Exploring Earth's Ecosystems Utilizing Google Applications

Submitted to David Taylor

By

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The Capstone Project entitled Exploring Earth's Ecosystems Utilizing Google Applications is approved by:

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I certify that this Capstone Project by Rosemarie Kingsberg entitled Exploring Earth's Ecosystems Utilizing Google Applications, in our opinion, is satisfactory in the scope and quality as Master of Science Project for the degree of Master of Science in Educational and Instructional Technology in the Sanford College of Education.

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ABSTRACT

Exploring Earth's Ecosystems Utilizing Google Applications is an e-learning course that can be completed long-distance or be blended with a seat-based option. It is designed for independent study high school students needing to earn elective credit towards graduation. The course integrates three subject disciplines and is aligned with 21st Century learning standards. It is rich with multimedia web-based learning programs. Google Applications are utilized to create a collaborative writing and presentation project. A project-based planning model was applied to conceptualize the courses' collaborative assignments. A review of research literature revealed that having students work collaboratively on a project is an effective classroom practice. The course is based in constructivist learning theory in that students will formulate questions and problem-solve for solutions. The course was developed using instructional design principles and was alpha tested for instructional validity and usability. It is delivered through PowerSchooLearning, a robust learning management system. All the learning assets of the course can be exported to any learning management system that utilizes HMLT protocols. Data from the alpha testing showed that *Exploring Earth's Ecosystems Utilizing Google Applications* is an engaging and well-designed instructional course.

CHAPTER 1

Introduction

The purpose of *Exploring Earth's Ecosystems Utilizing Google Applications* is to provide students with the opportunity to experience life science through an interdisciplinary standards-based study of Earth's endangered ecosystems in a collaborative model of learning. The elective online course can be accessed and completed asynchronously or be blended with a seat-based option. Synchronous lecture chats are available for students working long-distance. The course is designed for high school independent study students who have a single sign-on (SSO) to a learning management system (LMS) with access to the G-Suite.

The course will utilize a variety of Google Applications for exploration and collaboration. It will align with 21st Century technology standards established by the International Society for Technology in Education (ISTE, 2018) and meet Next Generation Standards for Biological Sciences (NGSS, 2013). Students work collaboratively to problem-solve complex environmental issues. The benefits of collaborative learning have been well documented (Ghodsi & Laal, 2012) and are essential for 21st Century learners to practice for participation in global communities. In this course, high school students will work collaboratively to explore Earth's ecosystems on a virtual field trip by using Google Cardboard and the Expeditions Application. The Expeditions Application will be downloaded to their smart phone for a 360, virtual reality experience (Miller, 2016). Students will continue to work collaboratively by researching and writing on a shared Google Document. The course also aligns with Common Core State Standards in English Language Arts (CCSS, 2013) by having students compose a "call to action" plan for an endangered ecosystem after identifying an ecological environmental issue threating the system's well-being. A visual representation of the issue and "call to action" plan will be created

collaboratively by using Google Slides for presentation. In addition to Google Applications, the

course will use other web-based learning programs. Web-based learning programs can be

accessed by logging in with a Google account, as they are third party sites.

Background of the Study

Exploring Earth's Ecosystems Utilizing Google Applications is the first segment of a larger

project where students work collaboratively to create a self-contained ecosystem. Self-contained

ecosystem projects have been a mainstay of life science classes for years, usually in the form of a

"bottle ecosystem" (Starr, 2019). This interdisciplinary e-learning course is unique because it

integrates English, technology, and ecology in a project-based learning model. Teachers from

varied disciplines work in a cohort with groups of students working collaboratively. Project

based learning (PBL) offers students the ability to inquire about complex topical issues, research,

and create real-life solutions to problems identified through their research findings (Provenzano,

2018).

Since students working on an LMS access the course, all teachers assigned to the cohort

can manage the course's instructional content. The course project was first proposed in October

2018 at the Project-Based Learning Leadership Academy at High Tech High School in San

Diego, California. There was an ensuing soft launch at Helen Hunt Jackson College Prep High

School (HHJCPHS) in late November 2018. The course follows the structure of PBL, starting

with the "big question" and ending with the project solution.

The course and final project have gone through several revisions since its initial proposal.

During the soft launch in November, it was discovered that a few students did not have smart

phones to download the Expeditions Application, leaving some students having to share. In

addition, a few of the self-sustaining ecosystem designs were not sustainable. Furthermore, since

Title One funded the course materials, a literacy component needed to be added. These issues are in the process of being corrected and the final project will be documented and presented at a PBL conference in April 2019.

Instructional Problem

The problem is, although HHJCPHS is an independent alternative study high school, within the jurisdiction of the Hemet Unified School District (HUSD), students must complete the same number of elective credits toward graduation as the district's comprehensive high schools. Offering a variety of elective courses has become a challenge for the limited amount of teaching staff at the school, creating a gap in the number of courses that can be offered for elective credit. The school does offer elective credit online through A+ Electives (part of the Fueled suite of courses) but Fueled is outdated web-based software. It is essentially a content dump of a series of slides with limited offerings and engagement. To provide students with a more engaging learning experience, teachers have an elective period on their teaching schedule where they can create 4-6-week elective courses delivered through PowerSchooLearning. Teachers make a proposal to administration for approval with a list of materials needed for implementation. Semesters are eighteen weeks long. By creating 4-6-week long electives, students can earn between ten to fifteen elective credits per semester, well within the needed target for graduation.

Purpose

The purpose of this project is to provide high school students with an engaging learning experience while learning about endangered ecosystems and is assessible online. The course is an interdisciplinary elective that meets standards in three disciplines: biology, English and applied technology. Because HHJCPHS is an online independent study school with limited seat-based options, it is imperative that all classes delivered through PowerSchooLearning can be

completed long-distance per HUSD board policy. To earn credit and daily attendance students

need only to submit weekly work within a four-week period. Although recommended they are

not required to attend seat-based classes like a traditional learning setting. A contract covering

the parameters is signed upon entry by parents, students, and teachers. The contract is maintained

at the school site.

