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RESEARCH ARTICLE

IMPACT OF CULTURALLY RESPONSIVE COMPUTING AS TECHNO-SOCIAL CHANGE AGENT

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ABSTRACT

Despite numerous efforts and substantial funding, the academic interest and performance of youth from historically marginalized classes (African American, Native American, Latino and Indigenous) along with racial minorities and women in science, technology, engineering and mathematics (STEM), statistically portrays a large variation in comparison to White and Asian counterparts. These discrepancies can be attributed to some extent to cultural factors which prevents the racial minorities from entering or persisting in the lucrative fields of science, technology, engineering and mathematics (STEM). Comprehending the potency of Culturally Responsive Teaching (CRT), some major technology enrichment programs reformed the Computer Responsive Pedagogy (CRP) principals to incorporate a Culturally Responsive Computing (CRC) environment for the subjugated class. Culturally responsive computing (CRC) needs to be re-conceptualized as an exploratory change agent in intersectionality, innovation and community advancement through techno-social engagement by regulating existing programmatic, theoretical and methodological doctrines.

INTRODUCTION

Researchers and policymakers have drawn attention to the fact and figures which depicts lack of interest and performance issues of historically marginalized classes in the field of science, technology, engineering, and mathematics (STEM). The following facts have now grown popular: Women tend not to enter information technology at the same rate as men (American Association of University Women 2010; National Science Foundation 2011); however, gender is only one unit shaping the contours of our life. Racialized minority groups (e.g., African-American, Native American, and Latinos) tend not to major in computer science at the same rate as their White counterparts (The National Academies 2011); students attending schools in economically disadvantaged districts have less access to advanced computer science courses (e.g., Araque et al. 2013). Technology being the sector of rapid growth in US (US Department of Labor 2010a, 2010b), can maintain the nation's global leadership position in innovation and productivity only if the digital disparity among these diverse groups can be addressed. Culturally Responsive Computing (CRC) is now the booming strategy using which educators can develop culturally responsive instructional practices through diversity of technologies like multimedia program for effective integration of STEM education in school context. Research and theorists illuminate on methods by which culturally responsive pedagogical strategies can be used to make technology and

technological education reachable to diverse techno-social groups by implementing asset building approaches along with reflectiveness and connectedness. The CRC framework now needs to undergo further refinement to be inclusive of trendy principles that adapt to the particularities of technological education settings. The main purpose of this conceptual paper is to draw attention of readers to comprehend how with the proliferation of digital technology, evolution of new tools for individualized technological creations using CRC framework is extremely necessary for techno-social relationship in professional community as well.

Literature Review and Theoretical Support: It is important to note that CRC grows out of CRP and CRT and shares the same concerns and goals: inclusive dialogical work, liberation philosophy, and an increase in levels of achievement for historically disenfranchised students. (Gay, 2012). Kimberly Scott, an Associate Professor in the Women and Gender Studies Department at Arizona State University (ASU) and Executive Director of a National Science Foundation-funded program, COMPUGIRLS (compugirls.org) with research interests in digital equity, intersectionality, and girlhood studies has made significant contributions to the literature of CRC, even though it still continues being a flourishing field. Culturally Responsive Teaching is the integral root to Culturally Responsive Computing. 'The nexus of "what", "how" and "why"' – Shevalier and McKenzie (2012) gives direction to know culturally relevant teaching. Culturally Responsive Teaching is termed as "a pedagogical strategy constructed to engage culturally and linguistically diverse youth (e.g., African Americans, Latinos, Native Americans, English

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Language Learners)" – Castagno and Brayboy (2008); Brown Jeffy and Cooper (2011). "It concerns empowerment, transformation, validation, comprehension, multidimensionality, and emancipation" – Gay (2010)

Unlike deficit thinking that accuses student's upbringing, communities, backgrounds and families, Culturally Responsive Teaching views these factors as assets on which learning occurs, by replacing the student's conservative heritage with more acceptable practices relevant to their culture. Therefore, we can conclude that "culturally responsive and relevant practices should be culturally sustainable" – Paris (2012). Seymour Papert's theory called constructionism is based on the work of John Dewey, Maria Montessori, Jean Piaget, Jerome Bruner, Lev Vygotsky, and Paulo Freire. Constructionism is opposite of instructionism and intends to place the seeker "in the position of designer/producer rather than consumer" (Harel & Papert, 1990) and this serves as an essential core element of what we need to purposefully create. Instructionism is easily understood as a traditional school model, which leads to "banking education" (Freire 1970).

The Problem Area: The prime concern is to identify whether Culturally Responsive Computing has a positive impact on learners to enable them to be designers or creators of their thoughts by connecting knowledge to learner's ability, strength, prior experience and interest which are strongly related to their race, class, sexual orientation and other intersecting identities. Issues of power, equity and diverse group of culture is sturdily related to education and society at large and yet remains unveiled. The challenge is therefore to examine the dynamic relationship between technology, cultural identities and community and implement CRC as a tool for individuals to interrogate, intervene and change existing societal bias and power relations in a professional community. The research in question is how much Culturally Responsive Computing as an effective tool is, to bring about a techno-social change to bridge the gap between marginalized groups including racial minorities and their white and Asian counterparts.

