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Promoting Critical Thinking Skills Within the Second Class Informatics Textbook of the Greek Lyceum

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Abstract: Societies and individuals are constantly facing problems. Critical thinking can contribute in improving problem solving skills. It can support identifying, constructing and evaluating arguments. It can help individuals to develop decision making competencies and communication skills. People can use critical thinking in order to confront their prejudices and stereotypes. These are some of the reasons why critical thinking is considered as a key pedagogical goal in many levels of education. Regarding Informatics, students cannot develop skills related to it, if they cannot think critically. Consequently, critical thinking is essential in teaching Informatics. For this reason, in Informatics textbooks the cultivation of critical thinking skills should be promoted. The present research aims to determine whether the cultivation of critical thinking skill is promoted within Informatics textbook of the second class of the Greek Lyceum. The method that was used in this paper is the Qualitative Content Analysis. The findings of the present study showed that within the examined textbook the promotion of the cultivation of critical thinking skills is insufficient and does not treat these skills equally.

Key words: critical thinking, critical thinking skills, content analysis, informatics, textbooks

1. Introduction

One of the learning competences for the 21st century that modern education internationally seeks to cultivate, is critical thinking (Kennedy, Latham & Jacinto 2016). Critical thinking is the key competency for economic survival in the 21st century (Matthews & Lally, 2010). In society and especially in higher education and professions, critical thinking is significant (Moon, 2008). Critical thinking courses helps acquire skills such as gathering and analyzing information and solving problems (Bassham et al., 2011). As a consequence of the above, in the textbooks of Informatics, promoting the cultivation of critical thinking skills is essential. The purpose of this paper is to determine whether cultivating of critical thinking skills is promoted in Informatics textbook of the second class of the Greek Lyceum.

1.1 Clarifying Critical Thinking

There are various approaches to critical thinking since it is a complex concept. Critical thinking can be approached philosophically, psychologically and educationally (Kules, 2016; Lai, 2011; Lewis & Smith, 1993;

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Moon, 2008; Sternberg, 1986). Proponents of philosophical approach see critical thinking as a procedure or form of logic and they focus on the requirements of formal logic (Bowell & Kemp, 2002). Philosophical approach encompasses definitions of critical thinking such as "reflective and reasonable thinking that is focused on deciding what to believe or do" (Ennis, 1985, p. 85), "disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought" (Paul, 1992, p. 9). Cognitive psychologists consider critical thinking as a means of problem solving, and often as "a form of problem solving" (Moon, 2008). Concerning psychological approach, there are definitions of critical thinking such as: "critical thinking comprises the mental strategies and representations people use to solve problems, make decisions and learn new concepts" (Sternberg, 1986, p. 3), "the use of those cognitive skills or strategies to increase the probability of a desirable outcome" (Halpern, 1998, p. 450). Educational approach consider critical thinking as an ability that students should develop and it focus on how this cultivation will take place. Educators often see critical thinking to be represented by the analysis, the synthesis and the evaluation of the Bloom taxonomy (Kennedy Fisher & Ennis, 1991).

1.2 Critical Thinking and Informatics

To manage information properly, it is essential to develop Information Literacy. Information Literacy is a set of skills for recognizing, evaluating and effectively using necessary information (American Library Association, 1989). Informatics is a science of computers, algorithms, data structures, mechanical processing of symbols and data, computer automation, computer simulation, and mechanization of thinking (Rechenberg, 1999). Students cannot cultivate Information literacy unless they have developed critical thinking skills (Paul & Edler, 2006). Therefore, Information Literacy interconnects critical thinking with Informatics.

Computational thinking has characteristics which are beneficial and necessary to many disciplines and therefore it affects them (Wing, 2006). Computational thinking is a brain activity which applies deduction, deconstruction, algorithmic design, generalization, and evaluation to the production of automation that can be implemented by a human or by a computing device in order to facilitate problem solving (Selby & Woollard, 2014). Computer Science and computational thinking are strongly related (Dagiene & Stupuriene, 2016). To solve complex technological problems computational thinking and critical thinking are necessary (Voskoglou & Buckley, 2012). Critical thinking skills are essential for solving problems and decision making (Halpern, 1998). Concerning problem solving, decision making and interaction with the world, computational thinking complements critical thinking and furthermore there are critical thinking skills and computational thinking skills which are similar (Kules, 2016). From the above, it is obvious that computational thinking interconnects critical thinking with Informatics.