Students can earn 3.0 elective credit within the four-week allocated time for working

online completing the projects' coursework.

Delimitations

Audience: This online elective course is designed for high school students.

Course delivery: The course is available on PowerSchooLearning. Access is also

available on the World Wide Web. For full feature use, it does require an SSO. Invitations are

enabled for outside the domain of HUSD for SSO usage.

Course materials: All content course materials are available on the course pages. Chrome-

books and Google Cardboard can be checked out from the school's media center. All seat-based

classrooms have a class set of Chromebooks and Google Cardboard. Every student enrolled in

HUSD has SSO access to the course. The school does not provide a smartphone. A few Wi-Fi

enable phones with the Expeditions Application preloaded are available through the course

instructor. All external software subscriptions will be provided through HHJCPHS.

Content depth: The depth of the content will be limited to that which is necessary for high

school level school projects.

Definitions

For purposes of this project, the following words are defined:

Citation Machine- Free online citation creator

Edpuzzle: Cloud-based video adaptation

Google Cardboard: A 360 VR headset

Google Chat: Web-based chatting application which is part of the G-Suite

Google Docs: Cloud-based computation software that can be shared

Google Expeditions Application: A free application that works with Google Cardboard

Google Slides: Cloud-based presentation software that can be shared

Independent Study Program: Students can work from home to earn high school credit

Learning Management System: (LMS) A web-based housing of instructional objects

Newsela: Cloud-based reading software

PowerSchoolLearning: A robust LMS that is a Chrome extension

Project Based Learning: (PBL) Students work collaboratively to create a deliverable

Rigorous Curriculum Design: A curriculum planning template that aligns curriculum with standards

Single Sign-On: (SSO) A dedicated sign-on for students enrolled in the course

The G-Suite: All the Google Applications available by having a Gmail account

Vocabulary.com: Cloud-based vocabulary practice

Summary

Exploring Earth's Ecosystems Utilizing Google Applications is a standards-based e-learning course with blended options. The course offers students the ability to learn about Earth's ecosystems by utilizing Google Applications in a collaborative PBL model. It is delivered through PowerSchoolLearning, an SSO LMS. It is designed as a high school elective class that creates maximum engagement opposed to a typical online massive courseware course could. Students work collaboratively to solve real-life problems.

Students will use Google Applications to explore, research, write, share, and create a solution to a real-life issue negatively effecting Earth's ecosystem. The course and project will be documented and presented at an upcoming PBL conference for final approve and submitted into the Project Based Academy, at High Tech High, for reuse.

CHAPTER 2: Review of the Literature

Introduction

Exploring Earth's Ecosystems Utilizing Google Applications is a standards-based e-learning course with blended options. The course offers students the ability to learn about Earth's ecosystems by utilizing Google Applications and other web-based programs in a collaborative PBL model. The purpose of the course is to provide students with the opportunity to experience life science through an interdisciplinary standards-based study of Earth's endangered ecosystems in a collaborative model of learning. Collaborative learning is a well-documented effective model that meets the skills necessary for 21st Century learners (Laal & Ghodsi, 2012). Technology will be integrated into every week of the four-week course that is available online.

The culminating project of this course is a "white paper" with a "call to action" plan tailored to be presented at the United Nations Environment Assembly. Google Applications will be used collaboratively to write and present the project. The course's final project is designed in accordance with the PBL model used at High Tech High in San Diego. PBL offers students the ability to inquire about real-life problems and propose realistic solutions (Rubenstein, 2008).

This chapter will present a historical overview of the usage of online collaboration and PBL for students. The chapter will also preview current research and trends using online collaboration with web-based technology.

Utilizing EBSCO Databases for Educators, found at National University Library System, "collaborative learning online," "writing collaboratively using Google Documents," as well as, "project-based learning," searches returned scholarly articles referenced in this chapter.

Historical Background

The origins of social learning can be traced back to ancient times. According to Banerjee and Weare (2014) as people moved away from small isolated societies and towards urbanization collaborative learning disappeared because people became more individualistic and competitive. In the early part of the 20th Century, the idea of the social citizen came to fruition and schools followed by implementing practices that encouraged students to learn by cooperating with their classmates. More recently, student programs are designed with the intent of having students work together collaboratively in PBL environments mirroring 21st Century workplace environments (MacMartin, 2017). Technology tools have made online collaborative learning more comprehensible from both the instructional design aspect of delivery and the learning aspect for students.

Online Collaborative Learning

With the development of the ability to share documents and projects, web-based collaborative composition has become easier than ever. The four-week course, *Exploring Earth's Ecosystems Utilizing Google Applications* will integrate current technological sharing tools by having students compose a collaborative document and a presentation slide show.

Although collaborative learning has the support of the instructional community, it is not without its criticism. Austrbara and Carlson (2012) state that the greatest argument against learners working in online collaborative teams is that some learners learn best when they work alone. Critics of this learning model usually cite individual accomplishments, such as, Edison inventing the incandescent light bulb or Einstein conceptualizing his theory of relativity without the need of others. Austrbara and Carlson suggest that applying technology to the classroom in a collaborative model should not only be limited to activities that are collaborative but integrated

with activities where the learner can work solely by exploring, investigate, creating, and

reflecting on their own. They conclude that a mingling effect of applied technology when

designing online courseware is most effective for learners. The project addressed in this course

will also mingle collaborative work with activities that will be completed individually.

 The following is a list of other web-based learning programs that students will use to

complete the project:

1. Vocabulary.com

2. Newsela

3. Edpuzzle

4. PowerSchooLearning Discussion Boards

5. Citation Machine

There other issues to consider when designing collaborative learning projects. Ku and

Thompson (2006) studied the social behavior of participants in a collaborative group working

online. They found that in a least one group there was a member who repeatedly missed or were

late for collaboration appointments. They also found that at least one member from each group

contributed less to the assigned project. Ku and Thompson concluded that during group work

there is a phenomenon called "social loafing" in which individual members of a team are more

than willing to step back and let others do most of the work by not doing their fair share.

