INTEL EDUCATION LAB CAMERA AND SPARKVUE
RESOURCES FOR PRIMARY TEACHERS

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of
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By
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CERTIFICATION OF APPROVAL

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PRIMARY TEACHERS

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DEDICATION

This project is dedicated to the primary students and teachers in Manteca Unified School District. The resources and tools developed for this project were developed with them in mind in order to help incorporate technology into their science instruction.
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ABSTRACT

This project creates a digital notebook for teachers of primary grades, kindergarten through third grade, of resources to help incorporate the Intel Education Lab Camera and SPARKvue software into their science instruction. The resources are organized by grade level, and by function of the two programs. Teachers may use this digital notebook to find resources on learning how to use the functions of the two programs, lesson ideas that correlate Next Generation Science Standards, as well as English Language Arts concepts, with the functions of the programs for each grade level, videos of lessons being implemented, and resources that can be used with the lessons. This digital notebook can be downloaded as a personal copy, and then edited by the user via visiting http://docs.com/sarah-guidry.
CHAPTER I

INTRODUCTION

Technology is a tool that is becoming more and more common in the elementary school classroom. Technology has the power to enhance student learning, if used meaningfully. In order for technology to be a powerful learning tool, it must be used to deepen students’ engagement and learning within the curriculum (Murphy, DePasquale, & McNamara, 2003). When students are taught how to use developmentally appropriate applications and software, in ways that connect to the curriculum, technology has a positive effect on student learning and development (Murphy, DePasquale, & McNamara, 2003).

The best way to increase student learning and achievement is by engaging them. There are six key drivers to engaging students: relevant learning, personalized learning, collaborative learning, connected learning, information literacy, and dialogical/dialectical thinking (Edwards, 2013). When relevant learning takes place, students are able to see the value in school. Students are able to personally connect to the learning that is taking place. Personalized learning takes place when teachers utilize formative assessments and differentiate their instruction to meet the needs of the individual, as well as the class. Collaborative learning happens when students are allowed to bring their talents and knowledge together to share and deepen their understandings of topics by working together. Connected learning involves student research which links them to people, places or information that they would not
normally be linked to without technology. Information literacy is the ability to conduct research, review credible sources online, and cite the sources. Dialogical/dialectical thinking is the consideration and analysis of all viewpoints on a given idea or issue. All six of these key drivers are best facilitated through the use of technology.

In general, many countries around the world have placed a priority on science and the success of students within the science field. Governments have realized that their economic futures depend on a workforce that is competent and capable in the areas of science, mathematics, and engineering (Slavin, Lake, Hanley, & Thurston, 2012). In the early elementary grades, students’ perceptions and opinions about science are shaped. Although it is of great importance that students develop positive perceptions and opinions about science during their early elementary years, science at the primary level proves to be problematic (Slavin, Lake, Hanley, & Thurston, 2012). Many teachers who teach early elementary school do not possess confidence in their scientific knowledge and science teaching skills. It is important that students receive high quality science instruction that is engaging, inquiry-based, develops conceptual understanding, and has real-world applications at an early age. A tool that can help aid teachers in delivering science instruction that incorporates those qualities is technology.

In Manteca Unified School District, all students, k-12th grade, are supplied with a Panasonic 3E hybrid tablet. The tablets run a Windows Operating System, and can be used for STEM (Science, Technology, Engineering, and Mathematics) based
learning. On each device, two programs are installed that allow students to explore scientific concepts. One of the programs is the Intel Education Lab Cam Software, and the other program is SPARKvue created by Pasco. The Intel Education Lab Cam software includes microscopes that snap onto the tablet’s camera, a time-lapse function, pathfinder function, and a motion cam that can be utilized in the primary classroom. The SPARKvue software uses temperature probes that plug into the student devices’ headphone jacks to read temperatures. Both programs are highly engaging for students to learn scientific concepts, but are often unused because teachers are unaware of best practices in using such software. Primary teachers, especially, believe these programs are meant for higher grades, and therefore they do not take the time to learn how to use the materials. They also do not know where to find resources to help them implement the Lab Cam or SPARKvue software into the lower grades.

**Statement of the Problem**

Nationally, trends have been reported of declining interest, poor preparedness, and low persistence of U.S students in STEM (Science, Technology, Engineering, and Mathematics) fields (Weaver, Cook, Foster, Moon, Phegley, & Tormoehlen, 2013). According to the National Science Foundation, students in the U.S. are choosing STEM majors less and less, while the demand for them in the labor market is increasing more and more (Heller, 2013). In order for the U.S. to keep its prominence within the STEM fields, it must produce at least one million more workers to fill jobs in those fields over the next 10 years (Gates & Mirkin, 2012).
There are not enough students entering into these fields due to inadequate preparation, lack of interest, as well as jobs in the field presenting an un-welcoming environment to women and minorities, who make up 70% of college students (Gates & Mirkin, 2012). In order to get students interested in and prepared for STEM majors and careers, teachers must start at the primary level, where attitudes and perceptions about science and math are fostered and developed. In order to raise student achievement in STEM fields, primary teachers must meaningfully engage students in the curriculum. The purpose of this project was to explore the Intel Lab Cam software as well as the SPARKvue software, and develop resources for primary teachers to help them to learn the programs and to comfortably, and confidently integrate the technology into their science instruction. Once these resources were developed, they were shared in a collective space, where teachers had access to them under Employee Resources on Manteca Unified School District’s website. Teachers were able to download the materials and edit on their own devices, but the original stayed intact on the district’s website.