Critical Analysis of prior reviews on Culturally Responsive Computing: Additional to Kimberly Scott, there are a few authors who chiefly focus on issues found in the intersections of education, computer science and / or technology. Seymour Papert and Andrew Feenberg are prime contributors in the discussion of computers in schools. Their work demonstrates the historicity, although there are more computers in schools than ever before.

Additionally, they harp on the need to keep feeding the innovations as much feasible when looming upon computing in education, and this directly connects to the essence and purpose of critical theory. They both urge us to create environments where learners can themselves learn by exploring with computers, rather than be addicted to use computer as an electronic device to receive information through software. Multiple writers on this topic seem to all approve that conventionally and artificially spawning content areas need to be combined once more, that learners, teachers and schools need to engage in and support an emancipatory dialogical practice of critical inquiry, and that investigation and innovation need to be stimulated and nurtured as a regular vigorous and reflective practice.

Culturally Responsive Computing (CRC) is founded on three pillars of Culturally Responsive Teaching (CRT). – asset building, reflection and connectedness, however CRC frames these factors towards addressing to goals related to Science, Technology, Engineering and Management (STEM) education like game design through mentoring and collaboration. Evidence collected during implementation of virtual and augmented reality in classroom. Developing digital content using CRC tool by educators helps them to integrate a culturally responsive classroom instruction. It helps learners develop their own voice and improve their academic potential by being conscious forces of change in their communities. High-Quality Digital Content (HQDC) along with graphically attractive visual design, ensures that students are naturally drawn into the subject. If a student stumbles on the meaning of a word, HQDC provides alternative explanations. For instance, if students struggle with reading fluency, HQDC provides a read aloud options. If the text is too complex, HQDC provides a lower level of complexity. If reading the text did not engage students, there is a video alternative, or better interactive tool to help them understand the concept. HQDC also provides multiple language options for students learning a second language. Currently, technological advancements in virtual reality helps building new experiences for students such as artificial planetarium which is implemented in few Capital district schools of the state of Delaware. that would be impossible to replicate in any other way.

These experiences can be implemented with minimal financial investment and can be viewed with the inexpensive Google Cardboard device and yet get exceptional 360° perspective, using arrow keys, a mouse, or by dragging on a touch screen. Digital resources therefore help in closing the belief gap among students from low-income families and student and empowers them to showcase their talents globally to achieve success in the world beyond classroom. For instance, I identified which students in my community do not have internet connections at home and enabled me to devise strategies to help them access instruction materials or enrichment programs outside the classroom by scrutiny of the target audience's cultural identities. Digital content and virtual classroom have the potential to serve as an equalizer. I discovered which language is spoken in my students' homes and eventually it enabled me to create alternative plans to better connect with parents for whom English is not the primary language. Case Study on diverse learning needs for a culturally responsive framework Recently, during one of the social events in our community, I casually asked a group of building-level school administrators, "What keeps you up at night?". However, as I drilled a little further into the conversation, I realized that the administrators analyzed the ongoing challenge of catering to the needs of a racially diverse group of learners as their number one concern. Equally daunting for these administrators was to cater the diverse needs of learners from differing languages, economic and cultural backgrounds, not to mention varying learning styles. From offering a range of reading levels within a classroom to ensuring the cultural relevance of topics within the curriculum, these administrators were sought to support the success of all learners in the district, which gradually has become overwhelming. Their basic question was, "How do I implement these principles effectively in a classroom with 30 students or 45 students?". When I travel across various country as a web blogger, I get to interact with leaders from all backgrounds in districts big and small. I have found that the question of meeting the needs of ever-increasing diverse

groups of learners is leading to sleepless nights for many school leaders across urban, rural and semi-urban districts. Educators are turning to a culturally responsive framework using digital content of actionable strategies to address needs of diverse seekers within the classroom based on the hypothesis that all students are capable of digital innovation as according to Gee (2012), students irrespective of their race, social class, ethnic, and/ or gender marginalization can acquire 'premium digital literacy' through a unique digital learning content.

RECOMMENDATIONS AND CONCLUSION

Evidence suggest that Culturally Responsive Computing can be better used to design need based digital programs for underrepresented populations. Improving the computational ability with a culturally relevant theme along with instructional target, prevents the potential of taking the students out of their comfort zone. Culturally Responsive Computing is now the new age vehicle which can be used by students to reflect and demonstrate understanding of their intersectional identities. The barometers of a techno-social tool like Culturally Responsive Computing (CRC) should emphasize on who creates, for whom, and to what extent by reflecting on constructionist approaches to knowledge building rather than who can endure socially and culturally irrelevant curriculum. The interpretation for Culturally Responsive Computing (CRC) is to advocate for narrowing the digital divide by providing support to create and innovate with latest technologies by following a transdisciplinary approach.

If we can synthesize the concepts and practice Culturally Responsive Computing (CRC), then a collective community which includes community leaders, computer scientists, social justice activists, scholars and culturally responsive teachers shall emerge to influence new generation in developing their consciousness as a techno-social change agent.

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