 Ku and Thompson suggest the solution to the phenomenon of "social loafing" is to

establish group norms and define roles early in the process of working together. Students

enrolled in *Exploring Earth's Ecosystems Utilizing Google Applications* will be randomly

assigned to a group and a role within the group by using Google Forms and Flippity.net.

Collaborative learning is an effective classroom practice. Hattie (2011) conducted a meta-analysis on the most effective classroom practices and then assigned an effect size to each practice. A list was created from the data ordering the most effective practices regarding student achievement. The average (hinge-point) for the effect size is 0.41. The effect size of collaborative learning is 0.55. One could argue that collaborative learning is a moderately effective practice, but when coupled with problem-solving teaching, which has an effect size of 0.67; it becomes a substantial effective practice.

Problem-solving learning is the cornerstone of PBL. Students ask the big question, identify the problem and create the solution. PBL can create both an engaging and safe learning environment for students. Through research, Hattie illustrates that student achievement is highest when they are engaged in positive student interaction with the learning content and have the support of an effective teacher. Utilizing 2.0 web-based tools ensure that all these practices can be relayed through an engaging well-designed e-learning course that offers the student the opportunity to interact with the content and work collaboratively with others.

Online Project Based Learning

MacMartin (2017) presents a historical perspective regarding PBL stating that PBL has been in use since the early 20th Century. Self-directed learning was first proposed by John Dewey and refined by Francis Parker in their respective educational theories. MacMartin claims that Dewey recognized the need for students to be ready for life after schooling in an ever-increasing diverse population. Students needed to attain the skills to become a good civic-minded contributing member of society.

MacMartin also states that PBL is rooted in constructivist principles and is an instructional model that embodies the principles of learning. She describes PBL as a new pedagogy that has

scrapped learning from a textbook by independently reading and checking for understanding. MacMartin connects PBL with career and college readiness by citing evidence that students enrolled at High Tech High PBL, in San Diego, have the highest accepted college rate of graduating seniors in the region. Furthermore, she explores the concept that students are readier for college and career after high school because PBL meets the needs of 21st Century employers. She cites that by the year 2020, 65% of jobs will require a post-secondary education.

The PBL planning model used in this course is highly engaging for the learner. MacMartin cites formal research on the level of engagement students experience while working together on PBL projects. Surveying teachers, Welsh (2006) found that students became increasingly more engaged when they knew the start date of their next project. In an article by Provenzano (2018), it is noted that attendance increased dramatically once PBL assignments were assigned to students because students had a stake in the outcome of a successful delivery.

Online PBL is best delivered by using an LMS because all assignments, tasks, directions, communications, grading, and learner activities can be accessed by using an SSO. The project this course addresses will be available on PowerSchooLearning. The project's instructional assets can be exported to any LMS that utilizes HTLM protocols.

Current Research and Development

Google Applications will be used to explore, research, write, and create the project. Google Cardboard and the Expedition application will provide students with a 360 virtual reality field trip to Earth's ecosystems. Google Cardboard is a highly engaging virtual reality experience. Google Documents will be used to write a shared report on a pressing environmental issue. Google Slides will be utilized to create the companion presentation to the report. When using the SSO for PowerSchooLearning, students have complete access to their G-Suite as

PowerSchooLearning is a Chrome extension. Students will be able to share their work with expedition team members to create the project.

By creating an attributional matrix of online writing tools, Vens (2010) compared different collaborative writing programs using six categories of efficiency and concluded that Google Documents was an appropriate writing tool for student collaboration. Vens' research revealed that Google Documents met all the standards of a successful collaborative writing environment.

In a recent survey of undergraduate college students, Chu and Kennedy (2011) found that many students highlighted the user friendliness of Google Documents while working on a collaborative group project. Students reported Google Documents ease of use when communicating role management and its synchronicity attributes.

Summary

Research provides the necessary evidence-based data to validate that students can learn online and still be engaged in learning by creating opportunities for them to work with others. *Exploring Earth's Ecosystems Utilizing Google Applications* will meet its goals of providing the opportunity to students who want to work online in an engaging collaborative PBL based course. By utilizing Google Applications and other web-based learning programs, students will be able to work on an engaging project and earn the necessary elective credit needed for graduation.

CHAPTER 3: Project Design

Learning Theory

The course *Exploring Earth's Ecosystems Utilizing Google Applications* is a collaborative PBL e-learning class. The course can be completed solely online by utilizing synchronous class chats or be blended with a seat-based option. The seat-based option is not required but it is recommended that students attend twice a week for further explanation of the curriculum content and activities. The learning theory used in the project design of the course is constructivism. Constructivist learning theory builds on what students know by asking questions, investigating, interacting with others, and reflecting on these experiences (Boss, 2011). The investigated question of this course is: "What are the environmental issues impacting Earth's ecosystems?" After exploring and researching ecosystems, students will be able to answer the question by interacting with the multimedia assets of the course. Students will explore, investigate, reflect, and collaborate to create a project that can be presented at the United Nations Environment Assembly.

Project Design

The project design model used to create *Exploring Earth's Ecosystems Utilizing Google Applications* is backward design. Backward design is a condensed version of *ADDIE,* which stands for analysis, design, develop, implement and evaluate. Although backward design was first utilized by car manufactures as early as 1949 for project design, Jay McTighe and Grant Wiggins (2008) first applied it to curriculum design in their book *Understanding by Design*. The process of backward design begins with the "big idea" (learning goal) and ends with the acquisition of activities that will meet learning goals and resulting in the transfer of knowledge (Bowen, 2015). Backward design has three stages: (Appendix A)

Stage One: Identify results

Stage Two: Determine acceptable evidence

Stage Three: Plan learning experiences and instruction

In *Exploring Earth's Ecosystems Utilizing Google Applications,* the result identified in stage one of the instructional designs is for students to be able to identify a problem within an ecosystem and propose a solution with a "call to action" plan written in the form of a "white paper" for the United Nations Environment Assembly. Acceptable evidence to determine if students will learn the goals outlined in the results is stage two. In this course, evidence collected will be determined by a series of performance tasks. For each week of the course, a series of performance tasks are assigned that increase the student's depth of knowledge. Performance tasks include quizzes, reading and taking notes, practicing subject vocabulary, and collaborative activities. The planning of learning experience is facilitated in stage three. Google Applications and other web-based learning programs are applied to meet the criteria of this stage. Technology skills are developed throughout each learning experience. To deliver the interactive instruction a web-based LMS is utilized.

