ISSN : 2394-2975 (Online)
ISSN : 2394-6814 (Print)

The Interplay of Technology and Critical Thinking Skills in the 21st Century Blended Classroom

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Abstract
In this age of information technology and globalization there is an inherent need for students to be prepared in such a way that they use critical thinking skills proactively. With current available access to a vast number of sources of information, the profitable use of technology provides a series of challenges and opportunities for the learner. Traditional instruction emphasized a teacher-dominated, test-oriented, and mechanistic approach that provided little opportunities for developing students' critical thinking skills. In the present age, the instructional strategies are more student-centered that focus on meeting diverse educational needs. The effective use of blended learning to enhance critical thinking skills will prepare the students for 21st century work-force. The position of the authors is that blended learning provides learning experiences that enable the development of critical thinking skills through the use of technology (in online settings), and inter-personal interactions in (face-to-face settings).

Keywords
Blended learning, Critical thinking, 21st century skills, Online settings, Face-to-face settings.

I. Introduction

With current available access to a vast number of sources of information, the profitable use of technology provides a series of challenges and opportunities for the learner. One challenge would be represented by having the capacity to discern the useful information from the irrelevant and being able to make meaningful sense out of it. Developing the quality of discernment in students is one of the important goals of 21st century education. This much needed quality, known as critical thinking, is defined as a metacognitive process that requires purposeful and reflective judgment, leading to improved logical conclusions to arguments or solutions to possible problems (Dwyer, Hogan, & Stewart, 2014). In this age of information technology and globalization, there is an inherent need for students to be prepared in such a way that they use critical thinking skills proactively. The purpose of this position paper is to discuss the importance of CTS for students in the 21th century and the advantages of blended learning -compared to online only- environments to develop such skills. It is the position of the authors that students develop their critical thinking skills more in a blended learning environment than in an online only environment where the lack of interpersonal interaction creates more challenges than opportunities for both, the instructor and the students.

II. Critical Thinking

The construct of critical thinking is an array of six cognitive skills. The first is identified as interpretation, explained by Facione (2007) as being able to understand and express the meaning of different knowledge; including the sub-skills of categorization, decoding significance, and clarifying meaning. Next is analysis, which focuses on identifying the intended meaning of any form of communication and is an important skill for understanding indirect statements. Evaluation is also important for the same reason. It has to do with making a judgment as to the validity of the speaker. Fourth is explanation, a comprehensive representation or interpretation of the knowledge that is acquired. This is required to know if knowledge was properly understood as intended. The fifth is inference, which means bringing together all the information to form a conclusion. Inference is necessary to form an accurate explanation. Finally, self-regulation is consciously being aware of what one is doing during the entire process (Facione, 2007).

Sharpe, Benfield, Roberts, and Francis (2006) indicate that most researchers and educators use analytical thinking, critical thinking, and problem solving as interchangeable terms that simply indicate "deeper" thinking. This confusion occurs, because these skills often use some of the same thinking techniques. However, in order to think critically, the thinker must first think analytically. In order to solve problems, an individual needs to think analytically and critically. Therefore, according to Bloom, thinking critically is more difficult than thinking analytically. Stobaugh (2013) states that a key component of critical thinking is the process of analyzing and assessing thinking with a view to improving it. Hence, many consider the analysis level as the beginning of deep thinking processes.

Critical thinking has been researched in many scholarly fields, including education and psychology, which has provided diverse definitions (Moore & Parker, 2012). Because critical thinking is an umbrella term used for a complicated array of thinking skills, it is important to clarify the term (Carmichael & Farrell, 2012). Critical thinking is the ability to examine information by posing crucial questions, analyzing and evaluating relevant information, implementing theoretic notions, and effectively communicating with others (Duron et al 2006). Moreover, critical thinking is defined as the art of appropriately disseminating evidence via observation, using context skills to identify a problem from presented context and add applicable theoretical arguments and techniques, in order to conclusively form a judgment. Critical thinking is also defined as the ability to work with complicated ideas, whereby a learner can effectively provide evidence to justify a reasonable judgment.

