Designing and implementing e-learning classrooms to improve students' writing

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Abstract: This paper aims to critically review how we can incorporate technology in school education to provide students with the critical skills needed for the 21st century. This paper will discuss how the knowledge economy demands a new set of survival skills from our students, and how appropriate use of pedagogical use of technology can enhance the quality of school education in the twenty-first century. Technological Pedagogical Content Knowledge (TPCK) framework and Active-Constructive-Interactive (ICAP) framework have been reviewed to examine the important balance of content, technology and pedagogy in designing and implementing effective e-learning classrooms for our students. The design of an online automated writing evaluation system has been examined to evaluate how it can improve students' English writing and their 21st century skills. This system will be put into practice in the next stage of this study.

Keywords: Process writing, 21st century skills, English writing skills, evaluation of CAL systems, automated writing evaluation

Introduction – The world is changing FAST!

IBM conducted a survey with 1,500 Chief Executive Officers from 60 countries in 33 industries in 2010 reveals alarming results [11]: 1) *Fewer than HALF* of the CEOs believe that their companies are equipped to deal with complexities and velocity of a world that is changing on a massively interconnected system. 2) The *impact of technology* on organizations has jumped from the 6th to the 2nd place in importance, and the executives believe that more technology-based solutions will be needed in the 21st century. 3) *Creativity* has been selected as the most crucial factor for future success in an increasingly complex world. *Are our students equipped with these skills?*

Thomas Friedman [8] also makes his case on his book, *The World is Flat*, that the world is shifting from an industrial economy to a highly complex knowledge economy. This global and Web-enabled platform allows any individual, any group, any school and any organization in the world to use new tools to communicate and collaborate. Wagner argues that the current school systems only prepare students for the tests, and even the best schools in the US do not teach the must-have skills students need to have to survive in the 21st century [17]. He describes such issue as the "*Global Achievement Gap*" and proposes that students must acquire subject content knowledge as well as the seven survival skills for the twenty-first century: critical thinking and problem solving, collaboration across networks and leading by influence, agility and adaptability, initiative and entrepreneurialism, effective oral and written communication, accessing and analyzing information, and curiosity and imagination.

1. The 21st Century Skills (21C)

1.1 What are the 21st Century Skills that our students need to develop?

Knight describes that education systems in the 20th century prepared people for work related to manufacturing, and supported a vocational training mentality [13]. The knowledge economy in the 21st century focuses on the trade in knowledge through the medium of communication technology. Knight indicates that there is a need to transform the traditional models of education with one that reflects the knowledge economy and the need for lifelong learning. Kong [12] further summarizes the 21st century skills (21C skills) as the skills needed to achieve the desired learning outcomes/educational goals in the 21st century: inquiry, critical thinking, communication and collaboration.

2. E-learning classrooms for the 21st century

2.1 Educational goals for the e-learning classrooms

When we design e-learning classrooms for the 21st century, it is important for us to make sure that we are providing students and teachers with an environment to support to achieve the 21st century educational goals [12]: use digital technology to facilitate learning and teaching, increase students' autonomy through the usage of ICT (on determining the educational goals and learning strategies, shift towards a more learner-centric model), as well as to provide students with more authentic learning opportunities through simulations, inquiry and collaborative learning (to develop students' inquiry, reflection, communication and collaboration skills)

2.2 Designing the e-learning classrooms

Many researches indicate that computer-assisted instruction in class had a positive effect on teaching and learning [6]. Mishra & Koehler [15] make the case that merely introducing technology to the educational process is not enough. They proposed a conceptual framework which describes three main components of the learning environments: content, pedagogy and technology. They emphasize the connections, interactions, affordances between and among these three components. The Technological Pedagogical Content Knowledge (TPCK) model suggests that knowledge about content (C), pedagogy (P) and technology (T) is crucial for effective teaching and learning. However, these three elements should not be viewed independently, and we should emphasize how these three elements relate to and complement each other.

Another important area to consider when we design e-learning classrooms relates to the design of different learning activities for our students. Chi [4] presents a conceptual Active-Constructive-Interactive framework for differentiating passive, active, constructive and interactive learning activities. Chi also proposes a hypothesis that interactive activities ("dialoguing") are most likely better than constructive ones ("generating") ; constructive activities will likely be better than active activities ("manipulating") ; while active activities will likely be better than being passive ("receiving").

