
<b>6<sup>th</sup> graders</b>	This refers to students in their first school year of middle school in the American schools, when a student's age is 11 - 12.
<b>Literacy Learning</b>	This term refers the ability to read and write. (Good, Dictionary of Education, p.25).
<b>SOLO Taxonomy</b>	The Structured Observed of Learning Outcomes (SOLO) classification or taxonomy describes a student’s understanding of a subject or topic in five levels of increasing complexity.
<b>Metacognitive Ability</b>	Metacognition has been defined as “one’s knowledge concerning one’s own cognitive processes or anything related to them” (Flavell, 1976, in Kaplan et al., 2013) and is commonly referred to as “thinking about one’s thinking”.
<b>NWEA</b>	NWEA stands for Northwest Evaluation Association. MAP stands for Measures of Academic Progress.
<b>Experimental Group</b>	This term refers to a group of students who received an intervention that helped them use extended thinking skills.
<b>Control Group</b>	This term refers to a group of students who did not receive any intervention.
<b>Comprehension</b>	This term refers to the construction of meaning using both the decoded language and prior knowledge. (Lunda, 1991).
<b>MAP tests</b>	MAP is an online assessment that is aligned to the Common Core standards (CCSS) commonly used in American schools.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 INTRODUCTION**

In 2018, an American school in Sharjah introduced a new curriculum which aims to empower students with critical and metacognitive thinking skills. According to a report by the National Council of Teachers of English (NCTE), the continuous decline in students' performance in international examinations including English subjects showed that the students' major weakness is in the area of reading. In 1996, Harp and Brewer stated clearly that the biggest frustration for both researchers and teachers lies in the student's inability to comprehend what they read. As a matter of fact, ESL students are unable to cope with these international exams which require readiness for grade-level reading (Ramirez & Ganaden, 2008). Students must navigate different texts in order to gain content knowledge specific to their grade level.

Among the four language skills, reading is essential in the development of higher order thinking skills. Critical reading is a requisite to attain critical thinking (Hudson, 2007). Reading is vital in activation of relevant knowledge and obtaining information which undertake a seminal role in complex cognitive process (Shang, 2010; Chamot, 2004). Developing critical thinking skills in reading are necessary for ESL and EFL learners to master, so they can apply the skills beyond the classroom (Levines, Ferenz & Reves, 2000). Hence, the study focuses on developing metacognitive skills in ESL reading in order to fully equip them with the necessary skills to progress in learning and apply these skills in the real world.

SOLO Taxonomy can play a pivotal role in addressing the issue of literacy learning. Having said that, literacy learning is essential to enhance the students' performance in different disciplines, but the English classroom is always viewed to be the primary platform for reading and writing instructions. Richard (2012) argued that SOLO taxonomy provides a feasible manner of how to evaluate students' progress from pre-structural competence to productive proficiency involving higher levels of SOLO taxonomy. This demonstrates the deep learning that students can attain as they reach higher levels of SOLO model. In particular, extend abstract level which is the final level in the taxonomy that leads to greater competence in applying and conceptualizing knowledge. It provides a fundamental foundation to the development of curriculum and classroom teaching designs for outcomes that are deep, relevant and applicable.

To date, SOLO Taxonomy has still not yet been comprehensively examined in the U.A.E. What we

know about SOLO teaching model is largely based on studies conducted in population of students from different countries. SOLO Taxonomy is usually used by teachers to construct learning outcomes, experiences and assessment of different levels that enable them to evaluate and regulate their teaching practice (Mahmood, Ali & Hussain, 2014). Thompson (2007) asserted that SOLO taxonomy provides a framework for assessing students' quality of responses and self-learning objectives that students should accomplish in order to be at particular levels of learning. Hook and Mills (2011) argued that the SOLO taxonomy systematically helps teachers and students to understand the learning process and learning outcomes.

A search of literature revealed few studies which showed that SOLO Taxonomy has been frequently used in assessments in order to assess students' quality of responses, set levels of questions and construct learning outcomes (Teaching and Educational Development Institute, 2015; Groth, 2003). In Asia, East Asia Learning Achievement Study, also known as EALAS was initiated as a result of the general interest among Asian countries and UNICEF to implement a joint regional activity on assessing learner achievement in the region. EALAS incorporated SOLO taxonomy in order to define a student's understanding of a subject at increasing levels of complexity. Pilot studies were carried out successfully in some selected schools in nine Asian countries: Mongolia, China, South Korea, Vietnam, Myanmar, Indonesia, the Philippines, Timor-Leste and the Pacific (UNICEF, 2007). In the province of Punjab of Pakistan, a new examination system which is based on SOLO taxonomy was introduced in 2005 to precisely set the quality of examination system and this requires teachers to have sufficient awareness of SOLO taxonomy in order to integrate the taxonomy into their teaching methods and assessment (Mahmood, Ali & Hussain, 2014). Moreover, some New Zealand schools have integrated SOLO taxonomy in their curricula and pedagogies in order to encourage students to be critical thinkers and discover knowledge (Hook & Mills, 2012).

## **1.2 BACKGROUND OF THE STUDY**

Structure of the Observed Learning Outcome (SOLO) Taxonomy is a model of learning. The model represents the ascending structure of complexity of learning outcomes as: pre-structural, unistructural, multistructural, relational and extended abstract. At pre-structural level, students do not understand the particular topic, problem or issue and there is no enough understanding of these alienated pieces of information. At unistructural level, students learn one relevant aspect of the whole by focusing on one single aspect with little clarity, meaning, and connection. At multistructural level, students learn about

several relevant yet independent aspects of the whole without making significant connections and adequate organization of information. At relational level, students learn to integrate several different aspects into a structure by making significant connections where understanding and application of the ideas have been attained. At extended abstract, 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 (Potter & Kustra, 2012).

SOLO taxonomy can facilitate students' learning by equipping them with awareness of how they should progress towards deep understanding and higher order thinking skills based on the SOLO levels of thinking skills ((Brandbrand & Dahl, 2009). SOLO levels assist students to acquire metacognitive strategies and techniques such as checking the complexity of their responses based on SOLO levels and asking questions which are developed based on SOLO levels to guide their thinking process (Hattie & Brown, 2004; Hook & Mills, 2011; Potter & Kustra, 2012; Mead, 2012). Therefore, SOLO taxonomy can serve as a pedagogical model for teachers to teach students to develop their thinking systematically and strategically. Subsequently, these might have a positive implication in developing their critical thinking skills in reading. Therefore, it is the aim of this study to examine the feasibility of SOLO taxonomy as a questioning method that can help students to develop critical thinking skills in an orderly, organized and hierarchical manner.

### **1.3 STATEMENT OF RESEARCH PROBLEM**

Previous studies have failed to show a connection between the qualitative increase in students' understanding and the quantitative change in linking new ideas when moving from one level to the other. Chan, Tsui, Chan and Hong (2002) studied the use of SOLO taxonomy by teachers of Hong Kong Polytechnic to assess and grade students' assignments in ESL subject. The results of interviewing the teachers show that there was positive feedback on its application with slight need for improvements. Solomon (2004) studied the effects of instruction on ESL students' writing in a higher learning institution in the Philippines using SOLO taxonomy, and it revealed the students' lack of skills in critical reading and poor reading comprehension. Maria and Ahlin (2014) investigated the role of SOLO levels in students' ability to comprehend their level of competence in ESL writing. The findings showed that students who did not understand lower level of SOLO taxonomy were not able to identify the gap in their understanding and constantly relied on teachers for feedback. Students need to be able to distinguish lower and higher levels of SOLO in order to identify their current levels and how to progress from that level

onto the next one. These studies indicate that role of SOLO taxonomy in ESL learning has been studied but the focus was limited and SOLO taxonomy was only used in assessment and feedback. Thus, this study aims to explore the role of SOLO taxonomy in literacy learning to facilitate students' development of thinking skills to go beyond basic comprehension to higher order thinking. In addition, the aim of this study is to investigate if there is any statistical relation between teaching literacy skills using SOLO Taxonomy and students' reading comprehension.

## **1.4 RESEARCH OBJECTIVES**

Admitting the seminal contribution of Biggs and Collis (1982) to SOLO model, this study was to identify the practicality of SOLO Taxonomy as a model in designing ESL reading comprehension activities. In essence, this paper endeavours to assess the feasibility of using SOLO model to increase students' reasoning ability to give a constructive feedback about their learning. The research seeks to address the following questions:

## **1.5 RESEARCH QUESTION**

1. Is there any significant influence on students' performance in reading tests as a result of using SOLO taxonomy as the framework for effective and reliable design of comprehension strategies?
2. What are the students' beliefs about SOLO reading comprehension strategies in developing their metacognitive ability?

## **1.6 SIGNIFICANCE OF THE STUDY**

The study aims to contribute to the growing area of research by exploring well-structured questions and teaching models that can help teachers to identify whether and how well students grasp what they ought to learn (Brualdi, 1998). SOLO taxonomy enables teachers to deliver differentiated instructions for students of mixed-abilities and different learning styles as the dynamism of SOLO questioning suits every type of student (Hook & Mills, 2012). This is because the question encompasses well-structured questions that begin with a unistructural questions and proceeds into extended abstract levels. All students are capable of answering the questions according to their levels of thinking and their responses to each question can help teachers deliver different types of assistance that suits the students' different needs (Martin, 2014). With this in mind, the findings of this study can provide teachers in the U.A.E. schools with methods that can help students to cultivate metacognitive thinking skills in literacy learning.

## **1.7 LIMITATIONS OF THE STUDY**

Due to the practical constraints, there were a few limitations in this study which should be taken into consideration. However, it is also crucial to acknowledge that there are rationales behind every limitation. First, t (Seliger & Shohamy, 2009) the limited number of sample where this study was involved 50 Emirati students from one school. With such a small number of populations, it is less plausible for the results of the study to be generalized to a wider context; Fraenkel, Wallen & Hyun, 2012). Second, the instruments used in this study are limited to tests, focus group interview, and journal writing.

## **1.8 CONCLUSION**

The first chapter highlights the issue of how reading to comprehend has become a strong foundation in educational transformation where the goal is to prepare students to be able to function effectively in the real world as effective thinkers, problem-solvers and decision makers. However, there are still problems with the implementation of literacy skills in education that can hamper the effort of transforming the education. Therefore, this study seeks to identify a better approach in teaching literacy by exploring the feasibility of SOLO taxonomy as a questioning method which can facilitate students' metacognitive skills in reading.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Chapter Overview**

In this chapter, we are going to draw the attention to the selection of SOLO taxonomy as the model that will underpin the questioning framework used in the reading tasks. It further explains how SOLO taxonomy can improve literacy skills and facilitate students' mastery of these skills especially in the form of questions that are designed based on SOLO levels. After that, we will review several similar previous studies: Analyzing the students' thinking levels based on different taxonomies for extended thinking, such as Fink's Taxonomy of Significant Learning, which definitely has a great impact on teaching in the classroom. The chapter will then conclude with a review of the literature's key findings based on the understanding gained from the similar earlier studies.

#### **2.2 Conceptual Analysis**

There is a large volume of published studies describing the role of tracking student's learning progress and identifying their next steps to further challenge their thinking abilities (Murphy, 2009). Although researchers may label learning stages differently, theories and concepts are linked together in order to enhance students' application of metacognitive thinking skills in reading. In ESL reading, reading comprehension is usually attained through comprehension questions related to a given text. Thus, SOLO taxonomy is used as the questioning framework for the reading activities. The SOLO questions are built based on the four SOLO levels: unistructural, multistructural, relational and extended abstract. As a result, there are four successive questions that degree each one of the SOLO levels in a various leveled ways. The method of replying to these four step SOLO questions is anticipated to encourage students' improvement of higher thinking levels.

### **2.2.1 Stages in Language Acquisition**

In 1983, Krashen and Terrell performed a study to describe the natural approach to language acquisition. As understanding deepens, the learning stages are labeled as follows: a) preproduction, b) early production, c) speech emergence, d) intermediate fluency, and e) advanced fluency. Hence, Hill and Miller adoption of Krashen and Terrell's stages of natural language acquisition offered a solid model for assessing ELLs. Few years later, Potter and Kustra (2012) argued that SOLO taxonomy can scaffold learning as it can assist students to delve deeper into their understanding in a consistent and sequential manner until they reach deep understanding of what they are learning. The model which consists of interrelated and well-structured levels allows them to efficiently progress to the higher level of thinking skill with clear outcomes. Hattie and Brown (2004) explained that SOLO taxonomy provides ways on how to focus on particular target knowledge and expand students' perception of the content knowledge to the extent of applying higher-order thinking skills at the end of the SOLO level.

### **2.2.1 Stages in Cognitive Ability**

To better understand the mechanisms of stages in acquiring L2, ELLs should think metacognitively about their learning process. Lake (1999), for instance, pointed out the possibility that SOLO taxonomy can be used in strategies of intervention and as a powerful teaching tool as it focuses on analysis of materials rather than the individual presentation of materials. SOLO taxonomy has been widely used in diagnostic manner as a method of assessing leaning outcomes and its potential as a teaching tool is yet to be explored. SOLO taxonomy can be utilized to clarify expectations and mechanism of interpreting materials and to create opportunities for developing these skills which can nurture learning environment (Shayer, 1974; Lawson, 1985; Clear et al., 2008). In fact, SOLO model makes it easy for educators to identify the cognitive complexity for different reading tasks.

