Journal of Research and Reflections in Education
December 2020, Vol.14, No 2, pp 249-258
http://www.ue.edu.pk/jrre

Critical Thinking: A Qualitative Content Analysis of Education Policy and Secondary School Science Curriculum Documents

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Critical thinking is one of the twenty-first-century skills and an essential aspect of formal education. The current study aimed to analyze the education policy documents to get an understanding of policy recommendations for developing critical thinking in secondary school students. The education policy document—National Education Policy and National Curriculum documents for Physics, Chemistry, and Biology, Grades IX-X were analyzed. These documents were analyzed through qualitative content analysis with the facilitation of NVivo 11. Findings suggested that the focus of these documents was to develop critical thinking through student-centered techniques and assessment system. The National Education Policy document aimed to produce critical thinkers, and for this purpose, much significance was given to curriculum and assessment processes. The National Curriculum for Physics, Chemistry, and Biology emphasized activity-based, conceptual, and critical thinking pedagogy. Students' engagement, problem-solving, questioning, discussions, debates, group work, cooperative learning strategies were recommended to produce critical thinkers for the twenty-first century. The documents also accentuated that the assessment system should also be focused on developing critical thinking by assessing higher-order abilities among secondary school students. The findings of the current study have strong implications for science teachers in their teaching at the secondary level.
Keywords: *critical thinking, science education, pedagogy, policy documents, secondary level*

Introduction

In this globalization age, the primary purpose of education has shifted towards developing critical thinking in students for effective dealing in every sphere of life (Higgins, 2015). Furthermore, it is also asserted that education should be aimed to produce critical thinkers for the betterment and competency of the students (Scherer, 2001). It is often underscored that the twenty-first century is the age of 'knowledge explosion,' and effective dealing with it requires critical discerning of the information (Zhang & Kim, 2018).
Several authors have variously defined critical thinking in academic literature. For example, It is defined as analysis, inference, evaluation and decision-making skills (Mendelman, 2007). It is also considered as a cognitive activity with judgment, attention and selection (Cottrell, 2011). Paul and Elder (2006) has named it a vehicle for the education of the human mind. In the view of Facione (2007), it is interpretation, inference, explanation, evaluation and self-regulation. In the literature, the most used definition is defined as the art to analyze and evaluate thinking (Paul & Elder, 2006) and reasonable, reflective thinking focusing on deciding what to believe or do (Ennis, 1993).
Dewey (1916) considered it a central point of education. In the view of Facione (1990), a committee of experts defined it as purposeful, judgmental and self-regulatory thinking. It is a process of metacognitive with inference, synthesis, and analysis. It is based on domain-specific and general knowledge for logical conclusions and solutions to different life problems (Garner, Pugh, & Kaplan, 2016). Critical thinking may be described as logical reasoning and decide the facts after taking opinions and

examining them before acceptance (Fahim & Pezeshki, 2012). Critical thinking skills in this study refers to the demonstration of skills related to higher-order reasoning. The hierarchical classification of learning behaviors, as proposed by Bloom (1956) was used to interpret these skills. As a result, the last three stages of Bloom's taxonomy: analysis, synthesis and evaluation, considered as higher-order or critical thinking skills, were used.

Critical thinking is considered a twenty-first-century skill (Bialik & Fadel, 2015; Wagner, 2014). Therefore, it should be incorporated in the teaching-learning process since it is useful in the general and academic life of an individual (Dwyer, Hogan, & Stewart, 2011). Critical thinking may serve for the guidance of learners to find the solution to their social problems. Therefore, it is necessary to acquire the required information for their solutions. According to Paul and Elder (2006), it is not limited to any specific subject, but it serves for rationale and logical thoughts. Within an informative society, learners should get knowledge, ability to compare and evaluate the knowledge critically with their own understanding.

In science education, critical thinking is considered an essential skill. In the view of Yacoubian (2015), critical thinking is the foundation pillar in science education for fostering scientific knowledge and future citizens. Critical questioning with question formulation ability is the most crucial aspect of science education (Demir, 2015; Osborne, 2014). Critical thinking in science education is linked with problem-solving (Demir, 2015), the practice of debate, discussion and argumentation evaluation and rigorous testing (Osborne, 2014). However, rote memorization is a significant hindrance in the production of knowledgeable, well-rounded and critically thinking students.