3. Process writing / ETS Criterion – an online automated writing evaluation service for secondary school students

3.1 Process writing to improve students' writing skills

Process writing has proven to be a long-lasting and innovative teaching approach since the 1980s [2005]. Traditional approaches to the teaching of writing focus on a teacher-centric model and the written product [13]. As a result, students' writing pieces are rather mechanical, and they also lack the skills needed to do free writing [13]. In addition, struggling students tend to produce writing pieces that are shorter, more poorly organized and weaker in overall quality [9]. They lack the motivation and confidence in writing [3].

Flower and Hayes [7] are among the first group of researchers who studied writing as a cognitive and problem-solving process. They identify that writing can be viewed as a set of unique thinking processes, and these processes have a hierarchical and non-linear structure. In addition, Flower and Hayes indicate that writing is goal-oriented, and that writers explore and refine their goals through the process of writing (planning, translating, reviewing and the monitor). Teachers in Hong Kong were introduced to the process approach to the teaching of writing in the 1990s [3] & [16]. Research studies on teaching process writing to students confirm that this approach can be a workable and effective approach in enhancing students' writing skills [2], [3] & [10]. It also increases students' confidence in writing and a greater awareness of the different stages in writing. Despite the long history of its benefits, the process approach to writing is still not being widely adopted by schools in Hong Kong [5] & [13]. That could have been caused by the lack of teacher training and time constraints on both the students and the teachers. Teachers need to allocate extra lessons to go through the different writing stages and students need the time to do the actual writing.

3.2 Will an online automated writing evaluation service promote process writing?

We are implementing a process writing project with three secondary schools utilizing ETS Criterion. Criterion is a web-based automated writing evaluation ("AWE") service developed by Educational Testing Service (ETS) in the US to evaluate students' writing skills and provide instant score reporting and diagnostic feedback [1]:

Educational goals:	Improve students' subject content, essay writing skills (e.g. cause-and-effect and persuasive essays), collaboration and critical thinking skills
Pedagogy:	Process writing & Peer Reviews
Content:	Language across the curriculum (existing subject content being taught)
Technology:	Criterion online writing evaluation service (with Artificial Intelligence & Natural Language Processing techniques)

3.3 Technological-Pedagogical-Content Model

Teachers create their own writing assignments or select from a list of predefined topics from the online library. Once a student submits his/her essay online, the system provides *instant scoring and feedback on errors* in grammar, usage, mechanics, styles, as well as organization & development. Criterion uses an artificial intelligence system with natural language processing to extract distinct features (over 50 language features) from essays, and to predict (with statistical techniques) what human raters will score a particular writing assignment [1]. *Students will then be able to quickly revise, edit and re-submit/re-publish their essays. There are no preset limits on the number of resubmissions, and the ability for*

the system to provide instant feedback to the students upon their submission will motivate them to write more and learn from the trait feedback analysis and comments from teachers.

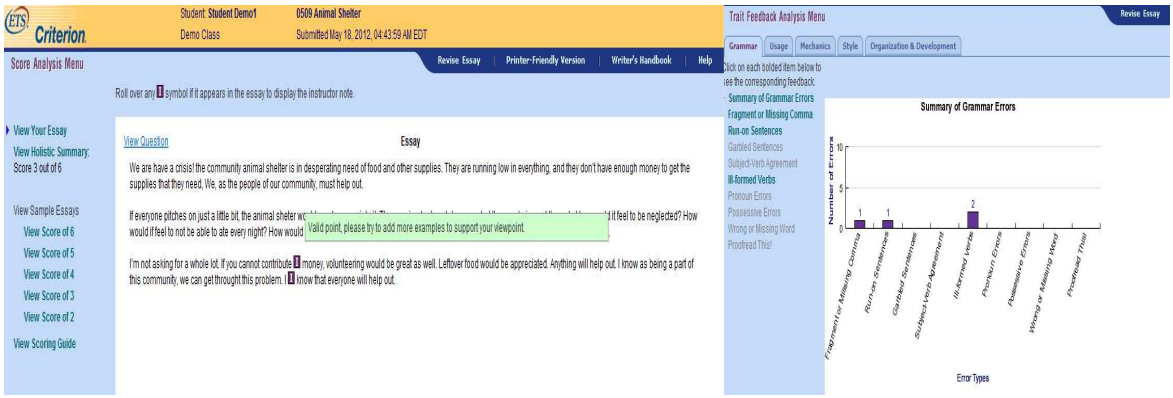

Figure 1: Students receive instant feedback upon submission of their writing

Teachers will also be able to give students feedback online, and the system also supports peer-editing. Teachers will also be able to access different analytic reports online to monitor students' writing progress.

