

K. Venkat Reddy  
G. Suvarna Lakshmi *Editors*

# Critical Thinking for Professional and Language Education

A Machine-Generated Literature  
Overview

 Springer

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*Editors*

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# Critical Thinking for Professional Education

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# Contents

<b>1</b>	<b>Introduction to Critical Thinking Skills</b> . . . . .	<b>1</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	
<b>2</b>	<b>Teach Critical Thinking</b> . . . . .	<b>21</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	
<b>3</b>	<b>Teaching Language Through Critical Thinking Strategies</b> . . . . .	<b>55</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	
<b>4</b>	<b>Tasks for Critical Thinking and Language Learning</b> . . . . .	<b>93</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	
<b>5</b>	<b>Practicing Critical Thinking: Issues and Challenges</b> . . . . .	<b>121</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	
<b>6</b>	<b>ICT and Critical Thinking</b> . . . . .	<b>141</b>
	K. Venkat Reddy and G. Suvarna Lakshmi	

# Chapter 1

## Introduction to Critical Thinking Skills



**K. Venkat Reddy and G. Suvarna Lakshmi**

### Introduction by the Editors

This chapter contains summaries of six articles that are machine generated. The first summary discusses the multitude ways in which the field of critical thinking has been understood and defined. Mostly the summaries included in the chapter project the view that critical thinking is all about certain cognitive abilities belonging to the higher order of thinking. The first summary explains the definition of critical thinking using a meta-level approach; it uses this approach because the problem of defining critical thinking is a meta-problem. The authors argue that the definitions proposed earlier were either subject-specific or skill-specific resulting in definitions that are neither universally applicable nor acceptable. The authors therefore have attempted to propose an approach that has three proper criteria that the definition should satisfy. They are: (1) rely on criteria, (2) self-correcting, and (3) sensitive to context. The summary of the second article on the skills required for the twenty-first-century education is based on the lists of skills proposed by various bodies that are broadly categorized as productive, critical, and creative thinking along with digital skills. The author proposes that the curriculum should incorporate skills that are required as per the current pace of change and the need of the hour.

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Language Education*, [https://doi.org/10.1007/978-3-031-37951-2\\_1](https://doi.org/10.1007/978-3-031-37951-2_1)

The third summary in this chapter proposes that critical thinking should be best viewed as a critical inquiry. The authors proposed six different contexts through which critical inquiry is developed in learners. They argue that the evaluation of arguments independent of the authors is incomplete as the authorship is important to understand the background of the construction of the arguments. The next article explains how concept mapping can help analyze the influence of teaching methods on students' cognitive abilities and fundamental concepts of communication technologies. This method helped to gauge the students' levels of understanding of a concept and is positively correlated with their critical thinking abilities. The summary of the fifth article presents two major competencies required in the twenty-first century: learning to live together and critical and creative thinking. In the curriculum, these skills must be aligned with the learning objectives and assessment criteria. The classroom practices should help develop the required skills in learners by modelling and nurturing the target skills that ensure lifelong learning. The last summary presents an experimental curriculum that incorporated Critical Thinking Across the Curriculum (CTAC) that includes general and subject-specific critical thinking. The two major methods used were lecture-discussion teaching (LDT) and problem-based learning. It was concluded that problem-based critical thinking helped in better subject matter retention when compared to the LDT method.

## Machine Generated Summaries

Disclaimer: The summaries in this chapter were generated from Springer Nature publications using extractive AI auto-summarization: An extraction-based summarizer aims to identify the most important sentences of a text using an algorithm and uses those original sentences to create the auto-summary (unlike generative AI). As the constituted sentences are machine selected, they may not fully reflect the body of the work, so we strongly advise that the original content is read and cited. The auto generated summaries were curated by the editor to meet Springer Nature publication standards. To cite this content, please refer to the original papers.

Machine generated keywords: century, curriculum, goal education, see, technology, issue, judgment, definition, premise, goal, vision, technological, argument, definition critical, define critical.

### *A Meta-Level Approach to the Problem of Defining 'Critical Thinking' [42]*

This is a machine-generated summary of:

Johnson, Ralph H.; Hamby, Benjamin: A Meta-Level Approach to the Problem of Defining 'Critical Thinking' [42].