However, these views have also been critiqued by other researchers, like Atherton (2013) who argued that several aspects of SOLO tasks are known but their relationships to each other and the whole are missed. In contrast, HookED (2014) clarified that students may be able to make a number of connections using SOLO model, but they have yet to identify the meta-connections between these aspects and their significance as a whole.

Unlike most reading questions and activities, the integration of SOLO taxonomy into reading activities

help creates an environment for students to be critical and creative. 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; Brabrand, 2007). The SOLO taxonomy is a model of understanding which illustrates a pedagogical template of questioning levels that usually consists of hierarchical learning stages (Lake, 1999; Lian & Yiew, 2011). SOLO taxonomy sets explicit competencies that students are expected to attain by taking into consideration their diverse abilities which determine the levels of competencies they need to achieve. Thus, this can help to solve the exclusion of low-achievers from the teaching of higher order thinking skills and help to set appropriate goals for them to achieve according to their current levels of competencies.

### 2.2.3 Reading Comprehension Strategies and SOLO Levels

The study sought to explore whether there was a significance difference in their performance in ESL reading tests and how they perceived the application of SOLO activities in ESL reading. The study also aimed to investigate how they develop higher order thinking skills to SOLO taxonomy through the analysis of their portfolio. According to Biggs and Collis (1982) and Potter and Kustra (2012), SOLO taxonomy can assist students to move from surface understanding to deep understanding. Teele (2004) and Block and Israel (2005) emphasized the use of reading strategies in enhancing reading comprehension and these strategies are establishing connection, visualizing, inferring, summarizing, questioning and predicting. This research focuses on four reading strategies which are also emphasized in SOLO taxonomy literacy: making connection, prediction, inference and questioning.

- **Making connection** is a reading skill where readers utilize their experience and knowledge to formulate ideas on what they read (Block & Israel, 2005). There are types of connections: text to self, text to text and text to the world ( Teele, 2004).
- **Predicting** is a strategy that can increase students' level of engagement in the text as they need to set a purpose for reading the text in order to make predictions and compare their predictions with the actual outcome (Oczkus, 2003; Duke & Pearson, 2005). They might need to assess and modify their prediction if necessary (Teele, 2004).
- **Inferring** is a strategy where students use their own knowledge and information from the text in order to deduce conclusions (Serafini, 2004). It allows them to make predictions, identify themes and create meanings based on the information from the text (Harvey & Goudvis, 2000).

- **Questioning** is a strategy that readers use to ask questions for themselves in order to create meanings, gain better understanding, solve problems, identify relevant information and make discoveries. It can be done at pre, while and post reading (Harvey & Goudvis, 2000). 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 (Piecki, 2001). However, the majority of teachers ask lower order thinking questions which only require recalling some facts (Airasian, 1991; Barnette, Orletsky, & Sattes, 1994). 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).

## **2.3 Theoretical Framework**

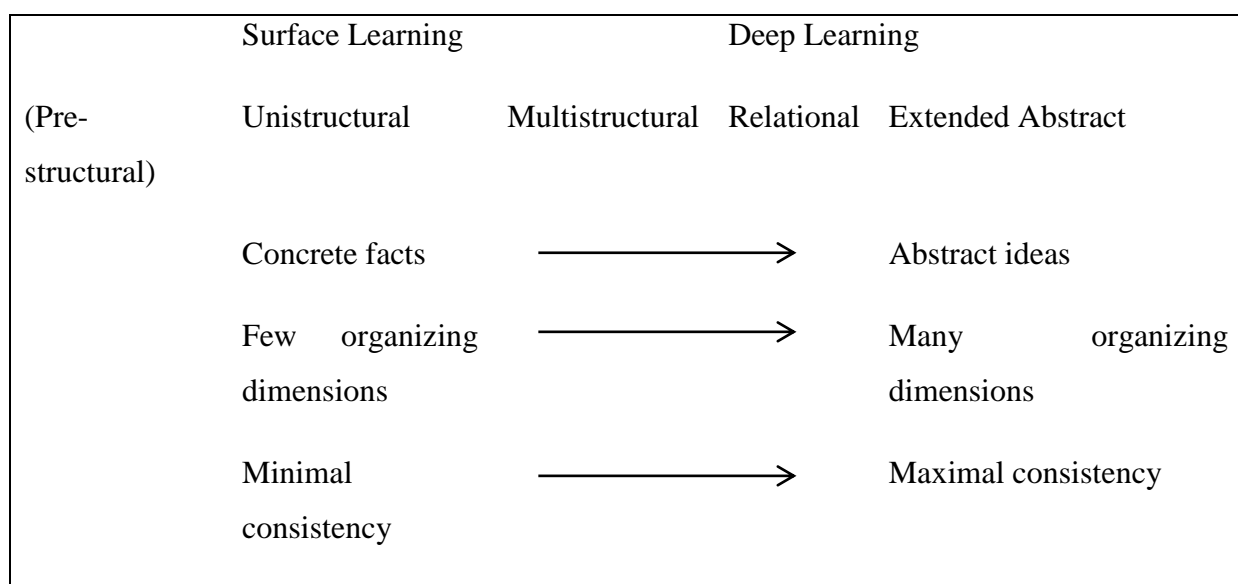
In view of the constant struggle of Emirati students to master metacognitive thinking skills and perform well in their learning experiences, it is vital to identify practical and viable solution to meet the lack in students' metacognitive thinking skills. The continuous decline in their performance in international tests and the increasing demand for graduates with metacognitive thinking abilities further necessitate the identification of a feasible and permanent solution. Thus, effective thinking is dependent on theoretical and metatheoretical knowledge (Potter & Kustra, 2011). Thus, this research intends to identify how to teach metacognitive thinking skills in reading effectively. With SOLO questioning method, teachers can easily classify students' thinking levels based on SOLO levels and provide appropriate scaffolding to guide them to progress to the next level of thinking (Potter & Kustra, 2012). It is hoped that the findings of this study can enhance teachers' method of addressing questions to students to enhance their reading.

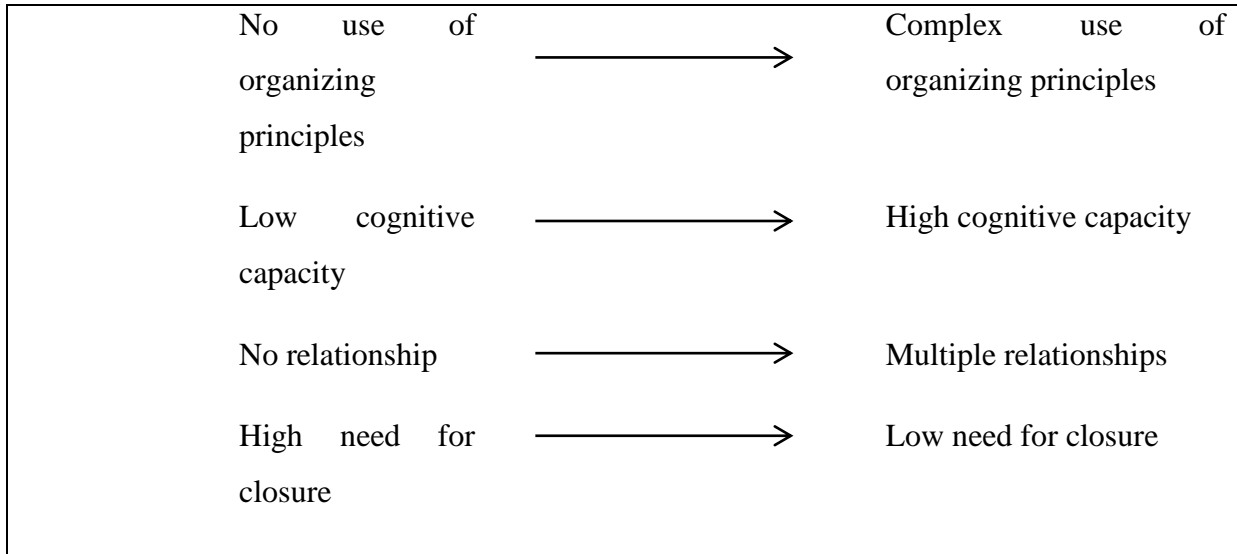
### **2.3.1 Visible Learning for Literacy**

In 2001, Byrns stated Cleary that SOLO Taxonomy plays a vital role in visible learning where teachers, before delving into the lesson themselves, measure their impact on learners who are able to explain their ideas and understanding using technical language. There are four major ways that SOLO taxonomy can increase in complexity across the four levels: capacity, relationship, consistency and closure and structure (Biggs & Collis, 1982; Biggs & Tang, 2009). In terms of capacity, as the level of complexity increases from the surface (unistructural and multistructural) to deep levels (relational or extended abstract), each

level demands more working memory and attention span of the students as they have to progress from merely identifying pieces of information to relating them to each other. As for building a relationship, students have to analyse and identify the relationship of the aspects in their responses as they move from unistructural level to multistructural level which involves several aspects. In other words, the relational level demands students to identify underlying conceptual structure between these aspects whereas the extended abstract level requires students to produce a generalised structure which can be applied in other contexts.

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 & Collis, 1982; Biggs & Tang, 2009). The SOLO Taxonomy was developed by analysing the structure of student responses to information and identifying the type of thinking demonstrated by students in assessment tasks (Biggs & Collis, 1982, 1986) and it has been prevalently used in a wide range of disciplines (Hattie & Brown, 2004 ). SOLO taxonomy can be used as a learning intervention which includes thinking skills, strategies, rubrics and tools in assisting students to achieve different learning outcomes. This intervention can show the changes in students' learning to learn ability (Hook & Mills, 2004). The taxonomy consists of five major levels: pre-structural, unistructural, multistructural, relational and extended abstract (Figure 2.1).





**Figure 2.1: The development from Surface Learning to Deep Learning**

Source: Potter & Kustra (2012)

In addition, Tomlinson (1999, 2001, 2003) and Subban (2006) argued for the importance of using differentiated instruction among students with different learning styles in a visible learning classroom. Chan, Tsui, and Chan (2002) argued SOLO taxonomy could be applied on students who are from different levels of cognitive learning outcomes. Martin (2014) posited that SOLO Taxonomy provides a more personalized learning environment as learning activities are designed based on level of success criteria in order to develop their competence. Tomlinson (2005) believed that students learn best when teachers can successfully cater to the different readiness levels, interests and learning profiles of the students. As a result, teachers are able to fully capitalize on every student’s ability to learn through various ways. With differentiated instructions, teachers can focus on the same content for all students with instructional process, pace and rate that vary (McAdamis, 2001; Tuttle, 2000). The concept of one-size-fits-all approach is no longer practical to be applied on a large number of students (Forsten, Grant, & Hollas, 2002; McCoy & Ketterlin-Geller, 2014).

Teachers and students can apply SOLO taxonomy to differentiate learning intention, success criteria and learning experiences at different levels of cognitive complexity. In New Zealand, teachers and students in schools are able to identify thinking levels using SOLO taxonomy which allows learning outcomes to be identified and differentiated according to SOLO taxonomy (Hook & Mills, 2012). This demonstrates how SOLO taxonomy can be utilized in order to differentiate instructions for students who clearly possess different learning styles, needs and interests. Generally, the linear progression from pre-structural to extended abstract level allows teachers to select and use teaching strategies and tools properly

to meet the students' needs in order to assist them to move from one level to the next one. It can manifest as a step-by-step procedure.

### **2.3.2 The Constructive Learning Theory**

Constructivism does not have a clear beginning: No single person or movement appears responsible for developing or laying the foundation for modern-day constructivist theories. The seeds of constructivist approaches, though, regularly are traced to Vico, Goodman, Rousseau, Kant, Dewey, and Vygotsky. While these early thinkers did not label themselves as “constructivists,” their key ideas have constructivist elements.

Constructivism as a theory of learning, or psychological constructivism, emerged from the work of cognitive psychologists such as Piaget, Vygotsky, and Bruner. With the rise of cultural psychology, two perspectives became dominant: individual constructivism and social constructivism. While these two schools of thought differ, perhaps as ends of a continuum (i.e., one focuses on the construction of meaning inside a person and the other focuses on the construction of meaning among people), others have argued that all learners construct meaning socially as well as individually. Individual or cognitive constructivism initially evolved from Piaget's work, specifically that on genetic epistemology. Cognitive constructivism developed as a reaction to behaviorist and information-processing theories of learning. It conceptualizes learning as the result of constructing meaning based on an individual's experience and prior knowledge.

While constructivism is not a theory of teaching, constructivists argue that pedagogy should be based in theories of learning to ensure that teaching always centers on student learning. Recently, constructivist theories of learning have sparked reforms in teaching practices, suggesting that learning environments focus directly on students, the importance of context, authentic problems and tasks, discovery learning, student's prior knowledge, group projects and discussion, student choice, and authentic assessment.

Explicit strategies or approaches to learning also have been identified that support individual and social learning: For example, anchored instruction, situated learning, and cognitive apprenticeship are just a few different approaches to teaching and learning that draw from constructivist theories. Despite the implications, adopting a constructivist theory of learning does not preclude teacher-centered approaches to teaching and learning because both knowledge and learning are the result of construction regardless of the teaching approach. In education from a constructivist perspective, teachers are encouraged to become

student centered because constructivism is first and foremost a theory of learning and knowledge acquisition, and the primary learner is the student. Consequently, the principals of this theory are required for a visible learning classroom.

