Teaching Critical Thinking Skills: Literature Review

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ABSTRACT
Critical Thinking (CT) has been recognized as one of the most important thinking skills and one of the most important indicators of student learning quality. In order to develop successful critical thinkers, CT must be incorporated into the curriculum content and teaching approaches and sequenced at all grade levels. This research provides a systematic review of the extant literature on teaching CT skills. The comprehensive review led to the building of a conceptual framework that discusses the four main debates among the researchers engaged in the field of teaching CT. One of these debates; can technology promote students CT skills? Overall, the study of actual practices indicates that teaching approaches tend to focus on subject content rather than CT development. The results indicate a gap in teaching CT skills in terms of innovative methods and particularly in the use of new technologies. They also highlight the need for further research that investigates new approaches for teaching CT skills.

KEYWORDS: Critical thinking skills, teaching critical thinking, assisting critical thinking, technology to promote critical thinking.

INTRODUCTION

Although the importance of Critical Thinking (CT) skills in the learning process is agreed upon, there is less agreement about how CT is defined (Alfadhli 2008). The first serious discussions and analyses of CT were conducted by John Dewey (1916, cited in Kuhn 1999), who discussed the concept of CT skills in education. Dewey perceived CT as a process that begins with a problem and ends with a solution and self-interpretation. Bean (2011, p. 3) elaborates on this point by stating that such a problem should 'evoke students' natural curiosity and stimulate both learning and critical thought'.

Many researchers agree with Dewey's point of view that CT begins with students' engagement with a problem. For example, Kurfiss (1988, p. 2) defined CT as 'an investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified'. Moreover, Pithers and Soden (2000, p. 238) state that 'Critical thinking involves being able to identify questions worth pursuing, being able to pursue one's questions through self-directed search and interrogation of knowledge, a sense that knowledge is contestable and being able to present evidence to support one's arguments'. This suggests that CT can be defined as an individual thought process that begins with the intent to solve a problem or to answer a question, by examining different options and choosing the most suitable and logical one.

From a cognitive psychologist's view, Halpren (1997, p. 4) emphasises that CT is the 'use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned and goal directed'. Halpren (1997, p. 4) states, 'Critical thinking is purposeful, reasoned, and goal-directed. It is the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions. Critical thinkers use these skills appropriately, without prompting, and usually with conscious intent, in a variety of settings'. In other words, when people think critically, they evaluate the outcomes of their thought processes, calculate how good a decision is, or identify how effectively a problem has been solved.

Furthermore, Paul (1992, p. 1) states that CT is 'the intellectually disciplined process of actively and skilfully conceptualizing, applying, analysing, synthesising, and/or evaluating information gathered from, or generated by observation, experience, reflection, reasoning, or communication as a rubric to belief and action'. Paul and Elder (2006, p. 4) expand on this point of view by defining CT as 'the art of analysing and evaluating thinking with a

view to improve it'. These definitions indicate that CT is the ability to apply cognitive skills, such as analysing, applying, and evaluating when thinking.

Based on the above review of CT definitions, it is important to note that no single definition of CT is applicable to every discipline at every level. Although researchers generally agree that CT is a high-level thinking skill, teachers' experiences and goals, as well as students' needs, determine the specific skills to be developed (Condon & Kelly-Riley 2004).

This study provides a systematic review of the literature on teaching CT skills focusing on published articles in academic journals as well as dissertations in this field. The rest of the article is organised as follows: First, the method used to identify and select studies for inclusion in this review is described. The article then presents the conceptual framework of the study and discusses the literature considering the four main debates among researchers in the field of teaching CT. Finally, the limitations of existing studies on teaching CT skills are listed and the suggestions for further studies.

METHOD

A systematic literature review was conducted, which focused on describing and discussing the topic from theoretical and conceptual viewpoints. This study followed the British Educational Research Association's guidelines for conducting a systematic review (Cohen, Manion, & Morrison 2011). First, an initial search for appropriate sources was conducted using Google Scholar and electronic databases from several academic fields such as education and psychology to identify CT-related articles. A variety of search terms were used including different variations and combinations of the following terms: 'critical thinking skills', 'teaching critical thinking skills', 'high-level thinking skills', 'innovative way to teach critical thinking skills', and 'critical thinking cross curriculum'. Second, the abstracts were read to screen the initial list of articles for the five main topics (teaching CT skills, assessing CT skills, strategies to teach CT skills, CT skills taxonomy, and using technology to teach CT skills). Later, these five topics were used to form the base of the conceptual framework of the present study. Third, a conceptual framework was designed, which summarised the main arguments among the researchers in this field, as will explained later. A systematic search focusing primarily on peer-reviewed theoretical and empirical studies on teaching students CT skills was conducted via different databases, including Education Full Text, Education Resources Information Center (ERIC), JISTR, and the Web of Science. The review included articles or reports from well-established research organizations. It also included dissertations that studied and examined this topic. Finally, a comprehensive review was conducted in terms of the conceptual framework of the research.