Published in: Argumentation (2015).

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### **Abstract-Summary**

“With a few exceptions, there has not been much discussion among proposers about the strength and weaknesses of the attempted definitions.”

“The approach we will argue for here is a ‘meta-level approach’: proposers of new definitions of ‘critical thinking’ should begin by arguing that none of the current crop of definitions is viable.”

“Our position is that new definitions should follow this meta-level approach, in addition to avoiding some common pitfalls.”

### **Introduction**

“Our focus here, then, will be with philosophical accounts that have often yielded theories, built around a conception, typically housed in a definition of ‘critical thinking.’”

“Our approach will be different from others in one crucial respect, for we believe that the problem of defining ‘critical thinking’ is a meta-problem, but that it has not been duly recognized as such.”

“To explain: If one proposes a definition of ‘critical thinking’ (often as the cornerstone of a theory of critical thinking), then that very act implies that one is unhappy with extant definitions.”

“To paving the way by indicating problems with extant definitions, we believe that anyone who proposes a definition of ‘critical thinking’ should, first, make clear what kind of definition is being offered; and second, having presented the definition, show that it satisfies the criteria for a good definition of that sort.”

“We are not going to propose a new definition of ‘critical thinking’ ourselves.”

### **The Problematicity of ‘Critical Thinking’**

“One might take the view that these various definitions reflect different theories of critical thinking, which are compatible in the broad sense, and which all offer some insight into the process, while no one theory captures all there is to say.”

“On deeper reflection, however, it became clear to us that there are incompatibilities: definitions imbedded in theories that hold that critical thinking is subject-matter dependent (McPeck 1) are incompatible with those that hold that critical thinking is not dependent on subject matter (Ennis 2, 3; Paul 4).”

“Definitions of ‘critical thinking’ have implications that become apparent when fleshed out in the form of a theory, and different definitions yield different

pedagogical strategies, resulting in different outcomes, requiring different testing procedures.”

“Reflections like these might cause one wonder whether there can be any such thing as ‘the one true definition’ that the more philosophically-inclined critical thinking theorists have seemed to have been pursuing.”

### **The Logic of Definition, and a Meta-Level Approach to Defining Critical Thinking**

“There has not been, so far as we know, any argument that ‘critical thinking’ is not definable, though the discrepancies and differences in the many definitions that have been offered might well suggest that very conclusion to an outsider.”

“The proposed definition must offer some justification that it is needed, which would entail giving reasons to think that extant definitions are defective on the question of meeting the proper criteria for the definition of that type.”

“We cannot here endeavour to resurrect the logic of definition, and since we are not proposing a definition of ‘critical thinking’ in this paper, but rather suggesting some of the conditions such a definition should satisfy, it does not matter for our purposes that we review all the possible types of definition.”

“We argue below that many of the definitions offered by theorists of critical thinking fail to satisfy this requirement, but we will not here pursue further the task of defining ‘critical thinking’ under these strictures.”

### **Dangers to Be Avoided in Defining ‘Critical Thinking’**

“Critical thinking has to be something more than just plain good thinking.”

“The ability to think in ways productive of good judgment (critical<sup>3</sup>) is crucial (critical<sup>2</sup>) for success in the modern world; thus might the two of the senses come together.”

“It is not at all clear that problem-solving is the same as critical<sup>3</sup> thinking.”

“We believe that problem solving is a different intellectual skill than critical thinking, and that definitions that conflate the two are therefore unhelpful.”

“The application of the Austin Principle to the present case is clear: The terms ‘critical thinking’ and ‘problem solving’ are not used to mean the same thing.”

“We mention Lipman’s definition of ‘critical thinking’ as “skillful responsible thinking that facilitates good thinking because it (1) relies on criteria, (2) is self-correcting and (3) is sensitive to context,” which points to this dimension (Lipman 5, p. 39).”

### **Conclusion**

“We have attempted to shed new light on the problem of defining ‘critical thinking.’”

“The ambiguity concerns the term ‘critical’ which is ambiguous as being thinking that is crucial for survival: thus problem solving and decision making are critical in this sense.”

“We have suggested that accounts of ‘critical thinking’ have taken as their setting the formation of belief but need to focus on the way such belief is maintained in light of criticisms: the willingness and capacity to take on and deal with criticisms one’s beliefs, propositions, and arguments.”

