The Global Impact of the Proliferation of ICT:
a Multi-National Study

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Abstract

There has been a significant proliferation of Information Communication Technology (ICT) throughout 21st century society due to the rapid transformation of the educational system. That proliferation has yielded profound changes, including near-instant global communication and ultra-high speed information access and retrieval. Innovative ICT curriculum takes on numerous dimensions including the ability to revolutionize the learning experience, captivate and empower learners and challenge them to success. The demand for blended learning across the curriculum connects on line and face-to-face classroom experiences, balances digital currency and fast forwards education. Content area instruction, particularly in science, technology, engineering and math (STEM) fields, that incorporates a variety of platforms clearly sets the stage for successful language acquisition and alleviates affective filters that may compromise learning. Classrooms in the 21st century are undergoing a rapid transformation into innovative learning environments that are connected, flexible, and collaborative. Incorporation of technology is at the forefront of best practices for 21st century language learning. This effort is coupled with accurate assessment that carefully measures student growth and achievement. While ICT is the foundation of success for language acquisition and incorporation of technology, a strong commitment to sustainable strategies is a goal positively impacting students and educators. It is crucial to ask further questions regarding the impact of ICT globally. These questions and their responses hold a number of opportunities for specific and practical academic pursuits.

The following questions relate to the impact of ICT on educational activities globally and provide a preliminary round of research for subsequent expansive international, empirical research. When posed to individuals from a variety of countries, they can provide a framework for further research and add inspiration to the quest to optimize ICT incorporation in the classroom. These questions are designed to provide information that is expected to lead to a funded study of multi-national/multi-cultural impacts of ICT on 21st century education.

1. *Has new ICT been employed in the classroom settings of your country?*
2. *Are ICT tools employed universally in your country's classrooms? Elementary? Secondary? Post-secondary?*
3. *How has your country's classroom curricula adapted to the technologies that students have already mastered outside of the classroom?*
4. *Has on-line educational support/instruction become available in your country? If so, how much is now available, and in which curricular areas?*
5. *Has blended learning particularly in STEM content areas been emphasized?*
6. *Has the high percentage of English language content on the internet impacted ICT usage in your country's classrooms? If so, how has it impacted language learning, particularly English Language Learning?*

This paper will share the progress of this ongoing study and support endeavors to add inspiration to the quest for ICT success in the 21st century. An overview of the essential components and outcomes emerging that allow educators to leverage their ideas and demonstrate how ICT can transform education.

1. Introduction

The emphasis and impact of ICT is not limited to the P-20 classroom setting, but extends far beyond measurable limits. This explosive and rapidly expanding impact varies depending on the location and technology tools supporting the pace of learning. Social media plays a major role in the institutionalization of technology as a common vehicle for communication. Parents are using technology as a tool to investigate and become more informed regarding their children's education. They are also incorporating

technology to cultivate their concerns [1]. 21st century educators are facing a sea-change in the roles and expectations that the global society is insisting upon. We are no longer able to quietly sit in a passive didactic environment, where teachers profess and student listen, evaluated using testing mechanisms that verify specific sets of specific facts based on the four W's (who, what, where, and when). Questions of "how" and "why" are becoming the relevant focus [2]. In this ongoing study of the multi-national/multi-cultural impacts of ICT on 21st Century education, greater flexibility and cooperation are achieved as educators worldwide embrace the pedagogies of technology and blended learning. The ultimate aim for students and educators alike is to develop and improve knowledge in a setting of multiple modalities. What follows is an overview of the responses to our questions on the multi-national/multi-cultural impacts of ICT.

2. Preliminary responses to the questions

This overview of key responses and thoughts from educators positions us to delve deeper into the enhanced feedback on the proliferation of ICT. Educators from across Europe as well as from Turkey, Iran and China have been interviewed at this point, and follow up sessions are planned to expand the information included in this study. Each one of these questions is expansive enough to merit a complete study on its own, so these responses are only the beginning of a much greater project.

