

The Use of Websites as an Aid in Differentiating Instruction

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Abstract: In a typical heterogeneous elementary school classroom, one might find highly motivated students, struggling readers, those reading two levels above grade level, unmotivated students, and students with behavior problems. Teachers are faced with the challenge of teaching these students the skills necessary to be successful 21st Century students as well as motivating them to attain proficiency. In order to provide effective instruction for all, many teachers have turned to differentiated instruction (DI). In differentiated instruction, student differences form the basis of planning and many instructional strategies are employed. This study focused on the development and evaluation of a class website to facilitate differentiation of instruction in a science lesson, and its potential use as a tool to increase instructional time and address all learners. Research results indicated the use of a class website can be a valuable tool for teachers to use in providing differentiated instruction. A class website was successfully utilized to disseminate information and assignment directions, as well as provide instruction, scaffolding, and additional resources to nine second grade students, based on their level of readiness. Further research is necessary to determine if its use results in an increase in instructional time.

Introduction

“How do I divide time, resources, and myself so that I am an effective catalyst for maximizing talent in all my students?”

-Teacher's question, *The Differentiated Classroom* (Tomlinson, 2005, p. 1)

Teachers today often find themselves in the curious position of being jugglers as well as educators. Due in large part to No Child Left Behind (NCLB) legislation, educators face issues of high stakes testing and accountability, coupled with needs of a diverse population of students. Students arrive in classrooms with different interests, strengths, background experiences, and are at different levels academically, as well as physically and emotionally. To provide instruction that addresses this plethora of needs, many teachers have turned to differentiated instruction.

The purpose of this action research study was to develop and evaluate the use of a class website to facilitate differentiation of instruction for nine second graders at a rural elementary school in Hawaii.

The instructional goal of the research was to determine if (a) students would be able to access their webpage and follow the directions independently with minimal intervention from the teacher, (b) students would be able complete a learning artifact and submit it either face to face or electronically, and (c) use of the class website would increase instruction time. The use of the website supplemented rather than supplanted classroom instruction.

Background

Today's second graders are digital natives, and laptops, iPads, smartphones, computers, GPS devices, and digital cameras are part of their everyday life. Technology changes at a rapid pace, and in addition to reading and writing, these young students must be taught the essential skills necessary to compete in the 21st century. For some students, school provides the only exposure to a computer, and for these students especially, it is critical that the school environment provide the teaching and practice of these skills.

To prepare students to be competitive, the nation needs an "NCLB plus" agenda that infuses 21st century skills into core academic subjects. This is not an either-or agenda: Students can master 21st century skills while they learn reading, mathematics, science, writing and other school subjects. (Partnership for 21st Century Skills, 2008, p. 8)

While a computer may not be part of every student's home inventory, students still manage to access videos, view web pages and tutorials, and create personalized presentations. In addition to learning to navigate a textbook, second grade students must also learn to navigate the Internet as well as a computer-based environment.

This study integrated technology into a short science lesson. The Center for Applied Research in Educational Technology (CARET), a project of the International Society for Technology in Education (ISTE), lists several ways student academic performance can be influenced by technology (CARET, 2005, Topic: Student Learning), two of which are:

1. Technology improves student performance when the application directly supports the curriculum objectives being assessed.
2. Technology improves performance when the application is integrated into the typical instruction day.

Blogs vs. Websites

A blog is a web log: a type of website that is a shared online journal. A group of people or an individual can post entries about personal experiences, share opinions, commentaries, participate in discussions, or any content that one might post in a diary.

Blogs have the ability to increase instructional time, as text, podcasts and vodcasts can be included on a blog. The use of blogs is also an advantage, since the technology is popular among students, and mobile devices and software such as iTunes make it possible to easily download instructional audio and video broadcasts anywhere (Colombo & Colombo, 2007). Blogs are an easy way to prepare elementary students for new literacies on the Internet, and can promote higher order thinking skills with structured activities (Zawiliski, 2009).

A website is a group of related or interlinked web pages. Originally a static collection of information developed and maintained by an institution, organization, company, government, or individual, websites have become more interactive with advances in technology. Like blogs, websites may include vodcasts, podcasts, text, and links to other websites. Websites can, but usually do not include journaling. Websites and blogs were both initially considered for use as an online tool to facilitate instruction. A website was chosen since most of the second graders are just beginning to access websites, and its use would provide practice in navigational skills.

Differentiated Instruction (DI)

“Differentiated instruction is a set of strategies that will help teachers meet each child where they are when they enter class and move them forward as far as possible on their educational path” (Levy, 2008, p. 162). There is no “right way” of providing differentiated instruction, nor is there a “right path”.