“We hope that these suggestions will be helpful in the ongoing challenges involved in the ongoing task of defining ‘critical thinking.’”

### ***Critical Thinking for Twenty-First-Century Education: A Cyber-Tooth Curriculum? [43]***

This is a machine-generated summary of:

Higgins, Steve: Critical thinking for twenty-first-century education: A cyber-tooth curriculum? [43].

Published in: PROSPECTS (2014).

Link to original: <https://doi.org/10.1007/s11125-014-9323-0>

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#### **Abstract-Summary**

“It is often assumed that the advent of digital technologies requires fundamental change to the curriculum and to the teaching and learning approaches used in schools around the world to educate this generation of “digital natives” or the “net generation”.”

“This article analyses the concepts of twenty-first-century skills and critical thinking, to understand how these aspects of learning might contribute to a twenty-first-century education.”

“The author argues that, although both critical thinking and twenty-first-century skills are indeed necessary in a curriculum for a twenty-first-century education, they are not sufficient, even in combination.”

#### **What is a twenty-first-Century Education?**

“The Metiri Group and the North Central Regional Education Laboratory (NCREL) have also developed the twenty-first Century Skills Framework (Burkhardt and others 6), again with four key groupings of skills: Digital Age Literacies, Inventive Thinking, Effective Communication and High Productivity.”

“These capabilities are similar to the six skills identified as vital for inclusion as part of the US National Educational Technology Standards for Students prepared by ISTE (7): Creativity and Innovation; Communication and Collaboration; Research and Information Fluency; Critical Thinking, Problem Solving, and Decision Making; Digital Citizenship; and Technology Operations and Concepts.”

“This reinforces the importance of more complex or productive thinking including both critical and creative thinking, as well as the importance of digital and

technological skills, communication skills, and the acquisition and application of knowledge to problems and real-life contexts, similar to the European “competences” framework.”

### **What is Critical Thinking?**

“It is perhaps no surprise that in the final decades of the last century critical thinking and developing thinking skills became more prominent in education as people recognised the changes that technology was enabling and requiring in terms of information and knowledge (Pithers and Soden 8).”

“Practitioners and policy-makers often use it, those actually involved in research and development rarely do because “skills” can have negative connotations and it is hard to teach thinking skills without also developing critical and reflective attitudes and dispositions and including specific subject content knowledge as part of students’ development.”

“Critical thinking emphasises the learner’s process of reflecting and analysis in the process of learning or coming to know (Higgins and Baumfield 9), and implies a difference in the quality of knowledge the learner achieves through purposeful activity.”

“It is learning and, through practical reflective and critical thinking, working out what information to apply and how to apply it purposefully becomes the distinguishing educational feature of knowledge that the individual sees as “productive”.”

### **From Gutenberg to Google: Plus ça Change?**

“Our school system will be completely changed inside of ten years.” (9 July, 1913, p. 24) What we need to decide, in the first quarter of the twenty-first century, is how much the current pace and scale of change should be reflected in the detail of the curriculum and the pedagogy for our time.”

“Do we need a curriculum with less specified knowledge, allowing a greater emphasis on skills, based on the argument that information (and therefore knowledge) is more readily accessible?”

“Digital skills are certainly important in allowing children and young people access to information and the ability to participate in the digital world and this may help to engage the learner in a contemporary curriculum (Colwill and Gallagher 10).”

“Critical thinking and digital skills are both clearly necessary for a twenty-first century education, but it is also clear that even together they are not sufficient.”

### **[Section 4]**

“In 1939 Howard Benjamin published a short book on the challenge of curriculum change entitled *The Saber-Tooth Curriculum*, supposedly written by Professor J. Abner Peddiwell.”

“Climate change at the end of the Pleistocene epoch led to the extinction of the saber-tooth tigers and the arrival of bears; rivers silted up, making the water too muddy to see the fish; and the horses migrated, to be replaced by swifter antelope.”

“It is something that endures through changing conditions like a solid rock, standing firmly in the middle of a raging torrent.”

“You must know that there are some eternal verities, and the saber-tooth curriculum is one of them!” (Benjamin 11, p. 20) Although written 75 years ago, this satire is particularly relevant today, as we face the challenges of a rapidly developing world and as we address the changes entailed by globalisation and by the proliferation and permeation of digital technologies in our diverse cultures.”