A. The Role of Critical Thinking and Learning in the 21st Century

Researchers note that instruction in critical thinking is paramount for learning, because it helps individuals to improve their understanding of the information they find and promotes problem-solving and better decision-making in real-life applications (Dwyer et al., 2014). Critical thinking helps learners to infer information from what they read, and it helps them understand it better. Critical thinking is a very important skill in terms of been equipped with an

inner compass that helps students making wise choices in a world that offers a profusion of pre-packaged ideas. They are then able to express that in discussions with other people or in what they write. In this respect, critical thinking is one of the basic pillars of success in personal and academic life (Duron, Limbach, & Waugh, 2006). It is essential in helping improve learners' leadership abilities, decision-making skills, and critical judgment, and gives learners a competitive advantage for success in the international job market (Adams, Cain, Giraud, & Stedman, 2012). Critical thinking is also crucial for social and intellectual progress. According to Walton (2000), critical thinking can be perceived as a means of preventing social problems in real life situations. Critical thinking skills have not been salient in traditional set ups, because the mode of delivery/ instruction is more than often a one way approach.

Traditional instruction emphasized a teacher-dominated, test-oriented, and mechanistic approach that provided little opportunities for developing students' critical thinking skills (Huang, Hung, & Cheng 2012). In the present age, the instructional strategies are more student-centered and focus on meeting diverse educational needs of the students. The effective use of technology, in combination with the application of critical thinking skills will prepare the students for the 21st century work-force. Although critical thinking is highly valued, it is also difficult to teach effectively (Gelder, 2001). There are two typical approaches to teach critical thinking skills: indirect and direct approaches. In indirect approaches, students are expected to develop indirect critical thinking skills by studying a variety of courses, such as literature and history. The direct approach implies teaching students in a direct manner how to think critically, such as theoretically based real life scenarios. However, Gelder (2001) indicates that neither approach effectively improved students' critical thinking skills. These findings make relevant the examination of technology resources to help improve such skills. The use of current and engaging technology tools may meet the students' needs and the goals of education.

B. The Role of Technology

New approaches, however, suggest that critical thinking skills can be successfully developed through a technology-rich environment to improve a series of factors: motivation, guidance, scaffolding, and feedback. Huang et al. (2012) mention that blended learning environments that incorporate technological tools into classrooms facilitate effective communication and thus enable students to develop arguments supported by evidence, explain opinions by making thinking processes 'visible', and eventually foster enhanced critical thinking skills. Blended learning also motivates students to be self-dependent thinkers (Burgess, 2009).

For example, Frisch, Jackson, and Murray (2013) created and implemented a model where the teaching-learning processes were inquiry-driven and student-centered. The authors used Web 2.0 technologies (del.i.cious, CiteULike, and Google docs and sites) to promote inquiry and conceptual understanding in biology, given that the use of these technologies increased collaboration among users to manipulate, understand and share information, helping to make better connections between real-world science and students' learning of content. Frisch et al. (2013) administered critical thinking assessment tests in their program and found important gains in the students' understanding of the relationship between Web 2.0 technologies, the science process, and scientific communication.

In a globalized world, with an increasing use of technology to access information, educators need to empower their students' learning with digital platforms, by providing opportunities for online interaction and facilitating ways for media literacy education. De Abreu (2010) considers that media literacy can enhance students' critical thinking skills, which are of great value in a globalized and technologically challenging 21st century. Although teachers acknowledged a need for better media literacy to empower their students, they also showed a "lack of focus and confusion in the area of media literacy education and digital technologies" (De Abreu, 2010, p.26). These findings make evident the need for teachers' professional development in this area, in order to consequently be able to empower their students. This paper discusses the effectiveness of a blended learning environment to improve students' critical thinking skills.

III. Blended Learning and Critical Thinking

Blended learning, known also as hybrid learning, is the elaborate melding of face-to-face and online learning experiences. The Teaching and Learning Center at the University of Calgary has put together a very comprehensive definition of blended learning: "the integration of face to face and online learning to help enhance the classroom experience and extend learning through the innovative use of information and communication technology. Blended strategies enhance student engagement and learning through online activities to the course curriculum, and improve effectiveness and efficiencies by reducing lecture time." (n.d., p. 5). We are living an age and time where, according to Garrison and Kanuka (2004), " Internet information and communications technologies are transforming much of society there is little reason to believe that it will not be defining transformative innovation for higher education in the 21st century" (p.95). One such transformation is ability to foresee, re-design, and adapt educational environments to suit the technological revolution that continues to grow in an unprecedented way. Blended learning is the answer, as it bridges the gap between traditional and online learning and in doing so, offers the best of both worlds to the students.