### **2.3.3 Directed Reading Thinking Approach (DRTA)**

Readence and Dishner (1995) explained that Directed Reading – Thinking Activity equips readers with the abilities to determine purposes for reading, process information and make decisions based on the information they obtain from the text and their background knowledge. They are required to make predictions based on contextual clues. This facilitates them to establish a reading purpose and develop questioning skills. The fact that they have to confirm their predictions encourage them to think critically and promote interaction (Allen, 2004). It is designed to move students through the process of reading comprehension (Stauffer, 1969). Bainbridge and Sylvia (1999) and Schumm (2006) described the different aspects of DRTA.

The first part is “Direct” that involves teachers giving directions to students to survey and scan the features of the texts such as the title, headings, and illustrations. Teachers then provide students with open-ended questions where they will have to brainstorm some ideas related to the topic and make predictions of what they will read about in the text. This will activate their background knowledge. The second part “Reading” is when the students read the sections of the text and they stop at certain point in order for teachers to ask questions on certain information in the text. The final part is “Thinking” which is done after the students read a section of the text and they either verify or adjust their predictions based on what they manage to find out and support their predictions. The teacher will suggest them to assess their predictions based on the information from the text in order to identify predictions which can be confirmed or disconfirmed as well as evaluate the probabilities of some predictions that are yet to be verified. They are also required to revise their predictions or make new ones based on the information they glean from the text. They also need to justify their predictions by identifying supporting clues from the text. The activity can be extended by asking the students to make further predictions beyond the given text by referring to their literary and life experience.

The “Direct” part of DRTA is consistent with unistructural and multistructural levels of SOLO taxonomy which requires learners to cite one or several facts and this stage involves surveying technical



features of the texts such title and headings. The “Reading” part which involves them to form hypotheses about what the text is about involves the skills of linking the ideas in the text as well as their background knowledge which is congruent with relational level of SOLO taxonomy. The “Thinking” aspects that involve evaluation and modifications of their predictions as well as making predictions beyond the text are consistent with relational and extended abstract levels. Extended abstract level demands learners to extent their thinking skills beyond the given context.

DRTA is used to develop students’ skills in making predictions and inferences since the two strategies involves the ability to form ideas and opinions based on the contextual clues and background knowledge.

#### **2.3.4. Questions and Answers (QAR)**

Raphael (1986) explained Question-Answer Relationship (QAR) as a questioning strategy that focuses on the relationship between questions, text and existing knowledge. There are four types of questions which can guide students on how to provide the acceptable answers to these different types of questions based on the text or their existing knowledge. One of the most important techniques in teaching reading strategies is to identify questions that can encourage students to think. In SOLO taxonomy, designing questions is also one of the emphases in developing critical thinking skills involving various tools that can be used to understand different demands of questions and how to design questions such as Q-Matrix and Three Story Intellect (Hook & Mills, 2012).

Raphael (1986) and Simmonds (1992) argued on the importance of making students aware of the classification of questions that can assist them to formulate their responses to questions. This awareness can benefit readers of lower levels to strategically answer comprehension questions. There are two major categories: questions with answers that can be found in the text (In the Text) and questions that require readers to use their knowledge to answer (In my Head).

The two major questions can each be further categorized into two types. There two specific types of “In the Text” questions. The first one is “Right There” in which the exact answers are in the text that readers can simply cite. The second category is “Think and Search”, the answers can be found in the text but in different sentences that the readers have to put them together to form a complete answer.

The two specific questions in the second major category “In the Head” are “Author and You” and “On my Own”. In “Author and You” questions, the readers have to link the texts with their existing knowledge

in order to provide adequate and correct answers to the questions. Lastly, the “On My Own” questions, the answers cannot be found in the text as the readers have to use their knowledge in order to answer the questions. The different types of questions are coherent with SOLO levels. The first two sub-categories of the “In the Text” main category of questions are consistent mainly with unistructural and multistructural levels. Kinniburgh and Prew (2010) describe “Right There” as literal questions which usually consist of who, where, what, where, how many and some questions that involve basic information. The unistructural and multistructural levels of SOLO taxonomy refer to the ability of identifying one or several ideas as separate responses without linking these ideas.

The “Think and Search” sub-question demand readers to link the different ideas in the text and the questions are usually more like “what were the reasons...?, how was...? And why did that require more thinking skills. While the questions can be at the same level with multistructural level of SOLO taxonomy which only requires different ideas, it is likely for some of the questions to meet the criteria of the relational level of SOLO taxonomy. Relational level requires learners to connect the different ideas and produce responses which have been processed cognitively.

Meanwhile, the second main category of questions “In my Head” which consists of two sub-categories are consistent with the higher levels of thinking and SOLO taxonomy. The first sub-category of the question “Author and Me” prompts readers to use their existing knowledge and clues from the text to answer questions. This is consistent with relational level that demands readers to link what the text provides with what they know. The questions can also fall under the category of extended abstract that make them think outside of the given context. Some examples of the questions are “would you...? Which character....? and Did you agree with...? The last sub-category “On my Own” is similar to extended abstract level since learners have to use their opinions and experiences to answer the questions without using the texts.

QAR will be used to teach the two reading strategies of questioning and making connection as the two reading strategies involve students to ask questions and to link text with one’s background knowledge and experience respectively.

### **2.3.5 Taxonomies of Metacognitive Strategies**

Marzano (2000) proposed a new taxonomy known as Taxonomy of Educational Objectives in response

to the shortcomings of Bloom’s Taxonomy which does not address the various possible factors which can influence learning and lacks theoretical basis. Marzano’s New Taxonomy is made up of Self-System, Metacognitive System, Cognitive System and Knowledge Domain. Cognitive System is the mechanism which enables access and manipulation of information and procedures in ones’ memory and there are four components of this system: knowledge retrieval, comprehension, analysis, and knowledge utilization. Marzano et al. (1988) considers knowledge utilization as the final level of cognitive processes and the most important component in project-based learning. He classifies five higher order thinking skills as decision making, investigation, problem solving, experimental inquiry, and invention (Table 2.2).

**Table 2.2: Marzano Higher Order Thinking Skills Taxonomy**

Higher Order Thinking Skills	Definition
Decision making	Generating and applying criteria to select from among seemingly equal alternative
Investigation	Identifying and resolving issues about which there are confusions or contradictions
Problem solving	Overcoming constraints or limiting conditions those are in the way of pursuing goals.
Experimental	Generating and testing explanations of observed phenomena
Invention	Developing unique products or processes that fulfil perceived need.

Source: Marzano (1988).

Fink (2003, 2009) developed a framework of learning known as Taxonomy of Significant Learning in order to compensate for the deficiencies in Bloom’s taxonomy which does not acknowledge the significance of human attitude that can motivate students to engage more in high-level learning and become reflective, critical and decisive students (Bonwell, 1996; Dougherty, 2003).

**Table 2.3: Fink’s Taxonomy of Significant Learning (2003, 2009)**

<b>Levels</b>	<b>Description</b>
Foundational Knowledge	Understand and remember
Application	Critical, creative and practical thinking; problem solving
Integration	Make connections among ideas, subjects, people
Human Dimensions	Learning about and changing one's self; understanding and interacting with others
Caring	Identifying/changing one's feelings, interests, values.
Learning to learn	Learning how to ask and answer questions, becoming a self-directed learner

Source: Fink (2003)

Bloom's taxonomy also lacks flexibility as emphasis is usually given at one aspect at a time without the involvement of the other levels. It represents depth of understanding regardless of difficulty. Therefore, it does not necessarily represent an increasing order of difficulty from the first level to the last one (Hattie & Brown, 2004). The five hierarchical and related levels of SOLO taxonomy can be effectively used to classify students' level of understanding and their progress and to determine the next steps in their learning (Ennis, 1985).

## 2.4 Review of Related Literature

To date, a number of studies tested the efficacy of SOLO taxonomy as a teaching model. Such studies took this subject from different perspectives and studied its effectiveness when it is properly understood and taught. Here is a summary of the current case studies that examined that SOLO could be effectively used to assess mastery of content and language skills in ESL lessons as well as other lessons.

In 1998 Campbell, Smith, Brooker argued that SOLO taxonomy can improve students' ability to write essay by developing clear goals based on the structure of SOLO. A study conducted by Solomon (2004) to identify the effects of instruction on graduate ESL students' academic writing in a Filipino institute. SOLO taxonomy was utilized to evaluate the students' essays which included the assessment of their reading comprehension, composition and grammar prior to and after the intervention. It was found that the students exhibited low level of critical reading and reading comprehension. In another research on the use of SOLO taxonomy in ESL writing, it was discovered that students need to know their current levels of thinking and the gap in their thinking skills and how to progress to the next level; otherwise, they would constantly demand teachers to spoon-feed them to achieve a specific level. This is due to the students' failure to master the lower order thinking skills level that hinder them from making systematic and strategic progress in their learning (Hyland, 2010). Chan, Tsui, Chan and Hong (2002) analyzed the application of SOLO taxonomy as a grading method in ESL assignments on 28 students in Hong Kong Polytechnic University.

Manson and Zaimuariffudin (2014) discovered that metacognitive strategies are crucial in students' reading comprehension and that they ought to apply these strategies to be critical readers. They emphasized the role of teacher in realizing the students' need to master metacognitive strategies. Noorbayah, Roose, Farah and Juhaida (2014) argued that reading strategies and metacognitive skills are crucial to develop critical readers as they will not acquire critical thinking skills without being able to read critically in the first place. Hence, teachers need to employ these strategies in their teaching. Noorizah (2003) studied six ESL students in Malaysia and discovered that students who employ various strategies in reading and are able to link ideas manage to develop deep level of understanding. On the other hand, students who are poor in applying strategies and only identify basic ideas of a text only attain surface understanding of what they read. She emphasized the role of questions especially student-generated

questions in helping students to tie what they read with what they know in ESL reading. It can be deduced that ESL students in Malaysia need to learn to be more aware of the thinking strategies they need to use in reading.

In Indonesia, a study exposed that SOLO scientific classification is additionally successful in classifying students' problem-solving capacity in polynomial math according to SOLO levels. Laisouw (2013), Serow (2007) and Jones et al. (1997) utilized interviews to characterize students' reactions on scientific assignments concurring to SOLO levels and distinguished that most understudies were either in multistructural level or social level. This suggests the application of SOLO categorization in classifying students' levels. In 2003, Groth conducted a research with a population of 15 American students to look at their relational level of thinking relating by classifying it according to SOLO levels. The research population of the study was inquired to utilize measurements to plan a certain task, and their reaction to the errand proved the students' diverse considering capacities to reach the relational level.

SOLO taxonomy was used to assess the effects of computer games on higher order thinking skills of 44 primary school students from Malaysia. The intervention involved teaching the students how to ask questions in responding to problems presented by the games. Their thinking levels were classified according to SOLO levels (Shamsuar, 2014). Lian and Yew (2012) conducted a research on nine Malaysian Form Four students on their ability in Algebraic solving ability through interview methods where the questions asked during the interview were based on SOLO taxonomy. The findings showed that the question items were able to differentiate students with excellent abilities in using their algebraic concept to solve problems and those who only mastered the basic skills of the concept.

SOLO taxonomy can also be applied to classify students' thinking in Malaysian higher learning institutions. A research was done on 120 undergraduates of teacher education faculty of a Malaysian university. They were given a pencil-and-paper test to assess their algebraic knowledge and the findings showed that majority of the trainee teachers did not reach extended abstract levels as most of them were still at either relational or multistructural levels ( Lian, Yew, & Meng, 2009). A research on Malaysian postgraduates was carried out with the goal of evaluating the students' statistical skills through interviews where their responses were categorized according to SOLO levels (Nora & Idrisa, 2010). The study illustrated how an interview based on SOLO could be done through a specific example in one of the interview sessions. In the research, a postgraduate student was interviewed with a series of questions on making statistical inferences. She was able to point out several specific values and results of statistical findings and explained how different elements of the statistics could be interpreted to justify her responses.

Her thinking skills were classified as relational as she exhibited ability to integrate information for her reasoning and conclusion. However, her thinking skills were not classified as extended abstract as she did not exploit the various possibilities of how the different elements might have resulted in different conclusions and she did not address the uncertainty in her own inference.

Mead (2012) explained how to classify students' thinking based on the responses that his student gave when they were required to illustrate the correct diagram of the movement of light in a given situation (Table 2.4). At the same time, SOLO taxonomy can be used to create assessment rubrics that enable teachers to see which component that the students fail to include or successfully apply in order to evaluate their performance.

