

Theory-Practice Gaps in Developing Critical Thinking: Insights from A Pedagogical Study in Omani Context

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Abstract

With this premise as a backdrop that effective use of Socratic questioning in instructional practices is of vital importance in English as a forging language (EFL) classrooms, this study was undertaken to investigate application of Omani knowledge of Socratic questioning (SQ) on students' critical thinking (CT) in post basic schools. This study investigates the application of Omani EFL of SQ on students' CT in post basic schools. The present study attempts to a) ascertain whether there is any statistically significant difference between mean scores of those who are taught through SQ and those obtained by students who are taught CT skills in a normal setting. b) identify SQ strategies that helped to develop the students' CT skills. An experimental research design was implemented. There were 60 students participated in this study 30 students in each group. The Mixed method procedures and data analysis showed that, a) significant differences between mean scores of those who were taught CT through SQ and those who were taught CT skills in a normal setting, c) there is clear evidence that students in the experimental group had evolved effective CT strategies during the intervention phase.

Keywords: critical thinking, Socratic questioning, teachers' knowledge

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Introduction

The Sultanate of Oman is facing the challenge of educating its youth for life and work in the new priorities made by the current global economy. These priorities need a high degree of adaptability and a concrete background in school education particularly in the English language, in order to deal with the modern economy, and capture international business opportunities. Consistent with this understanding, the Sultanate of Oman has specified in the Omani education system that Omani students acquire knowledge and skills in all areas of curriculum including skills in questioning, investigating, critical thinking, problem solving, and decision making (Ministry of Education, 2008). In addition, the following specific oral language objectives for higher classes are considered as fundamental productive skills that related to CT:

1. To initiate and participate in longer conversations and interactions.
2. To recognize and produce common idiomatic and conversational expressions.
3. To use English to carry out practical transactions in everyday life, using a largely predictable and restricted set of language and functions.
4. To use English for social communication.

Though it is stated in the national curriculum specifications that “the new English Language curriculum is being designed to equip learners with higher cognitive abilities and skills, and attitudes that Omani learners will need to succeed in this rapidly changing society” (Ministry of Education, 2008, p. 7). Teachers’ procedures and techniques of questioning may prevent learners from attaining this objective. This is based on the understanding that teacher’s knowledge and actual use of questions could influence the way they apply national education programs in their teaching, which in turn may affect the use of classroom questions. This will therefore hamper the nation’s effort in achieving its objectives as stated in its educational system.

Literature Review

An extensive review of literature indicates that some scholars employ CT and high order thinking seemingly. Elliot, (2006) is one of the scholars who were interested in studying and using CT and higher order thinking skills in teaching context. However, other scholars have different use of these two concepts and implement them differently according to the proper context and aim Zohar, (2004). The connection between “critical thinking,” “higher order thinking,” “thinking skills” and other terms such as “informal logic,” “informal reasoning,” “problem solving,” “argumentation,” “critical reflection,” “reflective judgment,” and “metacognition” have made them more difficult to apply differently. Scholars also have other issues that led to different understanding like (a) the degree to which CT is related to specific subject, (b) variations between novice and expert thinking in which novices can learn to reflect more like experts, and (d) if CT should be implemented as a process-based practice or a package of skills (Qing, Jing, & Yan, 2010; Keng, 2006; Gambrell, 2005; Thayer-Bacon, 2000). While some scholars have tried to use order on these different terminology (Preiss & Sternberg, 2010), none of them has managed to provide a description, classification, or even a theory could be conventional as ultimate (Martin, 2010; Folsom, 2009; Chenault & Orsello, 2008; Dagli, 2008). The main problem to this disagreement has rested in the grounding of different hypotheses separate fields that is related to this study. These two fields are philosophy and psychology. The current study aims to discuss both views in order to provide a clear picture of the nature of critical thinking in education.

Many philosophers have tried to discuss the quality and the nature of the results or conclusions of CT, such as analyzing justifications and reasoning responses. However, psychologists have focused on cognition procedures and process, the elements and practices implemented to indicate practical learning issues. In addition, psychology has been tested and examined through empirical research process, while philosophy has depended on logical justifications and reasoning to conclude solutions and recommendations. On the other hand, some educators realized the importance of both areas of psychology and philosophy to improve an accurate and reliable teaching methods and procedures of CT (Kuhn, 2005; Giancarlo, 2004; Marzano, Pickering & Pollock, 2003). The current study reflects on this dilemma and will try to investigate the correlation between psychological and philosophical aspects that affect teaching and learning of EFL (English as a foreign language) through CT.

Since the time of Socrates, CT has been related to philosophy. The importance of CT in the recent different educational reform projects has been directly related to informal logic as separate field within the area of philosophy. Many researchers consider informal logic as logic that is based on evaluation, interpretation, construction of argument and justification. Informal logicians consider CT as a general concept that includes and depends on the recommendations and conclusions of informal logic, not only that but it takes from other types of logic as well as from advantages of other fields (Johnson, 2008). The contribution of informal logic has been considered as a basic theoretical ground for CT.

Philosophers consider informal logic as a meeting point for examining and improving CT and philosophy-based theories, also, they have addressed various aspects and factors that related closely to CT and positively differ in a number of ways, they also reveal common concerns (Ennis, 2008; Siegel & Biro, 2008; Paul & Elder, 2006; Lipman, 2003; McPeck, 1981). Johnson's, (2008) analysis reflects an importance of CT on cognitive theories and competences introduces by informal logic with neglecting the active role of "affective propensities" on the practice of those skills.

In comparison to philosophy, psychology researchers have based their conclusions about CT on theories of intelligence, cognitive and developmental psychology (Walker, Brophy, Hodge & Bransford, 2006; Sternberg, Roediger & Halpern, 2007). Psychologists have tried to relate problem solving to CT. However, philosophers tend to deal with problem solving and CT as equivalent concepts. Sternberg et al (2007) has concluded that CT is "purposeful, reasoned, and goal directed". It is the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions" (p. 5). Though, Sternberg prefers using CT, other psychologists have used "thinking skills" as a general term (Miri, Chaim & Uri, 2007). Generally, cognitive-based theorists have analyzed and examined skills that contributed to thinking critically, often neglected characteristics of a good critical thinker and criteria for assessing thinking. In addition to general conclusions, recently some psychologists have started giving attention to learners' acts and have in order to examine models of CT (Wegerif, 2007; & Zohar, 2007).