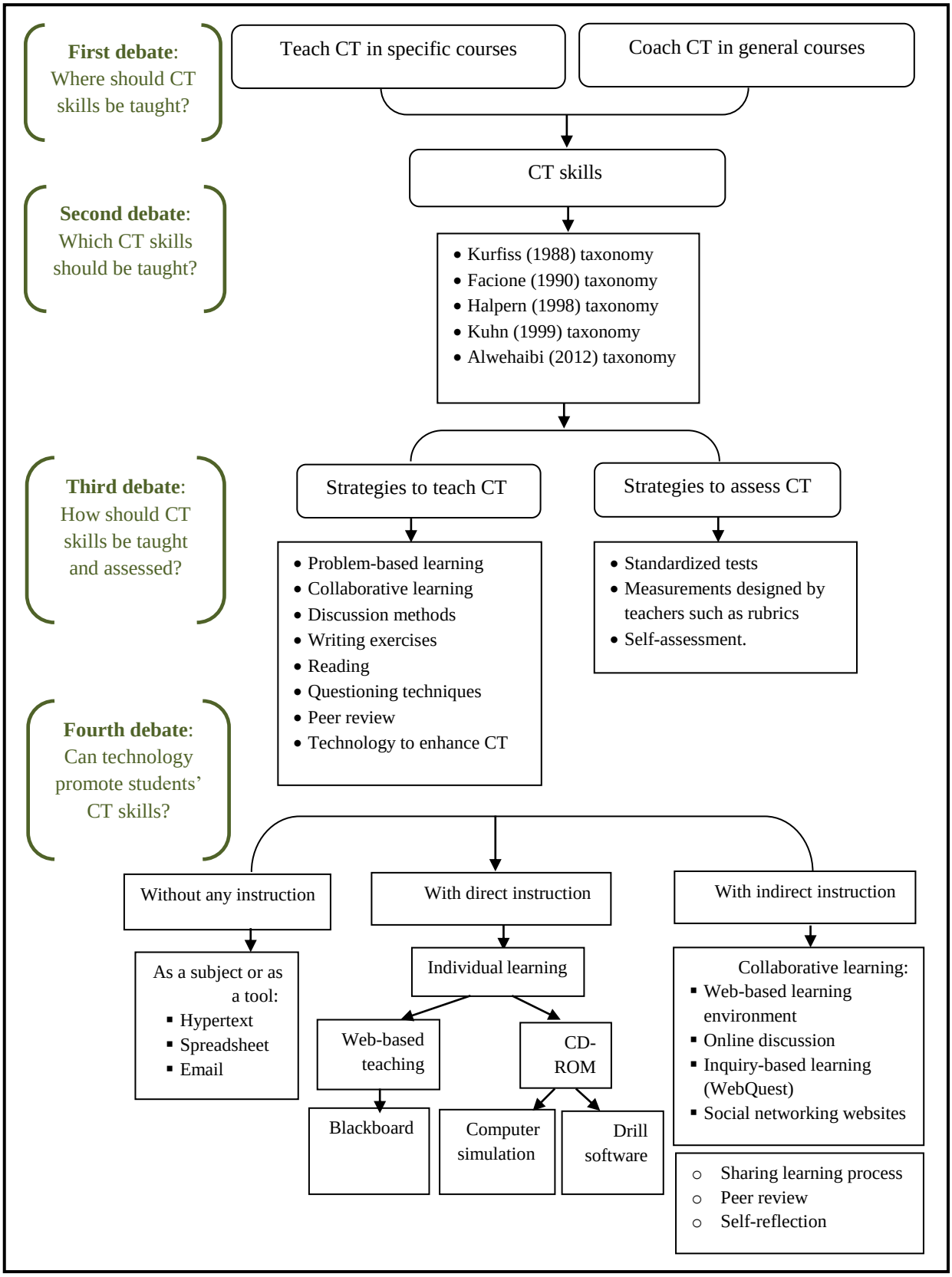
RESULT AND DISCUSSION

The review indicated that most researchers agreed that CT refers to the use of cognitive skills or strategies, and that through teaching and coaching, students can master CT (Fisher 1998; Halpern 1999; Pithers & Soden 2000). Gelder (2005) explained that CT skills can be taught in the same way that other cognitive skills are taught. He claimed that knowing the theory of CT and its related concepts, practising these skills in real situations, and then transferring these CT skills to different situations made students critical thinkers. Researchers appeared to be in agreement (Facione 1990; Halpren 1999; Kuhn 1999; Pithers & Soden 2000; Fuiks & Clark 2002) about the ability to teach and learn CT skills; however, some of them disagreed about several issues related to teaching and learning CT skills:

1. Where should CT skills be taught?
2. What CT skills should be taught?
3. How should CT skills be taught and assessed?
4. Can technology promote students' CT skills?

In order to organise the ideas and achieve the research purposes, a conceptual framework that included the main four debates in the area of teaching CT was used. According to Miles, Huberman, and Salana (2014), a conceptual framework is an analytical tool with several variations and contexts. It is used to create conceptual distinctions and organise ideas. Figure 1 presents the conceptual framework of the research and shows the four main debates among researchers in the field of teaching CT.

Figure 1: The Conceptual Framework of the Study



First Debate: Where Should CT Skills be Taught?

Researches disagreed about where CT skills should be taught: whether CT should be taught in specific courses on CT skills (CT as an isolated set of skills), or in general courses (as part of other subjects) (Perkins & Salomon 1989). This section elaborates upon this debate.

Teach CT in specific courses

CT skills can be taught in a specific course that focuses on CT theories, skills, and practices. Supporters of teaching CT as a specific set of skills suggest that it should be taught as a dedicated programme that aims to impart to students the CT theoretical framework, concepts, and skills. For example, Gelder (2005) claimed that promoting students' CT begins by teaching them the basic elements. Students must understand the theory of CT, the related vocabulary, and specific skills. Williams and Worth (2001) investigated the difference in the effectiveness of teaching CT skills in specific courses compared with incorporating CT skills into general courses that were not related directly to teach CT skills. They found that whereas the former offered some promise in promoting CT, the latter produced only marginal improvements in CT.

The results of several studies support the idea that the best method to enhance CT is to teach its theoretical background. For example, Alwehaibi (2012) investigated the effects of a dedicated CT programme during a five-week intervention with 40 female undergraduate students in the English Department at Princess Noura Bint Abdulrahman University in Saudi Arabia. She found that the CT programme had a significantly positive effect on the students' CT skills. This result was consistent with the findings of Bensley, Crowe, Bernhardt, Buckner, and Allman (2010) pertaining to 47 psychology students who were tested at a small, mid-Atlantic public university. In their study, they compared the CT skills of the 47 students after dividing them into two groups. The first group received instruction in CT skills during their course (they studied a methodological course on statistics that was supplemented with a CT textbook). The second group received instruction on learning statistics, research design and methodology, as well as on how to write an American Psychological Association (APA)-style research report, but they did not receive explicit instructions in CT skills. The group that received instruction in CT skills demonstrated a significantly greater increase in their argument analysis skills compared with the other group. These results support the researchers' views that CT skills should be taught similar to any other cognitive skill, explicitly rather than as a separate course.

Kuek (2010) also supported teaching CT skills through dedicated courses. He experimented with a 12-week intervention for two groups of university students in Sudan. The first group was taught reasoning and CT skills to enhance their argumentative writing abilities. The other group studied the same course (reasoning), but without the dedicated CT theory and skills component. He found significant differences between both groups. In the first group, students' CT, reasoning, and argumentative writing skills improved radically after the intervention. Moreover, students' attitudes towards thinking skills improved.

Although existing studies provide evidence indicating the effectiveness of formally teaching CT, this strategy might not be appropriate for all educational systems. For instance, in Saudi Arabia, all university programmes do not offer CT components, because of which some students graduate without being provided an opportunity to study CT; such students may lack CT skills as a consequence. Dedicated courses also rely heavily on the teachers themselves and their experiences (Alwehaibi 2012), which affects the final output and the extent to which the aims of individual courses are achieved.

Coach CT in general courses

Unlike the previous approach, Hatcher (2006) claimed that CT skills must be a main part of any course and that students should practise these skills in depth. In his study, he argued that an integrated approach to teaching CT would achieve significantly better outcomes than teaching CT as a stand-alone course. Moreover, he stated that one of the beneficial consequences of this approach is that it becomes possible for teachers from a variety of disciplines to provide the needed instruction in CT skills as part of their normally taught courses, instead of relying on select teachers to teach the skills in stand-alone courses.

Supporters of including coaching CT skills as part of each course believe that it is a mistake to concentrate on theory instead of practice. Perkins and Salomon (1989) claimed that the mistakes teachers usually make stem from their belief that skills follow naturally as a consequence of knowing the theory. Gelder (2005) argued that learning about CT is not adequate; it is not adequate to teach students a course on CT theory and assume that such students will turn out to be better critical thinkers. Students need to practise these skills in different contexts.

Halpern (1999) noted that after 25 years of work on CT theory and pedagogy, teaching students a set of thinking skills did not appear to be sufficient for them to master CT skills. Students should have the opportunity to practise CT skills in different contexts and in different situations in order to gain a more comprehensive understanding of the theory and application. Kuhn (1999) argued that if teachers want their students to master these skills, they should help them learn how to apply the knowledge and theories in different situations. This suggests that CT skills should be a goal for each course.

Hager, Sleet, Logan, and Hooper (2003) provided an example of how to coach undergraduate students CT skills through science courses. They designed and evaluated tasks related to applications of chemistry and physics in everyday life with the goal of fostering CT skills in first-year students at an Australian university. Students were required to complete tasks in co-operative groups and to interact in these groups in ways that would fostering some CT skills such as analysing arguments, asking and answering questions for clarification, defining terms, and judging the credibility of a source. Evidence obtained from students' discussion platforms, questionnaires, and teachers' observations indicated that many students considered that their thinking skills, and particularly some CT skills, were enhanced by the experience of attempting the tasks in small co-operative groups.

