

Meeting the Demands of the 21st Learner

Delivering Elementary Science and Math Methods Courses Online an Auto-ethnographic Approach

Cleveland Hayes¹, Andy K. Steck² and David R. Perry³

¹*Teacher Education and Advanced Studies in Education and Human Development,
University of La Verne, College of Education and Organizational Leadership, La Verne, CA, U.S.A.*

²*Liberal Studies, Education and Teacher Development,
University of La Verne College of Education and Organizational Leadership, La Verne, CA, U.S.A.*

³*Teacher Education, Liberal Studies Education and Teacher Development,
University of La Verne College of Education and Organizational Leadership La Verne, CA, U.S.A.*

Keywords: Online Learning, Teacher Education, Hybrid Courses, Challenges in Teaching, Autoethnographic Methods, Teaching Strategies.

Abstract: In the last two decades, online enrollment in higher education has increased substantially. As more students enroll in courses, Universities may find that the demand within the institution will grow beyond current offerings. Within the field of teacher education, hundreds of online course offerings in teacher preparation programs worldwide are offered. The advantages to online versus face-to-face courses are numerous. Despite the marked increase in online course offerings and enrollment, however, some obstacles do exist in online classes. A review of recent literature indicated a need to study the challenges faced by faculty who teach hybrid courses and the need to better understand what constitutes quality online education. So, the importance of this research is how do teacher preparation programs meet the demands and charges of institutions while maintaining quality of instruction. Using autoethnographic methods, two professors who teach elementary science methods and elementary math methods chronicle how they begin to address the challenges in online teaching and how they overcame those challenges to meet the needs of the 21st century learner. The participants in this study describe how they apply constructivist concepts solely online. These outcomes are what we call the call the good, the bad and the ugly.

1 INTRODUCTION

With the pressures of teaching online, it is important to consider faculty's perspectives on teaching in this environment. One way to understand how faculty members experience online teaching is by having faculty members' reconstruct experiences, and elaborating on the meaning that they assign to those experiences. The two participants in this study while have the same objectives, providing a quality online course; are intentional in the assignments given to students as a way to achieve similar but different objectives. For example, Cleveland with a background in social justice education his narrative is grounded in the 8 essentials for empowered teaching in learning. As a former public school science teacher, he knows that science is a gatekeeper who often keeps ethnic minority, the

poor and girls locked out of the gate and he wants his students to be able to give their students the keys to that gage. Conversely, Andy's outcome is to lower the affect of teaching math.

The purpose of this paper, using autoethnographic methods two faculty members at a small liberal arts college describe how they meet the above objectives and others in a methods course taught solely on line. These outcomes are what we call the call the good, the bad and the ugly.

2 LITERATURE REVIEW

Online education is defined as a platform for delivering educational content and facilitating instructor-student interaction over a computer network (Shelton and Saltsman, 2005). Online

courses are available anytime and anyplace and learning is interactive and collaborative. Students and instructors share discoveries throughout each step of the course. Many online courses use a combination of delivery modes including a variety of technologies.

Many faculty members in higher education have been asked to teach online. While online education has become routine with 65% of graduate programs across the country using the Internet to deliver classes (Norton and Hathaway, 2008), many colleges and universities are still struggling to discover how to provide a quality educational experience. For students, the virtual classroom provides unlimited access to course material, including resources, virtual manipulatives, lecture notes, and even video or audio recordings of lectures (Owen, 2010). For the instructor, however many cast a skeptical eye on the learning outcomes for online education. Allen, Seaman, Lederman and Jaschik (2012) reported that nearly two-thirds say they believe that the learning outcomes for an online course are inferior or somewhat inferior to those for a comparable face-to-face course. Most of the remaining faculty members report that the two have comparable outcomes. Even among those with a strong vested interest in online education – faculty members who are currently teaching online courses – considerable concern remains about the quality of the learning outcomes.

Dziuban et al. (2005) found that faculty perceptions regarding student learning in a hybrid courses were very satisfying and that student learning and performance is equal to or better than traditional face-to-face course settings.

3 THEORITICAL FRAMEWORK

As a framework for designing constructivist learning environments, Jonassen and Rohrer-Murphy (1999) postulate that conscious learning emerges from activity (performance), not as a precursor to it. Engestrom (in Jonassen and Rohrer-Murphy 1999, 72–77) lists six steps when designing learning experiences. These are: 1) clarify the purpose of the activity system (what are students' goals, motives and expectations?); 2) analyze the activity system (for example the student as subject, the community in which the subject works, the outcomes that need to be achieved); 3) analyze the activity (such as problem-solving actions); 4) analyze tools and mediators (such as methods, language, forms of work organization); 5) analyze the context (the real-

life, non-instructional contexts within which activities occur); and 6) analyze activity system dynamics (this requires a final assessment of how all the components affect one another).

Bruner's (1990) Constructivist theory has been adopted and utilized for many different instructional situations. The online classrooms can incorporate Bruner's theory of Constructivism in a number of ways. Discovery Learning is one way that Science teachers can make use of the theory since the theory itself is somewhat close to scientific inquiry. Similarly, Pais (1997) noted that the constructivist framework for mathematics education makes prominent the notion that each learner must actively construct her/his own mathematical concepts and that, ultimately, mathematical knowledge consists in the learner's individual ability to do mathematics in a given context, by purposefully re-constructing useful mathematical concepts and tools appropriate to the given context. Teachers have to communicate how to do mathematical operations to students so that they understand. The Constructivist approach requires that each learner actively construct their own internal concepts into their mathematical schema.