Many psychologists believe that Bloom (1956) taxonomy of educational objectives is considered as a foundation for psychology-based models and cognitive skills studies (Kite,

Stockdale, Whitley, & Johnson, 2005). Recently, psychologists have presented fast increasing knowledge base for different models for CT (Cheng, M., Cheng, & Tang, 2010; Hoa, 2008; Yamashita, 2007).

Presumably, if the college students attend their classes, participating and listening to lectures, writing their assignments and completing other learning activities, they would develop their CT skills. However, many researchers have indicated that developing students' CT skills needs more direct and well planned teaching of CT skill. (Paul & Elder, 2006; Muspratti, Luke, & Leonards, 2009; Facione, 2007; Egege & Kutieleh, 2004). Until recently, there is no strong evidence or conclusive research findings on the most successful instructional methods for developing students' CT skills. Forsyth, Story, Kelley & McMillan (2009) reviewed 27 studies that examined the result of different programs and courses on CT skills among college students, and they conclude that even results do not support the application of explicit instructional or course practices to increase CT; they did support the findings that college attendance improves CT. McMillan, (1987) concerned against using these conclusions to all courses or methods, quoting incomprehensive research designs, using weak instrumentation inappropriate to the treatments being evaluated, and unjustified definition and theory of CT. Halpern, (2002) recommended that the assessment tools existed in a particular study might add to the conflict of deciding the effectiveness of different approaches for CT. she has argued that assessment measures and tools must be constructed "more sensitive" to measure comprehensive progress in CT abilities. Obviously, more research is needed to find out which learning practices provide the best increases in CT. The current study is another attempt of investigation that would provide an understanding of different variables that are related to students' critical thinking skills.

The focused research on CT, along with frequent attention in developing higher cognitive abilities and skills for learners at different levels of education and ability, has brought different methods and approaches to teaching CT skills. One has been concerned with the improvement of the courses taught and assessment procedures that involved in teaching courses (Ennis, Martin, & Sun, 2007; Savery, 2006; David, Baumfield, Steve, Mei, & Jen, 2004). This approach has been commonly used in high schools' levels, particularly, in America such as California where the assessment and teaching of CT is a state-centered priority.

A second strategy has focused on "discipline specific efforts" to improve learners' skills and ability to apply CT behavior while learning. Specific journals in all fields involve teaching matters, including topics on improving learners' CT abilities. In teaching English as a second language, the TESOL Quarterly, the TESOL Journal, The Journal of Language Teaching and Research, and the ELT Journal have introduced widely read conclusions for instructional improvement, including suggestions and models for teaching for critical thinking to second language students.

Another teaching approach neglects specific plans and models while activating the enrichment of a classroom environment that supports learners' responses to CT, having a deep exposure of discussions, real questions and tasks introduced to learners, and focus on evidence and justifications to enhance written or spoken claims (Kamali & Fahim, 2011; Beaumont, 2011).

Though the three approaches just discussed and introduced, another educational approach has incorporated plans or models to be involved in critical thinking across the curriculum (Swartz,

2009; Sternberg, Roediger, & Halpern, 2007; Keng, 2006; Paul & Elder, 2006). Obviously, varied models and strategies are available to encourage learners to develop their CT skills, while each approach has its supporters; little empirical research has been done to decide if one approach reflects successful applications than another in developing learners' CT abilities and practices. Therefore, the current study aims to apply Paul and Eleder's, (2006) model of CT to investigate the result of applying teachers' knowledge of SQ questioning on students' CT. This is because Paul and Elder's, (2006) model is characterized with the following five standards that reflect the nature of the current study.

1. The model raises important questions and thinking process, constructing them evidently and specifically.
2. Collects and evaluates information, processing abstract concepts to understand them efficiently.
3. Reaches well-justified conclusions and answers compared to related and relevant indicators.
4. Students think deeply within different ways of thinking, identifying and evaluating their implications and assumptions in practical consequence.
5. The model helps students to communicate commendably with others to reach solutions to difficult issues.

The real ancient texts that function as basic foundations of what Socrates really said and did reflected a comprehensive knowledge of how Socrates applied the process of applying "counter-examples" to improve a series of questions that could increase the amount of thoughts, ideas, examples, and views to carry out the dialogue to a maximum advantage. It is clear that discussions and dialogues are the good means to maximize comprehension of the course content. On the other hand, there is no precise written manual that demonstrates how Socratic questioning should be used Paul & Elder, (2006). Generally, there is no specific Socratic model where someone can thoroughly try to use in teaching and learning practices.

Many scholars believe that the cause behind existence and extension of this approach is the way that interpreted. (Sahamed, 2004) indicates that Socratic questioning (SQ), having occurred about 2,500 years, has logically developed in its various practices today and the method has better adjusted to suit various purposes. Clearly scholars believe that questioning is an important tool of comprehension in teaching and learning context. As a result, scholars believe that Socratic questioning (SQ) can be adjusted and applied in various ways to different stages of comprehension (Paul & Elder, 2006). As a result, in literature we can underline different acts of applying this method, e.g. the "method of Dialectic "Socratic Method" (Paul & Elder, 2006). It also has been termed Socratic seminar and Socratic dialogue (Brickhouse & Smith, 2007). Keng, (2006) considers that over different applications of SQ as unreliable and considers that as misapplication of the pedagogy since only unreal features are applied without the nature of SQ. These misapplications have directed other researchers to consider SQ just open-ended questions and answer procedures (McCoy, 2008).

Purpose of the study

The purpose of this study is to investigate the result of applying SQ through reading texts in relation to students' CT in Omani General Diploma Certificate schools academic year 2016-2017. The researcher would like to know that because the new educational reform in Oman is heavily student-centered and communicative based teaching, this kind of education requires teachers with real understanding of different methodological and pedagogical aspects of questioning strategies.

Research objectives

The main objective of the current study is to examine the result of applying SQ through reading classes teachers' on students' CT skills. In so doing, the study will seek:

1. To ascertain whether there is any statistically significant difference between mean scores of those who are taught through SQ and those obtained by students who are taught CT skills in a normal setting?
2. To identify SQ strategies that helped to develop the students' CT skills.