2.1 Has new ICT been employed in the classroom settings of your country?

The response to this question from most who were interviewed was a resounding yes, ICT is being incorporated into the education structure. However, there is a considerable distinction between rural and urban settings as well as technology and internet access in each country. Students in urban areas and classrooms often have increased, redesigned and implemented newer technologies to support learning in the classroom. It is interesting to note that in China, students and parents make tremendous sacrifices to obtain personal technology for student use and access to technology becomes the responsibility of the student and family rather than the school. In some cases, this requires students to find jobs to pay for mobile devices and/or to purchase used devices. The brands that are available tend to be from Korea rather than Apple brands from the United States. (C. Zimmermann, personal communication, September 4, 2015). The tools that make ICT possible are now in the hands of young and old alike, on every continent on the planet. Education practitioners and researchers are facing change at a remarkable pace, and are confronted with impacts of this technological explosion in every aspect of their professional lives [3]. Responses did vary in terms of the resources and opportunities to access emerging technologies. Students and schools in more affluent settings are able to access increased technology, equipment and resources. Overall, access to personal technology became the responsibility of the family and individual, rather than the school.

2.2 Are ICT tools employed universally in your country's classrooms? Elementary? Secondary? Post-secondary?

This response varied greatly depending on the country. In most situations, incorporation of ICT tools in elementary classrooms is limited. Younger students are still thought to benefit from face to face time and close teacher relationships. In the United States, the majority of children in elementary, middle and secondary schools have access to personal computers provided by the school system. Some classrooms have sets of computers for students to use, computer labs, and forms of expanded and creative technology. Other school districts assign personal computers to students who are allowed to take them home. Knowledgeable educators capable of integrating complex roles and dispositions in the service of diverse communities of learners are tantamount to the success of students. These reflective practitioners are instrumental in transforming the classroom in complex settings and boosting learning outcomes [4].
Educators from Germany responded that ICT tools are implemented throughout the curriculum at all grade levels. They emphasize the significance of traditional values and importance of students coming to school prepared to learn. German educators noted the significance of students arriving with appropriate materials and a serious attitude toward learning. (H.Densley, personal communication, June 6, 2015). At the secondary and post-secondary levels, technology is more prevalent in the classroom. Students across the globe tended to share enthusiasm regarding personal mobile and technology devices and sought to obtain this type of technology as soon as possible.

2.3 How has your country's classroom curricula adapted to the technologies that students have already mastered outside of the classroom?

Educators at higher levels support the use of texts that incorporate e-text versions with digital learning tools that interface with the textbook to optimize and diversify learning strategies. They also encourage the use of smart phones and tablets for the integration of applications, information transfer, and real-time class polling. For example, the use of an online survey tool called Poll Everywhere is helpful when the students can text their answers in real-time. One strategy is to make up surveys about common misconceptions on media-hot topics in science like evolution or climate change. Then the instructor can assess course majority opinion, go through the questions with the class using the polling tool and provide instant feedback at the group level. To enhance targeted feedback at the individual level, instructors suggested assigning an article and requesting that students respond using the discussion tool on the course website. This allows educators to provide individualized feedback and cultivate a personalized teacher-student relationship [5].

2.4 Has on-line educational support/instruction become available in your country? If so, how much is now available, and in which curricular areas?

Although on-line educational support/instruction is available throughout the world, this varies considerably by location. In Turkey, students generally use tablets and the internet in the classroom, yet Turkish educators explain that, although technology support is increasing, there are still challenges (technical, geographical, budget) to using technology outside of the classroom (S. Kalem, personal communication, September 2, 2015). Educators from Iran explained that ICT is very new to mainstream education and is hardly used in schools other than at the secondary level. In spite of young people's interest in and their mastery of ICT, schools do not usually include it in their educational system. The most common technology in classrooms used by both teachers and students is the PowerPoint presentation format. Some students feel that they still learn better in traditional ways from a teacher rather than a computer and, at times, the speed of the internet is not high enough to keep in touch. For example, in the Iran English institute, on-line courses were offered in previous years, but no one applied to take advantage of the opportunity. (N. Zarei, personal communication, September 2, 2015).

2.5 Has blended learning particularly in STEM content areas been emphasized?

There are numerous advantages to blended learning and the valuable results of combining traditional face-to-face instruction and digital online learning. In STEM fields, students can work independently in an environment that addresses their particular STEM interests. By incorporating technology, students acquire flexibility in learning in addition to crucial content knowledge. While blended learning is fairly common across Europe, educators in Denmark present a model for developing blended and online learning based on a given curriculum and typical learning objectives at the university level. The model consists of a three-step-process in which the instructor formulates product-oriented tasks, develops and structures the learning materials and tools, outlines a schedule, and supports the students' learning activity in developing a product [6]. Similar models are being introduced at the secondary level throughout Western Europe and require new roles and skills for teachers. Depending on the grade level, this can take various forms and requires tasks and expectations appropriate for the learner.