### ***Critical Inquiry: Considering the Context [44]***

This is a machine-generated summary of:

Battersby, Mark; Bailin, Sharon: Critical Inquiry: Considering the Context [44].

Published in: Argumentation (2011).

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#### **Abstract-Summary**

“We argue that critical thinking is best viewed in terms of ‘critical inquiry’ in which argumentation is seen as a way of arriving at reasoned judgments on complex issues.”

“Using the model which we have developed for teaching critical thinking as critical inquiry, we demonstrate the role played by the following aspects of context: (1) knowledge of the dialectical context (the debate around an issue, both current and historical); (2) an understanding of the current state of practice and belief surrounding an issue; (3) an understanding of the intellectual, political, historical and social contexts in which an issue is embedded; (4) knowledge of the relevant disciplinary context; (5) information about the sources of an argument; (6) awareness of one’s own beliefs and biases.”

#### **Introduction**

“The significance of considering the context surrounding an issue is underestimated and often overlooked in approaches to critical thinking theory and instruction based on informal logic.”

“We challenge this view, demonstrating how and under what circumstances considering context is relevant and even vital to critical thinking.”

“We begin by arguing that the downplaying of the relevance of context stems from the view of critical thinking as essentially the evaluation of individual arguments.”

“We have argued, on the contrary, that critical thinking is better viewed in terms of what we refer to as critical inquiry in which argumentation is seen as a way of arriving at judgments on complex issues.”

### **The Role of Various Contexts**

“Contrary to the view that arguments should be evaluated independently of their authorship to avoid the fallacy of ad hominem, we argue that information about who is making an argument is frequently relevant to evaluation (although not determinative) because the credibility of an argument often involves trust that the author of the argument is appropriately knowledgeable and fair minded.”

“What makes ad hominem arguments fallacious is not that they use irrelevant information about the author, but that they are usually too persuasive.”

“If we have reasons to believe that the source of the argument is either not trustworthy (e.g., is not someone who would tell us about key counter arguments or evidence) or is not reliably competent (e.g., is not likely to have done due diligence on the relevant objections to the view), then these characteristics provide a good basis for not accepting the argument or conclusion.”

### **Summary**

“A reasonable assessment of an argument with the goal of reaching a reasoned judgment must take into account not only the content of the argument itself, but also a much wider context.”

“Dialectical context Evaluating arguments requires a knowledge of the history of the debate surrounding the issue, especially counter arguments to the current position or argument being evaluated.”

“Understanding an argument, understanding the significance of a claim, and appropriately conducting an inquiry into an issue, all require knowledge of the historical and social contexts.”

“Evaluating the trustworthiness of the source of the argument is almost always relevant.”

“Self The argument assessor or a person conducting an inquiry must be aware that they too are part of the context of evaluation.”

## ***An Exploratory Study on the Application of Conceptual Knowledge and Critical Thinking to Technological Issues [45]***

This is a machine-generated summary of:

Yu, Kuang-Chao; Lin, Kuen-Yi; Fan, Szu-Chun: An exploratory study on the application of conceptual knowledge and critical thinking to technological issues [45]. Published in: International Journal of Technology and Design Education (2014). Link to original: <https://doi.org/10.1007/s10798-014-9289-5>

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### **Abstract-Summary**

“This study explored how senior high school students apply their conceptual knowledge, consisting of theoretical and system knowledge, to think critically when confronted with technological issues.”

“We employed a curriculum on the history of communication technology to teach students about basic concepts in communication technology and to cultivate their ability to use critical thinking to confront issues in this domain.”

“Concept mapping was adopted to assess students’ ability to apply conceptual knowledge to their actual cognitive activities, and a critical thinking test was developed to evaluate students’ performance in this regard.”

“Although students’ critical thinking about technological issues was positively correlated with their application of conceptual knowledge, their incomplete system knowledge could affect their ability to identify core problems of technological issues, and incorrect theoretical knowledge could influence their abilities to interpret information, thereby affecting their judgments.”

### **Introduction**

“Appropriate conceptual knowledge and experience related to technological issues is essential for critical thinking (McPeck 13; Norris 14), and greater understanding of the issues can facilitate more effective and objective critical thinking (Cottrell 15).”