Methods and subjects

This study is based on a quasi-experimental design where the researcher investigates the application of teachers' knowledge of SQ on students' CT skills in reading classes. In this design two classes were selected randomly and were classified in two groups, one control group and one experimental group. In other words, each teacher taught one class with 30 students in each class. Therefore, 60 students subjected to CT pre-and post-tests to measure the result of the intervention program that is based on SQ. Also, the researcher randomly selected 5 students (20%) of the sample size for the interview.

All students were general diploma certificate students (grade 12), aged 17-19. Their first language is Arabic. At the time of the study, they had been learning English as a foreign language for at least 11 years.

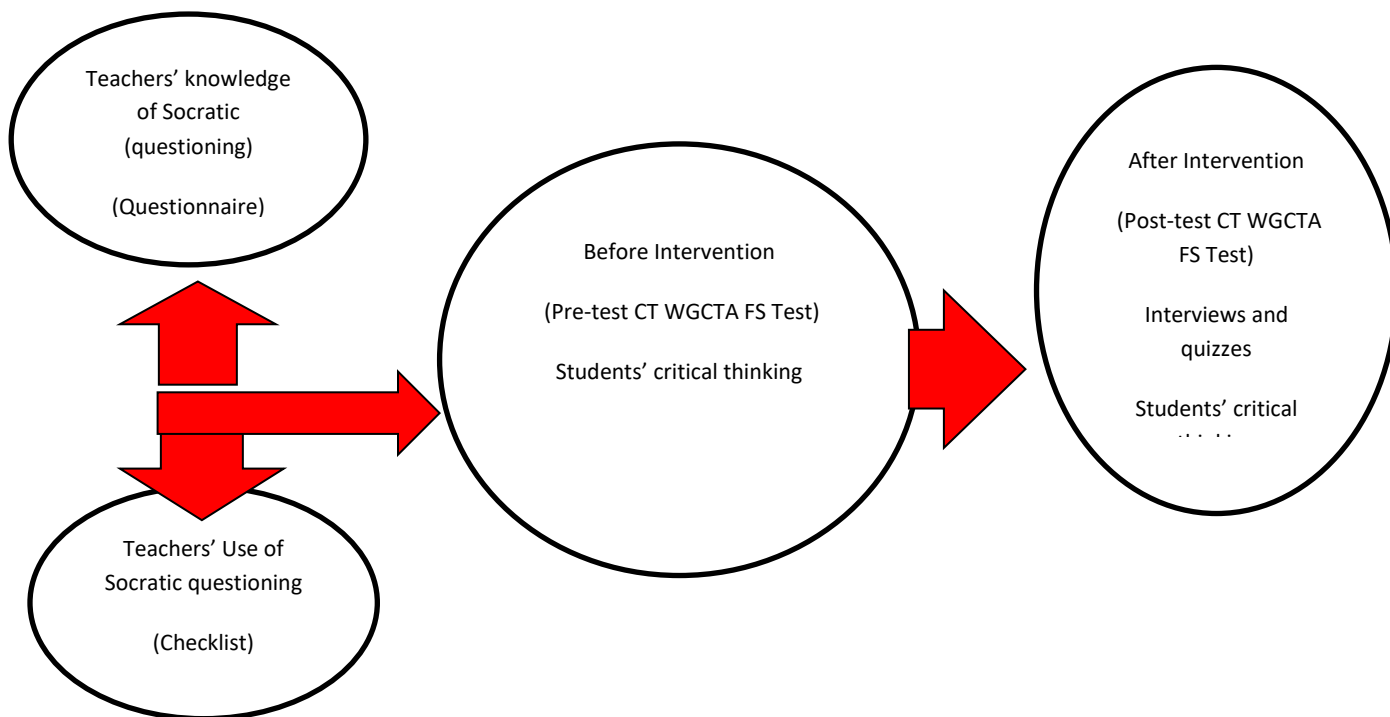


Figure 1: theoretical framework of the study

Research design

This is a “mixed method” study (Greene, 2005) that was conducted in two phases. Each phase employed a different research design. In phase I, the correlational research design was employed to collect descriptive quantitative data that will help to identify the correlation between teachers’ knowledge and their actual use of SQ. This was to ensure that if teachers’ application of SQ reflects the needed knowledge and good application skills of using SQ. The result of this phase helped to determine the nature of the intervention in phase II.

Incidentally, a quantitative correlation design is the most appropriate method for the research study where it offers a non-inquisitive method to the investigation and leads to identification of significant correlation between the variables of the study (Creswell, 2012). The proposed model of teachers’ knowledge of SQ, and teachers’ actual use of SQ in figure 1 was examined by applying Pearson’s correlation coefficient to measure the hypothesized relationship among the variables existed in phase I of current study.

In the current study the researcher used a quasi- experimental design. The reason behind choosing this specific design was that subjects were chosen randomly. It is very important to select the proper research design that “fits for purpose of the study” (Gorard, 2002a, p. 354). The nature of an experimental method is that researchers “intentionally manipulate the settings which determine the procedures in which they are interested (Creswell, 2012, p. 303)”. In other words, correlational studies only define or measure the possible relationship between dependent and independent variables but cannot demonstrate the main cause-and-effect relationship between the two variables. However, an experimental design is a design that exposes experimental groups to a particular treatment and certain statistical procedures that could identify the cause-and-effect relationship between the two variables.

Since the current study aims at investigating the result of applying SQ strategies in EFL reading classes on students CT skills, the researcher believes that conducting an experiment is the appropriate for the current study to answer the target questions in this research. Two types of data were collected in phase II of the study, namely quantitative and qualitative.

The use of mixed method approach

This study is driven by a mixed method research approach. It integrates quantitative and qualitative approaches to research design. Creswell, 2012; Teddlie & Tashakkori, 2009; Greene, 2007 conclude that mixed method can be accrued in different stages of the research, which can be indicated in the planning phase, research questions, research instruments, and analysis lead to research findings.

Creswell, 2011; Teddlie & Tashakkori, 2009; Greene, 2005 claim that there are seven mixed method approaches to research design, which explain sequential phases and parallel phases to the study application. Since the mixed method approach is the research design of this study, exploratory design using sequential phases (quantitative-qualitative) was the most appropriate design, because to collect bigger volume of data which was helpful in gaining better understanding of the research problem, in order to facilitate more insightful findings of the study.