MacKnight (2000) argued that teachers could engage their students in a wide range of activities in order to contribute to intellectual growth generally, and CT specifically. He confirmed that CT affected all forms of communication – speaking, listening, reading, and writing – and could therefore be practised daily in every interaction. It should not be considered a separate activity from problem solving, creativity, inquiry, or collaborative learning.

Paul and Elder (2006) argued that all courses should be designed to help students think within a discipline, and that the only way to learn any discipline is to learn to think critically within that discipline. They indicated that students need to see that there is an ordered and predictable set of relationships for all subjects and disciplines. Every subject generates purposes, raises questions, uses information and concepts, makes inferences and assumptions, generates implications, and embodies a point of view.

Duron, Limbach, and Waugh (2006) claimed that all disciplines need to design and manage courses in a manner that ensures that students effectively move toward CT. They suggested a five-step framework based on existing theory and best practices in cognitive development, effective learning environments, and outcomes-based assessments. They argued that this model could be implemented in any course and will encourage students to engage in CT. This model consists of the following steps: 1. determine learning objectives; 2. teach through questioning; 3. practise before you assess; 4. review, refine, and improve; and 5. provide feedback and assess learning. Thus, implementing CT through this framework clearly requires a commitment to active, student-centred learning. Furthermore, teachers should provide thoughtful consideration to current instructional methods and the personal beliefs that drive them prior to contemplating this particular approach to teaching.

Halpern (1997) suggested a model consisting of four components to guide teaching and learning for CT: 1. a dispositional component to prepare learners for effortful cognitive work; 2. instruction in CT skills; 3. training in the structural aspects of problems and arguments to promote trans-contextual transfers of CT skills; and 4. a metacognitive component that includes checking for accuracy and monitoring progress towards the goal. Previous models indicated that teachers from any context could modulate their context on these models in order to enhance students' CT.

Summarising, the methods used to teach CT skills aimed to teach specific courses about CT theory and skills, or alternatively, to coach students on CT skills as part of any course by providing students with different learning activities or teaching strategies aimed at promoting students' CT skills. Every approach has its own strengths and weaknesses. For example, the first option focuses on the importance of learning the theory before practice but is limited to some courses and subjects. On the other hand, coaching students on CT skills in every course they study ensures that students graduate with at least a minimum amount of CT skills. However, this approach requires special skills from teachers and a stimulating environment.

Second Debate: Which CT Skills Should be Taught?

Although there is consensus that CT is a human cognitive process that enables one to use a specific set of cognitive skills, significant controversy surrounds the skills that should be taught to develop such thinking (Alwehaibi 2012). Because of the multiple definitions of CT, researchers/teachers disagree about the skills that make a person a critical thinker. This section presents some taxonomies on CT skills.

Many authors have attempted to determine and classify the most important CT skills. Taylor (2002, p.12), for example, described CT skills as 'the ability to clearly communicate one's reasons for one's judgments'. Furthermore, he posited that critical thinkers usually commit to their own position and simultaneously have the ability to change their position if they face convincing evidence otherwise.

Giancarlo and Facione (2001) stated that CT has conceptual connections with reflective judgement, problem framing, higher-order thinking, logical thinking, decision making, problem solving, and use of the scientific method. Moreover, Swartz and Parks (1994) listed thinking capably and carefully about causal explanations, predictions, generalizations, reasoning, and the reliability of sources as major CT skills.

Paul and Elder (2006) assumed that CT is the ability to read, write, speak, and listen effectively. It enables people to impart meaning to events and patterns of events, as well as to assess the reasoning of others. They state that if students want be critical thinkers, they should be able to master systems, become more self-insightful, analyse and assess ideas more effectively, and achieve more control over their learning, their values, and their lives. In other words, CT is a broad set of skills and characteristics that sustain and define lifelong learning.

Teaching CT skills and coaching them requires a careful review of the underlying theory and related taxonomies. The literature on CT provides several taxonomies of CT skills. For example, Kuhn (1999) categorised CT skills as metacognitive, meta-strategic, and epistemological. Metacognitive skills refer to people in control of their own beliefs in the sense of exercising conscious control over their evolution in the face of external influences. They know what they think and can justify why. Their skills in the conscious coordination of theory and evidence also places them in a position to evaluate the assertions of others.

As Kuhn (1999) stated, people who have developed strong meta-strategic skills apply consistent standards of evaluation across time and situations. They do not succumb to a view of a favoured assertion as more probable than its alternatives because of its favoured status, and therefore, subject it to different standards of evaluation. They also resist the offer of local interpretation.

Finally, according to Kuhn (1999), epistemological understanding is the most fundamental underpinning of CT, as it helps people see the point of thinking in order to engage in it. If knowledge is entirely objective, unconnected to the human minds that do this knowing, or alternatively, if knowledge is entirely subjective to the tastes and wishes of the knower, then critical thinking and judgement are superfluous.

Another taxonomy is Dick's taxonomy (1991). Dick reviewed research in the area of CT for the last 40 years and indicated that CT consisted of identifying and analysing arguments, of considering external influences on arguing, of scientific analytic reasoning, and of logical reasoning. Dick (1991) suggested the following taxonomy for CT:

1- Identify arguments: This includes themes, conclusion, reasons, and organization.
2- Analyse arguments: This includes assumptions, vagueness, and omissions.
3- Consider external influences: This includes value, authority, and emotional language.
4- Scientific analytic reasoning: This includes causality and statistical reasoning.
5- Reasoning and logic: this includes analogy, deduction, and induction.

In addition, Halpern (1997) proposed a taxonomy of CT skills as a guide for instruction, which consists of the five main skills listed below:

> (a) Verbal reasoning skills: This category includes those skills needed to comprehend and defend against the persuasive techniques that are embedded in everyday language.
> (b) Argument analysis skills: An argument is a set of statements with at least one conclusion and one reason that supports the conclusion.
> (c) Skills in thinking as hypothesis testing: The rationale for this category is that people function similar to intuitive scientists who explain, predict, and control events.
> (d) Likelihood and uncertainty: Because very few events in life can be known with certainty, the correct use of cumulative, exclusive, and contingent probabilities should play a critical role in almost every decision.
> (e) Decision-making and problem-solving skills: In some sense, all CT skills are used to make decisions and solve problems, but the ones that are included here involve generating and selecting alternatives and judging among them. Creative thinking is subsumed under this category because of its importance in generating alternatives and restating problems and goals (p. 452).

Alwehaibi (2012) focused on the development of five particular skills: causal explanations, determining the reliability of sources, arguments, predictions, and determining part-whole relationships. She asserted that this selection is based on their suitability in terms of the academic level of the students she studied and the importance of CT skills for students' learning and daily lives.

The consensus reached by the researchers and teachers, who participated in the American Philosophical Association's Delphi project on the definition of CT, is that the characteristics of a critical thinker include traits such as being inquisitive, fair-minded, flexible, diligent, and focused on enquiry (Facione 1990). In Facione's taxonomy (1990, p.12), CT is composed of six main skills, each containing sub-skills, as indicated below:

1. Interpretation

- Categorisation
- Decoding significance
- Clarifying meaning

2. Analysis
    - Examining ideas
    - Identifying arguments
    - Analysing arguments
3. Evaluation
    - Assessing claims
    - Assessing arguments
4. Inference
    - Querying evidence.
    - Conjecturing alternatives
    - Drawing conclusions
5. Explanation
    - Stating results
    - Justifying procedures
    - Presenting arguments
6. Self-regulation
    - Self-examination
    - Self-correction

Facione (1990) asserts that CT is focused self-judgement that results in interpretation, analysis, evaluation, and inference, as well as an explanation of the evidential, conceptual, methodological, or contextual thoughts upon which such judgement is based.