In the international literature, different techniques have been suggested for developing CT skills like questioning, problem-solving, inquiry-based teaching (Hooks, 2010; Orlich, Harder, Callahan, Trevisan, & Brown, 2012), cooperative/collaborative learning, conversation, group discussion and debate (Fung, 2014; Stanley, 2017).

A brief preliminary examination of the educational policy documents, that is, National Education Policy (NEP, 2009), and National Curriculum for three science subjects, that is, Physics, Chemistry, and Biology for Grades IX-X (2006) reveals that the documents focus on the development of critical thinking among learners of the twenty-first century. Also, these documents aim at developing critical thinking among students for problem-solving, decision making, and make to citizens useful with facing challenges of the world. The recommended pedagogical practices are questioning, inquiry-based learning, cooperative learning, problem-solving, discussion, conversation, and learning by doing. However, there is a need to examine these documents for an in-depth analysis of critical thinking skills related recommendations. This is particularly important because of the dearth of research studies in this area.

Therefore, the current study was designed to analyze the curriculum policy documents to understand the policy recommendations for developing CT skills at the secondary level in the Pakistani context.

Methods

The current study was bases on qualitative content analysis (Kyngäs, 2020). The purposive sampling technique was used for the sampling of education policy documents since the main aim of the study was to analyze the official education policy documents produced by the government of Pakistan for the development of CT skills (Patton, 2015). This sampling technique was used to get an in-depth understanding of the education policy documents (Zikmund, Babin, Carr, & Griffin, 2013). Following four education policy documents were analyzed:

National Education Policy (2009)

National Curriculum for Physics, Grades IX-X (2006)

National Curriculum for Chemistry, Grades IX-X (2006)

National Curriculum for Biology, Grades IX-X (2006)

We chose to analyze the above-mentioned policy documents because they direct the teaching-learning processes in most of the secondary schools in Pakistan, even in 2020. In addition, National Curriculum for three science subjects, that is, Physics, Chemistry, and Biology for Grades IX-X (2006) was the 'main guide' for the development of textbooks for these subjects, which are currently used in most secondary schools.

Data Analysis

The data was analyzed through qualitative content analysis with the help of NVivo 11 software. The education policy documents consisted of many pages, and this software can easily handle a large amount of text data (Bazeley & Jackson, 2013; Jackson & Bazeley, 2019). Furthermore, this software was considered most suitable since it provides different tools to address the research aim from different sources of data (Bazeley & Jackson, 2013).

For qualitative content analysis, four steps were used in Nvivo, that is, importing data, coding data, creation of framework matrices, and reporting of the findings (Bazeley & Jackson, 2013).

All the policy documents were imported one by one as sources in pdf format in NVivo 11. Then the relevant text was coded as nodes. The relevant passages were coded in relevant nodes and child nodes (Miles, Huberman, & Saldaña, 2020). Moreover, the coding units were condensed after summarizing to get in-depth meanings of the text (Bazeley & Jackson, 2013). Four themes—the aim of education/curriculum and SLOs, the importance of CT, pedagogical practices for developing CT skills and assessment and CT—were generated, keeping in view the main aim of the study.

Findings/Results

The aim of examining the education policy documents was to develop an understanding of developing CT skills in secondary school students. The data analysis generated four themes, which are described below.

Aim of Education/Curriculum and SLOs

All education policy documents describe higher-order thinking skills as the aim of education. The National Education Policy (2009) describes the aim of education to make the students responsible, with analytical and critical abilities to develop CT skills among them. The objectives described in NEP (2009) are to produce self-reliant individuals who may become a responsible member of society with analytical thinking. Furthermore, curriculum development is suggested to be based on outcome-driven instead of content reflecting significant social issues to develop different skills like inquiry, problem-solving, teamwork and self-directed learning.

The Physics curriculum document focuses on problem-solving and developing other life skills among secondary school students. Problem-solving, reasoning, argumentation, and evaluation are the described benchmarks in the document. The aim of the Physics curriculum has been narrated to develop a conceptual understanding of principles, processes, systems, and applications of Physics for problem-solving, thinking process, investigation, data management and communication skills. A new paradigm shift has been discussed with an interactive and participative approach, so the learners of the twenty-first century may become independent. There is much focus on conceptual understanding with laboratory work and application-based investigation. The learning of students is discussed with analysis, investigation, and application with laboratory work. Both standards and benchmarks are discussed to develop higher-order thinking skills through reasoning, observation and investigation.

