Teaching Elementary School Teachers to Integrate Twenty-First Century Teaching Strategies Using Google Apps For Education

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Abstract: An elementary school in Hawaii began integrating Web 2.0 tools into their curriculum to prepare their students to solve problems using twenty-first century tools. They started with Google Apps For Education (GAFE) and commissioned the developer to design an online module that trains teachers and educational assistants to use and integrate GAFE in their classrooms. The developer conducted a literature review of online module development projects and the integration of GAFE in classrooms and used the knowledge gained to design an informative, engaging, and effective online module by using a rubric that rates the content, design, interactivity, and usability (Foster, Shurtz, & Pepper, 2014) of modules. The developer used Weebly to design the module’s layout, content, and slideshows; SoundCloud to host the module’s audio lessons; Google Forms to design the pretest, embedded test, post test, and post survey; and Google Sheets and Flubaroo to collect and analyze the data. The module was deemed highly effective by the learners and succeeded by accommodating different learning styles. The developer identified navigational and operational changes that can be made to increase the module’s effectiveness. The developer has since been commissioned to add more GAFE topics to the module for future trainings. (www.kipapagafe.weebly.com)

Introduction

The United States of America has developed into a world power through the innovation of scientists and engineers. These people have succeeded by taking their knowledge and applying it towards solving problems in creative ways. By 2020, job positions that require a background in science, technology, engineering, and mathematics (STEM) are projected to increase exponentially (“Science” n.d., para.1). When today’s children enter adulthood, they will need to be able to use twenty-first century technological tools to meet the requirements of STEM jobs.

Beginning in June 2015, the Technology Committee at a Title 1 elementary school in Hawaii took steps to develop its faculty into twenty-first century teachers who prepare their students for success in the digital age. A Title 1 school is a school where 50% or more of the students are from financially disadvantaged families. They decided to begin this process by integrating Web 2.0 tools into the school’s language arts curriculum and researched a list of different available applications. Web 2.0 tools are Internet sites that emphasize user-generated content. After much research and a cost benefits analysis of the different Web 2.0 tools that are available to schools, the Technology Committee chose to adopt Google Apps For Education (GAFE). They chose GAFE because it offered device agnosticism, online scheduling (Davidson, 2008), word processing, collaboration tools, and cloud storage (Johnson, 2011). Additionally, GAFE offered
tools that allowed teachers to check their students’ progress online and make them accountable for keeping up with the class (Nevin, 2009). GAFE had a multiple language translation feature that was a useful tool for students who were in the English Language Learners (ELL) demographic to complete written assignments (Gonsalves, 2009). ELL students are those who struggle with English because their families don’t speak it primarily at home. The online scheduling GAFE was found to be the most user friendly among the other available alternatives (Davidson, 2008).

The Technology Committee did a survey of the faculty at the school and found that there were a few teachers who were already implementing some of the different GAFE into their curriculum and other teachers who were familiar with some of the GAFE features and could use it to complete their own personal work, such as creating worksheets, when they were being coached by a more knowledgeable user. The Technology Committee began integrating GAFE activities into some faculty meetings to give the teachers more experience using the different applications that make up GAFE; however, they deemed that was not enough training to teach the teachers how to use GAFE and confidently implement it into their curriculum.

The Technology Committee divided the faculty into three groups, the Advanced Group, the Intermediate Group, and the Beginner Group. Then they decided to invite GAFE experienced members from the district office to conduct professional development workshops of GAFE for the Advanced Group and Intermediate Group. The Technology Committee nominated the Technology teacher to teach the Beginner Group. The beginner group would be taught the basics of using Google Drive, Google Calendar, and Google Documents. However, the Technology teacher expressed her desire to attend many of the GAFE workshops with the Advanced Group. She also expressed her concern about rotating trainers for the Beginner Group because she wanted to keep their training consistent between trainers.

The Technology Committee decided that it would be best to create an online module to train teachers to incorporate GAFE into their curriculum and keep the training quality consistent for years to come. Since the developer was a current teacher and candidate at the University of Hawaii at Manoa for a master’s degree in Learning Design and Technology, he became the sole content, delivery, web, and graphic designer of this project. The purpose of this instructional design project was to develop and evaluate the effectiveness of the online module that aimed to prepare elementary school teachers to use twenty-first century strategies in their teaching methods using GAFE.

**Literature Review**

The first step of creating the online module that taught GAFE to the teachers and staff was to do a literature review on the topic of GAFE to see if it was a worthwhile Web 2.0 tool in the classroom. The literature review showed that the implementation of GAFE was expected to lead to an increase in student engagement and achievement. A study of implementing GAFE showed that 87.5% of the students involved finished with positive feelings towards GAFE, 85% reported that it opened positive communication with other students, and 75% reported that it opened positive communication with the teacher (Lin & Jou, 2013). The students involved in that study
began to ask other teachers to adopt GAFE and influenced students who were in the control group to ask the developer for Google accounts. (Nevin, 2009).