In this study there are three instruments were used to collect the required data. First, CT test scores were tabulated to count the means and total average of SQ elements, and the T-test to measure the significant differences between mean scores in pre-test and post-test relevant to the research question 1 (RQ1). This research counts as instrument place the role of a quantitative data. Second, the scores of quizzes conducted four times by the end of every two weeks were recorded. This instrument also, serves as a quantitative tool for data collection. Third, structured interviews were conducted on the experimental group as a qualitative data instrument in order to triangulate the result of the effect of the intervention in this study. Incidentally, this qualitative data and the quantitative data collected through the results of quizzes and interview are directly linked with the research question 2 (RQ2).

Intervention

The classification of SQ developed by Paul and Elder (2006) is not ordered and organized in a rigged traditional manner. These categories (elements) in the model proposed by Paul are flexible, teachers can select questions (elements) randomly based on the category of questions that relevant to the target skill that they want to develop. The task of successful and effective teacher is to sustain and maintain the process of inquiry.

The subjects in both groups, i.e the control and the experimental group regularly met with the teacher for eight weeks. The control group was taught normally using traditional teaching method, whereas the experimental group was taught through SQ framework (SQF). Watson-Glaser Critical Thinking appraisal test (WGCT) pre-test and post-test were conducted before and after the intervention process. In addition to WGCT, the researcher used two additional instruments, namely the quiz and the structured interview to collect data from the students of the experimental group relevant to (RQ 2) after the completion of the intervention phase.

To elaborate further, the intervention included 8 reading topics. Each topic was taught and covered in one week (5 hours). SQ strategies used as teaching strategies in each reading topic which cover the five CT skills included in WGCT. The nature of SQ strategies is based on questions that evoke students' CT, which helps the teacher and the students to exchange ideas at higher cognitive level through authentic discussions in the lesson. The teacher will target the type of relevant questions to evoke students CT in terms of the demands of reflection the reading text pauses on the students.

Watson-Glaser Critical Thinking appraisal test

This test includes 80 multiple-choice items ranging from 2 to 5 in its five sub-sets. Students were given five scenarios to evaluate the performative function involved in each scenario. The five scenarios offer scores for five different subtests ranging from 0 to 80. The five sub-sets focused on the following: (1) Inference: respondents are supposed to conclude inference among different levels of truth or falsity from given data. (2) Recognition of Assumptions: respondents are expected to identify unstated assumptions or sup-positions implied in given statements or assertions. (3) Deductions: respondents are required to determine if certain conclusions logically follow from the given statements and the data. (4) Interpretation: respondents need to evaluate the evidence and come to a decision if conclusions or overviews are based on the given information. (5) Evaluation of Arguments: respondents are subjected to different between discussions that are relevant and well-built, and those that are irrelevant and not properly justified in a particular

situation (Watson & Glaser, 2006). This test covers a comprehensive range of CT: therefore, it is a valid benchmark for different professional and academic indices of success. This test is intended to collect quantitative data relevant to RQ1.

Interviews and Quizzes

Interviews and quizzes were considered important useful instruments of the study. Both interviews and quizzes were conducted only with the experimental group after the intervention period and post-test. Interviews aimed to collect qualitative data, whereas quizzes intended to collect quantitative data relevant to RQ2.

There were 30 students in the experimental group. By the end of the course and after the post-test was conducted, the researcher, in consultation with the concerned instructor of the group, randomly selected 5 students (20%) of the sample size for the interview. The researcher met these students, took their concerns to participate into the interview and explained to them about the interview process and all of them agreed to participate in the interviews. Interviews between the researcher and the participants were conducted individually after week eighth. The time was given for each interview was about 10 minutes. All the interviews were completely and carefully recorded in the form of dairy notes.

To address the issues of validity and reliability of the two instruments discussed in this section, the researcher would like to make two comments. One, as far as the validity and reliability of quizzes is concerned, it was ascertained as a part of the documents related to the intervention phase. Two, the validity and reliability of the structured interview can be considered as “met” or “achieved” because the findings of this data are close to the findings of the post-test data collected through the instruments of Watson & Glaser, (2006) CT test, and the results of the quizzes that assessed the progress line of the participants during the intervention.

Normality test

Normality test was conducted on the control group and experimental group to maintain normality distribution of the sample. Skewness coefficient for the control group ranged from (0.0) to (0.35), and for the experimental group from (0.0) to (0.58). Both results are close to (0) which indicate normal distribution of the sample in the two groups. Also, Kurtosis coefficient for the control group ranged from (0.46) to (-1.33) and (-0.39) to (-1.10) for the experimental group which is close to (1) for both the groups. This indicates normal distribution of the sample in the two groups. The researcher also used Kolmogorov-Smirnov test to determine if the two samples related to the control group and experimental group had the similar normal distribution. The Z value was (0.65), and the significance value was (0.78) which means that there was no statistical significance at the level of 0.05.

Homogeneity and equivalency test

In order to measure the homogeneity and the equivalency of the control group and the experimental group, before implementing the intervention of the variables, the participants' English language achievement score (ELAS), their total grade point average (TGPA), critical thinking skills score (CTSS), and intelligence quotient score (IQS) obtained in the tests conducted prior to the intervention phase were subjected to t-test in order to calculate the differences of the

afore-mentioned pre-variables between the two groups. Table (1) shows the differences of the significance between the participants in the two groups.

Table 1 Significance of Differences between the Two Groups in the Homogeneity and Equivalency

Variables	Experimental Group			Control Group			T test	Sig.
	N	Mean	Std. Div.	N	Mean	Std. Div.		
ELAS	30	79.38	9.95	30	79.52	9.95	0.05	0.96
TGPA	30	71.72	68.53	30	71.95	63.74	0.12	0.90
CTSS	30	29.28	02.39	30	29.66	2.92	0.54	0.59
IQS	30	45.69	06.30	30	45.17	5.99	0.32	0.75

Table 1 shows that there was no significant difference in the mean scores between the experimental group and the control group in the pre-test of the ELAS, TGPA, CTSS, and IQS. This shows that the two were equal in relation to afore-mentioned test scores prior to the beginning of the experiment.

Homogeneity and Equivalency of CT Skills test

The researcher conducted t-test in the pre-test stage which reflects the differences between the mean scores of the control group and the experimental group in the five domains (Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments) of Watson-Glasser, (2006) CT Test. This was to make sure that the dependent variable which is students' CT skills in both the control group and the experimental group was equal prior to the implementation stage. Table (2) below explains the equality of variances.