VanSciver (2005) provided the example of a slumping Little League pitcher getting rescued by his coach. The coach identifies the problem and applies a remedy, perhaps a change in arm or body position, or a grip on the ball. Not all pitchers get the same advice, as each remedy is based on the assessment of the pitcher’s performance. So it is with DI. It is the teacher’s response to a student’s needs. The teacher provides DI by modifying content, process, or product, according to the students’ readiness, interest, and learning profile (Tomlinson, 2005).

Smith and Throne (2007) determined that technology is a powerful tool in differentiating instruction. Technology can help DI by being an accommodating and patient teacher, and enhance and support student learning by providing necessary tools and scaffolds. Smith and Throne also note that technology is unsurpassed in differentiating by readiness, as it allows learning to be personalized. In a study of 30 second grade students using mobile devices, researchers (Looi et al., 2009) described a more personalized learning experience for students, as lessons were developed with differing entry points and multiple pathways to completion. Students were also able to share their learning artifacts easily. This study differentiated content and material by readiness. Students’ abilities, skills, and reading comprehension were taken into account when creating and selecting content and materials.

Methodology

This study was conducted to determine the effect of a class website in providing differentiated instruction. The website provided instructions and resources, as well as help in completing individual assignments. The website was designed to take on the role of another “part time classroom teacher” where students could go for information individually, a first stop before asking the classroom teacher for help. Its use could possibly free up the teacher to provide additional individual or small group instruction.

Students were asked to access the class website; find their individual pages; and complete Lesson 1 using the computer, their textbook, and the workbook, “Exploring Earth’s Surface.”

Preparation of instructional materials began in fall, 2010, when all students were asked to choose a Disney character. In this study, students and their web pages were identified by their chosen Disney character. Student Gmail addresses also included their character name. The use of Disney character names was for confidentiality and to provide students with a sense of ownership.

There were six class sessions, the first beginning with an introduction to the class website, and the last including a wrap up and discussion. Implementation began on January 31, 2011 and was completed on February 22, 2011.

Instructional Technologies and Materials

The lesson for presentation, “Exploring Earth’s Surface,” is part of a unit that addresses HCPS III Benchmark SC.2.8.1 Earth Materials: Identify different Earth materials and classify them by their physical properties. The big idea, or major understanding for this lesson is that the physical properties of Earth can be changed through weathering and erosion. The lesson is based on the second grade Harcourt Science curriculum currently in use at the school. The majority of the worksheets and pages utilized by the students are from the student booklets or lab manuals. Test problems pertaining to the lesson were separated from the unit test and recreated on a new sheet for presentation to the students.

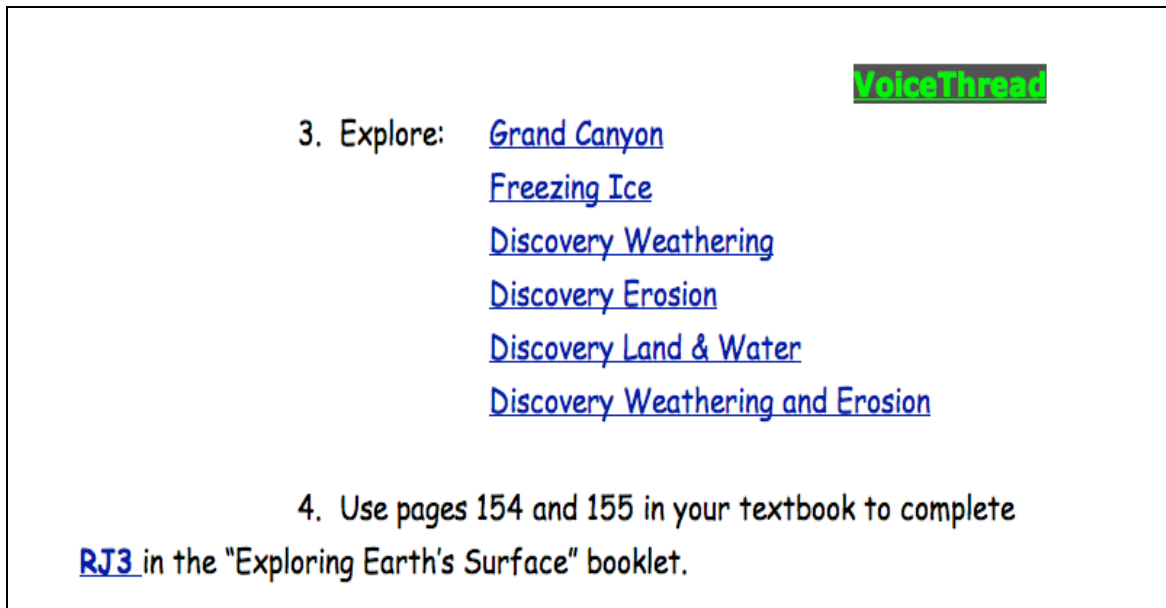
The lesson also addressed the following HCPS III Benchmarks (<http://standardstoolkit.k12.hi.us/index.html>):