The literature review looked into the factors of a successful online teaching module. It found that successful online modules focus on the attributes of: content, design, interactivity, and usability. The criteria of a rubric created through the study and examination of dozens of online modules and their effectiveness (Foster, Shurtz, & Pepper, 2014) was used as a guide for designing the GAFE module. A common mistake is that many module designers leave out user interactivity with their modules, thus lowering the users’ engagement and growth (Foster, Shurtz, & Pepper, 2014). Professional development, as a whole, is ineffective without learner participation and interaction (Cho & Rathbun, 2013). Therefore, the module was also designed with interactive slideshows, audio lessons, and task related activities that required users to practice what they had learned.

The GAFE module was designed to include activities to have users interact with their coworkers and other module users asynchronously because those actions led to a stronger learning experience (Goh, Dexter, & Self, 2014). Getting the users to be active participants in their own learning was meant to increase their retention of the information (Cho & Rathbun, 2013). The activities were designed to be short projects that simulate real world online collaboration situations which have been shown to increase the engagement of online module users (Fisher & Baird, 2006) and encourage the retention of their skills (Schneckenberg, Ehlers, & Adelsberger, 2011). Building the teachers’ confidence in their technological skills would motivate them to use those skills in the future (Chia-Pin, Ying-Tien, Chin-Chung, 2010).

The GAFE module was designed to support future users who prefer to use mobile devices to complete it, since this module is intended to be used as a teaching tool for years to come. The current participants in the instructional design project will use their Macbook Pros to complete the module but it had been found that the increase in smartphone usage has led to an increase in the number of people who prefer to learn on their mobile devices (Wang & Shen, 2012). Research suggested that in order to be mobile device friendly, a module must teach with multimedia so that people with small screens won’t struggle reading small text and any texts should be condensed to focus on key points and summaries that are accompanied with pictures (Wang & Shen, 2012).

Methods

Content development. The GAFE module’s content was designed with input from the Technology Committee. The developer created a list of objectives with rules, subordinate rules, concepts, and discriminations. This list was used to write the pretest, embedded tests, and post test. The original plan was to create a test question for each objective but after the developer consulted with his graduate advisor, it was decided that sixty questions made each test too long. Appendix A shows an example of how the test questions were condensed by combining a number of multiple choice questions into processes that users had to put in step-by-step order.

The developer decided to separate the module into eight sections which can be seen in Figure 1. A broken down list of the learning objectives can be seen in Appendix B.
The eight learning targets that this introductory GAFE module will cover are:

1. Log into Google Drive.
2. Upload files to Google Drive.
3. Organize files on Google Drive.
4. Share files on Google Drive.
5. View, add, and edit events on Google Calendar.
6. Create a document on Google Documents.
7. Check the "Revision History" on a Google document.

**Figure 1.** Screenshot of the eight learning targets.

During the design process, some potential users expressed a desire to the developer to see basic tutorials about Google Documents in the GAFE module. The developer designed three extra how-to informational web pages about fonts, alignments, and tools. These topics were not learning targets of the Technology Committee or the developer so they were labelled as “optional” and no embedded tests were created for them.

**Instrumentation.** The module was created and housed on Weebly which is an online website builder and host. Weebly offered user friendly web design services that did not require the developer to use advanced Hypertext Markup Language (html) codes. Websites built on Weebly were easily accessible and previous Weebly built websites had worked successfully at the school.

Google Forms, a survey and test creating application from Google, was chosen as the application to build the pretest, embedded tests, and post test. Google Forms can be embedded onto different web pages and collect user responses on a separate Google Sheets file. Flubaroo is an add-on that automatically corrects multiple choice assessment results on Google Sheets. Flubaroo was chosen as a tool that could be used to score the assessments. Users were asked to fill out a post module survey, made with Google Forms, after the post test.

When it came to teaching the content, the original idea was to create a series of how-to videos, upload them to a video streaming service called Youtube, and embed them in the appropriate Weebly web page. However, the school in Hawaii had been experiencing problems with a lack of bandwidth that had become apparent when four classes in the school tried to access the Internet at the same time to take the Smarter Balance Assessment and students were constantly being booted
off of the Internet. To avoid experiencing problems related to bandwidth issues, the designer decided to replace the how-to videos with how-to slideshows made with a picture tool in Weebly. Each slideshow allows users to see step-by-step instructions on how to accomplish a particular task. Each lesson was also connected to audio files that featured the developer teaching lessons to the users, thus allowing them to listen and learn without reading much text. The audio clips were hosted on an audio streaming service called SoundCloud and embedded into the appropriate webpages within the online module. An example is shown in Figure 2.