In the Chemistry curriculum document, the aim is described as to produce independent thinkers, problem solvers and decision-makers to solve real-life problems in personal, social, and professional lives. It has been described to make the students able to apply their understanding to solve the problems of daily life logically related to Chemistry. In the Chemistry curriculum document, the standards have been designed for in-depth knowledge and higher-order thinking to connect with the world. In the same way, the benchmarks are based on these standards. Curiosity about the natural world is expected from the students. It is emphasized that science and technology must be used to identify the problems in their personal, social, and professional lives. It can be seen from the description of the curriculum document of Chemistry, which aimed to produce independent thinker students, who may ask the questions and answer on their own. It is recommended that observation must be used for investigation and problem-solving. For the development of CT skills, application and analysis are recommended in the SLOs section of the Chemistry curriculum.

The Biology curriculum also aims at developing CT skills. The document recommends that the school should construct knowledge based on creativity. The introduction section of this document aims to enable the students' capacity building for a confident person, successful students, and responsible citizen of the society (NCB, 2006). The curriculum document describes the objective as making competent individuals, logical in writing and oral with solving problems of everyday life and developing responsible citizens to contribute to society as effective members of society. Bloom's taxonomy with all domains is discussed to be focused on the curriculum. Moreover, this document also focuses on developing scientific knowledge of living things with the ability of biological understating to solve daily life problems with logic and rational way.

The students should know the interaction of living things with the environment through questioning for decision making. To find solutions, they should get knowledge with reasoning through other sources.

Importance of CT

In all education policy documents, the importance of CT has been emphasized. In the NEP (2009), innovative skills are promoted, and rote learning is discouraged due to its hindrance in the mental growth. The importance of CT has been focused due to its links with analytical skills to produce life-long and independent learners. To improve quality education, the documents focus on different areas are teachers' quality, textbooks, curriculum, pedagogy, learning environment, and other learning facilities. Moreover, the revision of the assessment system is also suggested to promote quality education.

The Physics curriculum also focuses on conceptual understanding with problem-solving and real-life application skills to meet the academic and professional challenges of life after completion of secondary education.

The Chemistry curriculum document also focuses on different aspects of the development of CT skills. The students are expected to be curious about the natural world and technology. The document recommends that reasoning, observation, and investigation should be used for the solution of their problems. In this way, students can become creative and decision-makers through scientific and technological knowledge. The document presents that one of the aims is to develop the ability of problem-solving among the students in their daily life through the application of rationale and conceptual understanding. The standards narrated in the document also focus on higher-order thinking with analysis, application, and evaluation.

The Biology curriculum also focuses on developing CT skills among secondary school students. Learning through the interaction of living things is suggested through different strategies like questioning, problem-solving, and decision making. They should develop the ability for the identification of the problems, experimentation, and communication of findings through different contemporary tools. In-depth knowledge, substantive conversation, higher-order thinking, and connection with the world beyond the classroom are discussed standards. Furthermore, the aim of the curriculum is discussed with the scientific understanding of living things. In the document, it has been narrated to capacity building with logic in oral and writing and use suitable modes of communication-related to scientific work (NCB, 2006, p. 8).

For teachers, different techniques have been recommended for developing CT skills. In the Chemistry curriculum, teachers are suggested to design their lessons interactive based on questioning and different activities to develop analysis, evaluation, critical, and creative thinking in students.

Like teachers, for students, there are expectations to be able to identify, analyze, and solve the problems with creativity to solve problems of their daily lives. Students are expected to have an ability to identify, analyzing, and solving the problem with creativity to find out the conclusion in their daily lives. According to one of the standards, students will have the ability to be curious and wonder about the natural world with demonstration and increasing of the awareness for the advancement and development in science and technology (NCB, 2006). The Chemistry curriculum document focuses on practical work to develop reasoning abilities among students. For in-service teachers, training is suggested in NEP (2009) in order to develop conceptual understanding, produce problem-solving and reasoning skills. Furthermore, the training is recommended to focus on the subject and pedagogical content knowledge, assessment system, monitoring and evaluation.