**Table 2.4: Classification of Responses according to SOLO Levels**

Stage	Success criteria
Unistructural	<p>The light is being bent</p> <p>Diagram has light travelling in straight lines</p> <p>Inclusion of arrows</p>
Multistructural	<p>Inclusion of straight arrows to show direction of light</p> <p>Ray diagrams are continuous</p> <p>Word refraction, refract, refracted to describe the behaviour of light</p> <p>Distinguish between light bending and curving</p>
Relational	<p>Compare light travelling from your finger direct to your eye and passes through the Perspex</p>

	Give a reason why the light changes direction
Extended Abstract	<p>Answer refers to the density of the materials that light passes through</p> <p>It makes specific reference to the normal line</p> <p>Rules of refraction are clearly stated.</p>

Due to its clear and systematic classification of thinking levels, SOLO taxonomy has become the underlying principle for the development of other frameworks that categorize thinking skills into different levels. Mooney (2002) developed categorization framework based on SOLO taxonomy to classify specific type of thinking, statistical reasoning, which corresponds with the four levels of SOLO taxonomy: idiosyncratic, transitional, quantitative and analytical. Watson et al. (2003) defined four ability levels of students' understanding of variations which also derived from the SOLO levels: prerequisites for variations, partial recognition of variations, applications of variations and critical aspects of variations. Kusumawati (2010) conducted a study on Indonesian students in relation to their responses to statistical reasoning and used frameworks which were developed from SOLO taxonomy to map their responses and level of understanding.

SOLO taxonomy can familiarize students with metacognitive strategies in thinking that they need to acquire deep understanding. A study was conducted by Prakash, Narayan and Sethuraman (2010) on 20 undergraduates of a medical faculty in a Malaysian university where they were assigned to discuss respiratory and central nervous systems by using SOLO taxonomy as their guideline in preparing them for assessment. The findings showed that the experimental group which used SOLO taxonomy in their discussion performed better in descriptive tests than the control group. It was deduced from the findings that knowledge of SOLO taxonomy helps to develop students' metacognitive strategies because they understand the hierarchy of cognitive competence and factors that influence the outcomes of assessment. Prakash, Narayan and Sethuraman (2010) claimed that if students become oriented in SOLO taxonomy, they would have the opportunity to understand the aspects involved in how they are assessed and this helps them to improve their performance. Hussain Kayani, Ajmal and Rahman (2010) conducted a survey among 360 teachers from 12 schools in Punjab, Pakistan and the results showed that SOLO approach increased students' learning, reading and writing skills, and creative thinking skills. The teachers were



also contented with the use of SOLO approach in the examination system as it increased the reliability and validity of the assessment. It was also found that the SOLO approach prevented cheating and discouraged rote learning and memorization. Lake (1999) examined the adaptation of SOLO taxonomy as a pedagogical template to develop critical numeracy skills in sciences based on the suggestion that students' performance can be enhanced in two significant ways. First, the arrangement of testing situation where students can display their abilities to the best advantage that increase test readiness can cause them to experience rapid progress. Second, teaching methods which train students through active and analytical methods can result in permanent and improved competence of students in comparison with those who are not taught with such methods.

## **2.5 Summary**

Chapter 2 draws the attention to the selection of SOLO taxonomy as the model to underpin the questioning framework used in the ESL reading tasks. It further explains how SOLO taxonomy can improve metacognitive skills and facilitate students' mastery of certain reading skills especially in the form of questions that are designed based on its SOLO levels. The questions serve as four step questions in ESL reading task which can stimulate and facilitate students' development of reading comprehension skills.

## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Introduction**

The specific aim of this study was to test the hypothesis that using SOLO model can increase students' reasoning ability to give a constructive feedback about their learning; in other words, this dissertation intends to determine the extent to which SOLO Taxonomy can influence students' performance in their reading tests and whether it can affect students' metacognitive ability or not. This chapter describes the methodology of the research by highlighting the research design of the study; moreover, it presents details about the sampling and the instruments of this study in addition to data collection and data analysis.

#### **3.2 Research Design**

Previous studies on SOLO Taxonomy have based their criteria for selection on a descriptive research design (Seliger & Shohamy, 1989). A major advantage of descriptive research is that it helps to obtain a significant amount of information through descriptions, and it identifies possible variables and concepts which can be further explored. However, there are certain drawbacks associated with descriptive analysis is that it primarily focuses on describing the character of a demographic phase, without focusing on “why” a particular development happens.

For this study, a mixed-methods research approach was used to explore the subsurface relationship between the use of SOLO strategies as an intervention in literacy classes and its noteworthy effect on students' performance in reading tests. With that being said, a variety of methods were used to assess the cause and effect relationship between SOLO intervention and what is learned. A mixed-methods research approach has its advantages, for it gives a complete understanding about the research problem from multiple perspectives in addition to developing a clear focus on the phenomenon under study (Creswell & Clark, 2011). A quasi experimental design was adopted as a quantitative measure to provide rounded, detailed illustrations of the first research question. Two qualitative methods, a journal and a focus group, were given to a random population to ensure that the value of SOLO comprehension strategies would be seen through a unique approach of combining qualitative and quantitative methods.

In recent years, quasi-experiments have attempted to account for evaluating the effectiveness of an intervention once the intervention has been enforced by teacher researchers. The synthesis of the study was done according to the procedure of Shadish, Cook, & Campbell (2002). Since random assignment is

impractical due to real-life constraints, a pretest and posttest design was used to compare the reading scores of students who did not experience SOLO strategies to those who experienced SOLO strategies for 7 weeks or more.

### 3.3 Sampling

A random sample of students with two intact classes of 27 Emirati ESL students in each class was recruited from an American school located in the U.A.E. First, some creative techniques of the quasi experiment design were used to eliminate the negative impact of the extraneous variables that might cause the study findings to be unreliable (Green, 2006). Prior to commencing the experiment, a demographic survey was conducted to identify the recruited sample; a sample of fifty-four Emirati ESL students with the same English proficiency level based on NWEA MAP Growth scale, a scale stands for Measures of Academic Progress suggested by Northwest Evaluation Association, was selected for the study. Second, with problems of validity in mind, the researcher selected samples that are as similar as possible at the start of the experiment by utilizing stratifying techniques to ensure and generalize results in order for the independent variable to be measured (Shadish et al., 2002). Third, limiting the variables introduced into the study required the subjects to come from the same demographic area and exhibit similar demographic characteristics (Bryman, 2006). For this very reason, the intact two classes served as the most suitable subjects for this research due to the students’ English proficiency, socioeconomic backgrounds, previous exposure in English, and their level of academic achievement; in other words, the subjects of the study were selected on the basis of a degree of homogeneity of their English level. (See Table 3.5)

#### The Sample of Control and Experimental Groups

(Table 3.5)

School	Class	Group Name	Student No
Private School in Sharjah	6 G C	Control Group	25
	6 G D	Experimental Group	25
Total	2 classes		50

Fourth, in planning the design of the experiment, it was noted that Slavin (2007) declares, “Pre-posttest comparison are prone to so many errors and biases that they are rarely, if ever, justifiable” (p. 57). To eradicate unwanted effects, four non Emirati students were excluded from the study on basis of their English proficiency level that might account for the experiment’s findings. The first language for these

students is Arabic. The study population had learnt English as a Second Language (ESL) for eight years in the same primary school and got the same average score based on NWEA Reading Map Lexile Range Chart (see Appendix 1). Hence, these students were selected to decrease the different threats that might affect the findings of the research. .

### **3.4 Instruments**

The data for this study were gathered from multiple sources at various time points through the use of both quantitative and qualitative research instruments. On one hand, the quantitative data were collected using pre and post-tests. On the other hand, the qualitative data collection involved the use of journal writing and a focus group interview.

#### **3.4.1 Pre-Test and Post-Test**

Two kinds of tests were employed in order to assess the performance of the learners: pre and posttests. Both tests contained comprehension passages with the last questions as open-ended that asked the learners to utilize a specific comprehension strategies: inferring, predicting, connecting and questioning (refer to Appendix 2). Other four questions required deploying other skills as well to check the mastery level of the learners (Appendix 3). Each question checked one SOLO strategy. The data collected from both tests are addressing the first research question: “Is there any significant influence on students’ performance in reading tests as a result of using SOLO taxonomy as the framework for effective and reliable design of comprehension strategies?” that is to check the efficiency of the strategy used in raising the students’ comprehension level as reflected in their scores.

According to Sugrue’s model of assessment (1995), there are three models that can test higher order thinking skills. The first model is multiple choices and matching, while the second one includes formats such as, short answers, essays and performances. As far as the third model is concerned, questions that require reasoning and dependent on the former two models prevail in this very model. It is worth mentioning here that designing pre-test and post-test questions usually involve open ended questions that require students to use their reasoning. This type of questioning is considered as the most suitable way of integrating higher order thinking in assessment (Hattie & Brown, 2004).

#### **3.4.2 Focus Group Interview**

A focus group interview was predominately beneficial to address the second research question in this study which was to provide a seed for further discussion on students’ beliefs about SOLO reading

comprehension strategies in developing their metacognitive ability (Kitzinger, 1995). To determine the participants, the main respondents for the focus groups were heterogeneous composition to best achieve the aim of the research (Anderson, 1990; Khan et al., 1991). A focus group is “a group comprised of individuals with certain characteristics who focus discussions on a given issue or topic” (Anderson, 1990, p.241). According to Denscombe (2007, p.115), “focus group consists of a small group of people, usually between six and nine in number, who are brought together by a trained moderator (the researcher) to explore attitudes and perceptions, feelings and ideas about a topic”.

The focus group interview questions were composed of four sections and each section encompassed five items. Each section of the questions focused on one strategy. The five main items in each section were developed based on every learning activities and SOLO level that the reading activities of each strategy were based on. The items were developed to explore students’ viewpoints on the effectiveness of each of the learning strategies that was used to construct activities that can move students from lower level of thinking to higher order of thinking according to the hierarchical order of SOLO levels. The students were required to respond in a way that reflects their verbal reasoning ability. For the purpose of analysis, the recorded answers were sought to identify the students’ opinions towards the use of SOLO model in fostering and enhancing comprehension skills in reading.

Warm-up questions were utilized after acquiring formal written approval from five students randomly chosen in the experimental group. The main essence of these questions is to put the students at ease and to give them the freedom to express themselves to the interviewers. The questions of the focus group (Part B) involve around three questions that reveal students’ view point on applying SOLO questions to reading tasks. This may include the effectiveness, the method and the best way to apply this this approach. On the other hand, the questions that target reasoning and unravel how SOLO taxonomy works well were dominant in the other focus group (Part C) interview questions. (See Appendix 4)

### **3.5 Validity and Reliability**

Reliability and validity of research instruments were examined and verified in order to ensure that the instruments are appropriate, useful and effective in identifying and evaluating the relevant data (Wiersma, 2000). Validity is an evaluation of the extent empirical values and theoretical rationales determine the adequacy and appropriateness of interpretations on modes of assessment (Messick, 1995). Norris (1989) posed two questions in validating tests of metacognitive ability: (1) whether reasoning ability is generalizable and (2) what a critical thinking disposition is. Students sometimes possess critical reasoning skills but are unable to employ these skills in tests because of other factors such as beliefs and lack of target knowledge which can undermine the validity of the tests. As for the subjects of this study, they had

difficulty in reading comprehension and this was one of the factors as to why their metacognitive skills may not be that well-developed.

Criterion validity is utilized to find out to what extent the pre-test and post- test questions meet the criteria of SOLO assessment through the use of scoring rubric (Miller, Linn & Gronlund, 2009). The tests were selected from Raz-Plus which is a comprehensive learning platform widely used in many school across the U.A.E. providing literacy-focused resources and tools that improve students' reading, and it also develops the 21st century skills students need to succeed. All the resources are leveled and well-versed with SOLO taxonomy especially when SOLO taxonomy was already introduced in schools and colleges in Australia and United Kingdom. Fraenkel, Warren and Hyun (2012) argue the importance of validating a test in order to ensure that it measures what it is supposed to measure, and necessary modifications were made on the basis of SOLO rubrics.

Content validity ensured that the items in the focus group interview were representative of the construct that was measured. The items were sampled from all of the domains to form adequate items to measure the relevant construct under study. This was followed by constructive validity in which each item in the focus group interview were examined to ensure it measured what it is intended to be measured ( Fraenkel et al., 2012). Lastly, logical validity was also applied to confirm that the focus group questions appeared subjectively to measure what it purported to measure especially to the respondents who needed to see the relevancy of the instrument (Field, 2005). Respondents' validation was also utilized in order to enhance the validity of the focus group interview where the transcriptions of students' responses were reviewed and verified by the respondents (Silverman, 2003).

### **3.6 Data Collection Procedure**

The specific aim of this study was to check the hypothesis that using SOLO model can increase students' reasoning ability to present a constructive feedback about their learning; in other words, this dissertation intends to see the extent to which SOLO Taxonomy can influence students' performance in their reading tests and whether it can affect students' metacognitive ability or not. With this goal in mind, after obtaining a permission from the school principal (See Appendix 5), the two classes that were chosen by the researcher were informed and acquainted with the aim of his study. The researcher conducted the study while all the students are present in class and during official school hours. The timeline of the experiment took seven weeks of eight sessions weekly. The participants are exposed to a reading comprehension passage chosen by the researcher for them to comprehend and answer. The questions were all based on SOLO taxonomy and they require answers based on the same approach.