- SC.2.1.1: Develop predictions based on observations
- LA.2.1.5: Use new grade-appropriate vocabulary introduced in stories and informational texts
- LA.2.1.8: Locate information in a variety of grade-appropriate resources
- LA.2.4.1: Write in a variety of grade appropriate formats for a variety of purposes and audience; such as, brief narratives with logical sequencing and some detail, simple explanations of an event or circumstance
- LA.2.5.3: Use a beginning, middle, and ending in a piece of writing

A class website was created on Google Sites, and included a Home page, Introduction, Lesson, Vocabulary, Help, and student pages. Each student was given their own

individual web page, identified by their chosen Disney character name. The class website was private; the only other individuals with access and monitoring privileges were the researcher, the classroom teacher, and the principal.

Each student's page provided instructions on completing the lesson, as well as any necessary supports. The pages were prepared in Google Documents and uploaded to the individual student web pages. The pages and assignments included VoiceThreads for audio and visuals of text and worksheets, links to videos produced by Harcourt Science and Discovery Education, and links to other websites for student exploration (see Figure 1). Public school students in the State of Hawaii Department of Education all have access to content in Discovery Education, an online content provider.



VoiceThread

3. Explore: [Grand Canyon](#)
[Freezing Ice](#)
[Discovery Weathering](#)
[Discovery Erosion](#)
[Discovery Land & Water](#)
[Discovery Weathering and Erosion](#)

4. Use pages 154 and 155 in your textbook to complete
[RJ3](#) in the "Exploring Earth's Surface" booklet.

Figure 1. Section of "Below Grade Level" assignment page with links to external websites and support links to VoiceThread.

The assignments and instructions were prepared and differentiated using three levels of readiness.

- Below grade level (Valley Group)
 - VoiceThread provided audio of text
 - VoiceThreads provided audio and visuals of all student instructions;
 - VoiceThreads provided audio and visuals of all worksheets;
 - external websites and videos included "below grade level" and "on grade level" content.
- On grade level (Delta Group)
 - VoiceThreads provided audio and visuals of some student instructions;
 - VoiceThreads provided audio of some worksheets and visuals of all worksheets;
 - external websites and videos included "below, on, and some above grade level" content.

- Above grade level (Mountain Group)
 - VoiceThreads provided visuals of all worksheets;
 - external websites and videos included “above grade level” and some “on grade level” content.

The classroom teacher determined each student’s placement.

The materials the students utilized for the lessons were their science textbooks, desktop computers and earphones in the computer lab, materials for experiments provided by the instructor, and the “Exploring Earth’s Surface” supplemental handout created by the researcher. The “Exploring Earth’s Surface” handout (also referred to as a “workbook”) contained reading worksheets, lab manual worksheets, copies of the student assignment as shown on the student’s individual web page, Venn diagrams, and other support and scaffolding materials. The students were asked to complete the workbook while navigating the website and submit it for review at the end of the lesson. The workbook was intended to serve as a visual reminder for the student of completed work as well as those assignments “need to do.”

At the end of the lesson, all students were asked to complete a model volcano, take an identical paper and pencil test, and for the teacher’s grading purposes (not part of this study), produce an artifact based on a “Be Somebody!” assignment.

Population

Target population for this study was a second grade class at a rural elementary school in Hawaii. Total student population of the school is 243 students: 61% are eligible for free lunch and 12% for reduced lunch. The entire class of sixteen students participated; parental permission was received from only nine students. Analysis in this study is based solely on the nine students, 5 boys and 4 girls. Two were 7 year-olds and seven were 8 year-olds; 8 of the 9 students reported having a computer/Internet access at home.

Results

Quantitative data were collected using quiz results, review of student workbooks, and survey questions in the class discussion at the end of the lesson. Qualitative data were collected from teacher observations and class discussion, and reviewed using the constant comparative method.

Teacher Intervention

Teacher observations indicated all students were able to access the class website and individual web pages. Most, however, needed some teacher intervention. Based on observations, the nature of teacher intervention usually fell into four categories, listed according to frequency:

- Navigation – “Where do I go now?”
- Guidance in workbook completion – “What do I write? I don’t know what to write!”
- Validation – “This is correct, right? Supposed to look like this this, huh?”
- Reminders to stay on task.