Table 2 Equality of Variance Test in Students' CT Skills

Variable	Control Group (N=30)		Experimental Group (N=30)		t-value	Sig.
	Mean	Standard Deviation	Mean	Standard Deviation		
Inference	6.0	0.85	5.8	0.85	0.78	0.44
Recognition of Assumptions	5.8	0.69	6.0	0.76	- 1.27	0.21
Deduction	6.0	0.94	5.6	0.82	1.49	0.14
Interpretation	6.0	0.96	6.0	0.93	0.00	1.00
Evaluation of Arguments	5.9	0.70	5.8	0.76	0.54	0.59
Total	29.7	2.92	29.3	2.39	0.54	0.59

It is evident from the above table that there are no significant differences in the pre-test mean scores of students' CTS for both the control group and the experimental group in the five domains of Watson-Glasser's CT Test. The mean difference of inference domain in both groups was (0.44)

which is not significant at ($t=0.78$). The mean difference of recognition of assumptions domain in both groups was (0.21) which is considered as not significant at ($t=-1.27$). The mean difference of deduction domain in the two groups was (0.14) which is counted as not significant at ($t=1.49$). The mean difference of interpretation domain in both groups was (1.00) which is not worthy of considering it as significant at ($t=0.00$). The mean difference of evaluation of arguments domain in the two groups under examination was (0.59) which is not to be considered as significant at ($t=0.54$). As a result, both the control group and the experimental group were at equal level in all the five domains of Watson-Glasser's, (2006) CT Test.

Results

RQ 1: The result of t-test comparisons in table (3) suggests significant differences between mean scores of those who were taught CT through SQ and those who were taught CT skills in a normal setting. Put precisely, there are significant differences at (0.05) between mean scores of those who are in the first group, who were taught through SQ and those in the other group, who were taught CT skills in a normal setting. This result suggests that teaching CT skills through SQ strategies is beneficial and more productive. Furthermore, t-test results show significant differences between the two groups in relation to the five CT domains.

Table 3 Significance of Differences between the Two Groups in the Post-Test

Critical Thinking	Experimental Group			Control Group			T test	Sig.
	N	Mean	Std. Div.	N	Mean	Std. Div.		
Total C.T.	30	45.69	2.82	30	29.48	2.34	32.83	0.000
Inference.	30	9.35	1.23	30	6.24	1.02	10.43	0.000
Assumptions Recognition	30	8.66	0.97	30	5.76	0.87	11.93	0.000
Deduction.	30	9.21	0.73	30	5.66	0.86	17.03	0.000
Interpretation	30	9.03	0.98	30	6.03	0.73	13.20	0.000
Evaluation	30	9.45	1.06	30	5.79	0.86	14.45	0.000

RQ 2 Quantitative result: As discussed earlier, the quantitative data was collected through the results of the four quizzes conducted at the end of every two weeks. The quiz results were duly tabulated, as specified in table (4). Incidentally, the table shows the individual scores of the five students in each CT skill. In addition, the last column of the table highlights the average percentage of the scores of the five CT skills for each quiz. This information is tabulated in the ascending order of quizzes.

Table (4) shows the progress line of the five individual students' development in each CT skill exposed to during the experimental phase. The tabulated data clearly indicates that all the five students in the initial phase of quiz 1 and 2 could obtain lower scores in all the five skills. However, in the final phase of quiz 3 and 4, the trend changed and the students' scores improved gradually and significantly. Particularly, all the five students earned much higher scores in every single skill. The overall result in the ascending order of quizzes reflects a steady upward growth in terms of the marks gained by each student. On a separate note, individual differences between the results of the five students in each skill are also clearly visible which suggests the prevalence of mixed abilities of students.

Table 4 Students' Results of the Four Quizzes in each CT Skill

Student	Quiz Number	Critical Thinking Skills					%
		Inference	Recognition of Assumptions	Deduction	Interpretation	Evaluation of Arguments	
Student 1	Quiz 1	1/4	1/3	1/3	1/3	1/3	31.25
	Quiz 2	1/4	2/3	1/3	1/3	1/3	37.50
	Quiz 3	2/4	2/3	2/3	2/3	2/3	62.50
	Quiz 4	3/4	3/3	2/3	2/3	3/3	81.25
	Total	7/16	8/12	6/12	6/12	7/12	53.13
Student 2	Quiz 1	2/4	2/3	1/3	0/3	1/3	37.50
	Quiz 2	2/4	1/3	1/3	1/3	2/3	43.75
	Quiz 3	3/4	3/3	2/3	1/3	1/3	62.50
	Quiz 4	3/4	3/3	2/3	2/3	2/3	75.00
	Total	10/16	9/13	6/12	6/12	6/12	57.81
Student 3	Quiz 1	2/4	2/3	1/3	2/3	2/3	56.25
	Quiz 2	3/4	3/3	2/3	2/3	1/3	68.75
	Quiz 3	3/4	2/3	3/3	2/3	2/3	75.00
	Quiz 4	4/4	3/3	3/3	3/3	2/3	93.75
	Total	12/16	10/12	9/12	9/12	7/12	73.44

Student 4	Quiz 1	2/4	2/3	2/3	2/3	2/3	62.50
	Quiz 2	2/4	2/3	1/3	1/3	1/3	43.75
	Quiz 3	3/4	2/3	2/3	3/3	2/3	75.00
	Quiz 4	3/4	3/3	3/3	3/3	3/3	93.75
	Total	10/16	9/12	8/12	9/12	8/12	68.75
Student 5	Quiz 1	2/4	2/3	2/3	2/3	1/4	56.25
	Quiz 2	3/4	3/3	2/3	3/3	2/3	81.25
	Quiz 3	2/4	2/3	3/3	2/3	2/3	68.75
	Quiz 4	3/4	3/3	3/3	3/3	2/3	87.50
	Total	10/16	10/12	10/12	10/12	7/13	73.44

RQ 2 Qualitative Data: The qualitative data for this study was elicited through the structured interview mode. The interview questions focused only on the initial quiz and the final quiz, i.e. quiz 1 and quiz 4 as indicators of starting point as mentioned elsewhere. Quiz 1 was conducted immediately after the completion of the first two units/themes of the intervention of the experimental phase. This was the phase where the students had started gaining CT skills. And, quiz 4 was conducted finally after the completion of eight units/themes. Thus, quiz 1 can be considered to indicate the initial level of competence in students' CT skills, and quiz 4 results to indicate the final level of competence of students in their CT skills gained as a result of the implementation of the total experimental intervention program.