1. Right click on the files you want to move.
2. Left click on the "Move to" button.
3. Choose the folder you want to move the file into.
4. Left click on the "Move" option.

View the slideshow below to see how to move a file to a new folder on Google Drive.

**Figure 2.** Screenshot of an audio file, slideshow, and corresponding text.

When designing the visuals of the GAFE module the developer chose to go with a minimalist approach. Banners for the GAFE module’s Homepage, the Google Drive web pages, the Google Calendar web pages, and the Google Documents web pages were designed using an online photo editing application called Pixlr.

The GAFE module was designed to work properly on mobile devices for future users who prefer to use a mobile device to complete the GAFE module instead of a laptop. The designer had to make some minor adjustments to the alignments of certain objects, most notably the navigational buttons at the bottom of each webpage, to make the GAFE module visually appealing on a mobile device as well as a computer. An example is shown in Figure 3.
"Educational technology is not merely about teaching our students how to use technology, it is about training their minds to be creative and innovative with the technology that is available to them."

**Figure 3.** Screenshot of the GAFE module from a mobile device.

**Delivery procedure.** The instructional design project’s user test trial took place on a professional development day in January 2016. The trial was held in a classroom at the school in Hawaii. Each user used her school issued Macbook Pro to access the online GAFE module. Earbuds were offered to each user so that person could listen to the SoundCloud audio clips without distracting other users. Each user read and signed the Consent to Participate Form before beginning the trial. The users independently completed the GAFE module readings, tests, and activities within the two hours that had been set aside for this training. At the end of the GAFE module, users completed the Post Survey. During the trial, the technology coordinator’s assistant was also on hand to reset the Google accounts of users who did not remember their password. The developer was also on hand to answer questions about the module and took notes on the types of questions were being asked.

**Conclusion**

**Module changes.** After using the GAFE module for the first time, the developer made additions and edits to it. The developer will added new section to the beginning of the GAFE
module that teaches users how to navigate through the module, play SoundCloud files, manipulate 
slideshows, and submit Google Forms. The research edited the pretest by adding an “I don’t 
know” option to each question in the pretest and emphasized in the directions that the users 
should not feel pressured to score well on the pretest.

**Future Steps.** The Technology Committee was pleased with user feedback from the 
GAFE module. The school will continue to use the GAFE module to train and retrain staff 
members in the future. The Technology Committee asked the developer to extend the module to 
encompass GAFE topics such as Google Forms, Google Sheets, Google Slides, and Google 
Classroom. The navigational tabs on the module will change to reflect each GAFE being taught, 
as opposed to the singular subject. The module site will end up becoming an online course site 
about GAFE with a module devoted to each of the different GAFE. The course site will service 
users in the beginners group and intermediate group and will continue to be designed around the 
lessons learned during this instructional design project.
References


Appendix A
A Condensed Test Question

3. Put the steps for adding an event on Kipapa Elementary School’s Master Calendar (on Google Calendar) in order.

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
<th>Step 5</th>
<th>Step 6</th>
<th>Step 7</th>
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<tr>
<td>Set the &quot;Event color&quot; to a unique color for your grade level.</td>
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<td>Set the location of your event.</td>
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<td>Give your event a name.</td>
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<td>Click on the “Save” button.</td>
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<td>Set the date and start and end time of your event.</td>
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<td>Click on the “Create” button.</td>
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<td>Set the “Calendar” option to “Master Calendar.”</td>
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Appendix B
GAFE Module Learning Objectives

Objective 1: School Specific Teacher Usernames
Objective 2: School Specific Student Usernames
Objective 3: The Process of Logging In
Objective 4: The Process of Uploading Files
Objective 5: The Benefits of Uploading
Objective 6: How to Access Shared Files
Objective 7: The Process of Creating A Folder
Objective 8: The Process of File Moving
Objective 9: Choosing Sharing Permissions
Objective 10: The Benefits of Sharing
Objective 11: The Process of Sharing
Objective 12: How to Access the School’s Master Calendar
Objective 13: The Benefits of Google Calendar
Objective 14: The Process of Using Google Calendar
Objective 15: The Process of Document Creation
Objective 16: The Process of Viewing Revisions
Objective 17: The Process of Assessing Changes
Objective 18: The Benefits of Google Documents
Objective 19: The Process of Commenting
Objective 20: The Process of Recovering Comments
Objective 21: The Process of Suggesting