Third Debate: How Should CT skills be Taught and Assessed?
The review of literature indicates general agreement that CT includes a range of mental processes and skills such as interpretation, analysis, evaluation, inference, explanation, and self-regulation. Nevertheless, it is important for the teacher to decide how to teach and assess these skills. In fact, using strategies to teach and measure the improvement of CT skills is extremely complex and diverse.

Strategies to teach CT skills
Given the different taxonomies of CT skills, the appropriate strategies for teaching CT skills remain to be identified. Different studies have discussed the effectiveness of using specific strategies to enhance CT skills, such as class discussions, problem-based learning, collaborative learning, discussion methods, questioning techniques, and evidence-based projects (Kuhn 1999).

In order to teach CT skills and enable students to master them, teachers should choose a strategy that encourages students to understand and apply such skills. Lawrence et al. (2008) examined teachers and students' views to determine activities from which CT skills best emerged. They found that both teachers and students thought that critiquing journal articles, engaging in debates, writing research papers, evaluating case studies, and discussing questions helped them practise CT skills. This can be accomplished by teachers asking students to critique a journal article in a way that teaches them CT skills, such as asking them to look at multiple perspectives, question those perspectives, observe if they have sufficient evidence/research to back up their claims, and/or assess if the author of the journal is biased (e.g. is the article written in a way that favours only one side).

Questioning techniques, in addition, play an important role in inducing students' higher-level thinking skills, such as self-reflection, revision, and social debate, all of which are essential for CT. Socratic questioning is one of the most popular and powerful teaching approaches that can be used to guide students in generating thoughtful questions, thereby fostering their CT skills (Yang, Newby, & Bill 2005). Yang et al. (2005) investigated the effects of using Socratic questioning to enhance students' CT skills in an asynchronous discussion. They conducted the experiment for 2 consecutive 16-week semesters with 16 veterinary undergraduate students at a Midwestern university in the United States.

The results of their study indicated that, with appropriate course design and instructional interventions, CT skills can be refined and maintained using Socratic questioning techniques (Yang et al., 2005). This may be because this questioning technique provides students the time needed for thoughtful analysis, composition, negotiation,

and reflection, as their discussion of an issue evolves and allows instructors to model, foster, and evaluate the CT skills exhibited during the discussion.

Pithers and Soden (2000) supported the questioning technique as a strategy to enhance CT and indicated other approaches that, according to their review of literature, brought about changes in students' thinking. The most important of these involves students consciously reflecting on their main ideas and being encouraged to analyse these ideas. Students, for example, can be assisted in analysing their ideas by the teacher asking about similarities, assumptions, and alternatives; by questioning prior assumptions; by using classifications; and by deciding what data or information supports the idea.

Furthermore, Hansen and Salemi (2012, p.98) made a strong case for using class discussions to develop higher-order cognitive skills. They noted that 'in the course of discussion, students aim at producing their own answers and interpretations and at understanding and evaluating the interpretations and opinions of their colleague'. The dynamics and continued nature of an effective discussion allow for a flow of ideas and development of the thinking of all participants. They suggested five steps to design a successful class discussion: '1. Defining the goals of the course; 2. Choosing materials; 3. Preparing sets of questions to guide the discussion itself; 4. Planning the mechanics of the discussion itself; and 5. Defining the responsibilities and evaluating the performance of discussion leaders' (Hansen & Salemi 2012, p.41).

Taylor (2002) also believed that classroom discussions played a role in fostering CT skills, as a classroom discussion about course content could teach students what to do with the content and provide them an opportunity to practise forming their own judgements in an environment that was safe, supportive, and instructive. Taylor (2002) elaborated by stating that teachers' roles are very important in the classroom as they can lead discussions to help students think critically. The role of the teacher is to arrange conversations by: 1. Deciding what kind of conversation to begin the class with; 2. Being aware of the type of conversation that is occurring at any given point; and 3. Asking the right kinds of questions to initiate the type of conversation the teachers wishes for.

There is another, more specific, idea that teachers can adopt that is likely to enhance CT: a reading strategy, specifically reading between the lines, and attempting to understand hidden messages and arguments. To illustrate this, Pithers and Soden (2000) state that students might be asked to read a brief article that makes certain claims and then be tasked with suggesting ways of investigating the validity of these claims, implementing their suggestions, and finally reaching a conclusion about the validity of the article.

Moreover, writing activities have been used as a strategy in the field of enhancing CT for a long time. Condon and Kelly-Riley (2004, p.66) assert that 'writing acts as a vehicle for critical thinking, but writing is not itself critical thinking'. Cohen and Spencer (1993) provide an explicit model for using writing to teach CT. They note that the writing process provides an essential structure via which students can generate ideas and clarify their thinking about the relationship between those ideas. They further assert that writing can be an effective tool for teaching students a key element in CT: how to develop persuasive arguments supported by logic and evidence.
In a review of literature that sought to clarify the relationships between writing and CT, Bean (2011) provided guidelines on writing activities to promote CT skills. He emphasised writing assignments as one of the most flexible and effective ways to integrate CT activities into a course because the writing process itself involves complex CT skills. He claim that writing activities that aim to promote CT should shift their focus from topic-centred assignments to problem-centred assignments that are primarily argumentative or analytical.

Similarly, Quitadamo and Kurtz (2007) studied the efficiency of a writing strategy on students' CT. The participants included 310 non-major undergraduates who were taking biology to fulfil their general education science requirement at a state-funded university in the Pacific Northwest. In the study, they compared the CT performance of students who had undertaken a laboratory writing exercise with those who had undertaken a traditional quiz-based laboratory exercise in a general education biology course. The effect of writing on CT performance was investigated using the California Critical Thinking Skills Test (CCTST). The results of their study indicated significant differences between the writing and non-writing groups. Though modest, the strength of the relationship between the writing/non-writing groups and their CT performance was significant, accounting for more than 6% of the variance in CT performance. Specifically, analysis and inference skills increased significantly in the writing group but not in the non-writing group. Writing students also exhibited greater gains in evaluation skills; however, these were not significant. In brief, previous reviews have indicated that writing is a useful strategy that can be used to enhance CT skills.

Pithers and Soden (2000) suggested problem-based learning (PBL) as another promising strategy for developing CT. Well-designed problem-based courses are likely to encourage students to think critically about content since the courses begin with problems rather than with the content of the lectures and tutorials aimed at teaching students a body of knowledge. For example, students are required to understand and analyse the main issues within the problems, suggest a plan that might help resolve the problem, evaluate the proposed resolution, and decide on the final solution.

Questioning techniques, reading, writing and PBL approaches are very similar to general academic study skills. Some researchers have argued that there is an overlap between CT skills and other study skills, such as detecting fallacies, becoming familiar with one's audience, critical reading strategies, and writing skills (Stapleton 2001; Bean 2011). They have asserted the importance of recognising the differences between these skills. Where CT is a thinking process, study skills are strategies to practise and reflect CT skills (Bean 2011). To illustrate this, Bean (2011, p.4) provided the example that 'writing is the process of doing critical thinking and a product that communicates the results of critical thinking'.

