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Virtual Collaboration and Communities of Practice in Learning and Instruction

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Abstract

This research describes the development of online instruction designed to prepare teachers to implement virtual collaboration and communities of practice in the classroom. Student participants were inducted into an experience of interacting with resources highlighting the importance of communities of practice and virtual collaboration and encouraged to apply theories and technology in lesson designs and world wide web based projects. The study resulted in an overflowing of genius creations incorporating communities of practice and virtual collaboration. Virtual communication has become a necessary channel of activity in modern society and has tremendous potential for knowledge and development. There is an immediate need and incredible possibility to enable our population with the skills to connect among expanding groupings of information and people. Training teachers to apply and facilitate learning about and use of technology virtual learning is fundamental and possible.

Keywords

Virtual Collaboration, Communities of Practice, Online Education, Teacher Training

1. Introduction

There already existed tremendous potential for distant connection. There now exists a growing urgency for creative solutions in virtual connectivity. Wenger (1999) has advocated for developing communities of practice, which support communication and work among varying participants. Wenger's work suggests that communities of practice offer mentoring relationships and applied experiences, which are needed in educational contexts. Universities were first in utilizing and researching courseware for communing (Rice, 2006; Smith et al.,

2009; Allen & Lewis, 2006) and now many K-12 schools and teacher education programs around the world are activating and investigating the collaborative use of the Internet, the World Wide Web archives and tools, and cellular telephones (Rolando et al., 2014; Kennedy & Archambault, 2012; Bell & Linn, 2000; Barbour & Reeves, 2009; Cavanaugh, 2001; Dipietro, 2010).

Brown and Deguid (1991) have long argued for collaboration in communities and found improved learning via shared experiences. Perhaps, engaging teachers in more conversation about collective interaction could lead to furthered educational design and occurrence. Collins (1987) has recommended strategies for teaching with interactive technology. Scardamalia (Scardamalia & Bereiter, 1991) was one of the earliest thinkers encouraging communal creation of understanding in knowledge maps. The COVIS Project continued the idea of communal creation on the World Wide Web (Gordon et al., 1996). Silva and Breuleux (1994) were also early in looking at Internet based design and collaborative learning and its important potential impact in extending learning.

Many researchers are supporting the idea that we should work together, sharing resources, and communicating via varying forms of technology including images, audio, and text (Rheingold, 2000; Swan & Shea, 2005; Sheehy, 2008; Murphy & Cifuentes, 2001; Minoli, 1996; Preece & Maloney-Kritchmar, 2005; Hung et al., 2005; Hiltz & Goldman, 2005; Won Hur & Brush, 2009; Goodyear et al., 2014; Wegener & Leimeister, 2012). Technologists are evolving resources for communing and designing activity specifically for teaching and learners as the need for greater connection arises and the requirement for virtual participation.

The California School of Education at Alliant International University has included a course in Technology in the Curriculum in a sequence of courses designed for current and future educators to develop technology and learning integration skills. Course learning outcomes include critiquing instructional design of educational technology and evaluation theories and policies in teaching and learning and applying technology design, implementation, and evaluation theories and policies in education. A particular component of the course has been dedicated toward developing virtual collaboration in virtual communities. Kaplan (2017) describes the full course and course components.

The objective of this research is to develop teacher activation of and participation in virtual communities and determine how to effectively integrate communities of practice and social networking in lesson plan and project designs. A further goal is to develop the online instructional technologies to accomplish this goal. This paper describes a study in training teachers to understand and apply virtual collaboration and community of practice in instruction. The design of the study is presented in Section 2. Participant, instrument, and analysis information are presented in subsections 2.1 through 2.3. The course Modules are described in Section 3. Results are presented in Section 4. The Conclusion is given in section 5.

2. Design

2.1. Participants

Table 1 shows a number count for participant make-up out of 20 volunteers.

Study participants included Alliant International University California School of Education Credential and Master of Education students enrolled in Technology and the Curriculum over the course of several terms over two years. Twenty of sixty students volunteered to include their work in the study, seven male and thirteen female. The participant body is made up of teachers and teachers in training on intern and student teaching tracks in special education, single subject in varying subject areas and multiple subject credentials. Selection was determined by required participation in the course and volunteering for the study. The volunteers were representative of the course participants and teacher candidates in the University.

Table 1. Participant make-up.

Participants	
Male	Female
7	13

2.2. Procedure and Instruments

The course is divided into eight weekly modules covering technology in curriculum theories. Each module covers a set of theorists in technology in the classroom and instructional design. Modules include: 1) Blended Learning & Flipped Classrooms, 2) Technology & Education Policy, 3) Media Literacy, Learning Theories, Multimedia & Introduction to Instructional Design, 4) Anchored Instruction, Situated Cognition, & Goal-based Scenarios, 5) Teaching and Learning by Design, & Problem and Case based Learning, 6) Games, Simulation, Microworlds & Programming in Learning, 7) Communities of Practice, Learning Communities, Data Analysis and Visualization, and 8) Technology in Education Evaluation. The modules are made up of resources including links to course content and assignments and communication forums. Resources include readings and applications. Assignments include reviewing and discussing application of theories, creation of artifacts applying theories, and evaluation of artifacts applying theories. Assignment categories include discussion, course project, and lesson plans. Additionally, the course includes a Syllabus, Announcements, Course Materials, Discussions, Conferences, Grades, Chat, and a Questions center.