It should be noted that all courses developed on PowerSchooLearning, the districts' LMS, are designed using backward design in accordance with the HUSD planning model. The curriculum planning template utilized is rigorous curriculum design. Rigorous curriculum design is a model template for designing or redesigning curriculum so that it truly represents rigorous 21st Century units of study which align with existing state and the new Common Core State Standards (Ainsworth, 2010). HUSD holds all the rights of ownership of courses developed and implemented on PowerSchooLearning.

Procedure

Exploring Earth's Ecosystems Utilizing Google Applications is a four-week elective course. The course explores Earth's seven ecosystems with a focus on global environmental issues. The course is designed for high school students enrolled at HHJCPHS in Hemet, California. HHJCPHS is an independent study school that offers both seat-based classes and online classes. Although HHJCPHS is designated as an alternative education school, students are still required to complete the same number of elective credits that the comprehensive high schools in the district require.

A needs assessment at HHJCPHS was conducted in the spring of 2018 and it revealed that students lacked engaging elective options for graduation. The following procedure was used to rectify the gap in options and create the course addressed in this project:

- The PBL theme for the school year 2019-2020 is selected as "explore" at the school site.

- The staff makes a consensus by survey that all elective courses will be designed in a PBL planning model.

- A second team of teachers enrolls in High Tech High PBL Academy in early fall of 2018.

- Teams of teachers utilized High Tech High's PBL planning model to conceptualize seven new electives, including *Exploring Earth's Ecosystems.*

- Applying backward instructional design in accordance with school district mandates by using a rigorous curriculum design template (Ainsworth, 2010). *Exploring Earth's Ecosystems* is created.

- All materials were purchased for *Exploring Earth's Ecosystems* including two class sets of Google Cardboard (60) using Title One funds.

- A site map was conceptualized and created for the course.

- The course was developed on PowerSchooLearning complete with all multimedia learning assets.

- Evaluation and usability tests were conducted using subject matter experts (SMEs).

- A soft launch of the online course using four students, one from each grade level, was conducted in late fall 2018.

- After the soft launch, the initial course was redesigned and expanded into one four-week unit and a two-week "hands-on" unit. Certified single subject teachers will teach the 2-unit course, one in English and one in science, creating a cohort.

- *Exploring Earth's Ecosystems Utilizing Google Applications* becomes the first unit of a five-credit elective course with the addition of literacy documentation.

- Applying backward design, the first unit is created using a rigorous curriculum design template (Ainsworth, 2010).

- A new site map was created for the first unit (Appendix B).

- A schedule for developing unit one is published.

- The design of the course now utilizes Google Docs and Google Slides. *Exploring Earth's Ecosystems Utilizing Google Applications* is developed on PowerSchooLearning with a collaborative writing assignment task to adhere to Title One funding.

- At the school site, SMEs review the course's instructional content and students participate in a usability test.

- The full online course will be documented and presented at PBL Academy in May 2019.

Ethical Considerations

SMEs were utilized during alpha testing of the course. Alpha testing is the first test given to measure usability. The administration of alpha testing is usually in-house or at the site of development, giving developers more control of the testing variables (Skyes et al., 2018). All SMEs used in the alpha testing were adults and volunteered for the testing. All are proficient users of PowerSchooLearning, the sites LMS. No monetary currency was exchanged. None were hurt or damaged during the testing process.

Summary

Exploring Earth's Ecosystems Utilizing Google Applications is a constructivist learning theory-based e-learning elective course. Students will learn and develop understanding by asking questions, exploring, and investigating, while working with others in a PBL model. Learning experiences are cultivated by having students interact with the engaging attributes of the course's web-based programs.

To create the course addressed in this capstone report, backward instructional design was applied. Backward design has three stages, which begins with identifying the learning results and ending with the acquisition of learning objects that will achieve those results.

The course addressed in this report went through two design stages outlined in procedures. The focus of this project is unit one, which includes a collaborative writing assignment using Google Docs. The reason for the expansion of the course to include a writing project is that Title One funds the materials used in the course. Title One mandates that when funding is provided, documentation of English language development has occurred.

Usability testing occurred with SMEs during the design phase of the project before implementation. A site map was created before the course was developed on PowerSchooLearning. A schedule for the development of the course was maintained.

CHAPTER 4: Project Evaluation and Discussion

Introduction

To ensure instructional efficacy and usability integrity, *Exploring Earth's Ecosystems Utilizing Google Applications* was subjected to a series of evaluations throughout the design process. Project evaluation is an integral aspect of e-learning instructional design because it provides the necessary feedback to the course designer who can adjust, update, and make changes to the course content as needed.

Project Evaluation

Two types of alpha testing were used to evaluate the course addressed in this project. The first is instructional evaluation and the second is usability testing.

Piskuruch (2006) defines instructional evaluation as the process of determining a courses' impact on learning to improve its effectiveness. By evaluating, instructional designers are provided with the necessary feedback to know whether their course is effective in meeting the instructional learning goals. Evaluating also provides the designer with information regarding the likability, effectiveness of instructional attributes, and the engageable aspects of their course, which can be measured by testing the product before launching it for intended users. Instructional evaluation was utilized to measure the effectiveness of *Exploring Earth's Ecosystems Utilizing Google Applications*, an e-learning elective course for high school students enrolled at HHJCPH.