Initially, questions were non-stop, as shouts of “Ho, look at this!” or “Look at my page!” were heard and other students tried impatiently to rush and get to a webpage or view another’s page. Questions were fewer with each passing session.

Engagement

The students were engaged in the material most of the time; when they were not, it was usually because they were on a workbook page and did not want to write or did not know what to write. One student remarked that the linked websites were “awesome, radical”, and a number of students viewed some videos or web pages more than once. Both the researcher and teacher observed a noticeable change in behavior by the fourth session; students were engaged in the lesson, some were quietly listening to the VoiceThreads, questions were fewer and more content related, and the teacher was able to help more students individually. The teacher observed that a student who usually did not follow along in class, was listening to the VoiceThread and working independently.

Workbook, Quiz, and Artifact

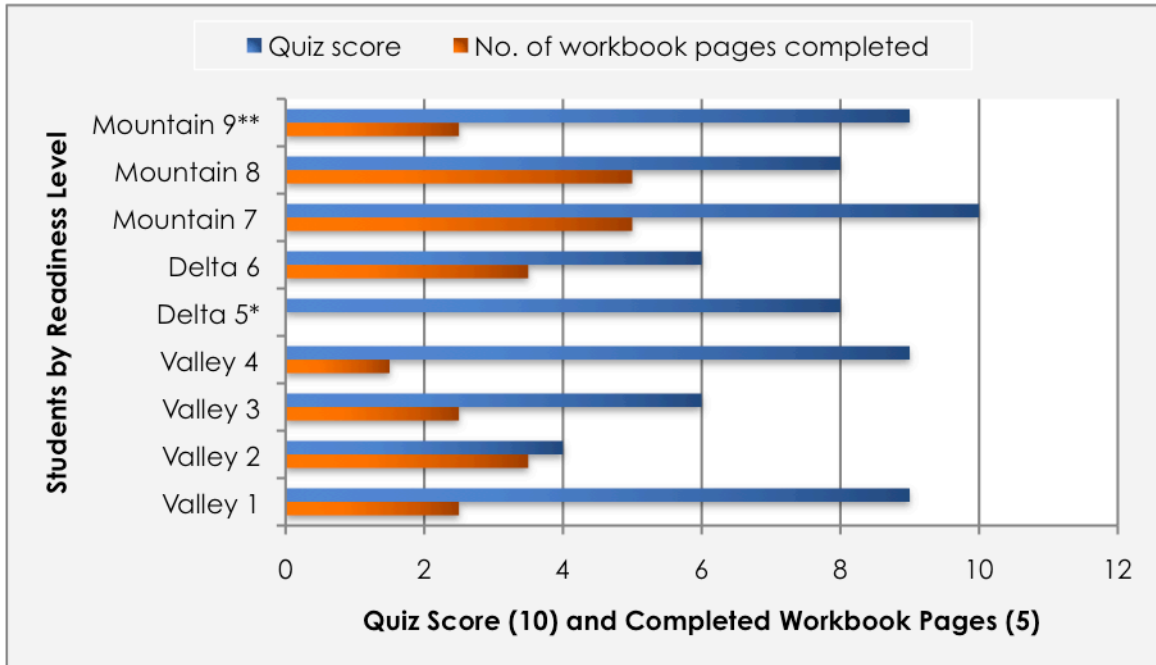


Figure 2. Results by student and readiness levels.

*Student unable to locate workbook

**Student missed one session

All nine students took the lesson end paper and pencil quiz; out of a possible 10 points, the highest score was a 10, the lowest a 4 (see Figure 2). Six of the nine students, or 67%, were considered “proficient”, with a score of 8 or more. All students completed at least one workbook page and completed the model volcano.

Discussion

Data were divided into two categories: (a) access and navigation of site and (b) assignment content and instruction. During the first session, navigation and access of the website posed numerous problems. Students were not used to a multiple page website and had trouble navigating between the web pages and VoiceThreads. Compounding the problem was the novelty of the website and due to scheduling issues, it was not possible to introduce and carry out the study in small groups. Also, as more computer savvy students found exciting pages or content, shouts of “Hey, look at this!”, “Cool!”, or “This is fun!” could be heard, and students gravitated for a look, or became impatient and very noisy. Some discipline issues as well as stagnation during completion of writing activities added to the length of the lesson. This was the first time the students experienced work through computer based individual instruction, and there was confusion at the beginning, but with each progressive session, students became more familiar with the routine, and the atmosphere became less “chaotic” as students worked more independently. In the wrap up discussion, the majority of students stated that navigating within the class website and assignments was “easy” or “kinda easy.”