Study instruments were embedded into the Technology and Curriculum course in the Virtual Collaboration and Communities of Practice Module. Participants were presented with Emotional Intelligence resources and assignments comprised of lesson designs and projects. Participants completed activities individually and in groups during the course of the week of the module and submit-

ted their assignments online. Understanding and application of theory were measured in lesson designs and group project designs received through online submissions in digital word or web format. Lesson designs required selection of a topic to teach based upon State Standards with a design incorporating the reading. Project designs were culminating group or individual work incorporating the reading into projects to improve critical thinking.

Three sets of prompts were utilized. The first prompt queried participant analysis of existing virtual communities of practice and requested to "Join several sites for virtual learning communities. You may use the ones provided this week or some you know of on your own. Respond to the following prompts in the Virtual Learning Communities forum by Wednesday: What communities did you join? How do they support learning and instruction? What kinds of activities are happening in the community?"

The second prompt queried lesson designs incorporating theories of virtual collaboration and communities of practice. "Adapt one of your lessons designs, from Weeks One, Four, or Five, to incorporate the following: Communities of practice, social networking, or collaboration, Argument, visualization and mapping, or data analysis."

The third prompt queried applications of theory and design in collaborative projects involving virtual collaboration and community of practice in action. "Brainstorm, in your project groups, how communities of learning and social networking and visualization and data analysis might be integrated into your group project."

2.3. Analysis

Student research and constructions were analyzed for theory understanding and referencing and application of theory in education. Theory discussions and analysis noted whether they acknowledged and noted theory and what they found relevant in the theory. Lesson analysis involved accounting for and describing referencing to theory and application of theory in lesson design. Projects were analyzed for theory referencing and application in project design.

3. Virtual Collaboration and Community of Practice Module

Module 7 is a unit on Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education. The goal of the module is to provide an overview of Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications. Learning objectives include analyzing principles of Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications and determining how to effectively apply the principles of Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications in lesson plan and project design. Learning objectives connect to School guiding Principles of Leadership, Application and Engagement.

The module is made up of readings, forums, and assignments. Readings include Swan and Shea (2005), Collins (1987), Bell and Linn (2000), and websites such as Wenger-Trayner's Communities of Practice, Geospatial revolution from Delaware Department of Education, GIS in K-12 Education from Minnesota Department of Education, National Academies Press Committee on Thinking Spatially, Google Maps, Google for Education, Apply Education, Intel Education, At&T K-12 Education, Common Sense Education, Wikipedia Education Program, Teaching Channel, Edutopia, and USGS Education. Readings present Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications. Assignments include brainstorming in project groups over how to incorporate Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications into project design, selecting insights from Communities of Practice, Learning Communities, & Data Analysis and Visualization in Education theories and applications and incorporating into lesson designed in Module 1, 2, and 3, or 4, 5, and 6, joining and reporting on several learning communities, and providing meaningful feedback to classmates' lesson designs and reporting.

4. Results

Table 2 shows a number count for participant applications of theory and technology out of 20 Volunteers.

4.1. Analyses of Virtual Communities of Practice

Participants explored the following suggested and self selected virtual learning communities: Apple Education, Blackboard, Google Classroom, Google for Education, Khan Academy, USGS, Schoology, Facebook, Edutopia, Wikipedia Education, Ted Talks, HAIKU, Edgenuity, TimeForLearning, Common Sense Education, Classflow, Teaching Channel, Pinterest, Techerade, Teachaide, Gizmos, Skype in the Classroom, Desmos.

The following types of activity and design were identified as occurring on the site: curriculum availability, including online technology integration, such as coding, discussion forums, resource libraries and links, user support and problem solving, video and data libraries, such as articles, newsletters, animations, and games, individual, school, and course pages, participation validation systems, such as earning points for interactivity in the community, peer recommendations, sharing and editing of projects, assessment systems, such as gradebooks and rubrics, mentoring and tutoring, online lessons, family and community connection and support, page and product construction, such as Wikipedia pages, community comments, community policies.

Table 2. Results summary.

Participant Application of Theory and Technology	
Lesson Design	20
Project Design	20

4.2. Applications in Lesson Designs

There were many brilliant resulting lessons incorporating theories and designs for virtual collaboration and communities of practice. In a lesson for second graders on landscape changes, students are intended to participate in an online community, listen to an online lecture and work in group projects in the classroom to give a group presentation. In a lesson to teach the students that all matter in the world can be classified as a solid, liquid or gas, students work in collaborative teams conducting experiments, and view online experiments on the Teaching Channel website modeling experimentation from experts and comment on the videos.