In terms of creating a usable online course, Krug's (2010) definition of usability, from the student end means that all aspects of the course are easy to navigate through to ensure that students are successful, and that the curriculum is rigorous enough to meet the expectations of the content standards. From the course creator side of this statement it means having to

prognosticate on multiple levels, including curriculum design and pacing, working links, and

website navigation all of which should be occurring as the course is being created. The most

important tool which should be done prior to the launch of the course is usability testing of a

pool of representative users. This type of testing reveals easily interpreted qualitative and

quantitative data. Effective testing should lead to specific potential problems so that course

creators can easily adjust or fix problems. In addition, according to research done on website

usability of university websites it "indicated that an organization's mission, policies, user

capabilities, and competitive environment all affect usability" (Snider & Martin, 2012).

Instructional Evaluation

This evaluation used Level 2 types of instructional evaluation, as feedback is needed to

measure the courses' instructional viability for continued use. Level 2 evaluations assess the

level of cognitive learning, attitude, and skills the participants acquire by using the course's

instructional program (Kirkpatrick, 1998). Level 2 evaluations can be in the form of a pre/post-

test or a survey on the instructional content of the learning object. A subject matter review in the

form of a response survey was used to evaluate the instructional validity of the project addressed

in this course.

SMEs evaluated the e-learning course during stage one of the projects' design, as the

instructional designer of the course is not a SME (Bunson, 2012).

 Test subjects completed the following instructional evaluation instrument:

- Subject Matter Review (Appendix C)

The following persons evaluated the instructional materials of the course:

- Linda Olsen-high school biology teacher-SME
- Cindy Graham-high school English teacher-SME
- April Boggess-TOSA -PBL coordinator HHJCPHS
- Suzanna Molina-Alvarez- Technology Chair/high school science teacher

Instructional Evaluation Data

Subject Matter Review Survey

Response Items 1=Strongly disagree 2=Disagree 3=Neither agree/nor disagree 4=Agree 5=Strongly agree	Average Score
Generally, the content was clearly and logically organized.	4.8
Important information or key concepts were easy to identify.	4.3
I was well informed about the objectives of this course.	5.0
The course content helped me to achieve the objectives.	4.5
The amount of information presented in each lesson was about right.	4.7
The content was interesting and kept my attention.	4.3
The course activities stimulated my learning.	5.0
Interactive multimedia was essential in the course.	5.0
The activities in this course gave me enough practice and feedback.	4.0
The pace of this course is appropriate.	3.0
I accomplished the objectives of this course.	4.0
From the start it was clear what I was going to do in the course.	4.5
Directions were clear and easy to follow.	4.1
This was a good way for me to learn this content.	5.0
Video and online activities are important aspects of the course.	5.0
This course lived up to my expectations.	4.0
The difficulty level of this course is appropriate.	4.3
The content of this course was too complicated.	3.0

Usability Evaluation

Usability, according to Krug, "really just means making sure that something works well: that a person of average intelligence (or even below average) ability and experience can use the thing…for its intended purpose without getting hopelessly frustrated" (2006, p.5). Krug, in his book *Don't Make Me Think*, makes several observations about typical website usage behaviors, such as, the fact that, people don't read the content on a web page, but rather, we scan them (p. 22), and that the look of the website will make or break its success.

Heuristic evaluation, in the form of exploratory testing, was conducted to ensure that all web-based assets were functioning, without errors, and were consistent regarding graphic and text elements across all web pages found within the course interface (Wong, 2018). A usability assessment in the form of a questionnaire was utilized during stage three of the course design, providing feedback early enough to make the necessary corrections before implementation (Krug, 2010). Testers used the following usability instrument:

- Usability Assessment (Appendix D)

Including the SMEs listed previously, the following persons evaluated the usability of the course:

- Andrew Casas- adult student HHJCPHS
- Eric Jaing- adult student HHJCPHS

Usability Assessment Data

Usability Assessment

Assessment Questions	Average of Scores 0-Never 1-Sometimes 2-Always
Do the links work?	2.0
Do the videos work?	2.0
Can you hear the audio?	2.0
Is the course visually interesting?	1.7
Is the course appealing to the eye?	1.8
Is the course easily navigable?	2.0

Discussion

From the assessment data, one can conclude that the e-learning course addressed in this project is an effective and engaging well-designed course. The usability test reveals that all multimedia links work and the course is easy to navigate. There are a few concerns regarding the visual interest that the course evokes mostly because the course is delivered through an LMS that employs a fixed theme throughout its delivery. Simply put, it visually looks the same week after week with content blocks that are the same color as the background, which is white. Another issue is the lack of graphics there are on each page. Because the instructional content is heavily depended on textual directions, the lack of graphics is a difficult issue to rectify. Content blocks which are text heavy can be collapsed showing only the heading. Collapsing the content block allows more space for graphics. Unfortunately, once the content block is opened, users are exposed to more scrolling and the learning objects on the sidebars will not align with the instructional text even when they are opened. The designer of the e-learning course chooses to leave all content blocks un-collapsed with the intent of making the instructional text-based directions as concise as possible. In addition, student users of this e-learning course have several other courses they are using and accessing from their PowerSchooLearning dashboard. It is the consensus of HHJCPHS staff that all content blocks remain open for easy access for students and are standardized for visual appeal.

The instructional content of this e-learning course has gone through rigorous scrutiny because of its interdisciplinary exploratory curriculum. The ecology subject matter utilized in the course is extracted from a unit, which already exists in *Biology 1A/B* based on Next Generation Science Standards. Within the course, writing across the curriculum was added to adhere to the

specific funding that was used to purchase the course materials. Furthermore, 2.0 web-based writing tools were applied to each week of the courses' instructional content.

The major findings on the instructional content reveal that the course development integrates all three of the disciplines in a well-organized delivery. Initially, there were minor concerns that the writing of the "white paper" would take students longer than a week to compose. To alleviate these concerns, a detailed template of the paper that has instructions on what information to put under each heading was created. The designer of the course will need more time to evaluate whether this issue is resolved by the addition of the template and if not, then the writing process needs to start earlier in the course.

It should be noted that the e-learning course addressed in this capstone project is an actual course that students will be able to enroll in for high school credit starting in the 2019-2020 school year. The designer of the course who is also the instructor will conduct ongoing evaluation of the course.