**Significance of the Project**

Many primary teachers are very timid when it comes to teaching science, as well as teaching using technology. When it comes to teaching science with technology, those teachers do not feel comfortable or confident, and often do not know where to start. The teachers in Manteca Unified School District did not receive training on how to use the Intel Education Lab Cam software or the SPARKvue
software, therefore did not even begin to explore the capabilities of the resources. Primary teachers often thought that these programs were not for younger grades, because the functions are too advanced. This is unfortunate for the students who could otherwise become highly engaged when using the technology to learn. This project has created a place, in the form of a OneNote Notebook posted under Employee Resources on the district website, where teachers can go to learn how to navigate these programs; find resources, lesson ideas, and videos of lessons; and collaborate with other primary teachers on ways to use the Intel Education Lab Cam software and SPARKvue software. This will allow teachers to become more confident in their knowledge of the programs, and in how to use them effectively with different primary concepts. The availability of these resources, in turn, hopefully will result in implementation of both the Lab Cam and SPARKvue software into science lessons with students. Students will benefit because they are able to use hands-on technology to explore science concepts in a highly engaging manner. This project has potential to develop and foster positive attitudes and perceptions about science early on, as well as develop conceptual understanding of scientific principles.

**Theoretical Framework**

There is no question that engaging students is a key factor in fostering their growth and achievement within the curriculum. The Engagement Theory was developed by Ben Shneiderman and Greg Kearsley (Kearsley & Shneiderman, 1998). The theory suggests that students have higher achievement when they are
meaningfully engaged in a worthwhile task while interacting with others (Kearsley & Shneiderman, 1998). The Engagement Theory is based on three components that make learning activities accessible to students, as well as have real-world applications. The three components are relate, create, and donate (Kearsley & Shneiderman, 1998). Relate refers to working collaboratively in a group. Create refers to the project or task the students will be completing. Donate refers to sharing their work with an “outside customer.” The donate component is what makes the task or project meaningful, authentic, and have a real-world application. Students will be meaningfully engaged and put forth much more effort if they know someone outside of their collaborative group will have a purpose for their project, and will actually be using it.

Shneiderman and Kearsley believe that technology is the tool that can best facilitate the three components to a meaningful, authentic, and engaging project or task in ways that cannot be done with any other type of tool. Technology can be used to facilitate and enhance engaged learning in ways that are not possible with traditional methods (Kearsley & Shneiderman, 1998). For example, students could be put into collaborative groups with others around the state, country, or even world using Skype in the classroom. These collaborative groups can talk and work together using video conferencing, email, Google docs, etc. Students are not only working with people in different areas, but are interacting with different cultures, ways of thinking, and are broadening their horizons past what they know and are comfortable with in their own day to day life. Students can use a variety of software, hardware,
and applications to build, solve, and create within their collaborative groups. With the use of technology they can share, or “donate,” their work at the click of a button.

Engagement Theory explains how the use of technology enhances student interest within any curriculum. When students are meaningfully engaged using technology to “relate, create, and donate,” achievement is affected positively (Kearsley & Shneiderman, 1998). The Intel Lab Cam software offers a way for students to interact with science concepts using technology. It allows students to digitally explore science concepts with four tools that use their tablet’s built-in camera. The tools include Time Lapse, Motion Cam, Pathfinder, and Microscope. Another resource that utilizes temperature probes to measure and analyze temperature is SPARKvue. The tools embedded in both of these programs foster deep understanding of concepts through the use of technology because students are highly engaged when using them. These tools allow students to relate, create and donate. Students are able to work collaboratively in a group to use each of these tools. They can easily create or design science experiments that incorporate these tools, and then carry them out. Students then record the steps and procedures in their experiment in order to donate, or share their work online for other students to try out.

**Definitions**

The following short descriptions define terms of importance in the understanding of this project.
Differentiation. In regard to teaching, differentiation is the act of making an activity or assignment different for each group of students in order to meet their needs, and allow them to be successful (Tomlinson, 2016).

Engage. Engage means to occupy, attract, or involve someone’s interest (Dictionary.com, 2016).

Motion Cam. The motion cam function is a camera that starts recording once it detects movement (“Intel® Education Lab Camera by Intellisense User’s Guide,” 2013).