In a 1st grade lesson on Nocturnal vs Diurnal Animals, students collaboratively sort through different animals to discover whether they are Nocturnal vs Diurnal Animals, and view PBS kids online videos and make poster charts of the animals. In an 11th grade sex education class, students watch an online forum video about sexual consent and work in groups to propose laws concerning sexual consent. An 11th grade astrophysics and mathematics has students undertaking the role of NASA scientists using Kepler satellite data to find exoplanets in different star systems and work collaboratively to share their responses to the data in a data worksheet.

In a 6th grade mathematics lesson on number systems, students work collaboratively sharing created problems and solutions, view online solutions on Kahn Academy site and work via social networking to communicate with each other. In a 9th grade Biology Life Sciences lesson, students calculate how much blood your heart can pump under different rates of exercise and construct a table they share with each other in Schoology, an online communication platform. A 7th grade life sciences lesson has students using Kahn Academy and Exploratorium to view experts and interact in the community. In a social studies class on school to prison programs, students view data collaboratively on racial diversity, preschool attendance, and school suspension.

In an 11th grade History lesson, students design online presentation in presi and design a collaborative database of images and text on WWII. In a 10th grade English lesson, students listen to two rap songs in order find story elements that are typically looked for within short story or novel narratives, construct and essay and share and edit them with partners. In a 7th grade ELA lesson, students watch a video on organizing an essay and work together writing. In a 2nd grade math lesson, learning to add and subtract currency within 100, students login to an Internet social networking site, share each other's transaction calculations, comment on each other's work, and contact the teacher if necessary. In a 2nd grade language arts course, introducing students to adjectives, students work in collaborative groups matching adjectives to items. In a 4th grade music lesson, students identify characteristics of the instruments in Peter and the Wolf and work in groups to develop a story based upon the instruments and design it in Scratch, an online simulation construction tool.

In a 5th grade science lesson, students work in online collaborative groups to discuss their observations in the sky and videos about constellations, research a constellation, summarize the myth about the constellation and a develop a drawing of the constellation. In a high school algebra lesson designed to recognize patterns in everyday life, students work in groups to draw graphs of linear and quadratic equations. In a 4th grade math course on area and perimeter, students work in teams to solve area and perimeter problems. In a 6th grade computer science lesson, students code and review each other's code in Scratch and Google classroom. In a science lesson, students work in pair share activities to evaluate each other's created models that describe changes in state of a pure substance and how energy is related to the changes in states of matter.

4.3. Applications in Project Designs

Projects revealed a deep embedding of theories and designs for virtual collaboration and community of practice. One project involves student to student presentations on current events. A Social Science curriculum, the designer included a website to model uses a how varying technologies could be integrated into their studies. One English Unit on reading a novel and determining its deeper meanings included bringing the class together in an online portal with communal resources and paired discussion. A 9th-12th special education unit integrated a community based online central place for students to interact with resources and each other and links to external virtual communities, which they could join to extend their learning.

A Grade 1 reading and math unit exposeS students to different communities of learning in the subject domains. In a project to teach copyright at the secondary school level, teleconferencing with experts is included in the community design, as is collaborative workspace in Google classroom. Students are asked to post projects, compile resources and share with peers. A kinematics high school physics project immerses students in a science fiction adventure together culminating in a debate over scientific dilemmas. A K-6th grade reading unit focused on developing reading skill included a virtual classroom for students to share news and support each other.

A 4th grade project on California missions, students visit mission websites and online video libraries of visits to missions to research for projects and participate in peer critique of each other's projects. A 5th grade solar system exploration project unit includes listening to scientist podcasts and participating in online blogging. A 3rd grade classroom technology integration project utilizes a community website, which links to Google classroom to expand the technological experience and support communal learning. A computer science course incorporates Google classroom to support collective activity through sharing of resources and discussion.

5. Conclusion

This course was successful in encouraging teacher candidates to analyze and ap-

ply virtual collaboration and community of practice theory to instruction with innovation. Upon reading theories in virtual collaboration and communities of practice, teacher education candidates analyzed and participated in virtual communities and referenced and applied theories in creative ways in lesson designs and final projects. The results of this study suggest that virtual collaboration and community of practice theories can inspire the teaching of teachers in developing their repertoire of knowledge and skills needed to shape student development. Participants invented instruction incorporating podcasts, discussion forums, email exchanges, virtual conferences, co-writing, and file exchange and presentation in varying subject domains innovating student activity to new realms of existence.

Results show that participants were able to understand and reference the theories and it is most likely that this is a result of exposure to the reading resources. A future study might pretest knowledge and compare groups who have experienced the resources and/or instructional activities and groups who have not to make a causal claim about instruction.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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