Limitations

The following study limits and constraints were considered:

- Technological: There were no technology limitations or constraints. Computers and Chromebooks were readily available with WI-FI available at the site where the testing occurred. PowerSchooLearning has several levels of access, including a SSOs for those enrolled in the course, and it is available on the WWW.

- Human: The course takes a blended learning approach to usability, with synchronous and asynchronous activities embedded for long distant users. Surveys and questionnaires were available in both paper version and digital

forms. It should be noted that all testers were given full access to all the features

embedded in the course on PowerSchooLearning by a linked invitation.

- Financial: This usability plan had no budget and participants were not

  compensated. There was motivation for testers to participate, as all learning assets

  can be copied and shared by instructors utilizing PowerSchooLearning.

- Time: Usability testing and instructional evaluation took no more than one hour.

  Testers needed only to commit 45-60 minutes in order to participate and could

  work at their own pace.

CHAPTER 5: Summary and Conclusion

Walt Disney once said, "You can design and create and build the most wonderful place in the world. But it takes people to make the dream a reality." The designer of *Exploring Earth's Ecosystems Utilizing Google Applications* is one of those people who took an instructional concept and designed the delivery method, turning it into a reality for the students at HHJCPHS. Student success at HHJCPHS is of the upmost importance to the designer of this course.

The PowerSchooLearning course *Exploring Earth's Ecosystems Utilizing Google Applications* was created to provide high school students working long-distance an opportunity to work collaboratively on a project for elective credit. This course is an alternative to previously used software. In the past, students enrolled at HHJCPHS who worked long-distance were regulated to working online with outdated web-based software, which provided little engagement and opportunities for collaboration.

Since students at HHJCPHS can work long-distance in an independent study learning program, the course this report addresses creates an opportunity for students to earn elective credit while collaboratively learning in an engaging project-based model. The course is essentially online PBL.

The course is standards based, meeting three recently adopted strands of curriculum content including: English Language Arts Common Core State Standards, Next Generation Science Standards, and International Society for Technology in Education Standards. The courses' final project delivers students with the necessary tools to be successful in the 21st Century.

Conclusions

The designer of this capstone project views the course as an asset to the schools' overall independent study program because the elective course can be completed solely online. Currently, PowerSchooLearning, the schools LMS, houses mainly core curriculum classes that can be accessed by an SSO and be completed long-distance. The designer of this course project has created many of the English courses that follow the Rigorous Curriculum Design (Ainsworth, 2010) template as prescribed by HUSD. This course is the first elective course created on PowerSchooLearning that students can participate in without needing to be enrolled in a seat-based option or be subjected to outdated online course curriculum.

Using a condensed version of ADDIE, called backward design, the instructional designer was able to create four weeks of online instruction within a short period. Applying new technology skills learned through designing the course the instructional designer was able to utilize 2.0 web-based technology to create a collaborative unit not available in traditional online instructional software. *Exploring Earth's Ecosystems Utilizing Google Applications* meets three disciplines' learning standards. By creating the course in a robust LMS with an SSO, such as PowerSchooLearning, learners in this course can communicate with others, critically think, problem solve collaboratively, and create written and presentational reports meeting 21st Century learning standards.

From the evaluation data, it can be concluded that *Exploring Earth's Ecosystems Utilizing Google Applications* is an engaging, well designed, and fully functioning online course. It utilizes Google Applications and other web-based learning programs effectively to maintain rigorous curriculum standards.

Implications for Teaching/Training

All teachers at HHJCPHS have been trained to create classes on the school's LMS. Currently, what is lacking is the quality of the courses being created. Many teachers at HHJCPHS do not use the available features in PowerSchooLearning to make their courses more interactive and engaging for students. *Exploring Earth's Ecosystems Utilizing Google Applications* purposely utilized every feature the LMS has to offer, including, discussion boards, and the page comment option. Multimedia can be embedded into any content block on PowerSchooLearning, but many teachers choose to provide a link instead, that is, if they even utilize third party web-based programs that the school spends money on for the subscriptions. Furthermore, submission boxes with built in annotators can be added for any assigned work. Many teachers choose to have students "share" their work through Google Docs or drop off handwritten work at the sites' office. This practice causes a loss of attendance for students and the school because often the work is turned in late after the four-week allotment.

Another issue related to quality is the lack of courses being fully developed for online use. Teachers at the site have been trained on the school's LMS, but they have not been trained to design and develop effective online courseware. The designer of this project sees the value in the process of using a design model, a site map, and conducting heuristic evaluation. Offering teachers at the site a course in instructional design would rectify these issues, as most already have the technical skills which they could apply.

Implications for Further Research

One of the greatest challenges of PBL is the addition of the discipline of mathematics, especially in an online course. The collaborative writing project in *Exploring Earth's Ecosystems Utilizing Google Applications* has already been successfully implemented in another course at

HHJCPHS, called "*A Government for Xlandia*." Acting as a United Nations Task Force students

work collaboratively to create a "white paper." Xlandia and the project addressed in this report

share the same course designer. Xlandia is a PBL unit that integrates the subjects of English and

government creating a humanities cohort. It is assessible online through PowerSchooLearning.

The course addressed in this capstone project integrates biology and English, creating an applied

science cohort. Currently, the same cohort from the *Xlandia Project* is in the process of reusing

some of the learning assets from *Exploring Earth's Ecosystems Utilizing Google Applications* to

focus on the Salton Sea, an ecological water wasteland in Southern California.

One of the goals of the *Salton Sea Project* is to incorporate mathematics within the study

of the economic devastation that the lack of governmental action has caused in the region.

Several solutions to the Salton Seas' current ecological issue have been postulated, but they do

not address the economic issues plaguing the region. Further research is needed, not only on how

to achieve the addition of mathematics in the course content, but how to deliver the math portion

online. Furthermore, the question remains: Will the mathematics online portion be rigorous

enough for high school students to earn algebra or geometry credit?