### 3.6.1 Procedures

**Table 3.6. Experimental Research Implementation**

No	Week	Details
1	Week 1	Pre-test
2	Week 2	Treatment “Making connection”
3	Week 3	Treatment “Making inference”
4	Week 4	Treatment “Making prediction”
5	Week 5	Treatment “Asking questions”
6	Week 6	Focus groups
		Journals
7	Week 7	Post-test

The study was conducted in seven weeks on the experimental and control groups. The treatment consisted of eight weekly sessions which incorporated reading text and reading comprehension tasks which included questions constructed based on SOLO levels. The pre-test on reading was administered to both groups in the first week by the researcher who informed the students about the purpose of the test. The students were briefed on the instructions regarding the test and were given 30 minutes to answer the test in class. The test was collected at the end of the 30 minutes. (See Appendix 2)

The researcher conducted a one day fun-learning workshop after the administration of the pre-test. The aim objective of the fun-learning workshop was to expose students to the study via interesting fun activities using SOLO taxonomy activities.

The actual intervention was carried out from the first week until the seventh week during ESL classes. Students in the experimental group were taught about SOLO taxonomy and the ESL teacher demonstrated how the questions in the reading comprehension tasks could be approached since the questions were designed based on SOLO levels. The students were first presented with explanations about SOLO taxonomy and its five levels. They were required to classify some highlighted contents of several texts

according to SOLO Levels. As they slowly exhibited better understanding in classifying the informative contents, they were required to select and develop some information from another set of texts according to each SOLO level where they were asked to write their responses. Once they were able to gain more insights of how SOLO levels are applied, they practiced on answering questions that were developed from each of the SOLO levels. The treatment consisted of reading texts and a set of SOLO questions and teaching techniques. Students in the control group were given a similar text but with different set of activities that did not incorporate SOLO levels.

1 hour 20 minutes (equivalent to a double period of a standard upper elementary school English periods) per day was allocated for each group to process a reading text and answer the related SOLO questions. The students were given one reading text for each session where they were required to read the text. They then discussed some basic comprehension questions with the teacher in order to ensure that they understood the text and the teacher encouraged a whole-class brainstorming of answers and ideas before discussing each of them in more details. This was followed by following activities involving four questions constructed from SOLO level in which they had to answer by writing down their responses to each of the question. They were allowed to collaborate with their peers in answering the questions and the teacher supervised and facilitated their completion of the questions. Assistance might be provided if they had difficulty in comprehending the text. The teacher researcher acted as a facilitator in ensuring that the students carried out the tasks accordingly and appropriately. Students were instructed to keep their answers to the questions in their individual portfolio after every treatment.

On one hand, the post-test was administered in the seventh week when students were given 30 minutes to complete the test. The researcher assumed the role of the invigilator for the test to deliver the essential instructions for the students to follow during the test. This test was collected after 30 minutes it was administered. On the other hand, the focus group interview and the journal writing task were administered in the sixth week before the post-test. Twenty minutes were allocated to conduct the focus group procedure and the journal writing before it was collected by the researcher. The researcher briefed the students on the purpose of the focus group and explained how to develop their answers accordingly with the help of their peers in a whole discussion. The journal writing procedure was conducted after the focus group was completed. The five randomly selected students were requested to individually to share their viewpoints and feelings with the researcher by writing a brief descriptive journal about SOLO activities in approximately 10 to 15 minutes.

### **3.6.2 Treatment**



The treatment consisted of reading comprehension module which contained reading texts, questions and activities that the students needed to read and complete.

### **3.6.1 Reading Texts**

The reading texts were consisted of twelve texts that were sourced from Raz-Plus (See Appendix 6), a website for leveled books and resources to support reading development by Learning A-Z of the U.S.A. These texts were informative texts with underlying themes of sociocultural significance and global issues. The word count for each story was between 1500-2000 words. The twelve texts correspond with the six themes that students in the U.A.E. ought to learn. The texts were tested for readability in order to determine the overall reading ease and grade level. For reading ease, NWEA MAP Growth chart was the readability formula used to identify the level of reading difficulty of the eight short stories. According to Fry (2006), a higher score indicates easier readability and the range of score is from 0 to 100. The standard interpretation of score between 90.0 and 100.00 indicates that a text can easily be understood by average 11 year old students and possibly below, a range of score from 60.0 to 70.0 implies that the text can be easily understood by 11 – 13 year old non-native students, and a score between 0.00 to 30.0 denotes ease of readability that suits university graduates.

### **3.7 Data Analysis**

Normality test was conducted using SPSS Shapiro-Wilk normality test in order ensure the normality of the distribution of the sample. This normality test is more appropriate for small sample sizes (< 50 samples) and there were 50 students who were the subjects for this research. Field (2005) proposed that if the result is non-significant ( $P > .05$ ), it indicates that the distribution of the sample is normal because it is not significantly different from a normal distribution; however, if the test is significant ( $P < .05$ ), then the distribution is not considered normal as it significantly differs from a normal distribution. The result of the test was 0.6 which indicates the normality of the distribution.

Data analysis was done in quantitative and qualitative manner. Descriptive statistics methods were used to summarize and organize data. Data were organized and summarized through graphs and certain descriptive values such as the average score. Descriptive Statistics are used to present quantitative descriptions in a manageable form by simplifying and reducing large amounts of data into a simpler and clear summary. (Miller et al., 2009; Field, 2005; Seliger & Shohamy, 2012). Moreover, inferential statistics were employed to draw general conclusions about populations based on the available data to more general conditions. Inferential statistics enabled conclusions that extend beyond the immediate data

to be made. There are several ways of processing the data in a way which allows inference and judgment to be made (Miller et al., 2009; Field, 2005; Seliger & Shohamy, 2012).

### 3.7.1 Pre-Test and Post-Test

The main aim of the first research question in the study was to examine the extent of the impact of students' performance on SOLO taxonomy-based comprehension strategies. The data analyzed used to spot the difference between the pre-test scores with the post-test ones and to explain the extent of improvement in this regard after the scores were calculated for each participant. The next step was marking all the participants' open-ended responses using SOLO taxonomy assessment rubric that was extracted from Potter and Kustra (2012). The responses were categorized based on SOLO levels, each with a specific range of points.

**Table 3.7: Assessment Rubric of SOLO Levels**

<b>SOLO levels</b>	<b>Description</b>	<b>Typical Characteristics</b>	<b>Score</b>
Pre-Structural	Students do not understand	<ul style="list-style-type: none"> <li>• Gather alienated items of information</li> <li>• No organization of information</li> <li>• No meaning</li> <li>• No demonstrated understanding</li> <li>• Misses the point</li> </ul>	0
Unistructural	Students learn one relevant aspect of the whole	<ul style="list-style-type: none"> <li>• Simple, obvious, connections made</li> <li>• Focused on one aspect</li> <li>• Information still has little meaning</li> <li>• Value and significance unclear</li> <li>• Concrete level</li> <li>• Unnecessarily reductive</li> </ul>	1-5
Multistructural	Students learn several relevant independent	<ul style="list-style-type: none"> <li>• Some connections made</li> <li>• Focus on several aspects</li> </ul>	5-10

	aspects of the whole	<ul style="list-style-type: none"> <li>• Meta connections between connections missing each treated independently, additively</li> <li>• Some disorganization and alienation of related concepts</li> <li>• Significance of parts to whole is absent</li> </ul>	
Relational	Students learn to integrate several different aspects into a structure	<ul style="list-style-type: none"> <li>• Some meta-connections</li> <li>• Connections between facts and theory, behavior and purpose</li> <li>• Understanding and integration of significance of parts to each other, and parts to whole</li> <li>• Able to apply to some problem situations</li> <li>• Generally considered adequate to end here</li> </ul>	10-13
Extended Abstract	Students can generalize what they learn into a new area of knowledge	<ul style="list-style-type: none"> <li>• Connections with other information in discipline beyond course, program and discipline</li> <li>• Generalization and abstraction of principles and underlying assumptions</li> <li>• Transfer to new experiences and unexpected problems</li> </ul>	13-15

Source: Potter & Kustra (2012)

The inter-rater test validity was employed in getting the scores of the pre and post tests using the same rubric. Two skilled English language teachers were asked to evaluate the participants' responses for the sake of authenticity in the study. One of these two is the researcher and the other is a grade 6 English native speaker teacher. According to Potter and Kustra (2012) in Table 3.7, the responses obtained were evaluated using SOLO level approach. The main point of analysis focused on the slight difference between the scores of the pre-test and the scores of the post-test. The statistical value was extracted when analyzing the scores.

The researcher utilized objective and independent samples when analyzing the statistical value of the mean scores when comparing the control group with the experimental one to measure the effectiveness of the method used (Fraenkel et al., 2012; Miller et al., 2009; Seliger & Shohamy, 1989). In other words, when the P value exceeds the 0.05, this means that the difference is worth considering between the control group and the experimental one.

### **3.7.2 Focus Group Interview**

The findings from the focus group interview were analyzed qualitatively in order to address the second research question which was to identify the students' beliefs about SOLO reading comprehension strategies in developing their metacognitive ability which was developed through the treatment. The data from the focus group was processed through an inductive approach that entailed identification of responses, analysis and categorization of responses according to relevant themes. Seliger and Shohamy (1989) argue on the importance of setting categories based on patterns, regularities and commonalities across the students' responses in analyzing findings. First, patterns or themes from the transcribed data of the focus group interview were identified. Second, the data were classified based on categories derived from initial classification of the data.

### **3.8 Summary**

In conclusion, chapter 3 elaborates on the methodology for this study. The study population consisted of 50 students from a private school. Following the demographic analysis of the population, different instruments were utilized to ensure data triangulation: pre-test and post-test, focus group interview, and journal writing. The quasi experiment on the utilization of SOLO taxonomy was conducted on the scholars and their performances within seven weeks then the data were analyzed through paired-sample t-test. The focus group interview was explained to the scholars who provided their viewpoints about the utilization of SOLO taxonomy in reading. Five randomly selected students were also interviewed. The information that is gathered from this study is expected to supply answers to the three research questions during this study.

## **CHAPTER 4**

### **RESULTS & DATA ANALYSIS**

#### **4.1 Introduction**

In order to assess the hypothesis that SOLO taxonomy can be integrated into reading comprehension activities in order to increase students' reading tests, this chapter examined the results obtained from the instruments used in this study. The results from the tests were analysed with independent samples and paired samples t-test in order to identify comparison within each of the group as well as between the control group and experimental group. Furthermore, the responses from the focus group interview were coded and categorized according to suitable patterns in order to deduce the relevant themes that the responses can be classified into. Lastly, the findings were compared and discussed in reference to previous studies and educational theories in order to shed more light on how SOLO taxonomy can be used effectively in teaching literacy skills.

#### **4.2 Discussion of the Study Data**

In the quantitative part of the study, the results from the tests were analysed with independent and paired samples t-test. There was one main set of pre-test and post-test that measured all four reading strategies. Moreover, the results from the focus group interview were classified to three sections where each section focused on the analysis of a specific part of the experiment; therefore, the responses from the interview were analysed qualitatively.

#### **4.3 The Analysis of Pre-test & Post-test Data**

To compare the scores seven weeks after conducting the pre-test, paired-samples t-test was used to analyse 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, 2008). The findings were used to answer the first research question which seeks to determine whether there is any significant influence on students' performance in reading tests as a result of using SOLO taxonomy as the designing framework of comprehension strategies

The average scores of the pre-test and the post-test were compared in order to prove that students indicated improvement in all four reading strategies. Bearing this in mind, this indicated the potential positive effects of SOLO levels in enhancing students' higher order thinking on how they cognitively processed information from the reading texts and gained deep understanding of reading texts. As

mentioned in the literature review, Courney (1986) proposed that the questions should be structured as a four sequential items in which each question is built on the SOLO level in order to provide students adequate chances to build up the quality of their answers to indicate their comprehension. In her research, 38 out of 68 students were able to answer at relational level as they were able to progress across the SOLO levels to attain a deeper understanding.