Blended learning is unique because it integrates the strength of face-to-face communication with online written communication, such as labs, simulation, tutorials, and assessments (Garrison & Vaughan, 2008). Blended learning has emerged in response to the increasing need and demand to respond to diverse students' needs and to provide engaging and meaningful learning experiences. It accommodates a variety of learning styles.

Blended learning increases students' participation in the learning process, and supports collaborative learning. It makes the learning environment less stressful, by providing a place to practice skills beyond the classroom. A study reporting the impact of blended learning on students and teachers found that blended learning, as reported by teachers, indicated an increase in student academic ability, student engagement, and communication (Werth & Werth, 2013). 54% of the teachers reported an increase in students' higher level thinking skills, and 65% teachers reported an increase in student motivation to participate in the class. These positive indicators make a strong case for blended learning. The flexibility that blended learning offers in terms of learning formats, styles, and the usage of technological tools to help both aspects of learning, be it face to face or online, helps students meet their individual needs and develop skills that are necessary for 21st century learning, such as critical thinking (Marsh, 2012).

The document, P21 Framework defines the components of critical thinking and problem solving as:

- Reason Effectively: Use various types of reasoning (inductive

, deductive etc.) as appropriate to the situation
- Use Systems Thinking: Analyze when parts of the whole interact with each other to produce overall outcomes in complex systems
- Make Judgments and Decisions: Effectively analyze and evaluate evidence, arguments, claims, and beliefs; analyze and evaluate major alternate points of view; synthesize and make connections between information and arguments; reflect critically on learning experiences and processes; interpret information and draw conclusions based on the best analysis (p.4).

Bringing together critical thinking skills and blended learning technological tools may be beneficial in that it provides an additional opportunity for interested students to achieve higher levels of knowing and to practice critical thinking skills (Carmichael & Farrell, 2012). Many interactive technologies, such as blogs, wikis, voice-threads, webquests, social media, video/ audio conferencing, video-recordings of teaching and learning interactions, discussion forums, and Second LifeTM (a free 3D virtual world where users can socialize, connect, and create using free voice and text chat, iPad or mobile technologies), have been integrated into the blended learning environments to enhance students' engagement, problem solving, and critical thinking skills. (COHERE, 2010). One specific example of using technology for promoting critical thinking is Reason!Able, a software designed to support quality practice where students practice two kinds of critical thinking activities, in which they put together an argument tree representing the reasoning and then systematically assess that reasoning (Gelder, 2001).

Blended learning environments provide educators with a variety of features and tools that effectively foster social interaction. Teachers can encourage their students to engage in social interaction by using one of the social media tools (blogs, Twitter, and Facebook) in the learning process. In blended learning environments, students can express thoughts and feelings. They can also assess their own work and become aware of others. Li (2010) claims that through blended learning that promotes inquiry processes by providing designed tasks, Internet resources, and interaction with others, students can develop critical thinking skills more effectively.

A. Teachers' and Students' Roles in Blended Learning

In blended learning, teachers' roles change as they evolve from "lecturer" to instructional guide. The responsibility of the teacher in a blended learning environment is to guide and direct students in a step-by-step process and to ensure that any difficulties students might face throughout this process are solved (Pedersen, 2003). The teacher continues to promote and encourage students, guide and monitor progress, provide feedback, reinforce confidence, and preserve motivation. In a blended learning classroom, teachers help to guide students, manage their activities, direct their learning, and help students develop their problem solving and critical thinking skills (Marsh, 2012). A blended learning environment aims to foster autonomous learning. The teachers' role is to help students who have poor time management skills and who are not used to working autonomously to develop the skills they require to work independently. This is particularly important if this is the first time the student has learned in a blended learning environment.