Algorithmic thinking is one of the most important competences in education of Informatics (Olsen, 2000). Algorithmic thinking is a group of abilities related to constructing and understanding algorithms. These abilities are: analyzing problems, accurately identifying a problem, finding the key actions that are appropriate to deal with a given problem, constructing an algorithm in order to solve a particular problem using the basic actions, capturing possible cases of a problem and improving the efficiency of an algorithm (Futschek, 2006). Logic and clarity are standards of critical thinking (Paul & Elder, 2006; Paul, 1992) and also constitute key elements of algorithmic thinking.). Thus, Logic and clarity are common in critical thinking and algorithmic thinking. From all the above, it has become clear that critical thinking and Informatics have a very strong relationship.

1.3 Critical Thinking and Informatics Curricula

Development of critical thinking is emphasized as teaching objective in curricula of primary, secondary and higher education (Thompson, 2011). Thinking skills or critical thinking programs have been incorporated into

curricula of several countries (Matthews & Lally, 2010). The Analytical Curriculum for Information and Computer Technology in Education consist an indicative curriculum that developed under the aegis of UNESCO. In this Curriculum, one of the skills that should be promoted is critical thinking (Weert & Anderson, 2002). So, internationally the curricula promote the cultivation of critical thinking.

In Greece, new curricula underlines the promotion of critical thinking as a teaching objective (Hellenic Pedagogical Institute, 2009). Particularly in school textbooks of Informatics the cultivation of critical thinking skills should be promoted because they are school textbooks and due to the fact that critical thinking is closely related to Informatics education. The present research examines if and in what way the cultivation of critical thinking skills is promoted in the Informatics textbook of the second class of the Greek Lyceum.

1.4 Research Questions

To examine the content of the second class Informatics textbook of the Greek General Lyceum, regarding the promotion of cultivating critical thinking skills within it, the following research questions were posed. In the second class Informatics textbook of the Greek Lyceum:

1) Which are the critical thinking skills whose cultivation is promoted, and which are the ones whose cultivation is not promoted?
2) If cultivating critical thinking skills is promoted, in what way is this promotion achieved per skill?
3) In case there are references promoting the cultivation of critical thinking skills, to which topics are they related?
4) If there are critical thinking skills whose cultivation is promoted, does this promotion occur in all of the sub-skills?

2. Method

2.1 Material

In the present research the examined material is the content of the second-class Informatics textbook of the Greek Lyceum. The aim of this book is for students to develop analytical and synthetic thinking as well as to be able to name and explain scientific areas of Informatics (Doukakis et al., 2014). The under study textbook is divided into the following units: (1) Basic concepts, (2) Theoretical Computer Science topics and (3) Applied Computer Science topics. Each unit consists from one or more topics. The first unit consists of the Computer Science topic. The second unit consists of Problem, Algorithms and Programming. The Operating Systems, the networks and the Artificial Intelligence are the topics of the third unit. In the present paper, all topics of the textbook were examined.

2.2 Research Design

To answer the research questions, the content of the Informatics textbook of the B-class of the Greek Lyceum was examined. To carry out this examination the Qualitative Content Analysis method was used. Qualitative Content Analysis examines the meanings, themes and patterns that are obvious or latent in a particular text (Zhang & Wildemuth, 2016). The basic idea of Content Analysis is the inclusion of elements of a text into categories (Mayring, 2014; Creswell & Clark, 2007; Krippendorff, 2004; Huntemann & Morgan, 2001; Berelson, 1952; Rustermeyer, 1992; Holsti, 1969). Qualitative Content Analysis is a systematic methodology of translating the concepts around us into categories for coding (Kohlbacher, 2009; Manzo & Trotter, 2007). The basic concept of this research is to find parts of the under examination text through which the cultivation of critical thinking skills is promoted and

then to include these parts of text in categories. To achieve this, a recording unit was selected and a system of categories (category system) was established. The recording unit determines which parts of the text fall into the category system (Krippendorff, 2004). The recording unit is the smallest part of the content in which the display of a message is measured (Weber, 1986). In the present research, the recording unit is defined as a part of the under examination text which contains exactly one message that promotes cultivation of a critical thinking skill. Any part of the examined text that contains exactly one message promoting cultivation of a critical thinking skill, should be included in a category of the category system. In the beginning, an initial category system is used, which helps classify parts of the text in the categories of this system. In the present research, the initial category system consists of the categories (skills) and the subcategories (sub-skills) that were defined by the American Philosophical Association (Facione, 1990). These categories and subcategories are the following:

Interpretation skill

1) Categorization sub-skill
2) Decoding Significance sub-skill
3) Clarifying Meaning sub-skill

Analysis skill

1) Examining Ideas sub-skill
2) Identifying Arguments sub-skill
3) Analyzing Arguments sub-skill

Evaluation skill

1) Assessing Claims sub-skill
2) Assessing Arguments sub-skill

Inference skill

1) Querying Evidence sub-skill
2) Conjecturing Alternatives sub-skill
3) Drawing Conclusions sub-skill

Explanation skill

1) Stating Results sub-skill
2) Justifying Procedures sub-skill
3) Presenting Arguments sub-skill

Self-Regulation skill

1) Self-examination sub-skill
2) Self-correction sub-skill

The under study textbook was investigated to determine whether there are subcategories that do not contain references promoting the cultivation of critical thinking skills. There were found such subcategories. These empty subcategories correspond to: identifying arguments sub-skill, analyzing arguments sub-skill, assessing arguments sub-skill, querying evidence sub-skill, conjecturing alternatives sub-skill, stating results sub-skill, justifying procedures sub-skill, self-examination sub-skill and self-correction sub-skill. In a final category system to be used in Content Analysis, there should be no category that does not contain references (Berelson, 1952; Rustermeyer, 1992; Holsti, 1969). For this reason, the above empty sub-categories were removed from the initial category system and a final category system emerged whose categories and sub-categories are the following:

Interpretation skill

1) Categorization sub-skill
2) Decoding significance sub-skill
3) Clarifying meaning sub-skill

Analysis

1) Examining ideas sub-skill

Evaluation

1) Assessing claims sub-skill

Inference

1) Drawing conclusions sub-skill

Explanation

1) Presenting arguments sub-skill.

2.3 Data Collection and Analysis

First the under research text was selected and the recording unit was defined. Then, after examining the text, the final system of categories and sub-categories was established. Categories correspond to critical thinking skills and subcategories to critical thinking sub-skills. A category consists of all the members of its subcategories. Any part of the text which contains one message promoting cultivation of a critical thinking sub-skill was included into one sub-category. If a part of the text is included in one sub-category then this part is a categorized part of the text, otherwise it is not a categorized part of the text. Subsequently, the categorized parts of the text were briefly described for each subcategory separately. For documentation reasons, each description was followed by corresponding original parts of the text.

3. Results

3.1 Interpretation Skill

Interpretation skill is represented by categorization sub-skill, decoding significance sub-skill and clarifying meaning sub-skill.

With regard to categorization sub-skill, references were found describing activities, in which students are asked to:

1) Classify Computer Science terms into categories:

> "Search the Internet, working in teams, terms related to Computer Science, ... On the basis of this search, list the most well-known fields and divide them into theoretical and applied ones" (Doukakis et al., 2014, p. 10).

2) Classify Problems:

> "Work in teams. Each group will pose a problem to the other group, which is called upon to discover the category to which the problem belongs" (Doukakis et al., 2014, p. 18).

Concerning the decoding significance sub-skill, there are references describing activities in which students are asked to explore the importance of developmental and ethical issues related to the use of a computer system:

> "Explore what it means for man, his codes of ethics, and his evolution to accept help or advice from a machine or a computer system?" (Doukakis et al., 2014, p. 96).

As far as clarifying meaning sub-skill is concerned, references were found describing activities, in which students are asked to illustrate how certain actions are performed:

> "What do you do to find a word in a dictionary?" (Doukakis et al., 2014, p. 19).

3.2 Analysis Skill

Analysis skill is represented by examining ideas sub-skill. With regard to examining ideas sub-skill, there are references containing teaching objectives which suggest that students should be able to distinguish the characteristics, the basic commands and the structures of the algorithms:

> "... to discern the existence of specific features that an algorithm needs to have" (Doukakis et al., 2014, p. 19).

> "... to distinguish the basic commands and structures used in an algorithm" (Doukakis et al., 2014, p. 19).