The interview questions were analytical in nature as the students were asked to explain and justify their responses in quiz 1 and quiz 4, on the basis of relevant strategies that they had exploited to answer the questions for each CT skill in the two quizzes. This analytical interview helped the researcher to get comparatively more detailed and deeper insights into their thought, and process involved while answering the questions in the two quizzes. The interview results also helped the researcher in triangulating these results with the results of the quantitative data (quizzes) to testify the credibility of the two types of instruments and the results. Now, the researcher would like to present the summary of students' responses to interview questions for each CT skill related to quiz 1 and quiz 4.

Table (5) below comprises of students' responses to the five CT skills tested in quiz 1. This summary is not exhaustive. It only includes the most relevant and representative comments of the participants which were directly linked with the main focus and the purpose of the study. The redundant and irrelevant parts have been ignored.

Table 5 Students' CT Responses in Quiz 1

Critical Thinking Skills – Quiz 1					
Students	Inference	Recognition of Assumptions	Deduction	Interpretation	Evaluation of Arguments
	Quiz 1	Quiz 1	Quiz 1	Quiz 1	Quiz 1
1	was difficult, just select any answers.	too much time, frustrating	too much pressure at the first quiz, reading text too long, lost reading the text.	answers were very close to each other; focused on answers not questions	very hard, reading, guessing
2	many times I read the text, was not clear.	can't, reading the text only, try to guess answer	question was not clear, I read the text, difficult	answers looks all correct	read conclusions but not understand
3	some words were difficult...and time was passing very quickly	answers were same	reading but too much information	only focused on the statement, forgot to connect with the text	can't match between the argument and the statement
4	(pause) didn't understand the text, question was difficult	couldn't control the time, statement wasn't clear	couldn't focus on major information in the statement	was tensioned, don't know how to start, just guessing	couldn't read the arguments with appropriate understanding
5	first quiz and second one were difficult, I read the text but couldn't understand the conclusions.	was difficult to make sense of assumptions	couldn't use deduction skill, many information in the text	I think you need more than reading, was not really focused	couldn't link different arguments to the main statement

After presenting the students' responses to their achievement in the five CT skills in quiz 1, what follows next in sequence is the table (6) which shows the responses of the students relevant to their achievement in the five domains of CT skills in quiz 4.

Table 6 Students' CT Responses In Quiz 4

Critical Thinking Skills – Quiz 4					
Students	Inference	Recognition of Assumptions	Deduction	Interpretation	Evaluation of Arguments
	Quiz 4	Quiz 4	Quiz 4	Quiz 4	Quiz 4
1	read the question first, understand the question	was clear, assumptions should be identified, cause	able to identify extra information,	Um, reading the text, many times,	find connections between the statement and the

		we had this many times, sometimes no assumptions in the questions, easy to select the correct answer	understand the question	underlying key words, link to given answers	text, check the truth of the statement, statement could be true but the answer.....conclusion could be wrong
2	identify key words, read the text and make notes, underline expected wrong answers	planning, reordering events, read and link to answers, some words help to identify the assumptions	I understand the question, focus, identify the answer,link the conclusion to the statement	Um, read statement very carefully, read the text many times, read, compare answers with statement	truth, sometimes conclusions are not convincing, which one cloze by comparing conclusions
3	planning my reading, identify difficult words, read again, ask the teacher. Compare answers with the statement	read the statement many times, take notes, I think before choosing the answer	focus on the question, underline details, find specific information in the statement	I focused on the text, also, then I linked the answers to statement	tried to find if the argument is strongly connected to the statement
4	quickly read the text, underline key words, read the text again, teacher helped to explain difficult words	read the statement many times and compare it with the arguments, find connections between them	identify key information in the statement, compare it to given answers	try to find the relation between the statement and conclusions, also, check the importance of information.	read the arguments with good understanding, asking the teachers for difficult words, and make connections with the statement.
5	I identified the purpose of the question, read the text, then I apply the information	the concept was clear; we had practiced it many times. I analyzed the given assumptions and relate them the text	identify key information in the statement, compare it to given answers	reading the text but with expectations, also, I had to remember different ideas in the text	identify wrong statements, check answers and link them with the text

Having presented the results of the qualitative data in the two tables above, it is now time to juxtapose the results of the qualitative data with the quantitative data and evolve a critical discussion of the findings duly supported by the relevant researches. This analytical discussion will be carried out in a triangulated framework, which will also serve as a testing ground for the effectiveness and the validity of instruments and data collected relevant to RQ2.

Discussion

Are there any statistically significant differences between mean scores of those who are taught CT through SQ and those who are taught CT skills in a normal setting?

This section is meant to discuss the results relevant to the RQ1, as shown above in table (3). The data in this table highlights the differences between mean scores of those who were taught CT through SQ and those who were taught CT skills in a normal setting. The t-test was conducted to

know the differences between the two groups in relation to the five CT domains as specified in Watson-Glasser's, (2006) CT test.

The result of t-test comparisons suggests significant differences between mean scores of those who were taught CT through SQ and those who were taught CT skills in a normal setting. Put precisely, there are significant differences at (0.05) between mean scores of those who are in the first group, who were taught through SQ and those in the other group, who were taught CT skills in a normal setting. This result suggests that teaching CT skills through SQ strategies is beneficial and more productive. Furthermore, t-test results show significant differences between the two groups in relation to the five CT domains.

It is evident from the result that those students who were taught through SQ gained higher scores than the ones who were taught CT in a normal setting. The mean scores of the five CT domains show that students who were taught CT using SQ were able to develop and use the target skills in the five domains better than those who were taught in a normal setting. This result clearly demonstrates that the students who were taught CT skills through SQ developed abilities to use CT skills in the five domains at different levels of comprehension. This argument gets desired support from Paul & Elder's, (2006) remark that SQ can be adjusted and applied through various techniques at different stages of comprehension. The researcher's argument is consistent with the experimental work of Wenning, (2006) in which he proposed a typology, which is similar to SQ that can be considered as a "comprehensive treatment kit" to improve CT skills. Though this result of the study is not directly consistent with Forsyth, Paul, Kelley, & McMillan's, (2009) study which reviewed 27 studies that examined the result of different programs and courses on CT skills among college students, and they drew a cumulative conclusion which does not support the view that the application of explicit instructional practices lead to an increase in CT. And, at the same time, they did support the findings that college attendance improves CT skills. The college attendance linked with the improvement in CT reflects the autonomous learning abilities of college students as against the school level students who, in contrast, depend on guided learning and therefore, explicit instructional practice to develop CT skills at school levels remains relevant which finds desired support in Thakur & Al Mahrooqi's, (2015, p.126) argument that unlike ordinary thinking which is an inborn human ability, CT needs to be taught through implicit and/or explicit instruction. Thus, as an alternative interpretation of Forsyth, Paul, Kelley, & McMillan, (2009) study, the researcher intends to claim that the abilities to use CT skills do develop through explicit instructional practices involving SQ strategies at school levels, where the students have not yet become independent autonomous learners unlike the college students referred to in the afore-mentioned study.