Teachers help develop students' critical thinking skills by creating a supportive online community. Teachers encourage students to reply to each other's questions rather than relying only on the teacher's contributions (Marsh, 2012). Another role of teachers is to plan the blend carefully and consider the learning outcomes, the technology available, and the institutional constraints, in order to build an effective blended learning environment. In addition, they evaluate student advancement and then employ various tools and resources, including digital content, to distinguish instruction, in order to meet students' needs. Teachers encourage students to work collaboratively to reflect and assess each other's works (Armes, 2012). Blended learning is very effective in authentic learning settings, especially in context of work place learning where one needs to develop critical thinking skills to be able to interact and communicate with different layers of hierarchy. The practical aspects of work place learning, for example, meeting with experts could be structured and provided in face to face settings while the related course materials and learning resources could be supplied online (Oliver, Herrington, & Reeves, 2005).

It is the position of the authors that, blended learning offers multiple ways to build learning opportunities. However, many different factors need to be considered in order to achieve a blend that is appropriate to the needs of students. Marsh (2012) states that four steps are required to start designing a personalized blend: 1) Identify the learning outcomes for your classroom lesson. If a teacher does not start with a clear idea of the learning objectives, the lesson will not be successful. 2) Identify the activities for students to do in class. In this stage, teachers can focus on communicative activities that develop critical thinking skills through pair and group work. Students are prepared online to actively participate in personalized pair and group work activities in class. Also, student-to-student interaction is also maximized in the classroom. 3) Identify the activities for students to do online before class. For example, students can watch the lesson at home and discuss it in class. 4) Identify the activities for student to do after class.

Students need to be supported in a blended learning environment. It takes time for students to adapt to the new environment. A students' role in a blended learning environment is completely different from that of the traditional environment, in which they needed to be good listeners. Students now need to get used to working independently, making their own decisions, and taking responsibility for their own learning. In the early stages of the course, some students will need help and guidance as to when and how to make these decisions. It is important that students understand that flexibility is a positive attribute offered by blended learning, but it does not mean they can leave all the online work until the last minute (Armes, 2012).

IV. Conclusions

Blended learning creates an effective learning environment that motivates students to collaboratively and individually construct knowledge and develop critical thinking skills. Blended learning fosters external thinking styles by allowing students to interact with each other. It also integrates the internal thinking style by providing effective tools for students who prefer to learn alone (Yang & Wu, 2012). Blended learning affords both the teacher and learner the time to work online for sharing the content, ideas and construct knowledge through these online interaction. The gaps in understanding that need support are provided by the face to face settings, in terms of problem solving and work places related mentorships. A well designed blended learning class can be an asset to both the teacher and the learner as it aims at engaging and supporting student centered learning. The teacher in providing such an environment will collaborate with other teachers, reflect on their own practice, and the outcome would be designing teaching

strategies that address student needs pertinent to their optimal learning.

The development of learning behaviors, including higher order thinking can be effectively and efficiently accomplished through a variety of blended learning strategies, such as weblogs, photographic assignments, and digital storytelling. However, the success of using blended learning for the development of students' critical thinking skills largely depends on teachers' support and guidance. Miller and Olthouse (2013) indicates that success depends on the presence of a skilled teacher and supportive peers, rather than on the presence of a specific technology tool. Therefore, teachers need to provide high expectations, modeling, and constructive feedback. They also need to effectively facilitate students' learning processes and support social interaction. Teachers should keep a watchful eye on the forums and chats, so they know what is being discussed in these spaces and can make sure they are not being used for other non-academic interactions and activities like cyber-bullying.

Blended learning is not an addition that just increases the educational expenses. It symbolizes a restructuring of class contact hours with the goal to enhance engagement and critical thinking skills through extending access to Internet based learning opportunities (Garrison & Vaughan, 2008). Moreover, the success of blended learning relies on students' abilities to use technology in academic settings, while benefitting from the interpersonal interactions with their teachers and other students as well as building social and critical thinking skills needed in the 21st century work-place. Most American students do use technology at home, but this is not true for some other countries. Teachers need to be aware of how familiar students are with technology as well as their level of expertise. More attention may need to be paid to students who are not as familiar with the type of technology that is being used in a blended learning environment. Overall, if these few problems can be resolved, a blended learning environment can help students learn and develop their critical thinking skills.