### 4.3.1 Performance in the Pre-test

(Table 4.8 the performance of control group and experimental one on the pre-test)

<b>Participant No.</b>	<b>Control Group</b>
6 C/ 1	9
6 C/ 2	7
6 C/ 3	8
6 C/ 4	8
6 C/ 5	6
6 C/ 6	7
6 C/ 7	7
6 C/ 8	9
6 C/ 9	11
6 C/ 10	5
6 C/ 11	6
6 C/ 12	6
6 C/ 13	5
6 C/ 14	8
6 C/ 15	7
6 C/ 16	7
6 C/ 17	6
6 C/ 18	6
6 C/ 19	5
6 C/ 20	8
6 C/ 21	7
6 C/ 22	7
6 C/ 23	6
6 C/ 24	6
6 C/ 25	7
<b>MEAN</b>	<b>6.96</b>
<b>Participants' No.</b>	<b>Experimental Group</b>
9 D/ 1	4
9 D/ 2	6
9 D/ 3	6
9 D/ 4	5
9 D/ 5	7
9 D/ 6	7
9 D/ 7	9
6 D/ 8	8
6 D/ 9	8
6 D/ 10	4
6 D/ 11	7

6 D/ 12	9
6 D/ 13	8
6 D/ 14	9
6 D/ 15	8
6 D/ 16	8
6 D/ 17	6
6 D/ 18	7
6 D/ 19	9
6 D/ 20	9
6 D/ 21	8
6 D/ 22	8
6 D/ 23	8
6 D/ 24	4
6 D/ 25	7
MEAN	7.16

The table above shows that the

performance of both groups before the intervention is similar in the level, as the means score for both the control and experimental group in respective are (m=6.96; SD=1.39) and (m=7.16; SD=1.59). With problems of validity in mind, it is evident that the researcher selected samples that are as similar as possible at the start of the experiment to ensure and generalize results in order for the independent variable to be measured. In addition, limiting the variables introduced into the study required, the two classes served as the most suitable subjects for this research due to the students' similar English proficiency. In other words, the subjects of the study were selected on the basis of a degree of homogeneity of their English level. (See Table 3.5 & Table 4.8)

### 4.3.2 Performance in the Post-test

(Table 4.9 the performance of control group and experimental one on the post-test)

Participant No.	Control Group
6 C/ 1	9
6 C/ 2	8
6 C/ 3	8
6 C/ 4	8
6 C/ 5	7
6 C/ 6	8
6 C/ 7	7
6 C/ 8	8
6 C/ 9	11
6 C/ 10	6
6 C/ 11	7
6 C/ 12	7
6 C/ 13	6
6 C/ 14	9
6 C/ 15	8

6 C/ 16	7
6 C/ 17	8
6 C/ 18	11
6 C/ 19	6
6 C/ 20	7
6 C/ 21	7
6 C/ 22	8
6 C/ 23	11
6 C/ 24	6
6 C/ 25	7
<b>Participants' No.</b>	<b>Experimental Group</b>
6 D/ 1	8
6 D/ 2	12
6 D/ 3	13
6 D/ 4	12
6 D/ 5	13
6 D/ 6	13
6 D/ 7	13
6 D/ 8	14
6 D/ 9	14
6 D/ 10	8
6 D/ 11	13
6 D/ 12	13
6 D/ 13	12
6 D/ 14	13
6 D/ 15	14
6 D/ 16	14
6 D/ 17	14
6 D/ 18	13
6 D/ 19	14
6 D/ 20	13
6 D/ 21	14
6 D/ 22	12
6 D/ 23	14
6 D/ 24	13
6 D/ 25	14

It is apparent from the table above that the difference in means between the scores of the experimental group in the pre and post- test indicates a significance change in the students' performance after receiving the intervention. The results, as shown in Table 4.9, indicate a positive correlation between the use of SOLO strategies as an intervention in literacy classes and its noteworthy effect on students' performance in reading tests.



### 4.3.3 The Control Group’s Performance in the Pre-test and Post-test

(Table 4.10 the performance of control group on the pre-test and post-test)

Participant No.	Pre-Test Data	Post-Test Data	Gains
6 C/ 1	9	9	0
6 C/ 2	7	8	+1
6 C/ 3	8	8	0
6 C/ 4	8	8	0
6 C/ 5	6	7	+1
6 C/ 6	7	8	+1
6C/ 7	7	7	0
6C/ 8	9	8	+1
6 C/ 9	11	11	0
6C/ 10	5	6	+1
6 C/ 11	6	7	+1
6 C/ 12	6	7	+1
6 C/ 13	5	6	+1
6 C/ 14	8	9	+1
6 C/ 15	7	8	+1
6 C/ 16	7	7	0
6 C/ 17	6	8	+2
6 C/ 18	6	11	+5
6 C/ 19	5	6	+1
6 C/ 20	8	7	-1
6 C/ 21	7	7	0
6 C/ 22	7	8	+1
6 C/ 23	6	11	+5
6 C/ 24	6	6	0
6 C/ 25	7	7	0
<b>MEANS</b>	<b>6.96</b>	<b>7.8</b>	<b>+0.84</b>

The table above is quite revealing. First, unlike other tables the difference in means between the scores of the control group in the pre and post- test was poor - just (0.8). In Table 4.10, it can be seen by far the greatest demand is for teaching strategies in effective reading which encompassed pre-reading, while-reading and post-reading strategies. The strategies which promote comprehension involve various critical thinking processes especially while comparing, making inferences, predicting, evaluating, synthesizing, reflecting, applying other contexts, and relating to one’s experience.

It is worth mentioning here that the students’ reading comprehension answers tend to be superficial as there is no effort to delve into deeper understanding; it appears like a hit-and-miss attempt. In fact, it is difficult to identify whether the students really understood what they read. They seem to select answers using the strategy of answering formulaic exam questions which is usually the results of “teaching to the test”. They barely identify their answers by matching the words and structures in the questions with

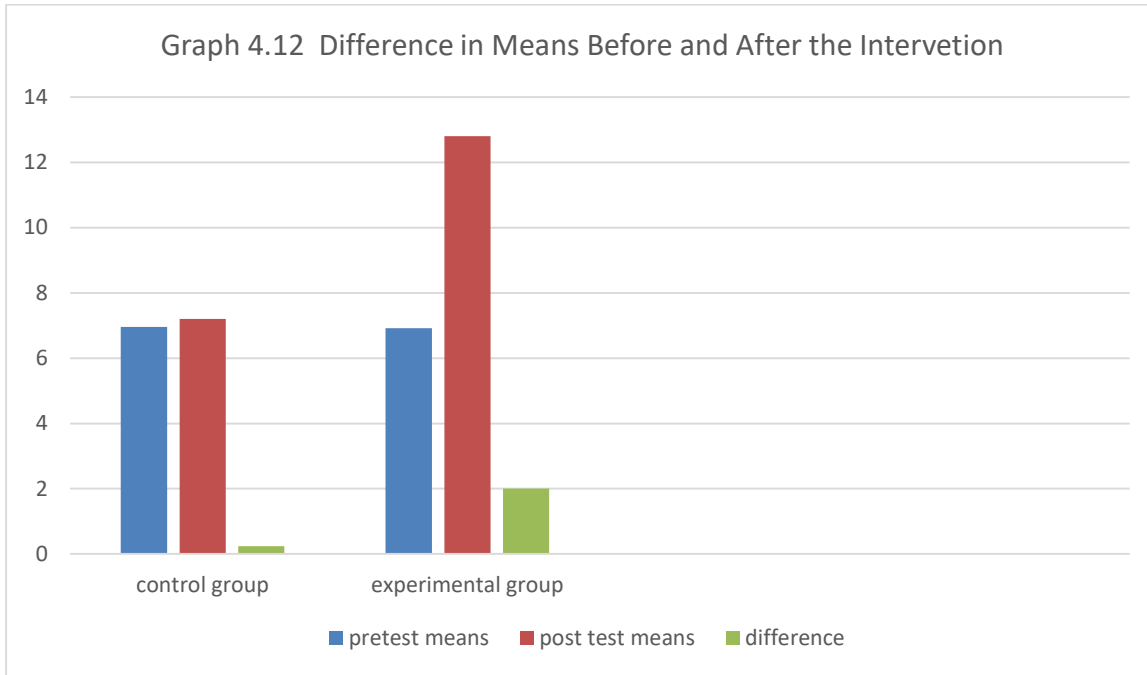
specific parts of the text, for they might have become accustomed to the habit of getting verbatim answers directly from the given texts especially when they encounter metacognitive thinking questions.

#### 4.3.4 The Experimental Group's Performance in the Pre-test and Post-test

(Table 4.11 the performance of experimental group on the pre-test and post-test)

Participant No.	Pre-Test Data	Post-Test Data	Gains
6 D/ 1	4	8	+4
6D/ 2	6	12	+6
6 D/ 3	6	13	+7
6 D/ 4	5	12	+7
6 D/ 5	7	13	+6
6 D/ 6	7	13	+6
6D/ 7	9	13	+4
6 D/ 8	8	14	+6
6 D/ 9	8	14	+6
6 D/ 10	4	8	+4
6 D/ 11	7	13	+6
6 D/ 12	9	13	+4
6 D/ 13	8	12	+4
6 D/ 14	9	13	+4
6 C/ 15	8	14	+6
6 C/ 16	8	14	+6
6 D/ 17	6	14	+8
6 D/ 18	7	13	+6
6 D/ 19	9	14	+5
6 D/ 20	9	13	+4
6 D/ 21	8	14	+6
6 D/ 22	8	12	+4
6 D/ 23	8	14	+6
6 D/ 24	4	13	+9
6 D/ 25	7	14	+7
<b>MEANS</b>	<b>7.16</b>	<b>12.8</b>	<b>5.64</b>

A quick glance at the means of both groups before the intervention shows that they are similar in the level, as the means score for both the control and experimental group in respective are ( $m=6.96$ ;  $SD=1.39$ ) and ( $m=7.16$ ;  $SD=1.59$ ). That ensures the validity of the effect of the intervention, as all other variables are controlled, and only the SOLO taxonomy learning method was introduced to the experimental group. The difference in means between the scores of the control group of the pre and post- test is just (0.8), while it is (5.7) in the experimental group.



As shown in the graph 4.12, the experimental group outperformed the control group in the post test, which shows a strong effect of using the SOLO taxonomy method in raising the performance of students in reading comprehension tasks. To test if this difference is significant or not, a paired sample t-test is performed using the marks of the experimental group.

**Paired Samples Statistics**

**(Table 4.13)**

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 PRT	7.1600	25	1.59896	.31979
POT	12.8000	25	1.60728	.32146

**Paired Samples Test**

**(Table 4.14)**

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 POT - PRT	5.64000	1.38082	.27616	5.07003	6.20997	20.423	24	.000

An inferential analysis was performed to measure the effect of the intervention on the performance of the experimental group, and check the significance of the relationship between using the SOLO taxonomy as a learning method of reading comprehension, and the students' performance as reflected in their marks in the post-test.

As shown in the tables above (Table 4.13 & Table 4.14), there is strong evidence ( $t = 20.423$ ,  $p = 0.000$ ), that the SOLO taxonomy teaching and learning method improves marks. In this case shown, it enhanced marks, on average, by around 5 points in average, with a confidence interval of 95%CL. As  $p < 0.05$

## **4.4 Focus Group Questions Data: A Thematic Analysis**

### **4.4.1 Explicit knowledge of SOLO criteria**

SOLO helps students to reach higher level of understanding in their learning as the taxonomy sets clear criteria of levels of thinking that the students should meet. Lucander et al. (2010) found in his study that students performed better when they were introduced on how to structure their responses according to SOLO levels. As a result, his experimental group was able to provide answers at relational level. He discovered that the students became more aware of their own learning when they were introduced to SOLO levels and they were able to identify relationships between facts and not just knowing facts alone. This is corroborated by the findings from a study conducted by Prakash et al. (2010) who showed his subjects on how to structure their answers according to SOLO levels and how their responses would be evaluated using SOLO criteria. His analysis on the students' perceptions indicated that all of them believed that learning about SOLO levels improved the quality of their answers and their level of readiness.

#### 4.4.2 Catering to Individual Needs

The results from the focus group implied students' positive and favourable views on the integration of SOLO taxonomy into reading comprehension activities. Hook and Mills (2012) as well as Martin (2014) proposed that SOLO can cater to the diverse needs of mixed-abilities class since activities and questions can be designed and modified to meet students' different levels of thinking. Furthermore, SOLO levels enable teachers to identify students' levels of thinking and tailor the instructions, support, materials, expectations and assessment according to their readiness.

Chan, Tsui, and Chan (2002) claimed that SOLO levels can be used for students of different levels of thinking who likely produce different cognitive learning outcomes in accordance with their current readiness. Martin (2014) highlighted how SOLO taxonomy can create a more personalized learning environment for students since learning activities are developed to meet their individual levels and to assist them to progress from their current levels. In New Zealand, SOLO taxonomy has been used as a technique to identify students' different thinking levels and differentiate instructions based on students' diverse needs instead of adopting a one size fits all approach (Hook & Mills, 2012). In order to facilitate students' development of reading skills effectively, teachers need to be able to differentiate their instructions in reading which can be done if teachers acquire an extensive understanding of reading process that they can use to respond to well-understood students' needs and capabilities. Otherwise, teachers usually focus on average students only while students of high and low achieving students do not receive the necessary support to make progress (Ankrum & Bean, 2008).

#### 4.4.3 Hierarchical Progress

The students' perceptions on the application of the different learning verbs of SOLO in each reading strategy were generally positive. The learning verbs are categorized based on the different levels of SOLO and students are acquiring a set of learning verbs that derived from each of the level progressively as they learn to fully grasp the specific reading comprehension strategy. Table 4.15 indicated the learning verbs in each SOLO level for every reading strategy.

**Table 4.15: Learning verbs in each SOLO level for every reading strategy**

<b>Unistructural</b>	<b>Multistructural</b>	<b>Relational</b>	<b>Extended abstract</b>	<b>Reading Strategies</b>
Identify	Describe	Classify	Generalize	Connect

Arrange	Characterize	Compare and contrast	Reflect	Question
Name	Define	Sequence	Hypothesize	Inference
Identify	Define	Cause-effect relationship	Predict	Predict

According to Simmons (2015), providing level-based reading intervention module also known as tiered model is a form of differentiation that can meet students' needs based on their individual levels. This is congruent with what Martin (2014) proposed that the well-structured levels of activities based on SOLO taxonomy can provide every student the support they need to advance their learning to the next level. Pyle and Vaughn (2012) claimed that the tiered levels of reading comprehension can lead to individualized learning that significantly improve students' reading ability. Some of the strategies of providing reading comprehension activities that are based on tiered levels are graphic organizers, systematic instructions and questioning styles. It is claimed by Morgan (2014) that differentiated reading activities allow students to develop their reading ability as they become engaged in the reading activities and successfully establish connection with the reading text.