The results of Garret's, (2006) action research on higher level questioning at SQ clearly demonstrates a significant growth (76%) in the students' ability to construct higher-level thinking in terms of using questions at the upper level of Bloom's taxonomy as a result of explicit instructional input and practice. There is a strong connection of this finding of Garret's study with the finding of the current study as reflected in the results of the four quizzes conducted in phase II. These results show that (a) There was an upward steady growth in terms of the participants' performance scores from quiz 1 to quiz 4, and (b) There was also a process of internalization of

the knowledge of SQ in the five domains of CT and a gradual scaffolding of this knowledge as a result of explicit instructional input given to the participants of the experimental group.

The cumulative results of the four quizzes conducted on the community of 30 Omani students in the experimental classroom of this study indicate that the continuously given instructional input in SQ led to improved students' output in CT skills. This pedagogical gain is a result of the interactive instructional practice used in the classroom, which transformed learning and interaction. In this situation the CT is being used as a means to transform learning and the community, which strengthens the argument of Benesch, (1993); Atkinson, (1997); Fox, (1994) that social practice is one of the indispensable components of CT in developing information-based community. Having discussed the results of RQ1, the study moves on to the discussion of RQ2.

What are SQ strategies that helped to develop the students' CT skills?

The aim of RQ2 was to identify SQ strategies and processes that students developed in the experimental ESL reading classes in order to enhance their CT skills during the experimental intervention phase. As discussed in the proceeding chapters, SQ strategies would enhance students' CT and help them to understand, interpret and evaluate ideas, and provide more reflective responses.

To answer RQ 2, the researcher deployed a mixed methods approach. Four quizzes were used as an instrument used in relation to RQ2. Each quiz was conducted after completing 2 thematic reading units. Eight units were taught during the course of intervention. All the quizzes were developed based on Watson & Glasser's (2006) five domains of CT Test (inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments). The purpose of these quizzes was to measure the developmental progress of CT skills that students made through the intervention phase. The second instrument was the structured interview. Five students were selected randomly from the experimental group and duly interviewed. In this structured interview the students were asked to inform about what did they actually do to answer the questions in the quizzes and justify their answers. Quiz 1 was selected as the starting point, and quiz 4 as the finishing point to investigate students' improvement in CT skills. After the preliminary discussion of RQ 2 instruments, it is now time to present the quantitative and quantitative data generated from the related instruments.

The analytical investigation of the responses made in table (5) in quiz 1 clearly suggests that at this stage participants' reading was an unplanned activity which was seemingly based on merely a blind guess work devoid of any concrete strategy to process textual information critically. Therefore, the responses of the participants reflected negativity and frustration on their performance in the initial phase of intervention results. However, as the intervention process progressed and reached to its final phase, the performance and responses of the participants delivered encouraging and positive results. To illustrate this point, the researcher will analyze and discuss the quantitative results of quiz 1 and 4 and juxtapose it with the qualitative results of quiz 1 and 4.

The qualitative responses and also the quantitative results of students 1 and 2 in quiz 1 clearly indicate that they were very weak and were not able to process the reading texts and deal with higher order demands of the five CT skills. This is very clearly reflected in their qualitative

responses in quiz 1, which includes the comments that the reading text and the tasks were: *not clear; difficult; time consuming and frustrating. They had to depend on guess work; they were lost in the reading and felt pressured; answers were confusing; and they read the text and tasks without understanding.* This difficulty and inability of students 1 and 2 is clearly reflected in their cumulative quantitative scores in quiz 1 which was 31% and 37% respectively. Evidently, these two students have heavily failed in quiz 1 by 69% and 63% respectively.

This failure caused frustration and negativity in these two students. However, this situation improved considerably when these students reached to the last phase of the intervention in quiz 4 as overtly reflected in both the qualitative as well as quantitative results in quiz 4. The two students were able to read and process the reading texts and answer the questions related to the five CT skills as a result of their growth and development of cognitive abilities through continuous instructional input and related practice sessions given during the eight weeks of the intervention. The qualitative responses in quiz 4 testify this situation of improvement as reflected in their comments that they were able to *read and understand, focus on key words, make notes and sift wrong answers.* Both of them had the ability to *read and locate answers, plan, reorder events, and find signal words for assumptions.* They were also able to *sift extra information, understand relate, and conclude.* In addition, they had the ability to use the strategy of *repeated reading and focusing on key words, scaffolding and comparing.*

Furthermore, these two students had developed the ability to *find connections between the task and the text, assess conclusions, and judge the quality of argument.* This heightened awareness and strategy-oriented abilities that developed in the two students in the domain of the five CT skills are strongly supported by considerably improved performance in the quantitative results, in which they scored 81% and 75% with a phenomenal raise of 50% and 38% respectively as compared to their scores in quiz 1. Having compared the qualitative and quantitative data of the students 1 and 2 the researcher, similarly, needs to juxtapose the two sets of data for the students 3 and 4 for further confirmation of effectiveness and validity of the intervention phase. This will be dealt with in the next following paragraphs.

The qualitative data results of students 3 and 4 in quiz 1 also reflect their weakness and inability to process the reading texts and deal with the challenging demands of the five CT skills, which simultaneously gets confirmed by the poor results of the quantitative data. This is evident in the tone and tenor of the responses made by the participants of this study in quiz 1. Those comments are: *difficult vocabulary and shortage of time; confusing answers; lot of information to process; connection lost and partial focus on the text and missed the link; difficult to match argument and statement; difficult text and difficult question; unclear statement and failed time management; lack of focus on key information; starting difficulty and guess work cause tension; gap between reading and comprehension.* This difficulty and inability of students 3 and 4 corresponds with their cumulative average score obtained in quiz 1 which was 56% and 62% respectively.