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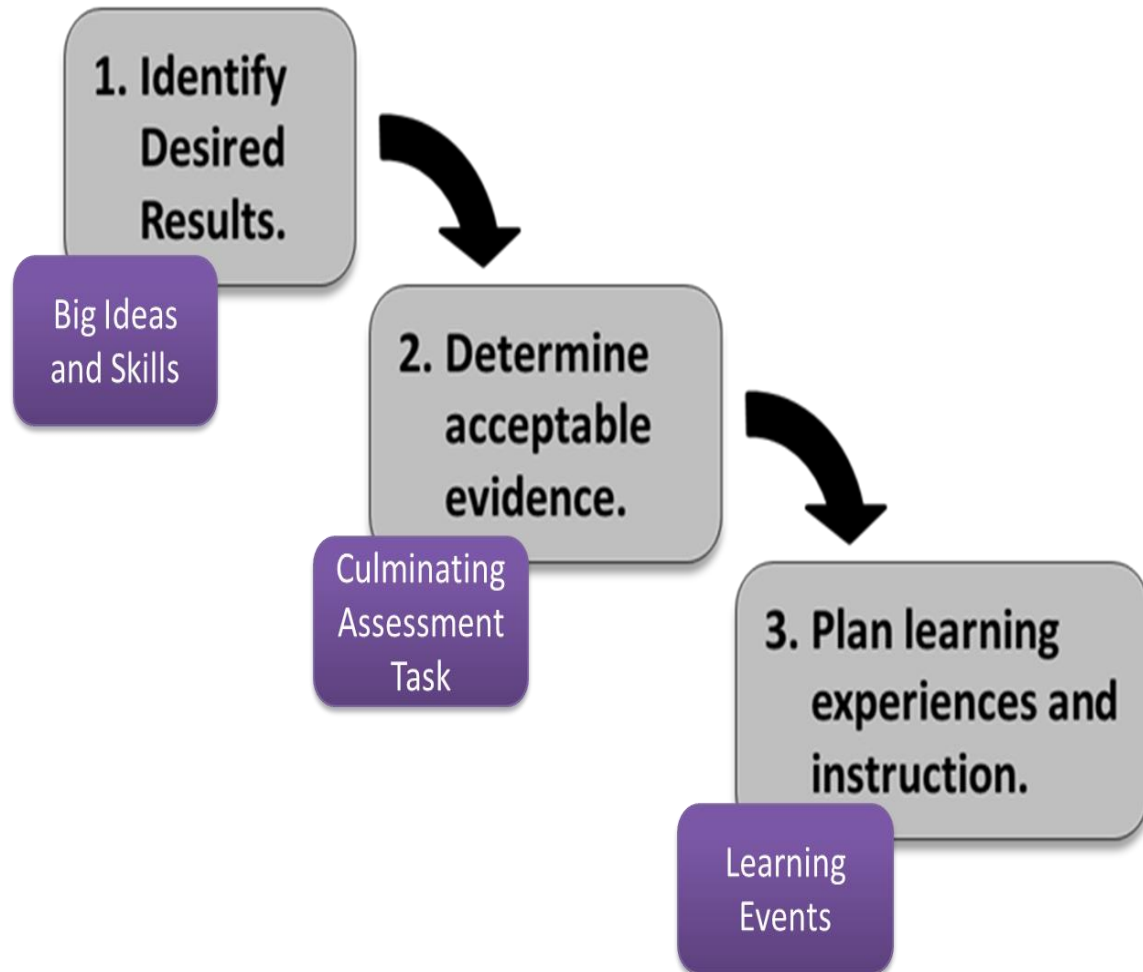Retrieved from https://www.edutopia.org/collaboration-age-technology-high-tech

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APPENDICES

Appendix A

Backward Design Model

Backward Design

1. Identify Desired Results.

Big Ideas and Skills

2. Determine acceptable evidence.

Culminating Assessment Task

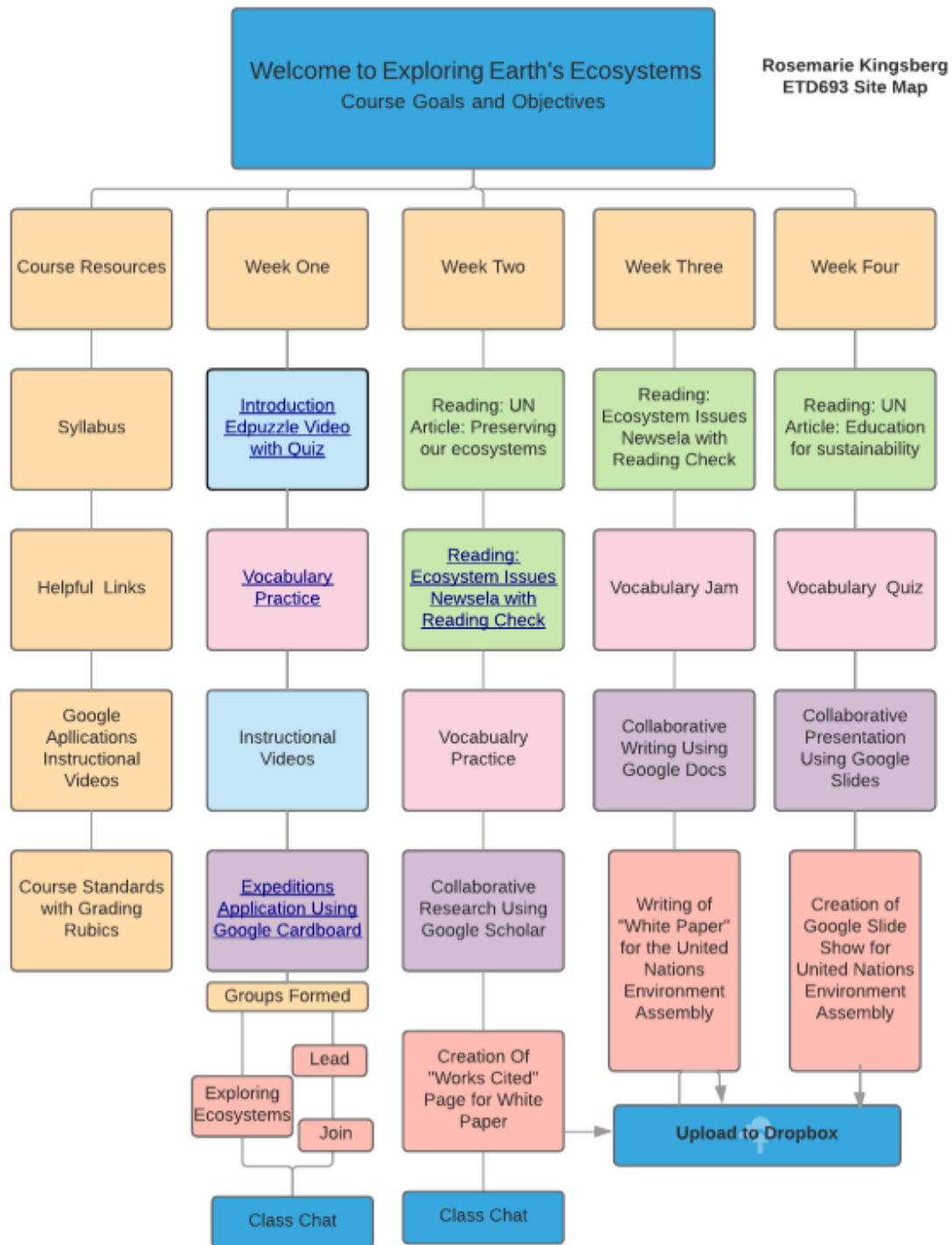3. Plan learning experiences and instruction.