4 METHODS

Reed-Danahay (1997) describes autoethnography as enlisting a rewriting of the social self. For the purpose of this research we are asking the questions, "What are triumphs and challenges of moving a course historically designed to be taught face-to-face to solely on line? A second research question would be how are we meeting the demands/needs of the 21st Century learner/student and the 21st Century student these pre-service teacher will eventually teach?

Quicke (2010) argues that autoethnographic work often involves, as is the case of this project, looking back and analyzing personal memoirs and is often focused on the self as participant in the social process. Autoethnographic accounts of experiences, by virtue of being self-reflective, are deeply personal and researchers using this still must produce a highly personalized revealing text in with an author tells stories about his or her own lived experiences.

Autoethnographic methods according to Douglas and Carless (2013) are centered on the various aspects of our lives. While these narratives can serve as models for others to reflect on their practice as described in the narratives. It is important that these narratives are individual and does not speak

for other professor who teach methods course on line. But as well all stories we as a community of academics we can all learn for each other's stories and lived experiences (Douglas and Carless, 2013; du Perez, 2008; Leonardo, 2009).

Cleveland Hayes and Andy Steck are faculty members at a small private college in the American West. Several years ago the Dean of the College answered the Universities call to move as many of the College's program to totally on-line and /or hybrid were the course are taught as in the case of this department 70% face to face and 30% on line. Two of the authors of this paper were also tasked to provide our science and math methods courses totally on-line. Initially, we were both skeptical about teaching a methods course totally on line. The first question we asked ourselves was how are we going to create a constructivist classroom online. This translates to how do we provide pre-service teachers a constructivist experience on-line and in the case of one of the researchers how was he going to incorporate social justice curriculum into an online environment, because so much of social justice education depends on relationships between students, between students and the professor and between the content. This researcher sees teaching as a how to think process and less how to process and how too (Hayes et al., 2011). This was a challenge for Cleveland. Bottom line we have two different approaches to teaching methods course in general let alone in an online setting.

5 AUTO-ETHNOGRAPHIC APPROACH TO TEACHING ON-LINE

5.1 Cleveland

There are several themes that come out of my narrative. The more pressing theme is lowering the students' affect towards the science content as well as teaching science. As a former high school science teacher, I know that science is a gatekeeper. It is a gatekeeper because while it may open many opportunities not knowing the content is also a gate closer. As a gatekeeper it keeps students, especially those in poverty, from career opportunities that may get them out of poverty: careers in health care, science and engineering courses.

A second theme from my narrative is that by taking a class on line forces pre-service teachers to use the latest technology and Web 2.0 tools not only

for their engagement in the curriculum but also as a means to engage their future students in the curricular. Because if as educators we are going to move students out of poverty, closing the digital divide through teaching a methods course online, provides opportunities for students to use the latest technology tools as a way to show their understanding of the science concepts. The way the students have to engage the material forces them to learn ways to close the digital divide as we know being educated is one way of getting students out of poverty and technology is one of those ways to help students out of poverty (Hayes et al., 2011).

5.2 Andy

Several themes emerge teaching a math methods class online. The first theme is the affect of teaching math. Another theme is changing the mindset of students to teaching math effectively versus the approach they learned from in their own experiences.

How do I as the instructor reduce math anxiety my students exhibit and endorse when they share their "stars and wishes" of their strengths and weaknesses in math as an initial assignment. I learn quickly the anxieties they share about teaching math. In the face-to-face class, learning to use a variety of manipulatives to understand math concepts prior to learning the procedural concepts greatly reduces the amount of anxiety. Students comment, "if only we used these when I was in elementary school my math skills would be stronger. The online challenge to use manipulatives is met through virtual manipulatives found on many websites, but this challenge is also met as students demonstrate their understanding and use of manipulatives through technology using Voice Thread, You Tube videos or Jings.

Changing the mindsets of students is a challenging feat in itself when an instructor meets face-to-face with students to initiate discussion, set with examples of how effective instruction can occur. To meet this challenge online, videos of classrooms must be analyzed, as are articles through the use of blogs and wiki discussions in class. To show an understanding of how effective instruction is internalized, one assignment is to have students in the course create word problems online, solicit responses from students at the appropriate grade level and analyze the various approaches used to complete the word problems. A reflective piece is written as a response to the analysis. Students must begin to understand there are a variety of procedural

skills, which can be developed and used to solve problems, versus the one procedure they learned themselves.

6 CONCLUSIONS

Through the use of autoethnographic methods, this paper responds to 1) the challenges faced by faculty who teach hybrid courses and 2) the need to better understand what constitutes quality online education. This research with two professors who teach elementary science and math methods and how they begin to address the challenges and how they overcame those challenges to meet the needs of the 21st century learner. In our classes we have both traditional undergraduate student and adult learners from our universities program geared towards working adults and the unique set of challenges they bring. Through our narratives we are self-reflective on how we struggled and in many cases overcame the challenges finding ways to deliver quality distance education.

There is a growing body of literature that addresses what students identify as challenges in distance education (Hughes, 2007; Hilgenberg and Tolone, 2000; Chen et al., 2007; O'Malley and McCraw, 1999). However, there is not the same level of research about what instructors believe and their perceptions, concerns and challenges teaching in the online classroom. Interest in online learning will continue to grow as more and more students experience online courses (Brown and Corkill, 2007). As more students enroll in courses, Universities may find that the demand within the institution will grow beyond current offerings. So, the importance of this research is how do teacher preparation programs meet the demands and charges of institutions while maintaining quality of instruction.

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