Because the Criterion Service is available online, students and teachers **can access it seamlessly from anywhere with an internet connection at anytime** – school, home, libary or office. The instant feedback and easy-to-use features encourage frequent writing practice, one of the keys to improving writing. Students can also choose from **writing templates/scaffolds** to plan and organize their essays, as well as communicate with their teachers and fellow classmates on peer editig The writing service also enables teachers to spend more time on teaching and focus their instruction in critical areas by reducing time spent assigning, reading and correct student writings.

Attali [1] and Chen & Cheng [3] reported that students benefited from automated writing evaluation systems, for example students had higher writing scores [1]] fewer errors in their resubmissions and increased writing practice. Students could also use the system effectively during the drafting and revising stages of process writing [3].

That is consistent with Wagner's view regarding how this generation is motivated to learn: instant gratification and use of the web for self-directed learning and peer interactions. That would allow teachers to better understand their students' writing ability and thinking process. While it supports all stages of English-language writing, the Criterion service does not grade essay content and cannot take the place of instruction and feedback in a blended learning environment. We plan to study this area in detail (e.g. how we can most effectively incorporate this automated writing evaluation system into the Process Writing curriculum) in the next stage of our study.

4. Conclusion

This paper critically reviews how we incorporate technology in school education to provide students with the critical skills needed for the 21st century. Technological Pedagogical Content Knowledge (TPCK) framework and Active-Constructive-Interactive (ICAP) framework have been reviewed to illustrate the important balance of content, technology and pedagogy in designing and implementing effective e-learning classrooms for our students. The design of an online automated writing evaluation system has been examined to evaluate how it can improve students' English writing and their 21st century skills. This system will be put into practice in the next stage of this study.

References

[1] Attali, Y. (2004, April). Exploring the feedback and revision features of Criterion. Paper presented at the National Council on Measurement in Education (NCME), San Diego, CA.

[2] Chan, K.K.W., & Kong, S.C. (2011, December). Process writing: An online collaborative writing environment for primary school students. Proceedings of the 19th International Conference on Computers in Education: ICCE 2011, Thailand.

[3] Cheung, M. and Chan, A. 1994. Teaching Writing as a Process. Hong Kong: Education Department.

[4] Chi, M. T. H. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. Topics in Cognitive Science, 1(1), 73-105. doi:10.1111/j.1756-8765.2008.01005.x

[5] Curtis, A., Heron, A. (1998). On being less innovative: Peer groups and process writing in Hong Kong.1(1), Asia Pacific Journal of Language in Education, 99-118.

[6] Debevec, K., Shih, M.Y., & Kashyap, V. (2006). Learning strategies and performance in a technology integrated classroom. Journal of Research on Technology in Education, 38(3), 293-307.

[7] Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. College Composition and Communication, 32(4), pp. 365-387.

[8] Friedman, Thomas (2006): The World is Flat: The Globalized World in the Twenty-First Century. London: Penguin.

[9] Harris, K. R., Graham, S., & Mason, L. H. (2006). Improving the writing, knowledge, and motivation of struggling young writers: Effects of self-regulated strategy development with and without peer support. American Educational Research Journal, 43(2), 295-340.

[10] Ho, B. (2006). Using the process approach to teach writing in 6 Hong Kong primary classrooms. New Horizons in Education, 53, 22.

[11] IBM (2010): IBM 2010 Global CEO Study: Creativity Selected as Most Crucial Factor for Future Success. Available: http://www-03.ibm.com/press/us/en/pressrelease/31670.wss

[12] Kong, S. C. (2007). The development and validation of an information literacy model for hong kong students: Key issues in the professional development of teachers for capacity building. Technology, Pedagogy and Education, 16(1), 57-75. doi:10.1080/14759390601168031

[13] Knight, C., Knight, B., & Teghe, D. (2006, May 31). Releasing the pedagogical power of information and communication technology for learners: A case study. International Journal of Education and Development using ICT [Online], 2(2). Available: http://ijedict.dec.uwi.edu/viewarticle.php?id=167.

[14] Lim, C. P., & Chai, C. S. (2008). Teachers' pedagogical beliefs and their planning and conduct of computer-mediated classroom lessons. British Journal of Educational Technology, 39(5), 807-828. doi:10.1111/j.1467-8535.2007.00774.x

[15] Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A new framework for teacher knowledge. Teachers College Record. 108(6), 1017-1054.

[16] Pennington, M. C., Brock, M. N., & Yue, F. (1996). Explaining Hong Kong students' response to process writing: An exploration of causes and outcomes. Journal of Second Language Writing, 5(3), 227-252.

[17] Wagner, T. (2008) 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.