A review of CT teaching strategies reveals that various methods and activities that can be used to enhance students CT skills. Therefore, the present study summarises some suggestions that might assist teachers in choosing and applying the most suitable strategy. First, Moseley et al. (2005) suggested a framework encompassing understanding, thinking, and learning. According to Moseley et al. (2005), CT skills can be promoted through the use of several simultaneous strategies, such as using reading and writing approaches. They proposed that engaging students in focused writing activities, which begin with different reading strategies and follow the argumentative and persuasive writing style, would improve their CT skills.

Second, Karns (2005) asserted the importance of providing strategies and activities that fit the students' preferences and perceptions. To provide evidence, he conducted a study to investigate students' perceptions of learning activities using survey responses from 227 students at 8 universities in the United States. He examined students' preferences and the effectiveness of some learning activities and found that according to students, internships, class discussion, and case analyses were the learning activities that contributed the most to their learning. Therefore, he claimed that responding to students' preferences through the use of these strategies helps promote student learning.

Finally, Edman (2002) argued that given the various teaching CT strategies, the strategy should be well designed regardless of which strategy is used. The design process needs to be based on a set of models, theories, and a revision of the course aims and components of CT that the designers want to enhance. It should also be designed based on students' contexts and backgrounds.

Strategies to assess CT

An initial overview seems to indicate overlap and confusion between CT teaching strategies and assessment strategies, as many people find them to be the same; however, there are differences between them. For example, if students are asked to write essays to promote their CT skills and are encouraged to use higher-level thinking skills, such as analysis and evaluation, the submission of these essays does not mean that the students have mastered CT skills. Teachers need an instrument to assess these essays and make decisions about them. This holds true for classroom discussions as well; even if students participate in classroom discussions, their participation does not necessarily indicate the presence of CT skills.

The effective assessment of students' CT skills is a major issue for higher education. The issue here is whether teachers, during the process of a CT assessment, can reliably assess the level of a student's CT (Quitadamo & Kurtz 2007). In fact, assessment remains a major concern in developing instructional activities to enhance students' CT skills (ibid).

Different approaches are used to assess CT skills (Ennis 1993; Andrade 2000; Paul & Elder 2006), and it is important for teachers who seek to enhance these skills to determine at an earlier stage the type of approach they will use and the reason for doing so. As Alfadhli (2008) stated, the following three main approaches can be used to assess CT, and teachers can use any of them based on their goals: 1. commercially available, general knowledge standardised tests; 2. researcher or teacher-designed assessments that attempt to capture aspects of CT more directly related to the purposes of the research project or subject of instruction, such as rubrics; and 3. teaching students to assess their own thinking. This allows the teacher to build his/her own assessments to fit within the course goals, students' needs, and the teacher's aims. The choice between these approaches will depend on the course's goal and aims, students' needs and abilities, and the ability and availability of the teacher.

CT standardised tests are one of the most popular tools used to assess CT, and they have been examined and explained in several studies (Ennis 1993). For example, CCTST is a famous instrument in this field that measures cognitive and meta-cognitive skills associated with CT. It is based on an agreed definition of CT and has been evaluated for validity and reliability for measuring CT at the college level for four years (Facione 1990). The CCTST measures the cognitive skills indicated by a Delphi panel of experts on the component skills of critical thinking (analysis, inference, evaluation, induction, and deduction) (Quitadamo & Kurtz 2007).

Another well-known measurement is the WSU Guide to Rating CT, which was developed by Washington State University (WSU). The earlier version of this instrument was first developed in 1997 and was used to evaluate students' CT based on their writing abilities. Later, this instrument was improved to be adapted by teachers to suit their instructional and evaluative methodologies, and to be employed across the curriculum to evaluate students' CT outcomes (Condon & Kelly-Riley 2004).

The rating procedures that are used in the WSU guide ensure that faculty provide ratings in a thoughtful and consistent. Using a six-point scale for each dimension, teachers select one of the following levels indicated in Table 1.

Table 1: *WSU Guide Rating Scale*

Scale	1	2	3	4	5	6
Description, etc.: • identification of a problem or issue. • establishment of a clear perspective on the issue.	Not evident; can't find it anywhere in the paper	Discernible, but not developed	Better than 2, but not yet 4. Could be confused, inconsistent	Important to the paper	Better than 4, but not yet 6. May be substantially developed in places, but not throughout the paper	Substantially developed; considered in full complexity; nuanced and sophisticated

Another guide for assessing CT was designed by Condon and Kelly-Riley (2004), and was derived from scholarly work, including that of Facione (1990) and Paul (1992), and local practices and expertise, to develop a process for improvement and a means for measuring students' CT skills throughout their college period. The guide can be adapted instructionally and can be used as an evaluative tool. It includes seven key areas of CT skills:

1. Identification of a problem or issue;
2. Establishment of a clear perspective on the issue;
3. Recognition of alternative perspectives;
4. Location of the issue within an appropriate context(s);
5. Identification and evaluation of evidence;
6. Recognition of fundamental assumptions, implicit or stated by the representation of an issue;
7. Assessment of implications and potential conclusions (Condon & Kelly-Riley 2004).

According to Condon and Kelly-Riley (2004), teachers are encouraged to use as many of the above seven points within their classrooms, their teaching styles, the makeup of the students in their course, and so on. Moreover, teachers are encouraged to distribute these criteria to students before assignments so that students can develop a clear understanding of expectations.

In terms of collecting and analysing CT tests, Bers (2005) reviewed the most popular CT tests and listed them as follows:

- **Academic Profile:** This examines college-level reading and CT skills in the context of the humanities, social sciences, and natural sciences.
- **College BASE**: This is designed to be administered after students complete a college-level core curriculum. It tests knowledge and skills in English, mathematics, science, and social studies, and provides performance rankings in higher-order thinking skills, such as interpretive, strategic, and adaptive reasoning abilities.
- **Collegiate Learning Assessment Project (CAL)**. In this assessment, the students are assigned open-ended tasks and asked to write essays in response. These are then assessed for students' ability to identify the strengths and limitations of an argument; present a coherent argument in support of a proposition; or interpret, analyse, and synthesise information.

- **Tasks in Critical Thinking:** This test is performance-based and generates group rather than individual scores. Students are asked to solve a dilemma or task in an area of humanities, social sciences, or natural sciences. Teachers use rubrics to evaluate responses, targeting the skills areas of inquiry, analysis, and communication.
- **Test of Everyday Reasoning:** This thirty-five-item multiple-choice test is designed to assess an individual's or group's basic reasoning skills.
- **Watson-Glaser Critical Thinking Appraisal**: This test was developed in the 1960s, and in addition to a total score, it features five sub-scores in inference, recognition of assumption, deduction, interpretation, and evaluation of an argument. This test, similar to all the standardised tests presented thus far, is intended to test students' ability to think critically.

Although some of the previous tests are very common and have been cited numerous times in different research such as CCTST, they might not be appropriate for use in any study in any context. Teachers should have a defensible elaborated definition of CT when selecting a test. Teachers must also have a clear idea of the purpose for which the test is to be used. Moreover, there are some limitations surrounding the use of standardised tests that were indicated by Ennis (1993). Examples are as follows: 1. These tests should be examined twice, as a pre-test and post-test, in order to determine if there is any improvement in CT skills; however, this implementation poses a potential problem of informing the students of the test questions. 2. Most of the CT tests are multiple-choice tests, which are not comprehensive; they lack information that is important in CT. 3. The differences in background, views, and assumptions between teachers and students can sometimes result in different answers to test questions. 4. Results might be expected too quickly; learning to think critically takes a long time.