With respect to the examining ideas sub-skill, references were found describing activities in which students are encouraged to:

1) Associate Concepts With Computer Science:

> "Search the Internet, teamwork, terms related to Computer Science, its areas, the areas of application, and relate the concepts to each other..." (Doukakis et al., 2014, p. 10).

2) Compare Algorithms:

> "The following algorithm performs a serial search on element K in Table A. Find the differences with the algorithm of Example 2.29. Which is preferable and why? Consider the case of successful and unsuccessful searches. …" (Doukakis et al., 2014, p. 53).

3) Compare Operating Systems:

> "If there are students of different backgrounds in your classroom, consider the incompatibilities of students. between different languages" (Doukakis et al., 2014, p. 81).

> "See which OS has the school's computer lab and identify similarities and differences" (Doukakis et al., 2014, p. 81).

4) Compare Mobile Networks:

> "Search the web for information on the structure of the mobile network. If students from different backgrounds are in your classroom, compare the relevant networks with each other in terms of their structure (teamwork)" (Doukakis et al., 2014, p. 91).

3.3 Evaluation Skill

Evaluation skill is represented by accessing claims sub-skill. With regard to assessing claims sub-skill, references were found in which students are asked to mark the correct answers between given answers that refer to formulated questions:

> "Write down the right answers
>
> A. Which of the following is a numerical constant?
>
> i. 2009 ii. '2009' iii. Show iv. 'Algorithm'
>
> B. The rational act or between two sentences
>
> is true when: i. Any of the suggestions are true

ii. The first sentence is true iii. The first sentence is false

iv. Both propositions are true

C. If A and B are integers, which of the following expressions are numeric?

i. A + B2 2 ii. A> B + 3 iii. A div 3 ^ B iv. A and B > 3" (Doukakis et. al., 2014, p. 51).

3.4 Inference Skill

Inference skill is represented by drawing conclusions sub-skill. With regard to drawing conclusions sub-skill, there are references containing teaching objectives which suggest that students should be able to:

1) find and correct logical errors of algorithms:

"[...] to detect and correct the logical errors of an algorithm" (Doukakis et al., 2014, p. 19).

2) to develop simple algorithms. The following is a characteristic reference:

"... to develop simple algorithms" (Doukakis et al., 2014, p. 19).

3) Create a program by combining data, data structures and algorithmic structures:

" … Combine algorithmic structures and data/data structures to create code/program" (Doukakis et al., 2014, p. 55).

In addition, students are encouraged to:

1) Find and Correct Logical Errors of Algorithms:

"The following algorithm segment was developed to calculate the sum of 5 numbers. However, it contains logical errors. Identify the logical errors and correct them…" (Doukakis et al., 2014, p. 54).

"The following part of the algorithm was developed to check if a number is positive. However it contains a logical error. Locate it. …" (Doukakis et al., 2014, p. 54).

2) Solve Problems Using Computer:

"For the problem of classifying a table, no faster algorithm has been found to date than the fast classification algorithm, while no faster algorithm has been found for the problem of calculating highest common divisor. This leads to the question: Is there no better algorithm, do these problems have an inherent complexity?" (Doukakis et al., 2014, p. 25).

"How would you instruct a motor vehicle to cross an obstacle course?" (Doukakis et al., 2014, p. 93).

3) Convert Verbal Expressions into Algorithmic Commands:

"Convert the following sentences into assignment commands:

A. Variable a has twice the value of Variable b

B. The MO variable is the average of a, b, c

C. The variable β increases by 2

D. The variable i is reduced by a and b

E. The variable i is half of the sum of a and b" (Doukakis et al., 2014, p. 51).

4) Run Algorithms and Find the Output Of Algorithms:

"Through role-playing to implement and execute the example algorithm 2.5 serially and in parallel" (Doukakis et al.,

2014, p. 51).

"Run the following algorithm part …" (Doukakis et al., 2014, p. 54).

"What do the next sections of algorithms show? …" (Doukakis et al., 2014, p. 51).

5) Modify Algorithms:

"Modify the algorithm of Example 2.26 to find the product of the table elements" (Doukakis et al., 2014, p. 53).

"Modify the algorithm of Example 2.28 to find the average of each lesson (Calculation of column totals is required)" (Doukakis et al., 2014, p. 53).

"In the algorithm of Example 2.29 it is well known from the expression that the same school cannot exist on the table a second time. If in a table it is not known whether or not there are duplicates of the same items, how should the search problem be resolved? Provide a relevant algorithm" (Doukakis et al., 2014, p. 53).