“The quality of students’ knowledge on scientific and technological concepts is a key factor affecting critical thinking performance.”

“This study adopted a section within an existing technology curriculum that focuses on the history of communication technology to help high school students develop conceptual knowledge related to communication technology.”

“This conceptual knowledge was applied to critical thinking related to the technological issues discussed in the class and aimed to help students understand how to make appropriate judgments.”

“Drawing on the history of communication technology, this study was designed to aid students in establishing their conceptual knowledge about communication technology and to enhance their critical thinking abilities.”

“This study also examined the conditions under which students organize knowledge and engage in critical thinking when confronting technological issues.”

### **Method**

“Drawing on the history of communication technology, this study involved teaching senior high school students fundamental concepts related to communication technology to develop their ability to think critically to examine the relationship between conceptual knowledge and critical thinking.”

“We used the following research tools in this study: (1) teaching materials and practice worksheets focused on the history of communication technology, which helped students to understand concepts related to technology, draw concept maps, and practice critical thinking regarding technological issues; (2) a concept map test, which assessed students’ conceptual knowledge about the operating principles of cell phones; and (3) a critical thinking test, which measured students’ critical thinking regarding communication-technology issues.”

“In the social interactivity sections, controversies regarding issues related to each communication technology were presented so that students could reflect on the influences of technology on society and develop their ability to think critically and make value judgments.”

### **Findings and Results**

“According to Navak and Gowin’s (16) discussion of concept maps, the crosslink performance reflects the degree to which students are competent in establishing accurate conceptual networks, and the example performance indicates students’ comprehension and internalization of knowledge about communication technology.”

“The conceptual networks offered by most students regarding system knowledge were incomplete, and their crosslink performance, which involved the six key communication concepts, was less than ideal.”

“Students were also unable to connect individual examples with concepts, indicating their inability to apply their daily experiences with technology products to their system knowledge.”

“Students in this group did not possess a complete understanding of the overall communication-related system; they committed errors and performed poorly with respect to coding and decoding concepts.”

“The most significant disadvantage of the categorical group was its inability to present the level at which students understand concepts about technological systems.”

### **Discussion**

“These materials were used to help students understand conceptual knowledge of communication technology.”

“According to the analysis results, the conceptual knowledge performance of the students was positively correlated with their critical thinking.”

“From the qualitative analysis of students’ critical thinking arguments, we found that few students effectively applied their knowledge about communication-technology systems and relevant concepts to the crucial elements of the problem.”

“The analysis results of different concept groups showed that students in the categorical and hierarchical groups relied on fragmented conceptual knowledge to think critically about technological issues and that they were constrained by the textual descriptions of the problem, finding it difficult to identify elements of the core problem.”

“Students in the procedural group relied on their system knowledge when engaging in critical thinking and were able to identify the core elements of the problem by appropriately utilizing what they knew about communication-technology systems.”



### **Limitations of the Study**

“The first limitation concerns the research design.”

“This study was exploratory and lacked a control group, which limits the generalizability of our results.”

“The second limitation is the design of the teaching materials.”

“The third limitation involves the research tools and data-analysis method.”

### **Conclusions and Implications**

“This study emphasized the development of a curriculum of communication technology history designed to help high school students acquire conceptual knowledge in communication technology and cultivate their critical thinking.”

“We explored how students construct their conceptual knowledge and how they think critically when confronted with technological issues.”

“This showed that the students gained a basic understanding of the system and theoretical knowledge of communication technology that was taught in the curriculum.”

“Students’ critical thinking about technological issues was positively correlated with their application of conceptual knowledge.”

“We noticed that students had difficulties confirming the credibility of information related to a technological issue and raising relevant questions when they lacked appropriate theoretical knowledge.”

“To better improve critical thinking instruction, we recommend that teachers focus on helping students identify the core elements of problems through their system knowledge and assist them in formulating correct interpretations by using appropriate theoretical knowledge.”

### ***Principles for Learning and Competences in the Twenty-First-Century Curriculum [46]***

This is a machine-generated summary of:

Acedo, Clementina; Hughes, Conrad: Principles for learning and competences in the twenty-first-century curriculum [46].

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