Other researchers, such as Ennis (1993), Quitadamo and Kurtz (2007), and AlFadhli (2008), suggested different methods to assess students' CT skills and to circumvent the limitations of standardised tests; teachers can design their own scale to measure CT skills, which fit within the research aims and goals. Rubrics are one of the most common tools used to assess students' CT. A considerable number of example rubrics are now available as guides (Ennis 1993; Facione & Facione 1994; Andrade 2000; Mansilla, Duraisingh, Wolfe, & Haynes 2009). In order to design and use a rubric, Peach et al. (2010) asserted that teachers must develop one that captures their learning outcomes in a way they find meaningful. The key is to 'get it down, then get it right' (Peach et al. 2010, p.316). Moreover, teachers must learn that in developing rubrics, they are not likely to be accurate the first time. If teachers understand that assessment is a journey, they will not expect perfection on the first attempt; instead, they will develop a usable rubric understanding that it can be improved over time (ibid).

Facione and Facione (1994) developed a four-level scoring rubric for considering the subject matter or context in which CT skills are applied, called 'Holistic Critical Thinking Scoring Rubric'. It does not enable an institution to compare students' results with national norms, but is based on extensive research on assessing CT. The scoring is on a four-point scale (4: *Strong*; 3: *Acceptable*; 2: *Unacceptable*; 1: *Weak*) and is used to assess the following skills:

- Interprets evidence, statements, graphics, questions, etc.
- Identifies the salient arguments' (reasons and claims) pro and con.
- Analyses and evaluates major alternative points of view.
- Draws warranted, judicious, and non-fallacious conclusions.
- Justifies key results and procedures and explains assumptions and reasons.
- Fair-mindedly follows evidence and reason.

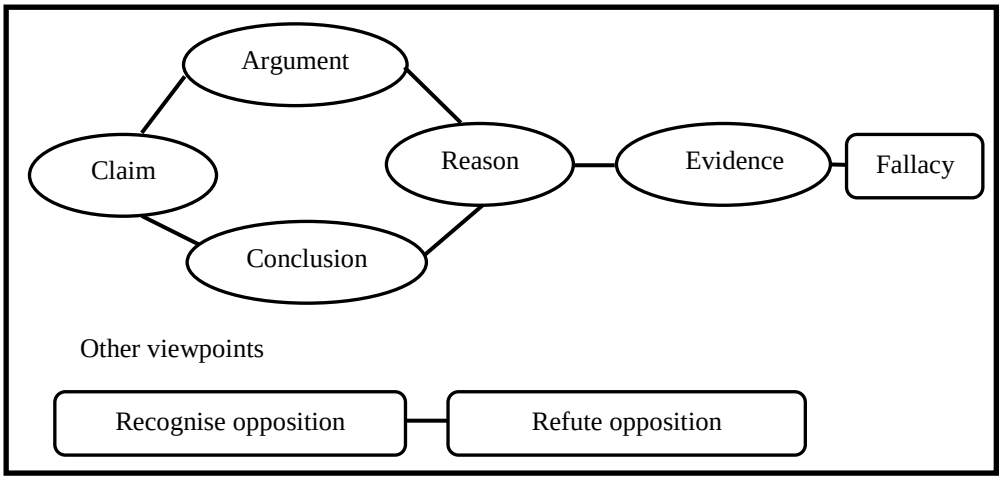
Writing has long been perceived as a tool to assess CT skills (Ennis 1993; Halpren 2001; Hersh 2007; Quitadamo & Kurtz 2007). Condon and Kelly-Riley (2004) stated theirn opinion about using writing as a tool to assess CT:

> 'The best way to learn to think is to read a lot of good writing and write a lot about what you have read. Writing and the communication of ideas are central to all disciplines whether one is in college or the workplace. One of the most important skills in the digital age is, in fact, one of the oldest – writing'. (p.56)

Ennis (1993) suggested that teachers can ask students to write an argumentative essay and then analyse those essays using a CT scale or rubric designed by the teachers based on their requirement. Cottrell (2005) defined argumentative writing as a writing style where the writer persuades readers to accept certain positions or points of view, by supporting the opinions with appropriate reasons and evidence.

Stapleton (2001) proposed a model to assess CT skills that are reflected in argumentative texts. His model was based on a review of the literature, a pilot study, and well-established models for analysing argumentative writing (Toulmin 1958, cited in Crammond 1998). Stapleton (2001, p.44) claimed, "Identification of arguments is based on semantic structures and linguistic elements that typically signal the presence of reasons'. In addition, he said that to investigate the extent and nature of CT skills in writing, the following basic elements should be observed: arguments, claims, reasons, evidence, fallacy, conclusions, recognition of opposite viewpoints, and refuting opposition (Figure 2).

Figure 2: Structure of Argumentative Writing (Stapleton, 2001, p.128)



According to Stapleton (2001), the argumentative structure consists of a statement of belief (claim) supported by reasons that justify the claims made, and those that raise and address counter arguments. Moreover, argumentative writing might contain intermediate conclusions, which can also serve as reasons before the final conclusion is drawn.

In addition, Stapleton's model (2001) includes an assessment scale to assess CT elements, and not just an evaluation of the argumentative writing structure, by identifying and counting the key elements of CT displayed in students' writing, such as the following: (a) the number of arguments; (b) the extent of evidence provided; (c) the recognition of opposing arguments; (d) corresponding refutations; and (e) the number of fallacies. Stapleton's model (2001) offers an educated tool to assess students' argumentative writing and test their CT skills.

Fourth Debate: Can Technology Promote Students' CT skills?

Many researchers have attempted to investigate the role of integrating technology for learning purposes, as well as the use of technology to enhance CT skills. Astleitner (2002) provided a narrative literature review on the effects of collaborative computer-supported environments, computer simulations, and logic software on CT. His findings have been cross-referenced with the literature and are described in the next section.

Using technology without any instruction.

In this approach, the technology itself acts as a tool for solving given tasks without providing any instructional functions about CT concepts and skills (Astleitner 2002). Examples include a teacher's use of a PowerPoint presentation to illustrate the lecture, a student's use of Word software to complete their homework, or the use of e-mail to contact a teacher or other students. In this approach, technology does not offer any instruction or information about CT skills or how to apply them; it merely acts as a tool to facilitate the teaching and learning process.

Scarce (1997) tested this approach by examining the efficiency of using e-mail to exchange assignments and communicate with other students to promote their CT skills. He conducted his study during his 10-week sociology class. Students were asked to read and react to a book selected exclusively for this assignment. He found that using e-mail as a communication tool without any further instructional function did not improve CT when compared with traditional classroom instruction. Moreover, Santos and de Oliveira (1999) found similar non-significant results when using the Internet for content presentation. These findings are consistent with other research findings pertaining to this type of approach (Wilkinson, Bennett, & Oliver 1997; Scarce 1997;

Duffelmeyer 2000). Using technology, such as computer software and Internet websites, without providing any CT skills as a way to enhance CT skills is ineffective and does not improve CT skills.

In contrast, Jonassen, Carr, and Yueh (1998) argued that technology can be used as content (for teaching about technology) and as a tool (for problem solving) to stimulate and support CT. Expanding on this point of view, Hopson et al. (214) noted positive effects from the use of computer tools such as spreadsheets, databases and word processing software in promoting undergraduate students' high-level thinking skills and CT, when they were used to take notes, create assignments, and construct projects. Furthermore, Mandernach (2006) described how using simulation technology provided undergraduates with an opportunity for decision-making, team building, and CT. These differences in research findings may be due to the rapidly changing nature of technology and calls for further research in this area.