For example, in science courses that focus on improving taxonomic skills in biological diversity like botany and mycology classes, students are encouraged to use applications that have been developed for regional organismal identification. A tool called Simbio [7] simulates biological or ecological scenarios in virtual lab platform allowing the students to manipulate theoretical experiments so they can see what happens when you change a variable in one of these virtual experiments. It helps the students understand difficult scientific concepts by allowing them to "do" the experiment and see the results.

In order to validate and articulate the informal, self-directed learning that is happening outside of the formal school setting, the use of assessment tools that incorporate projects that happen beyond the formal course hours are encouraged. Giving students credit for life experiences that are engineered to occur outside the classroom is valuable. In the science classroom, students can be awarded credit for patronizing museums, nature centers, and special exhibits that are an educational learning opportunity for students, and a benefit to the community as a whole.

2.6 Has the high percentage of English language content on the internet impacted ICT usage in your country's classrooms? If so, how has it impacted language learning, particularly English Language Learning?

The implementation of responsive ICT learning strategies is on the rise throughout the world. The limitations to language learning are directly linked to internet access creating a digital divide among those who have quality technology and those who are challenged by an inability to take advantage of technological advancements. With regard to language acquisition, numerous tools exist universally that incorporate English language content. One example of this relates to music and song lyrics that combine excellent teaching strategies with leisure activities. Educators interviewed emphasized that students learned more at home from the English language on the internet rather than in the classroom.

Responses to this question varied depending on the English as a Foreign Language (EFL) situation in the country. For example, in Iran, the English language content has impacted ICT usage at a personal level for learning purposes and this, in turn, has enhanced students' motivation to improve their English, especially in an EFL situation (N. Zarei, personal communication, September 2, 2015).

3. Conclusions and implications for further study

This preliminary study has explored the proliferation of ICT at a global scale and raises many questions that deserve further exploration. Teachers have always held the role of subject experts, but they now must be content facilitators and a gateway to the use of technological tools that help with content mastery. It is the responsibility of the educator to point the students to the optimal websites, tools, and apps that are most helpful and up to date. Ambrose points out that it is essential to "create assignments that focus on strategizing rather than implementation" [8]. The crucial roles of teachers in an interconnected system where students have multiple opportunities to legitimately learn outside of the structure of the school system are challenging educators globally.

Education policies must transition to support more flexibility in terms of timing and locations for learning. The use of hybrid and online course offerings has the potential to encourage participation of a much wider student demographic. The use of discussion boards, digital submission, and online group projects in classes that meet in real-time can also improve communication and ease of use. In-class projects that involve service-learning or field components which embrace a way of learning that is rooted in doing are the wave of the future.

As we consider what an "educated person" looks like today, we must examine how that picture will change in the future, given how ICT has changed the fabric of our society and how technology will continue to initiate and inform change in education. Because information is less costly in modern times, the educated are now those who know how to find the answers rather than the answers themselves. That is why it is critical that, as instructors, we support an educational paradigm that isn't necessarily about content mastery, but emphasizes a student's capacity to problem solve if given a challenge and limited suite of resources to solve it. Further discussion is required and this preliminary study is only the beginning of the examination of ICT and its powerful impact on the rapid transformation of learning.

References

[1] M. Blumenreich & R. Jaffe-Walter (2015). Social media illuminates some truths about school reform *Kappan.* 97 (1). 25-28p.

[2,3] Boothe, D., O'Bryhim, K., Wickstrom, C., Caspary, M. (2013). Posing 'Big Questions" regarding changes in education prompted by the rapidly expanding 21st century ICT proliferation. *Proceedings from the 6th International Conference of Education, Research and Innovation, Seville, Spain.*

[4] Boothe, D. & Clark, L. (2014) The 21st Century Classroom: Creating a Culture of Innovation in ICT. *Conference Proceedings for the 7th International Conference for Language Learning.*

[5,8] Ambrose, S., Bridges, M., DiPietro, M., Lovett, M., and Norman, M. 2010. Create assignments that focus on strategizing rather than implementation. *How Learning Works: Seven Research-based Principles for Smart Teaching.* Jossey-Bass Press. 301p.

[6] Dalsgaard, C. Institute of Information and Media Studies, University of Aarhus, Helsingforsgade 14, DK-8200 Aarhus N, Denmark, cnd@ imv. au. dk-2 The E-learning Unit, University of Aarhus, Fredrik Nielsens Vej 5, DK-8000 Aarhus C, Denmark, godsk@ e-learning. au. dk.

[7] Simbio. 2015. Virtual Biology Labs. http://simbio.com/