References

[1] *Adams, B. L., Cain, H. R., Giraud, V., & Stedman, N. L. (2012). Leadership, motivation, and teamwork behaviors of principal investigator's in interdisciplinary teams: A synthesis of research. Journal of Leadership Education, 11(2).*

[2] *Armes, C. (2012, April 17). The role of the teacher in blended learning: Data, management, and student support. Scientific Learning. Retrieved from http://www.scilearn.com/blog/role-of-the-teacher-in-blended-learning.php.*

[3] *Carmichael, E., & Farrell, H. (2012). Evaluation of the effectiveness of online resources in developing student critical thinking: Review of literature and case study of a critical thinking online site. Journal of University Teaching and Learning Practice, 9(1).*

[4] *COHERE.ca. (2010). Innovative practices research project COHERE report on blended learning. Human resources and skills development Canada. Retrieved from http://cohere.ca/wp-content/uploads/2011/11/REPORT-ON-BLENDED-LEARNING-FINAL1.pdf.*

[5] *De Abreu, B. (2010). Changing Technology = Empowering students through media literacy education. New Horizons in Education, 58(3), 26-33.*

[6] *Duron, R., Limbach, B., & Waugh, W. (2006). Critical thinking framework for any discipline. International Journal of Teaching and Learning in Higher Education, 17(2), 160-166.*

[7] *Dwyer, C. P., Hogan, M. J., & Stewart, I. (2014). An integrated critical thinking framework for the 21st century. Thinking Skills and Creativity, 12, 43-52.*

[8] *Facione, P. A. (1998). Critical thinking: What it is and why it counts. Millbrae, CA: California Academic Press. Retrieved May, 1, 2013.*

[9] *Frisch, J. K., Jackson, P. C., & Murray, M. C. (2013). WikiED: Using web 2.0 tools to teach content and critical thinking. Journal of College Science Teaching, 43(1), 70-80.*

[10] *Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. The Internet and Higher Education, 7(2), 95-105. doi:10.1016/j.iheduc.2004.02.001*

[11] *Garrison, R., & Vaughan, H. (2008). Blended learning in higher education: Framework, principles and guidelines. San Francisco, CA: Jossey-Bass.*

[12] *Gelder, T. V. (2001). How to improve critical thinking using educational technology. ASCILITE 2001 conference proceeding, 539-548.*

[13] *Huang, K. H., Hung, K. C., & Cheng, C. C. (2012). Enhancing interactivity in geography class: Fostering critical thinking skills through technology. Problems of Education in the 21st Century, 50.*

[14] *Marsh, D. (2012). Blended learning creating learning opportunities for language learners. New York, NY: Cambridge University Press.*

[15] *Moore, B. N. & Parker, R. (2012). Critical thinking. 10th ed. New York, NY: McGraw-Hill.*

[16] *Oliver, R., Herrington, J., & Reeves, T., (2005). Creating authentic learning environments through blended-learning approaches. In C. Bonk & C. Graham (Eds.). Proceedings of HERDSA. Joon dalup: Edith Cowan University.*

[17] *Pedersen, S., & Liu, M. (2003). Teachers' beliefs about issues in the implementation of a student-centered learning environment. Educational Technology Research and Development, 51(2), 57-76.*

[18] *Sharpe, R., Benfield, G., Roberts, G., & Francis, R. (2006). The undergraduate experience of blended e-learning: A review of UK literature and practice. York, UK: The Higher Education Academy. Retrieved from: http://www.heacademy.ac.uk/assets/documents/teachingandresearch/Sharpe_Benfield_Roberts_Francis.pdf*

[19] *Stobaugh, R. (2013). Assessing critical thinking in elementary schools: Meeting the Common Core. New York, NY: Routledge.*

[20] *Walton, D. (2000). Problems and useful techniques in teaching argumentation, informal logic and critical thinking. Informal Logic, 20, 35-89.*

[21] *Werth, L., & Werth, E.P. (2013). Educational technology: Perceptions and use by a sample of K-12 teachers. ISTE (International Society for Technology in Education) Conference Proceedings. San Antonio, TX.*