6) Develop Algorithms:

"Newton's law of gravity says that every body in the universe attracts every other body with a force given by the formula F = G (m1m2)/r2, where m1 and m2 are the masses of the two bodies (in kilograms), r the distance between them (in meters) and G is the global gravitational constant. Develop an algorithm that reads the two masses, the distance between them, and calculates and prints the force. It is given that G = 6.67 × 10-11 N m2 kg-2" (Doukakis et al., 2014, p. 51).

"During the discount period you bought a bike with a 25% discount. The amount you paid for the bike was 100 euros. Develop an algorithm that will calculate the starting value of the bike" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that reads a number and calculates and displays the product of that number on its last digit. Think of the number as positive and integer" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that reads a real number to 2 decimal places and rounded it to the nearest integer. For example, if the number reads 4,23, it shows 4, and if it is 4,70 it shows 5" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that reads an integer and calculates and displays the next parcel" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that will read this year and if this is from 2001 until 2099 it will display the '21st Century' message. If the year is from 2002 onwards, it will display the message 'Using the €'" (Doukakis et al., 2014, p. 52).

"A scientific association has 1,200 members. The general meeting of the association is quorum when 1/3 of its members are present. To vote in favor of a proposal, you need more than 1/2 of those present members to vote in favor. Develop an algorithm that will read the number of members present and if the number allows voting, it will read the number of those who voted for it proposal and it will show the result of the vote, that is, if it was voted for, voted against or it could not be voted on" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that will read the minutes of minutes, the number of SMS, the number of MBs and accordingly show the monthly billing of the consumer" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that will print the values of the function f (x) = 4log (5 + e3x + 2) when x takes the values in space [10, 50] with a step of 0.5" (Doukakis et. al., 2014, p. 52).

"Develop an algorithm that will read letters until it finds three letters A. When the letters stop reading, the algorithm will print how many letters have been read" (Doukakis et al., 2014, p. 52).

"Develop an algorithm that will read numbers until the number is read zero. The algorithm will print the sum and the number of numbers given and were greater than 5" (Doukakis et al., 2014, p. 53).

"A digital photo album has Nbytes of storage. Develop an algorithm that will read the size of each photo attempting to be saved to the album until the album can fit another photo. The algorithm will repeat and stop if the size of the photo

that one is trying to save is larger than the available album space. When the import of photos is stopped, the algorithm will print the message 'Does not fit'. If there is space left to print it. Finally, it prints the multitude of photos that were saved" (Doukakis et al., 2014, p. 53).

"Develop an algorithm that:

A. He will read the crowd of students in a high school.

B. It will read the average score of each student who is listed. The average grade of each student should be checked to be greater than or equal to (one) 1 and less than or equal to twenty (20).

C. It will show where it is and where it is the smallest average. Think of it as unique.

D. It will show the average of all students.

E. It will display with appropriate messages the percentage of students with an average greater than 18" (Doukakis et. al., 2014, p. 53).

"Consolidate the algorithms of Examples 2.23, 2.24 and 2.25 into a single algorithm in which to propose a function selection menu. (see par. 2.17)" (Doukakis et al., 2014, p. 53).

"In the virtual learning business, develop an algorithm that:

A. Read and store a business's receipts for each month of a school year.

B. will sort the table of receipts in descending order and display the sorted table.

C. will show the smallest and largest revenue collection of the business" (Doukakis et al., 2014, p. 53).

"If Table A of Example 2.29 was sorted, could this additional knowledge lead to some improvement in the serial search algorithm? If so, work out the modified algorithm" (Doukakis et al., 2014, p. 54).

"Develop an algorithm that reads an integer positive number, and calls an algorithm that calculates the number of digits in the number. The so-called algorithm will return the number of digits of the number. A good algorithm will print the crowds" (Doukakis et al., 2014, p. 54).

"To develop an algorithm that:

A. It will read and enter a table of 1000 item names.

B. It will read a requested name.

C. It will invoke an algorithm, which will search the table for the name read in the previous query and return the number of people with that name.

A good algorithm will print the crowds" (Doukakis et al., 2014, p. 54).

"Discuss in class how the computational problem described in Example 2.1 could be programmed. in chapter 2.1" (Doukakis et al., 2014, p. 74).