Pedagogical Practices for Developing CT Skills

All the curriculum policy documents recommend students centered and interactive pedagogical practices for the development of CT skills. The NEP (2009) focuses on these pedagogical practices for quality education. Students' centered pedagogy has been suggested for developing CT skills as narrated in the documents' policy action section "schools shall introduce more student-centered pedagogies" (NEP, 2009, p. 37). The curriculum development section also focuses on the achievement of learning objectives through different factors. Curriculum development is focused based on objectives and outcomes. Furthermore, different social issues are suggested to be included in capacity building. The aim should be to develop self-directed learning, inquiry, problem solving, critical thinking, and teamwork among secondary level science students (NEP, 2009).

The Physics curriculum document also focuses on interactive and student-centered approaches for developing higher-order thinking. The suggested strategies are investigation, problem-solving, discussion, engagement of the students for conceptual and clear understanding. The focus of described SLOs is on the investigation, observation and laboratory work related to Physics. Modern techniques and methods are recommended to be used to make students active learners. For teachers, interactive lessons are suggested to be designed for the development of the various type of thinking, including analysis, synthesis, evaluation and creative thinking. Different pedagogical practices like problem-solving, questioning, cooperative learning, discussion, debates, and students' engagement are suggested for the teachers.

The Chemistry curriculum also emphasizes interactive, learner-centered, participative, inquiry-based, practical, problem-solving, and analytical skills because the curriculum aimed at higher-order thinking, to make students independent learners, problem solvers by asking questions. The recommended pedagogical practices in the curriculum are activity-based and learner-centered, like active participation, demonstration, laboratory work, workshops, inquiry-based teaching, diagrams, graphs, flow charts, and fieldwork.

In the Biology curriculum, the focus is also on student-centered, activity and inquiry-based strategies to explain and understand since it has been recommended that there should be student-centered teaching with conceptual understanding having practical work for the development of reasoning and motor skills in students (NCB, 2006). In addition, it is recommended that the students should be thoughtful and reflective thinkers through interpretation, explanation, and application of their acquired knowledge for the development of higher-order thinking skills. Open-ended questions are demanded the students' creativity and critical thinking. The recommended pedagogical practices in the Biology curriculum are group work, focusing rationale thinking with questioning, diagrams, drawing, audio-video presentation, graphs, flowcharts, investigation, and debates.

Science teachers are recommended to use innovative and creative teaching, as NEP (2009) recommends pedagogy based on the real-life situation during teaching. In the Chemistry document, inquiry-based teaching is suggested to be used in the classrooms as described; teaching approaches and materials should be students centered with the provision of practical work to develop reasoning abilities and motor skills among students. The Biology curriculum suggests teaching of inquiry process through experienced-based techniques like fieldwork and laboratory to develop cooperative abilities.

For the teachers, training has been suggested. In NEP (2009), it has been emphasized for the development of conceptual understanding through reasoning and problem-solving skills. All the education policy documents recommend in-service training for the professional development of the teachers with respect to content and methodology. The focus of these training should be based on activity-based and student-centered methods described in all three curriculum documents with a focus on activity-based and learner-centered approaches. Furthermore, laboratory work, demonstration, fieldwork, students' participation should be compulsory.

Assessment and CT

For the achievement of quality education, assessments based on analytical and reflective thinking have been proposed. Rote learning is portrayed as something which hinders mental growth and the development of CT skills. The need is described to produce CT and analytical skills for life-long learning (NEP, 2009). The assessment system focusing on analytical and critical thinking is focused.

Similarly, for formative and summative assessment, different contemporary assessment tools are suggested. The NCP (2006) focuses on the assessment system to assess students' different abilities in understanding, knowledge, and application. Furthermore, the questions based on analysis, synthesis and evaluation are given more emphasis to provide more place in the assessment. The Chemistry curriculum document focuses on analysis and synthesis as "assessment should measure the capacity of students for critical judgment" (NCC, 2006, p. 55). The students' strengths and weaknesses should be focused on. The document recommends that the cognitive skills of Bloom's taxonomy should be used for measuring reasoning. The Biology curriculum also focuses on an assessment system for developing CT skills focusing on competency and problem-solving skills development (NCB, 2006). Higher-order and problem-solving questions are recommended for assessment in all the curriculum documents.

There is given much emphasis on the higher cognitive abilities of the students through assessment. The practical examination is recommended, so there may be produced daily life, problem-solving, and investigation skills among students. The documents propose formative and summative assessments should be conducted with different techniques like worksheets, quizzes, observations, review questions, lab competition, discussion, and oral presentations so that the objectives of the curriculum can be achieved.