Summarising, there is no clear no consensus about the role of technology without any instructional functions on promoting students' CT. However, being critical of Internet websites and having tools such as e-mail does not guarantee CT.

Using technology with direct instruction

In this approach, technology is used to deliver direct instructional functions in different subjects (Astleitner 2002). Examples include the use of a learning management system such as Blackboard to deliver distance learning or logic software, Internet websites, or computer simulations to deliver some teaching functions.

According to Yeh and Strang (1997), computer simulations provide an alternative setting for teachers-in-training to become capable cultivators of critical thinkers. A program called Computer Simulation for Teaching CT was developed to assist teachers and functions on the principle that teachers, through reflective teaching, will improve their professional knowledge and thus develop effective strategies for teaching CT. They found that young teachers were better skilled at teaching CT after using computer simulation modelling daily for classroom problems.

Another study by Gokhale (1996) examined the effectiveness of integrating guided discovery computer simulation into traditional lecture-lab activities to enhance students' higher order thinking skills such as problem solving. The sample included 32 students divided into two sections (control and experimental), enrolled in an electronics course offered in an industrial technology department at a state university in the Midwest (in the United States). The treatment was a computer-based simulation software that enabled students to experiment interactively with the fundamental theories and applications of electronic devices. It provided instant and reliable feedback. Based on the study's results, it was concluded that the computer simulation software was effective in motivating students into self-discovery and in developing their reasoning skills.

Moreover, Salleh, Tasir, and Shukor (2012) developed several web-based simulations for learning Communication and Networking in Education and delivered it through an interactive web-based learning environment. The aim was to enhance students' CT based on interactive simulation features, social constructivist theory, and CT skills. To evaluate the effectiveness of the framework and the approach, a case study involving 21 university students was conducted to investigate the impact of the simulations on the students' CT skills. The results indicated that the implemented web-based simulation learning framework had a positive impact on students' CT skills.

In addition, drill and practice programs offer positive findings in this area of research. For example, Ellis (2001) examined the effectiveness of multimedia in developing the CT capabilities necessary for applying facts learned in solving problems. In his study, a computer-based tutorial and a drill-and-practice program were augmented with multimedia features and administered to 38 male and female students enrolled in Introduction to Computers classes and Medical Office Procedures in the Division of Continuing Education campus in the Nova Southeastern University in the United States. The findings revealed that multimedia-enhanced educational products are potentially effective in developing CT skills.

Jonassen et al. (1998) investigated a different type of computer software called 'Mindtools software' to promote CT. They described this software as a computer application that, when used by students to represent what they know, engaged them in reflective CT about the ideas they are studying, and helped them scaffold different forms of reasoning about content. Therefore, they argued that using this type of software helps in promoting students' higher level thinking skills such as CT. However, they emphasised the importance of conducting more research on this type of software.

Moreover, some learning management systems, such as Blackboard, offer some features that support student-centred learning approaches. This approach aims to develop learner autonomy and independence by shifting the responsibility for the learning path to the students (Garrison 1992). Researchers (Pedersen & Liu 2003; Jones 2007; Hannafin & Hannafin 2010) have agreed that that this style of learning (students-centred learning) treats students seriously as active participants in their own learning and fosters transferable skills such as problem-solving, reflective thinking, and CT.

Astleitner (2002) reviewed studies in the area of using technology with direct instructions to enhance CT (e.g. Stenning, Cox, & Oberlander 1995; Gokhale 1996). He stated that using technology, such as Internet websites and computer software, to facilitate self-learning had a positive effect and can be used to enhance CT skills; however, he advised further research. Although significantly more research has been conducted in this area compared to the previous approach, because of the rapid growth of technology, there is a need for further research.

Using technology with indirect instruction.

In this approach, technology can deliver some instructional functions within a traditional learning environment, where the teacher still controls and evaluates the learning process (Astleitner 2002). Based on the present study's survey of the literature, it seems clear that this approach had been studied more extensively than the two previous approaches of integrating technology to enhance CT. The research provided different technology strategies that could be applied within this approach, such as online discussions, web-based learning, inquiry-based learning, and SN websites. The next section provides some examples of this strategy.

Teachers can engage their students in a wide range of activities that can contribute to intellectual growth. Diamond (1998) reviewed students in a distance-learning program at the University of Massachusetts that used an online Café (WebCT's chat) for idea generation and online help sessions. The bulletin board offered the possibility for coaching discussions to take students' ideas to the next level to attain deeper, more intellectual, and reflective learning through e-mail, or enable faculty communication with students one-on-one or one-to-many. Presentation tools provided students the opportunity to work collaboratively on project planning, peer editing, and research reports. All of these tools can give students practice in sharpening their CT skills. Moreover, Newman, Johnson, Cochrane, and Webb (1996) explored the quality of learning and depth of CT in seminars conducted via a computer conferencing system. Their findings indicated that computer conference discussions promoted significantly deeper CT than face-to-face seminars.

According to Mandernach (2006), using online instructional technology to support the traditional classroom imparts two distinct benefits for teachers wishing to enhance students' CT about the course material. First, it provides a means of moving lower-level learning tasks outside of class time, so that limited student contact time can be devoted to higher-order CT activities. Second, it fosters the use of constructivist teaching philosophies by supplementing traditional face-to-face activities with opportunities for individualised, in-depth interactions with the course material. However, the focus should not be on the technology itself; the emphasis must rather be on the careful selection of appropriate online instructional strategies to meet course content and process goals.

A significant number of teachers have investigated the role of online discussions in their teaching. Simkins (1999) suggested that Web-based tools, such as online discussions, can provide a different learning environment with interesting new opportunities for collaborative learning. Chizmar and Walbert (1999) used online discussions to help students clarify their thinking on different topics explained in class, and to identify what they found to be the most important or least understood idea among those discussed. Vachris (1999) used online discussions as part of a strictly online principles course to have students comment on a reading assignment.

Greenlaw and Deloach (2003) argued that when used effectively, online discussions can provide a natural framework for teaching CT to a group, as they can capture the best features of traditional writing assignments and in-class discussions. They based this on several factors: first, online discussions change the focus of the learning process, replacing the single view of the teacher with a variety of views from students. Second, this variety of views implicitly requires readers to compare and evaluate these views. Third, the asynchronous nature of online discussions provides participants time to reflect on what others have said and how they wish to respond. Finally, unlike class discussions, every participant has the opportunity to be fully heard.

In addition, MacKnight (2000) confirmed that teaching CT through online discussions is an important strategy in advancing teaching and learning in electronic forums. He stated that online discussions offer the potential for collaboration and increased participation in the learning process, as well as reflection, peer tutoring, and

monitoring of student learning as it occurs as an extension of classroom learning. He suggested some steps that should be used to support online discussions:

1. Maintain a focused discussion;
2. Keep the discussion intellectually responsible;
3. Stimulate the discussion by asking probing questions that hold students accountable for their thinking;
4. Infuse these questions in the mind of students;
5. Encourage full participation;
6. Periodically summarise what has or needs to be done (p.39).