The qualitative response data of the students 3 and 4 in quiz 4 is realized in numerous encouraging, positive, and confident statements influenced by their own successful performance in the five CT skills. Their responses include; *identify key words and infer meaning from the context; repeated reading, note taking, assessing, judging, and finding the answer; sifting the*

details from the main idea; focus on the text and generate the answer; find and judge a strong connection; repeated reading, compare arguments and link; identify main ideas and compare relevance; link relevant ideas and assess key information; comprehend argument, identify key words, and link relevant information.

These positive responses are clearly developed as a result of the overall outcome of improvement in their abilities and confidence in handling the reading texts and addressing the five CT skills after the completion of the intervention phase. These responses of success are very closely associated with the scores that students 3 and 4 achieved in quiz 4. Matching with the high spirit of the qualitative responses, the students 3 and 4 scored very high average marks in the domains of five CT skills which is 93% and also 93% respectively.

The quantitative scores established the fact that students 3 and 4 had already evolved a functional ability to apply CT skills on the reading tasks and they were able to use them successfully. At the same time, the qualitative responses of these students are clear indicators of their well-informed awareness of the knowledge of relevant strategies required in the five domains of CT skills. For an at-a-glance view, the CT strategies that the participants of the study were able to develop as a cumulative result of eight weeks' intervention phase are presented in following table.

Table 7 Evolved Critical Reading Strategies in Quiz 4

Students	Inference	Recognition of Assumptions	Deduction	Interpretation	Evaluation of Arguments
	Quiz 4	Quiz 4	Quiz 4	Quiz 4	Quiz 4
1	Read and understand	read and locate	sift extra information	repeated reading and focus on key words	finding connections between the task and the text, and make judgement on the quality of argument
2	Focus on key words, make notes, and sift wrong answers	Plan, reorder events, locate answers, and find signal words for assumptions	Understand, relate, and conclude	Repeated reading, Scaffold, and compare	Assess conclusions
3	Identify difficult words, read the text, and recognize meaning in the context	Repeated reading, take notes, and judge, assess, and choose the answer	Sift the details from the main idea	Focus on the text and generate answer	Find and Judge a strong connection
4	Guess the meaning in context	Repeated reading, compare arguments, and link	Identify main ideas, and compare with answers	Link relevant ideas, and assess key information	Comprehend argument, identify difficult words, and link relevant information
5	Identify the purpose, read and process information	Investigate assumption and link with the text	Identify the purpose and link it with answer	Read with the purpose, recall, and reproduce main ideas	sift irrelevant information, link with answers

The analytical discussion of the evolution of CT strategies thus far, the following transformations in the students' knowledge, skills, and competence in CT have emerged as obvious. First, the functional strategy of students in reading the text critically got transformed from the stage of unplanned application to the planned implementation of reading strategies.

Second, as a result of the development of this strategic ability, the confidence and spirit of the students in examining the reading texts critically got elevated. Third, the students were able to demonstrate well-informed awareness and strategy-oriented approach to process the reading texts critically. These favorable pedagogical gains were made by the students by exploiting the CT strategies evolved through explicitly taught and frequently practiced CT skills during the experimental intervention phase. It is now opportune time to examine these pedagogical gains made by the participants of the study in terms of research perspectives.

The developmental performance and consistent improvement of the five students in all the CT domains find support in Miri, Chiam, & Uri, (2007) study which strongly suggests that fostering inquiry-oriented thinking and encouraging open-ended discussions lead to consequent development of CT thinking capabilities.

The results of growth and development of the participants of this study in the CT skills claim common grounds with the results of the similar study conducted by Sahmid, (2004) Who found that in the first two phases students' anxiety was considerably reduced; their perceptions of the English teacher and what is expected of them in English classes were slowly evolving into something more realistic. By the third week and into the fourth stage of the study students were showing signs of adapting to the culture and practice of Socratic questioning. Similar incidents were observed in the participants' progress of this study during the period of quiz 1 to quiz 4. Characteristically speaking, the CT strategies developed by the participants of this study are flexible, spontaneous, diverse, based on individual responses, and authentic. Attainment of such strategies through this experimental study lends strong research support to Thakur's, (2016) remark that in line with the socially-aligned view of competence much needed spontaneity, flexibility, and diversity accrues only through a process-centred pedagogy of voice, agency and response, which was also involved in the strategy-oriented and well informed SQ pedagogy approach during the intervention phase of this study.

Conclusion

In conclusion, the data collected through the CT test was subjected to the statistical analysis, in which the t-test was conducted on the data related to the control group and the experimental group to find out the statistical difference between the two groups. After that, the data collected through the four quizzes and the interviews were put through the statistical and descriptive analyses. The most prominent finding relevant to RQ1 that emerged from the statistical analyses of the t-test is that teaching CT skills through SQ strategies is beneficial and more productive. Students who are taught through SQ strategies are better able to develop and use the target skills in the five domains of CT. Another important finding suggests that continuous instructional practice leads to upward and steady growth in the effective use of CT resulting in the internalization and gradual scaffolding of knowledge, skills, and competence of CT. Furthermore, an additional finding strongly indicates that CT skills do develop through explicit instructional practice of SQ strategies at school level, where students have not yet become independent and autonomous learners as against the tertiary level students. The quantitative results suggest that all the five students demonstrated a gradual

improvement in the five domains of CT skills in their performance from quiz 1 to 4. Furthermore, the results of the qualitative data suggest that all the five students had developed and informed understanding and awareness about the SQ strategies that they had gained in order to develop and enhance their CT skills in all the five domains. The triangulated data collected through the quantitative and qualitative instruments reflect a) at the end of the eight week intervention phase the participants had developed the knowledge and awareness of and the strategy-oriented abilities to use CT skills, b) the performance of the students had improved consistently to more or less at a similar exit level in quiz 4, c) the tone and tenor of the qualitative responsive related to quiz 4 indicates towards a significant reduction in participants' frustration and lack of confidence which prevailed at the level of quiz 1 and 2. d) a significant raise was evident in the level of enthusiasm and confidence as all the five students placed themselves at a reasonably adequate level of competence in handling the CT skills in the reading texts using the required strategies to deal with the five domains of CT.

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