In addition, the final evaluation is recommended to be comprised of 85% weightage of Bloom's taxonomy levels. Moreover, in theory, 40% of the questions should be comprised to measure higher-order abilities based on problem-solving and application of the information (NCB, 2006; NCC, 2006).

In the assessment, question papers are recommended based on the curriculum rather than a textbook to develop and evaluate problem-solving and CT skills among secondary school science students. Moreover, the questions based on understanding, argumentation, and reasoning are recommended to develop higher-order thinking. In Physics and Chemistry curriculum documents, suggestions are given for assessment. Questions from daily-life experience are recommended for the assessment of students' problem-solving and higher-order thinking skills. The students should apply their conceptual understanding and investigation skills to solve these types of questions.

Conclusion

This study was designed to analyze the curriculum policy documents to understand the policy recommendations for developing CT skills among secondary science school students. All four policy documents were analyzed. The aim of all these documents is described to make the students self-reliant, problem-solvers, analytical thinkers, and responsible members of society. All these documents focus on conceptual understanding, application, analysis, synthesis, and evaluation. Students are suggested to learn through problem-solving, questioning, and decision making. The teachers are expected to design their lessons interactive and student-centered for the production of higher-order thinking among students. For students, interactive pedagogical practices are recommended for the development of CT skills like questioning, students' engagement, discussion, problem-solving, debates, discussion, group work, practical work, and cooperative learning. The assessment system is also recommended based on measuring analysis, synthesis, evaluation, problem-solving, and analytical thinking. Much emphasis is given to the questions assessing CT skills. Question paper is suggested to be designed on curriculum-based instead of textbook-based.

With these policy recommendations for the development of CT skills among secondary school science students, we see that research on critical thinking skills should focus on ground realities in diverse school systems in Pakistan, especially looking at how these policy recommendations are unfolding in teachers' practices (Ahmed, Muhammad, & Anis, 2020; Muhammad, & Brett, 2019). This is particularly important since teachers are more inclined towards teaching only what is assessed (Muhammad, 2015). Pakistan's secondary school examination system also assesses lower-level cognitive skills, and less weightage is given to higher-level cognitive skills (Naseer, Muhammad, & Masood, 2020). This can be another avenue for future research to explore how the state examination system is pushing towards adopting those pedagogical practices which hinder the development of critical thinking skills among secondary school students (Muhammad & Brett, 2017).

Authors' Acknowledgment

This article is based on the PhD research project of the first author. The second author is the supervisor. Third and fourth authors helped in writing this article, especially in addressing changes suggested by reviewers. We thank all who facilitated

in acquiring the documents used in this study.

REFERENCES

Ahmed, F., Muhammad, Y., & Anis, F. (2020). Developing Secondary School Teachers' Positive Attitude towards Reflective Teaching: A Collaborative Action Research Study. *sjesr*, 3(4), 43-53.

Bazeley, P., & Jackson, K. (2013). *Qualitative data analysis with NVivo*. London: Sage Publications.

Bialik, M., & Fadel, C. (2015). *Skills for the 21st century: What should students learn?* Boston: Centre for Curriculum Redesign

Cottrell, S. (2011). *Critical thinking skills: Developing effective analysis and argument.* New York: Palgrave Macmillan.

Demir, S. (2015). Perspectives of science teacher candidates regarding scientific creativity and critical thinking. *Journal of Education and Practice, 6*(17), 157-159.

Dewey, J. (1916). Democracy and education. New York: Macmillan.

Dwyer, C., Hogan, M. J., & Stewart, I. (2011). The promotion of critical thinking skills through argument mapping. In Horvath, C. P., &, Forte, J. M. (Eds.), *Critical thinking* (pp. 1–25). New York: Nova Science Publishers Inc

Ennis, R. H. (1993). Critical thinking assessment. *Theory into Practice, 32*(3), 179-186. doi:.http://dx.doi.org/10.1080/00405849309543594

Facione, P. (1990). *The complete American Philosophical Association Delphi research report.* Millbrae: The California Academic Press.