Students all felt the VoiceThreads helped with assignment completion. One student remarked that the VoiceThread did not help, but in the same sentence, stated that the VoiceThread helped to “find where to go and what to do” and “let me know if I was on the correct place or not.” Another commented, “It told me what to do. I listened and it explained to me what to do and what I was looking at.” All students enjoyed learning in this manner, but two students stated that they would rather read from a book.

One surprising and encouraging result of the study was the quiz scores of two students in the “Below Grade Level” group. Both students did not complete even half of the workbook pages, but viewed all the videos and websites. Both scored 9 on the quiz, out of a possible 10 (“proficient”). Are these students visual learners? They probably are, and the lesson may have addressed their learning style. In discussions, many of the students quite frequently understood the concepts or ideas; they could articulate it but were unable to transfer the knowledge to paper. This would explain the avoidance of workbook pages and work stoppage during assignments to complete workbook pages.

The use of a class website was deemed to have increased instructional time if the following criteria were met:

- All activities completed within 5 days
- 75% of students are proficient in the quiz

The use of the class website did not result in an increase instructional time, as only 67% of students were identified as “proficient” and not all workbook pages were completed.

Conclusion

This study was encouraging; it demonstrated that second grade students were able to access a class website and complete assignments with some intervention. The amount of intervention appeared to be dependent mainly on the students’ navigational and writing skills. Does this study imply that had students been instructed on website navigation and introduced to the class website earlier, they would have been able to complete the assignment with minimal intervention and increased instructional time? Quite possibly, but due to the small number of participants, further research needs to be done to make that determination. In addition, while the research did not show any increase in instructional time, a more precise definition of “increase in instructional time” needs to be developed. Utilization of a class website provided a tool that allowed the teacher to present a science lesson using differentiated instruction; the teacher provided instruction with audio visual support and scaffolding based on the needs of the students and addressed different learning styles. It also provided an engaging and interactive way for the students to learn, as well as the opportunity to use and practice 21st Century technical and critical thinking skills. The research showed that the use of a class website was a valuable tool for teachers to use in providing differentiated instruction in the classroom.

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Appendix

Student Pages and Supports

VoiceThread

7. Explore: [Discovery Rivers](#)
[Discovery Land, Water, Air](#)
[Discovery Earthquakes & Mountains](#)

8. Use page 158 in your textbook to complete [RJ5](#) in the "Exploring Earth's Surface" booklet.

___ Activity D: Make a Model of a Volcano using [AS1](#).

Sample 1. Section of "Below Level" student assignment page with links to external websites and Voice Thread support pages.

7. Explore: [Landforms1](#)
[Landforms2](#)
[Discovery Rivers](#)
[Discovery Land, Water, Air](#)
[Discovery Earthquakes & Mountains](#)

8. Use page 158 in your textbook to complete [RJ5](#) in the "Exploring Earth's Surface" booklet.

___ Activity D: Make a Model of a Volcano using [AS1](#).

Sample 2. Section of "On Level" student assignment page with links to external websites and VoiceThread support pages.

7. Explore: [Landforms1](#)
[Landforms2](#)
[Discovery Rivers](#)
[Discovery Land, Water, Air1](#)
[Discovery Earthquakes & Mountains1](#)
[Discovery Water](#)

8. Use page 158 in your textbook to complete [RJ5](#) in the "Exploring Earth's Surface" booklet.

Sample 3. Section of "Above Level" student assignment page with links to external websites and VoiceThread support pages.

The screenshot shows a VoiceThread interface. On the left, there is a sidebar with a list of "Student Pages" including Aladdin, Belle, Cinderella, Daisy, Doc, Donald, Goofy, Jasmine, Mickey, Peter Pan, Minnie, Sebastian, Sleeping Beauty, Snow White, Tinkerbell, and Tritan. A red arrow points from the "Vocabulary" link in the top navigation bar to the "Vocabulary" link in the sidebar. The main content area displays two activity instructions. The first instruction, "Activity C", asks the student to read pages 154, 155, 156, 157, and 158 of a science book. The second instruction, "RJ2", asks the student to use the "Vocabulary" page of the website to find words in alphabetical order, click on each word to access a glossary, and use a loudspeaker icon to listen to the meaning. A red arrow points to the "RJ2" instruction. A small audio player icon is visible in the top left corner of the main content area.

Sample 4. Screen shot of VoiceThread providing audio and visual support. Assignment is read and additional oral instructions are provided, with arrows providing reference points.