#### **4.4.4 Open-endedness**

The results from the focus group interview illustrate students' preference of the nature of the responses required by the reading comprehension activities that allow them to provide open-ended answers instead of closed-ended specific responses. Ankrum and Bean (2015) stated that student become more engaged in the reading activities as they can independently apply any reading techniques to respond to the questions and they could be creative on how they would like to approach the activities. Since the questions and activities in the reading comprehension task were open to wide possibilities of answers, the students were not constrained by a set of strict requisites on how they needed to answer the questions in the reading comprehension module. According to the students, it helped to foster more ideas as they cognitively explored many possibilities and alternatives in answering the reading comprehension questions.

#### **4.4.5 Variety of Techniques**

The students also felt that the variety of techniques used in the reading comprehension activities increased their level of engagement and interest in completing the task. Some cited that the visual tools

help them to organize information better and it enables them to analyze the texts from different perspectives. Visual aids and graphic organizers can help students to structure information, examine their significance and identify the connection between the different facts (Connor & Lagares, 2007; McMackin & Witherell, 2010). Simmons (2015) stated that visual tools could challenge the students' minds to delve into deeper understanding and go beyond facts.

### **a. The first question**

#### **Did the SOLO activities help you to develop your thinking skills? What are the reasons?**

The students' responses vary in regard to the effectiveness of SOLO activities on their deliberation. Talking about this issue four interviewees declared that these differentiated exercises allow them to point out their place in the learning process; " I can see what I am capable of now and what is my next target," said S4. Some felt that having this hierarchical way of teaching permits the learner to smoothly run through the educational path, while S2 and S3 considered that they feel ashamed to reveal their current level as they might be underestimated by their colleagues. This, in turn, hinders them from fulfilling the progression.

### **b. The second question**

#### **Which aspect of the SOLO reading activities that help you learn best? How?**

It is quite manifest that these reading activities get the highest number of interest amongst the learners compared to other learning strategies. The exercises give the students a sense of competition. The overall response to this question was supporting that the most attractive aspects are the Remembering and Creating activities. As for the Remembering, around 60 percent of the focus group mentioned that this step is interesting for its easiness. Moreover, the Creating part is favorable for most of them as well because it involves them in doing some hands on activities. Having the students using their motor skills motivates them to become confidently engaged with the text they read.

### **c. The third question**

**Which aspect of the SOLO reading activities that you did not find helpful in your learning?  
What are the reasons?**

Nevertheless, they showed less attraction in Evaluating and Analyzing. They found out that these two steps require them to analytically dig deep into the text, and hence they will be struggling moving on in SOLO continuum. Moreover, the steps as per S1 “was heavy and boring” comparing to Creating.

## **4.5 Summary**

Overall, these results suggest that the nature of SOLO levels enables students to learn more effectively as the taxonomy is a model that can be used to classify the level of thinking demonstrated in every response that students generate. This can be used to identify students’ level of thinking and assist them to progress to reach higher level of thinking.



## CHAPTER 5

### SUMMARY AND CONCLUSION

#### 5.1 Overview

The present study was designed to objectively measure some reflective ideas and perceptions regarding the practicality of SOLO Taxonomy to be adapted, improved or reviewed in a more plausible manner to improve students' literacy skills. It could be deduced that SOLO taxonomy offers new insight on how reading comprehension activities and metacognitive thinking skills could be developed, assessed and practiced in the teaching and learning of English language.

#### 5.2 Findings

The experiment confirmed that teaching using SOLO model proved to have a positive impact on students who became active thinker. This research aimed to explore the practicality and potential of SOLO taxonomy, a teaching model to impact students' learning, to be integrated into reading comprehension activities in order to enhance students' performance in literacy. There are four reading strategies that this study sought to specifically examine on how SOLO levels could possibly assist students to acquire these strategies: making connection, inferring, predicting and questioning.

There were two research questions that this study focused on. The first one was to identify any significant difference in students' performance in reading tests as a result of the ESL reading comprehension activities which were designed according to SOLO levels. The second question was to examine students' views on the ESL reading comprehension activities that were built upon the learning verbs in each of the SOLO levels; particularly whether the activities helped them to develop their thinking skills. As shown in the tables above (Table 4.13 & Table 4.14), there is strong evidence ( $t = 20.423$ ,  $p = 0.000$ ), that the SOLO taxonomy teaching and learning method improves marks. In this case shown, it enhanced marks, on average, by around 5 points in average, with a confidence interval of 95%CL. As  $p < 0.05$

Based on the tests, students indicated improvement in all four reading strategies which indicated the potential positive effects of SOLO levels in enhancing students' thinking on how they cognitively processed information from the reading texts and gained deep understanding of reading texts. This could be attributed to the systematic, interrelated and hierarchical set of questions and activities which were

designed according to SOLO levels.

Questions and activities that were used during the intervention were constructed upon SOLO levels. This pedagogical template of strategic questions allow students to develop their thinking skills systematically and hierarchically as the four steps questions built upon each of the SOLO level move them from surface to deep understanding (Leng, 2006; Hattie & Brown, 2004; Brabrand & Dahl, 2009; Brabrand, 2007).

### **5.3 Implications of the current study**

The study has gone some way towards enhancing our understanding of SOLO taxonomy levels: pre-structural, unistructural, multistructural, relational and extended abstract. In the context of students, students are at pre-structural level when they have no idea over a particular subject or topic, they are at unistructural level if they are able to generate one idea and they reach multistructural level if they can produce several ideas. At relational level, students are able to link the different ideas and once they are able to go beyond the given context with the ideas that they expand, they are considered to have reached extended abstract, the final level of SOLO taxonomy.

There were two instruments used to answer the two research questions: tests and focus group interviews. Two intact classes of 27 students from an American school were the subjects of the study and the 7 weeks intervention focused on four reading strategies of making predictions, making inferences, establishing connection and asking questions. The results from the tests were analyzed with paired samples t-test and independent samples t-test in order to identify students' possible improvement as a result of the intervention. The results from the focus group interviews addressed the second research question that investigated how students' metacognitive thinking skills developed in response to SOLO taxonomy to determine their perceptions on the use of the taxonomy in reading comprehension activities.

A key strength of this study was the apparent evidence of how students proceed from surface understanding to deep understanding. SOLO questions which are designed according to the hierarchical SOLO levels is a plausible method that can help teachers to determine students' levels of understanding and identify their next steps in teaching them according to students' responses to the questions ( Hattie & Brown, 2004; Hook & Mills, 2012). SOLO questioning methods can help teachers to facilitate the development of higher order thinking skills among students whether they are high achievers or low achievers.

## 5.4 Recommendations

What is now needed is a cross-national study involving further experiments across the U.A.E schools to support the notion that SOLO taxonomy teaching approach may lead to a significant improvement in students' literacy skills and metacognitive capabilities. Taking this research a step further is recommended to assert the pedagogical template of four SOLO-structured questions to help students demonstrating their fullest abilities to further progress in their literacy learning.

## 5.3 Limitations of the study

- **Human limitation:** The limited number of sample where this study was involved 50 Emirati students from one school. With such a small number of populations, it is less plausible for the results of the study to be generalized to a wider context.
- **Locative limitation:** the instruments used in this study are limited to tests, focus group interview, and journal writing conducted in an American-curriculum school.

## 5.6 Concluding Note

This paper has discussed and tested the hypothesis that SOLO taxonomy can be integrated into reading comprehension activities in order to increase students' metacognitive thinking skills to the extent that they can master the reading comprehension strategies: predicting, inferring, making connection and questioning. Each of SOLO levels contain learning verbs (name, describe, evaluate, hypothesize etc.) that demonstrate the thinking skills and process that the levels represent. Returning to the questions posed at the beginning of this study, it is now possible to state that SOLO taxonomy provides a systematic way of describing how a learner's performance grows in structural complexity when mastering many tasks as they develop concepts and skills in general sequence. This can guide the formulation of specific targets or the assessment of specific outcomes (Teaching and Educational Development Institute, 2015). Students who practiced the systematic and sequential questions of SOLO taxonomy during the intervention phase gained deep understanding of given texts by producing more evaluative remarks and questions to monitor their reasoning and comprehension in English reading tests.

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## Appendix 1

### Grade Bands related to Lexile measure and RIT

Grade Band	Lexile Bands Associated with College and Career Readiness*	Associated Reading RIT Band
<b>K-1</b>	N/A	<202
<b>2-3</b>	420L-820L	190-212
<b>4-5</b>	740L-1010L	208-223
<b>6-8</b>	925L-1185L	218-232
<b>9-10</b>	1050L-1335L	225-241
<b>11-CCR</b>	1185L-1385L	232-244

\*Source: Supplemental Information for Appendix A of the Common Core State Standards for English Language Arts and Literacy:  
New Research on Text Complexity

## Appendix 2

### Pre-Test

Reading a-z

LEVEL 5

Benchmark Passage

Unusual Homes

Name \_\_\_\_\_

Word Count: 153

#### Unusual Homes

Some people are not satisfied to live in traditional houses or apartments, but choose instead to create homes of their own design. These homes show a sense of imagination.

A house in Mexico blends architecture with art. It's built to look like a giant nautilus seashell. The rooms are curved to match the shape of the shell. The walls of one room are sandy, and there are blue tiles on the floor and a window in the ceiling to give a feeling of being underwater.

A house in Pennsylvania is shaped like an enormous shoe. There are five floors and three bedrooms inside this shoe! Even the doghouse and mailbox are shaped like shoes.

Reactions from visitors vary a great deal. There are those who appreciate the unusual buildings, while others scratch their heads and wonder what the homeowners were thinking. Regardless of those reactions, unusual homes can be functional, fantastic, and fun.

Reading A-Z

LEVEL 5

Benchmark Passage Quick Check

Unusual Homes

Name \_\_\_\_\_ Date \_\_\_\_\_

Instructions: Read each question carefully and choose the best answer.

- The main idea of the passage is that \_\_\_\_\_.
  - many artists enjoy creating artwork in usual spaces
  - builders can create homes that make it feel like you are underwater when you are inside
  - some homes are designed to look very different from most other homes
  - houses sometimes look like shells or shoes
- Read the example sentence: *Some people are not **satisfied** to live in traditional houses or apartments, so they choose to create homes of their own design.* What does the word **satisfied** mean?
  - helped by a process
  - created to be a certain way
  - made happy or pleased
  - asked to put an end to
- What is one difference between unusual homes and most other homes?
  - Unusual homes have very few rooms, while most other homes have many rooms.
  - Unusual homes have many different shapes, while most other homes have similar shapes.
  - Unusual homes have art inside them, while most other homes do not have art.
  - Unusual homes have colorful walls, while most other homes have white walls.
- What is the author's point of view on the topic of this passage?
  - Unusual homes are fantastic houses for everyone.
  - Unusual homes are uncomfortable.
  - Unusual homes often take up too much space.
  - Unusual homes can be perfect homes for some people.

#### Open-ended Questions

What does the text say? (Literal)

How does the text work? (Structural)

What does the text mean? (Inferential)

What does the text inspire you to do? (Interpretive)

# Appendix 3

## Post-Test

Reading a-z

LEVEL X

Benchmark Passage

The Green Town of Greensburg

Name \_\_\_\_\_

Word Count: 188

### The Green Town of Greensburg

Before May 4, 2007, Greensburg, Kansas, was a typical farming town of about 1,400 people. That evening, a funnel of winds spinning at more than two hundred miles per hour blasted through the town. The tornado took eleven lives and demolished more than 95 percent of the town.

The destruction became an opportunity for the residents of Greensburg. After the storm, the town came together and proposed a radical plan to rebuild. Greensburg would come back to life as the first entirely “green” U.S. city.

The Greensburg GreenTown program started helping the town’s residents and businesses “go green,” or live with less environmental impact. Homeowners built new houses that met the Leadership in Energy and Environmental Design, or LEED, platinum standard (the highest LEED standard). The city made plans to rebuild a bank, hospital, school, and other sites using energy-saving materials. Tall, spinning wind turbines were proposed to generate all the town’s power using the very force that destroyed the town. The people in Greensburg didn’t just

want to rebuild—they wanted to transform their town in order to set an example for other communities around the world.

### Open-ended Questions

What does the text say? (Literal)

How does the text work? (Structural)

What does the text mean? (Inferential)

What does the text inspire you to do? (Interpretive)

Reading A-Z

LEVEL X

Benchmark Passage Quick Check

The Green Town of Greensburg

Name \_\_\_\_\_ Date \_\_\_\_\_

Instructions: Read each question carefully and choose the best answer.