Learning Events

Wiggins, G. P., & McTighe, J. (2005). *Understanding by design*. Association for Supervision & Curriculum Development.

Appendix B

Site Map

Appendix C

Subject Matter Review Evaluation

PARTICIPANT EVALUATION QUESTIONNAIRE: Subject Matter Review

Course Name: *Exploring Earth's Ecosystems Utilizing Google Applications*

Participant Name (optional): _____ Date: _____

Job Title: _____Years in present position? <1   1-3   3-5   5+

INSTRUCTIONS

Please circle your response to the items. Rate aspects of the course on a 1 to 5 scale. 1 equals "strongly disagree" and 5 equals "strongly agree." 1 represents the lowest and most negative impression on the scale, 3 represents an adequate impression, and 5 represents the highest and most positive impression. Choose N/A if the item is not appropriate or not applicable to this course. Your feedback is sincerely appreciated. Thank you.

COURSE CONTENT (Circle your response to each item.)
NA=Not applicable 1=Strongly disagree 2=Disagree 3=Neither agree/nor disagree 4=Agree   5=Strongly agree

1.   Generally, the content was clearly and logically organized.   N/A 1   2   3   4   5

2.   Important information or key concepts were easy
       to identify.   N/A 1   2   3   4   5

3.   I was well informed about the objectives   N/A 1   2   3   4   5
       of this course.

4.   The course content helped me to achieve the objectives.   N/A 1   2   3   4   5

5.   The content of this course was too complicated.   N/A 1   2   3   4   5

6.   The amount of information presented in each lesson   N/A 1   2   3   4   5
       was about right.

7.   The content of this course was too basic.   N/A 1   2   3   4   5

8.   This course lived up to my expectations.   N/A 1   2   3   4   5

9.   The content is relevant to my interests.   N/A 1   2   3   4   5

10.   The content was interesting and kept my attention.   N/A 1   2   3   4   5

 COURSE DESIGN (Circle your response to each item.)

NA=Not applicable 1=Strongly disagree 2=Disagree 3=Neither agree/nor disagree 4=Agree   5=Strongly agree

11.   The course activities stimulated my learning.   N/A 1   2   3   4   5

12.   Interactive multimedia was essential in the course.   N/A 1   2   3   4   5

13. The activities in this course gave me enough practice and feedback.   N/A 1   2   3   4   5

14. The difficulty level of this course is appropriate.   N/A 1   2   3   4   5

15. The pace of this course is appropriate.   N/A 1   2   3   4   5

COURSE RESULTS (Circle your response to each item.)

16. I accomplished the objectives of this course.   N/A 1   2   3   4   5

17. I will be able to use what I learned in this course.   N/A 1   2   3   4   5

COURSE STRUCTURE (Circle your response to each item.)

18. From the start it was clear what I was going to do in the course.   N/A 1   2   3   4   5

19. Directions were clear and easy to follow.   N/A 1   2   3   4   5

SELF-PACED DELIVERY (Circle your response to each item.)

20.   This was a good way for me to learn this content.   N/A 1   2   3   4   5

21.   Video and online activities are important aspects of the   N/A 1   2   3   4   5
      course.

22.   How would you improve this course?   (Check all that apply.)

___ Provide better information before course.	___ Clarify the course objectives.
___ Reduce content covered in course.	___ Increase content covered in course.
___ Update content covered in course.	___ Improve the instructional methods.
___ Make course activities more stimulating.	___ Improve course organization.
___ Make the course less difficult.	___ Make the course more difficult.
___ Slow down the pace of the course.	___ Speed up the pace of the course.
___ A lot more time for the course.	___ Shorten the time for the course.
___ _Improve the tests used in the course.	___ Add more video to the course.

Appendix D

Usability Assessment

Usability Assessment
Please fill out the scale for each question before looking at the content of the "*Exploring Earth's Ecosystems Utilizing Google Applications*."

Do the links work?

Never   Sometimes   Always

Do the videos work?

Never   Sometimes   Always

Can you hear the audio?

Never   Sometimes   Always

Is the course visually interesting?

Never   Sometimes   Always

Is the course appealing to the eye?

Never   Sometimes   Always

Is the course easily navigable?

Never   Sometimes   Always

Is there anything would you change?

_____
_____
_____
_____

Is there anything that you felt did not fit?

_____
_____
_____