Finally, Mandernach (2006, p. 45) suggested a similar type of online discussion that he named 'Online Asynchronous Threaded Discussions' to promote students' CT. Threaded discussion boards provide the opportunity to fully utilise the benefits of student-teacher and student-student interactions in an environment that encourages planned, meaningful, and prepared discussions. It creates an outlet for in-depth interactions that may require additional thought, investigation, or research.

Another strategy that can be used to enhance CT through using technology is web-based inquiry learning such as WebQuest, which is a type of resources-based learning (MacGregor and Lou 2006). It is a strategy that requires students to analyse, synthesise, and exercise information seeking strategies that represent higher levels of thinking skills (Dodge 1995; MacGregor & Lou 2006). MacGregor and Lou (2006) argue that this approach has great potential to improve the development of higher-order cognitive skills, CT, and problem-solving skills that the fast-paced information age demands. However, in order for it to work effectively, students need support and a framework for developing the requisite skills.

MacGregor and Lou (2006) designed a WebQuest intervention to obtain a better understanding of how to enhance the pedagogical effectiveness of WebQuest and of how students interact with the various features inherent to informational websites. The main objective was to explore the effectiveness of inquiry-based learning on students' CT skills. A total of 32 students from fifth-grade classes were the subject for this inquiry-based learning (WebQuest activities) in their science classroom over a three-week period. The findings indicated that concept mapping templates, coordinated with the research tasks, enhanced students' free recall, the application of acquired knowledge, and helped promote higher level thinking skills such as CT.

In inquiry-based learning, particularly on the Web, a significant number of resources are available with a few easy clicks of a computer mouse. However, unlike reference books and journals in a library, anyone can publish on the Web without being reviewed or approved by experts, and without following any standards in the design of the website's homepage (Nielsen & Tahir 2001). Thus, in Web resource-based learning, learners are challenged with the need to quickly and critically evaluate both the credibility and content relevance of a website for a given task.

Another trend that can be used to enhance CT through using social networking websites. The continued growth of educational technologies challenges teachers to discover a novel technology that will assist current learning situations and their objectives. Modern technologies and associated networks, such as blogs, wikis, YouTube, Twitter, and Facebook, which are called Web2.0 tools or social networking websites (SN), have been studied intensively over the last decade, (see Bryant 2006; Mandernach 2006; Bosch 2009; Carlisle 2010; Buus 2012). The studied Bryant (2006), Bosch (2009), Sun (2009), Carlisle (2010) and Buus (2012) indicated that using SN websites for educational purposes fit well with the current educational policies of many countries, such as the United Kingdom and the United States, who are aiming to develop their educational practices and outcomes. Furthermore, they are consistent with several learning theories, such as constructivism and social constructivism, in addition to offering educational advantages in several learning situations.

While reviewing the literature, the present study identified some studies that attempted to explore the effect of SN websites on teaching and promoting students' CT indirectly. The focus of the research was on other aspects, such as social relationships and communication that, in turn, could help promote students' CT.

According to Duffy (2008), participation via blogs could promote higher-level thinking skills such as critical, analytical, creative, intuitive, associational, and analogical thinking. He suggested several ways to uses blog in education in order to promote these skills, such as comments based on subjects and student responses; a collaborative space for students to act as reviewers for course materials; and an online space for review of works and projects or a space to provide peer reviews. Duffy (2008) stated that within the structure of a blog, students could demonstrate CT, take creative risks, and make advanced use of language and design elements. In doing so,

students acquire creative, critical, communicative, and collaborative skills that may be useful to them in both scholarly and professional contexts. The growing popularity of blogs suggests the possibility that some of the work that students need to do in order to read well, respond critically and write vigorously might be accomplished under circumstances that are dramatically different from those currently utilised in education.

Moreover, Yang (2005) explained how he used blogs as a reflective platform for the student teacher training programme in Taiwan in order to encourage students to engage in CT. The student teachers made use of blogs as a platform to critically reflect on their learning processes as well as to gauge the impact of blogs on their own professional growth. He qualitatively analysed the data, which consisted of the messages and comments posted by the student teachers on the blog. The findings revealed that the student teachers actively discussed different topics related to their training programme and their academic career through blogs. All the participants reflected on their experiences and made significant comments. However, using blogs for reflection does not guarantee the acquisition of CT skills, indicating the need for further research in this area.

In addition, Hadjerrouit (2011) claimed that the collaborative feature of some SN websites, such as wikis, could potentially provide teachers with significant opportunities to enhance CT. He argued that wikis could create socially engaged tasks that require active student participation and collaboration. Wikis allow students to work together to develop content on the web, imparting to them a sense of how writing can be collaborative. This type of practice offers opportunities not only to practise writing and reading skills but also to stimulate reflection, knowledge sharing, and critical thinking.

Mandernach (2006) argued that technologies such as blogs and wikis offer different instructional advantages in promoting students' CT skills, and he suggested some uses for these websites in order to enhance CT. For example, blogs may be used within a course management system (usually private) or on several free, public blog sites available throughout the Internet (typically classified based on common theme, topic, or point of interest). In addition, wikis have the advantage of allowing students to easily add and edit content. They are thus particularly suited for collaborative writing or group projects, which, through practice, will enhance students' CT.

Yunus, Salehi, and Chenzi (2012) stated that using SN websites in writing and reading could improve creative thinking skills. Since students write directly on SN websites, shy students may be less afraid to post publicly. On the discussion platforms offered through these websites, students exchange ideas in order to improve their CT skills. SN websites provide more access and opportunity for interaction, planning, and gathering more information. In general, they could be effective for students to promote CT by practising SN reading and writing activities. However, Minocha (2009) claims that there are few novel practices for using SN websites to promote CT skills. Most of the studies have been reviewed used SN websites as a platform for discussion and communication, on the basis that discussion in itself will develop CT skills. However, the use of SN in higher education is still at an early stage (Alabdulkareem 2015), necessitating additional research.

CONCLUSION

The extant literature has provided a solid understanding of the concept of CT, and there is no debate about the importance of teaching CT skills. However, reviewing the literature indicated for main arguments between the researchers in the field of teaching CT skills. First, researches disagree on where to teach CT; whether CT should be taught in specific courses of CT skills (CT as an isolated set of skills), or in general courses (as part of other subjects). Every approach has its own strengths and weaknesses, therefor, the decision regarding to where to teach CT is based on the nature of the course and its goals.

Second, although there is agreement that CT is a human cognitive process that enables one to use a specific set of cognitive skills, significant controversy surrounds which skills should be taught to develop such thinking. Researchers disagree about the skills that make a person a critical thinker, however, it seems evident from the literature that there is general agreement that CT includes a range of mental processes and skills such as interpretation, analysis, evaluation, inference, explanation and self-regulation.

Third, it is important for the teacher to decide how to teach and assess CT skills. A review of the CT teaching strategies shows that there are various methods and activities that can be used to enhance students CT skills. Moreover, there seems to be overlap and confusion between CT teaching strategies and assessment strategies as many people think they are the same; however, there are differences between them. The effective assessment of students' CT skills is a major issue for education. The issue here is whether teachers, during the process of a CT assessment, can reliably assess the level of a student's CT. In fact, assessment remains a major concern in developing instructional activities to enhance students' CT skills.

Finally, many researchers have tried to investigate the role of integrating technology to enhance CT skills. Nevertheless, there is still much room to better understand the impact of using different pedagogical strategies and technology in enhancing student CT. Reviewing the literature revealed that studies seldom attempted to explore the effect of new technology such as SN websites on teaching and promoting students' CT in a direct way, and there is a need for further studies on technology and its effect on promoting CT skills in particular.

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