Facione, P. (2007). Talking critical thinking. *Change: The magazine of higher learning, 39*(2), 38-45. doi:10.3200/CHNG.39.2.38-45

Fahim, M., & Pezeshki, M. (2012). Manipulating critical thinking skills in test taking. *International Journal of Education, 4*(1), 153-160. doi:10.5296/ije.v4i1.1169

Fung, D. (2014). Promoting critical thinking through effective group work: A teaching intervention for Hong Kong primary school students. *International Journal of Educational Research, 66*(3), 45-62. doi:10.1016/j.ijer.2014.02.002

Garner, J. K., Pugh, K., & Kaplan, A. (2016). *Museum visitor identification and engagement with science (VINES): A theory-driven process for designing transformational experiences.* Paper presented at the Annual Meeting of the American Educational Research Association, Washington DC.

Higgins, S. (2015). A recent history of teaching thinking. In R. Wegerif, L. Li, & J. C. Kaufman (Eds.), *The Routledge International Handbook of Research on Teaching Thinking* (pp. 19-28). London: Routledge.

Hooks, B. (2010). *Teaching critical thinking: Practical wisdom*. New York: Routledge.

Jackson, K., & Bazeley, P. (2019). *Qualitative data analysis with NVivo* (3rd ed.). London: SAGE Publications Limited.

Kyngäs, H. (2020). Qualitative research and content analysis. In H. Kyngäs, K. Mikkonen, & M. Kääriäinen (Eds.), *The application of content analysis in nursing science research* (pp. 1-11). Switzerland AG: Springer Nature.

Mendelman, L. (2007). Critical thinking and reading. *Journal of Adolescent & Adult Literacy, 51*(4), 300-302.

Miles, M., Huberman, M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). New York: Sage Publications.

Muhammad, Y. (2015). *Pakistani national identity, cultural diversity and global perspective: A policy trajectory study of the national curriculum for secondary school Pakistan Studies in Punjab*. (Unpublished doctoral dissertation), University of Tasmania, Tasmania.

Muhammad, Y., & Brett, P. (2017). Some challenges in teaching citizenship in an Islamic context: Pakistan Studies teachers' perspectives and practices in relation to teaching about Identity. *Citizenship Teaching and Learning*, 12(3), 279–298.

Muhammad, Y., & Brett, P. (2019). Addressing social justice and cultural identity in Pakistani education: A qualitative content analysis of curriculum policy. In *Education, ethnicity and equity in the multilingual Asian context* (pp. 235-253). New York: Springer.

Naseer, H., Muhammad, Y., & Masood, S. (2020). Critical thinking skills in a secondary school Pakistan Studies textbook: A Qualitative content analysis. *sjesr*, 3(4), 84-95.

NCB. (2006). *National curriculum for Biology grades IX – X*. Islamabad: Ministry of Education, Government of Pakistan

NCC. (2006). *National curriculum for Chemistry grades IX – X*. Islamabad: Ministry of Education, Government of Pakistan

NCP. (2006). *National curriculum for Physics grades IX – X*. Islamabad: Ministry of Education, Government of Pakistan

NEP. (2009). *The National Education Policy (NEP)*. Islamabad: Ministry of Education, Government of Pakistan

Orlich, D. C., Harder, R. J., Callahan, R. C., Trevisan, M. S., & Brown, A. H. (2012). *Teaching strategies: A guide to effective instruction*. Boston: Cengage Learning.

Osborne, J. (2014). Teaching critical thinking? New directions in science education. *School Science Review, 95*(352), 53-62.

Patton, M. Q. (2015). *Qualitative research & research methods (4th ed.)*. Thousand Oaks: Sage Publications, Inc.

Paul, R., & Elder, L. (2006). Critical Thinking Reading & Writing Test. *Tomales, CA: Foundation for Critical Thinking*.

Scherer, M. (2001). How and why standards can improve student achievement: A conversation with Robert J. Marzano. *Educational Leadership, 59*(1), 14-18.

Stanley, T. L. (2017). *Increasing students' critical thinking and improving performance in elementary social studies classroom*. (Unpublished doctoral dissertation), Capella University,

Wagner, T. (2014). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need and what we can do about it*. New York: Basic Books.

Yacoubian, H. A. (2015). A framework for guiding future citizens to think critically about nature of science and socio-scientific issues. *Canadian Journal of Science, Mathematics and Technology*

Education, *15*(3), 248-260. doi:10.1080/14926156.2015.1051671

Zhang, L., & Kim, S. (2018). Critical thinking cultivation in Chinese college English classes. *English Language Teaching*, *11*(8), 1-6.

Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. Hampshire: Cengage Learning.