- Which of the following best summarizes the passage?  
  - (A) Homeowners in Greensburg, Kansas, built new houses that met the highest standard for Leadership in Energy and Environmental Design, or LEED.
  - (B) After a powerful tornado destroyed Greensburg, Kansas, the town rebuilt to limit the town’s impact on the environment.
  - (C) The farm town of Greensburg, Kansas, was hit by a tornado that created the need to rebuild the town.
  - (D) After a storm, the residents of Greensburg, Kansas, decided to generate their power with wind energy resources.
- What does the word **demolished** mean?  
  - (A) determined
  - (B) defused
  - (C) declared
  - (D) destroyed
- How many people died in the tornado in Greensburg?  
  - (A) eleven
  - (B) ninety-five
  - (C) one thousand four hundred
  - (D) two thousand seven
- How did the tornado create an opportunity in Greensburg?  
  - (A) by forcing the town to rebuild
  - (B) by scaring all but the smartest people away
  - (C) by creating landscapes that tourists came to see
  - (D) by attracting storm watchers who asked townspeople for food

## APPENDIX 4: INTERVIEW QUESTIONS

### Focus Group Questions

#### Part A

1. Could you tell me about yourselves? Your background, education, interest etc.
2. How do you rate your English proficiency: poor, satisfactory or proficient user?
3. What is your learning preference? What do you think you need to help you in your study?

#### Part B

1. How did you usually answer the questions in the reading comprehension?
2. Were there any strategy or technique that you usually use when answering the questions?
3. What do you think about the level of the questions as it progressed in each reading text?

#### Part C

1. Did the SOLO activities help you to develop your thinking skills? What are the reasons?
2. Which aspect of the SOLO reading activities that helped you learn best? How?
3. Which aspect of the SOLO reading activities that you did not find helpful in your learning? What are the reasons?

**Appendix 5**  
**Informed Consent Form**  
**Consent Form**

The specific aim of this study was to test the hypothesis that using SOLO model can increase students' reasoning ability to give a constructive feedback about their learning; in other words, this dissertation intends to determine the extent to which SOLO Taxonomy can influence students' performance in their reading tests and whether it can affect students' metacognitive ability or not. While there are no direct benefits to the participants, it is intended that future students fitting this profile will be provided with improved resources in their first semester studying in the school as a result of this study. There are no risks involved in participating in this study.

Participation consists of one focus group interview, lasting approximately half an hour. This interview will be audio taped, unless otherwise requested by the participant. There may be additional follow-up/clarification through email, unless otherwise requested by participant. Privacy will be ensured through confidentiality. If participant wishes for the use of her full name in the study, this request will be adhered to as well. Participation is voluntary and the interviewee has the right to terminate the interview at any time.

A summary of the results will be available to participants upon request. Please contact interviewer/researcher, with any questions or concerns.

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Signature of Principal

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Signature of Researcher

## APPENDIX 6: The Reading Comprehension Passages

### Reading Strategies Session (Questioning)

Read the texts and answer the following questions.

Picture this: a herd of elephants flies past you at sixty miles per hour, followed by a streak of tigers, a pride of lions, and a bunch of clowns. What do you see? It must be a circus train! One of the first uses of the circus train is credited to W.C. Coup. He partnered with P.T. Barnum in 1871 to expand the reach of their newly combined shows using locomotives. Before circus trains, these operators had to lug around all of their animals, performers, and equipment with a team of more than 600 horses. Since there were no highways, these voyages were rough and took a long time. Circuses would stop at many small towns between the large venues. Performing at many of these small towns was not very profitable. Because of these limitations, circuses could not grow as large as the imaginations of the operators. After they began using circus trains, Barnum and Coup only brought their show to large cities. These performances were much more profitable and the profits went toward creating an even bigger and better circus. Multiple rings were added and the show went on. Today, Ringling Bros. and Barnum and Bailey Circus still rely on the circus train to transport their astounding show, but now they use two.

1. What questions you could ask based on the information from the text?
2. Which information that you bas your questions on?
3. Why would you ask such question?

### Reading Strategies Test (Inference)

Read the texts and answer the following questions.

Every day after work Paul took his muddy boots off on the steps of the front porch. Alice would have a fit if the boots made it so far as the welcome mat. He then took off his dusty overalls and threw them into a plastic garbage bag; Alice left a new garbage bag tied to the porch railing for him every morning. On his way in the house, he dropped the garbage bag off at the washing machine and went straight up the stairs to the shower as he was instructed. He would eat dinner with her after he was "presentable," as Alice had often said.

1. What type of job does Paul do? How do you know this?
2. Describe Alice. What in the text supports your description?
3. What relationship do Paul and Alice have? Why do you feel this way?

### Reading Strategies Test (Inference)

Read the texts and answer the following questions.

As the teacher brought the class back from the washroom, he noticed that Alvin and Elijah were nowhere to be seen. He asked the class, "Has anyone seen Alvin or Elijah?" Most of the students confirmed that they had not seen them, except for Rodney, who remained silent while tapping his foot on the floor anxiously. The teacher noticed this. "Rodney, do you happen to know where your best buddies Alvin and Elijah went?" Rodney looked away and said, "Nah, I haven't seen them." The teacher notified the office of the missing students. An announcement was made over the PA system and a few minutes later, Alvin and Elijah returned to class. Both of them were very sweaty and Elijah was carrying a basketball. "Sorry we took so long. We had to use the bathroom," said Elijah. "Yeah," chimed in Alvin, "it took longer than we thought."

1. What were Alvin and Elijah doing while they were gone? How do you know this?
2. Why was Rodney acting so strangely? How do you know this?
3. Will the teacher believe Alvin and Elijah's story? How do you know this?

### Reading Strategies Session (Prediction)

Read the texts and answer the following questions.

Vince Thunder waved to the crowd one more time before he put on his motorcycle helmet. The crowd cheered uproariously. Vince looked down the ramp and across the 17 school busses that he was about to attempt to jump. It was a difficult trick and everything would need to go right for him to nail it. His cape blew in the wind. As Vince hopped on his motorcycle and started down the ramp, he noticed something that he had not seen before. There was large oil slick at the end of the ramp. He attempted to stop the bike, but it was too late. He had already built up too much momentum...

1. What event is most likely to occur next? What evidence from the text supports your prediction?

Rex sat at the mouth of the alley and chewed the bone that he had found by the dumpster. It was a meaty bone that had belonged to a larger animal, perhaps a state fair prize winning pig. Rex was attracted to the bone by its strong scent. Apparently, he was not the only one who could smell it. He heard the jangle of tags behind him and turned to see a larger dog. Rex released the bone and began growling at the other dog. The other dog began growling at Rex. The two dogs inched toward one another, maintaining eye contact. Each began growling louder as the other approached within striking distance...

2. What event is most likely to occur next? What evidence from the text supports your prediction?

### Reading Strategies Session (Prediction)

Read the texts and answer the following questions.

As Frank marched through the desert, the high winds blew sand at speeds that stung his exposed skin. He looked back and could see his footprints for hundreds of feet, beyond that the winds had blown them away. He had no idea how long or how far he had walked. He turned his back to the wind and opened his canteen. He attempted to pour it into his mouth, but there was not a drop. He rolled his tongue around the nozzle of the canteen, but it was bone dry. Frank dropped the canteen in the sand and continued walking. His steps slowed. He was getting dizzy. The sun's rays seemed to only increase in intensity throughout the day. It hung high overhead and punished all that resided in the desert beneath it. Frank was lightheaded. He felt his knees get wobbly...

1. What event is most likely to occur next? What evidence from the text supports your prediction?

Valarie pulled into her mother's driveway on a lovely morning in the month of May. She got the kids out of the car and walked them up to the door. Grandma smiled brightly and welcomed them, "So nice to see you children. You too, Valarie, I hope that you have a wonderful vacation. We will see you in a couple weeks." The kids kissed their mother goodbye and went outside to play in the warm sun. They were wearing shorts and t-shirts and had sunblock on their noses. As mom pulled out of the driveway, a storm cloud rolled across the sky. The temperature suddenly dropped. Grandma looked at the weather report and saw a bunch of snowflake icons across the next few days. Then Grandma looked at the shivering children in their summer clothes. "Do you have anything warmer in your bags, kids?" The children shook their heads. Grandma replied, "Ok, well, hop in the car. We've got to go to the store." Tiny snowflakes began to fall...

2. What event is most likely to occur next? What evidence from the text supports your prediction?

### Reading Strategies Session (Making Connections)

Read the texts and answer the following questions.

A penny for your thoughts! If it's a 1943 copper penny, it could be worth as much as fifty thousand dollars. In 1943, most pennies were made out of steel since copper was needed for World War II, so the 1943 copper penny is ultra-rare. Another rarity is the 1955 double die penny. These pennies were mistakenly double stamped, so they have overlapping dates and letters. If it's uncirculated, it'd easily fetch \$25,000 at an auction. Now that's a pretty penny.

1. Does this remind you of something old yet precious to you? Please explain it.

When one hears the term "reality" applied to a television show, one might expect that the events portrayed occurred naturally or, at the least, were not scripted, but this is not always the case. Many reality shows occur in unreal environments, like rented mansions occupied by film crews. Such living environments do not reflect what most people understand to be "reality." Worse, there have been accusations that events not captured on film were later restaged by producers. Worse still, some involved in the production of "reality" television claim that the participants were urged to act out story lines premeditated by producers. With such accusations floating around, it's no wonder many people take reality TV to be about as real as the sitcom.

2. Have you ever watched a reality TV show? Do you think it was real? Why?



### Reading Strategies Session (Making Connections)

Read the texts and answer the following questions.

Being a clown isn't all fun and games. Rodeo clowns expose themselves to great danger every time they perform. When cowboys dismount or are bucked off of bulls at riding competitions, rodeo clowns jump in front of the bulls and motion wildly to get their attention. In this way rodeo clowns provide an alternate target, and in doing so protect the rider. So you see, sometimes clowning around can be serious business.

1. Have you ever experienced of doing something dangerous? Why did you decide to do so?

The wolverine, a medium sized mammal weighing no more than 50 lbs., has earned its reputation for ferocity with its documented ability to kill prey many times its size. The reason why wolverines have so many conflicts with other animals (including wolves, cougars, and even bears) is probably because of the wolverine's preferred hunting style. Rather than chasing down or tricking its prey like most hunters, the wolverine prefers to take its meals directly from other hunters. So while a polar bear or a lone wolf might be enjoying a hard earned carcass, a hungry wolverine may try to take his lunch. This keeps the wolverine in plenty of fights.

2. Have you ever seen a predatory animal? How did it make you feel? Why?

### Reading Strategies Session (Prediction)

Read the texts and answer the following questions.

"You have a pimple on your forehead!" Eric snooted to Katie. Katie snapped back at him, "I do not!" Eric was delighted to see that he had gotten under her skin. He laughed, "Ha ha! You do too, and now that you're turning red, it's easier to see." Katie scowled then she charged at Eric. Eric knew better than to stand still when Katie charged, so he started running. Katie caught up to him in the living room. Mom had a beautiful antique vase on a large marble pedestal near the corner of the room. Eric took refuge behind it, knowing that as long as he could keep running around the vase faster than Katie, she would never catch him. Katie yelled at the top of her lungs, "Take it back!" As she circled around the pedestal, her foot bumped into the corner. The antique vase wobbled on the top of the pedestal. "Your pimple looks really red when you get mad!" Eric remarked snidely. He was really enjoying this. The vase continued wobbling but remained upright. Katie charged again. This time she bumped the pedestal with her elbow as she circled it...

1. What event is most likely to occur next? What evidence from the text supports your prediction?  
Inference

### Reading Strategies Session (Prediction)

Read the texts and answer the following questions.

"You have to water the tomatoes in the morning, not a midday or night," Veronica told her brother A.J. He nodded, but it didn't really look like he was paying attention. "They need to aspirate water all day, so please water them in the morning," she continued. "Yeah, yeah, water the plants," A.J. said with frustration. Veronica was travelling out of the country to Spain for two weeks. She was counting on her brother A.J. to water her plants. He had been irresponsible in the past, but she was giving him another chance. She had heard that gardening was therapeutic and A.J. needed therapy. She hugged and kissed him goodbye and then went to the airport. While she was gone, A.J. stopped by the garden once or twice at the start of the first week, and then he lost interest. Veronica wanted to call her brother to remind him to water the plants, but she was having so much fun in Spain that she forgot. When Veronica finally returned, the first thing she did was check out her garden. She walked up to the patch and...

1. What event is most likely to occur next? What evidence from the text supports your prediction?

## APPENDIX 7: All Data Analysis Tables

### T-Test

[DataSet0]

**Paired Samples Statistics**

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 PRT	7.1600	25	1.59896	.31979
POT	12.8000	25	1.60728	.32146

**Paired Samples Correlations**

	N	Correlation	Sig.
Pair 1 PRT & POT	25	.629	.001

**Paired Samples Test**

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	PRT - POT	-5.64000	1.38082	.27616	-6.20997	-5.07003	-20.423	24	.000

### T-Test

**Paired Samples Statistics**

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 POT	12.8000	25	1.60728	.32146
PRT	7.1600	25	1.59896	.31979

**Paired Samples Correlations**

	N	Correlation	Sig.
Pair 1 POT & PRT	25	.629	.001

### Frequencies

**Statistics**

	PRT	POT
N Valid	25	25
Missing	0	0

### Means

**Case Processing Summary**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
CPOT	25	100.0%	0	0.0%	25	100.0%

**Report**

CPOT

Mean	N	Std. Deviation
7.8000	25	1.47196

### Frequency Table

**PRT**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 4.00	3	12.0	12.0	12.0
5.00	1	4.0	4.0	16.0
6.00	3	12.0	12.0	28.0
7.00	5	20.0	20.0	48.0
8.00	8	32.0	32.0	80.0
9.00	5	20.0	20.0	100.0
Total	25	100.0	100.0	