7) Develop a program:

"Develop a program in the programming language Interpreter Interpreter (ViALGOL) that A. accepts the names of 20 companies and their revenue for the previous year. B. print the average revenue. C. print the company name with the highest revenue. D. to read the name of a company and to show its revenue. If the company does not have the appropriate message" (Doukakis et al., 2014, p. 74).

"Develop appropriate subprograms for Queries B and C of activity 17 and write the corresponding program code. The subprograms should return the average and the name of the company respectively" (Doukakis et al., 2014, p. 74).

8) Develop an Information System:

> "Organize data and information about your classroom or your school (how many students, how many students, how many classes) and form a small true classroom. that concerns school life" (Doukakis et al., 2014, p. 86).

3.5 Explanation Skill

Explanation skill is represented by presenting arguments sub-skill. Regarding the presenting arguments sub-skill, references were found in which students are encouraged to present the reasons why films related to artificial intelligence are impressive:

> "Comment and propose science fiction films with main reference to TN. Explain why they impressed you" (Doukakis et al., 2014, p. 96).

4. Discussion and Conclusions

From of the present research it was emerged that there critical thinking skills whose cultivation is promoted in the examined textbook. These are the interpretation skill, the analysis skill, the evaluation skill, the inference skill and the explanation skill. No parts of the text were found promoting the cultivation of the self-regulation skill.

The way of promoting the cultivation of a critical thinking skill depends on the corresponding skill. The references which promote the cultivation of critical thinking skills, are related to teaching objectives or to activities. References promoting the cultivation of the interpretation skill, the evaluation skill and the explanation skill are connected with activities. References promoting the cultivation of the analysis skill and the inference skill, are linked to teaching objectives and to activities.

References promoting the cultivation of a critical thinking skill, are related to certain topics depending on the skill. References promoting the cultivation of the interpretation skill are related to Computer Science, algorithms and artificial intelligence. References promoting the cultivation of the analysis skill are related to Computer Science, algorithms, operating systems and networks. References promoting the cultivation of the evaluation skill are related to algorithms. References promoting the cultivation of the inference skill are related to algorithms, programming, information systems and artificial intelligence. References promoting the cultivation of the explanation skill are related to artificial intelligence.

The critical thinking skills of analysis, evaluation, inference and explanation are represented by only one of their sub-skills. The interpretation skill is the only one which is represented by all of its sub-skills. Although promotion of cultivating critical thinking skills within the examined textbook occurs, this promotion is not sufficient, since critical thinking skills, except interpretation, are not represented by all of their sub-skills and furthermore the self-regulation skill is not represented at all.

Findings of the present study are consistent with the results of other relevant researches. In most popular business management books, students' critical thinking development is either insufficiently supported or not supported (Errington & Bubna, 2015). Critical thinking is poorly promoted in the activities of social studies textbooks (Aybek & Aslan, 2016). Insufficient promotion of cultivating critical thinking skills in the examined text could be attribute to various reasons related to educators attributes, to school teaching, and to properties of critical thinking. Reasons related to educators are the lack of training in the methodology of teaching critical thinking, the lack of information about educational material that promotes critical thinking, the personal beliefs and prejudices of educators about the content of the curriculum and the way they teach it (Snyder & Snyder, 2008). There is the

lack of knowledge about what is critical thinking and how it is being promoted (Aliakbari & Sadeghdaghighi, 2013). Adults are not able to think critically in many cases (Halpern, 1998). Essential reasoning skills of many adults are insufficient (Kennedy et al., 1991; Gelder, 2005). Typical school teaching does not encourage high-level thinking skills such as critical thinking (Paul, 1992). It is difficult to cultivate Critical thinking (Brookfield, 2013; Willingham, 2007). There and barriers to critical thinking such as egocentrism, sociocentrism, unwarranted assumptions, stereotypes, relativistic thinking and wishful thinking (Bassham et al., 2011).

Due to the nature of the present research, the findings cannot be generalized to refer to other books. It is suggested that research be conducted where the content of the school textbooks and a range of cognitive subjects are studied, with regard to the cultivation of critical thinking skills in them. These types of research may not only shed light on the quality of the existing textbooks and how they can potentially be used as far as the critical thinking and the promotion of its cultivation is concerned, but also provide useful insights that may help the authors in compiling textbooks where the cultivation of critical thinking skills is adequately promoted.

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