Motivation. Motivation is an internal state or condition (sometimes described as a need, desire, or want) that serves to activate or energize behavior and give it direction (Huit, 2011).

OneNote. OneNote is a Microsoft program where information is gathered, and multi-user collaboration in possible. It is a collective space for users' notes (handwritten or typed), drawings, screen clippings and audio commentaries. It is a digital notebook (“What is OneNote?,” 2016).


Time Lapse. The time lapse function photographs a sequence of frames at set intervals to record changes that take place slowly over time. When the frames are shown at a normal speed, the action seems much faster (“Intel® Education Lab Camera by Intellisense User’s Guide,” 2013).
SPARKvue. SPARKvue is a science learning application that combines rich standards-based content, data collection, visualization, analysis, and assessment into one seamless environment. The framework also allows students to perform sensor data analysis (Cider House Tech, 2014).

Summary

It is well known that technology increases engagement, and engagement positively affects learning. With so many science-based jobs available, it is essential that students are receiving engaging science instruction. One way to engage students in science is by involving technology use into the learning environment. Students’ perceptions of science are formed at an early age. In order to make these perceptions positive, students need engaging instruction that involves technology use. This chapter explained that students need to be engaged in order to learn, and in these times technology is what engages students the most. Chapter II will share an overview of the literature related to using technology in order to engage students in instruction, specifically science instruction.
CHAPTER II

REVIEW OF THE LITERATURE

Engagement and motivation are two huge factors in the success of students in the U.S. education system. Without engagement and motivation, students would have difficulty being successful with the material. When they are fully involved and interacting with the material they are presented with, they are likely to learn more, and retain their knowledge. It is of high importance that teachers work to find what makes students excited to learn. Studies, though minimal, have measured the impact technology has on students’ engagement and motivation, as well as the perceptions teachers, administrators, students, and parents have about technology in education.

Engagement

Project Tomorrow (2011) conducted a study in which, k-12 students, parents, teachers, librarians, and administrators were polled about the role of technology in learning in and out of the classroom. Over 377,894 students, parents, teachers, librarians, and administrators across public and private schools from over 1,340 districts were surveyed. These schools represented urban, suburban, and rural communities. Over half of the schools were eligible for Title I. The survey asked questions about the use of technology for learning, 21st century skills, emerging technologies (online learning, mobile devices and digital content), science instruction, and STEM career exploration. Educators were also asked to share the challenges they
encountered when integrating technology into their teaching. From the survey data, three key trends emerged. Key trend 1 showed that there has been a huge increase in interest across education with mobile learning. The interest lied in small, portable devices that can facilitate anytime, anywhere learning. Key trend 2 found that students and parents showed great interest in online learning. Key trend 3 showed that administrators and parents were excited about the idea of E-textbooks. E-textbooks eliminated the burden of carrying heavy textbooks around every day, as well as could eliminate the high cost of printed books. Overall the survey indicated that technology enables, engages, and empowers students. People from very diverse backgrounds felt technology is important in education. The stakeholders agreed that technology was a tool that could be used to motivate, empower, and engage students in their education. When students are engaged, they achieve.

Godzicki, Godzicki, Krofel, and Michaels (2013) carried out an action research project, in which the authors examined the motivation and engagement of students through technology-supported learning environments. The purpose of the study was to determine if the use of technology would increase student motivation and engagement during lessons. The sample consisted of 116 students ranging in grades 1-8 from an elementary school as well as a middle school in Chicago, IL. The researchers distributed a student survey that asked about motivation and engagement. The teacher researchers then implemented technology-supported learning in their classrooms for a total of 12 weeks. At the end of the 12 weeks, the student survey was redistributed to determine if motivation and engagement were improved with the use
of technology. The results indicated that students were more motivated and actively engaged in learning when using technology. A technology supported learning environment increased student engagement and motivation by 9%, according to data collected from the student surveys.

This study confirmed that students want to use technology. Technology interested them, motivated them, and involved them in their education in meaningful ways. When asked, students would rather learn and complete assignments using technology than via traditional paper and pencil methods. When students were engaged and motivated, they produced high quality work. When students put forth effort and produced high quality work, their learning was high quality as well.

Dietrich and Balli (2014) interviewed 34 fifth-grade students about classroom learning and technology. This qualitative study explored learning and technology with “digital natives,” or someone who has spent his or her entire life surrounded by technology and digital toys/tools. The purpose was to investigate the extent of which technology engages a “digital native.” The researchers interviewed 34 fifth-grade students from six different classrooms, across three schools; one private, and two public. Students were selected based on their ability to proficiently articulate their thoughts. This was determined by responses to the writing prompt, “describe being fully engaged.” The chosen students were then interviewed with questions about their involvement in lessons. All responses were audio recorded, and transcribed word for word. All transcripts underwent line by line coding, were categorized, and then were examined for patterns.
The results of this study demonstrated that technology such as the Promethean board (interactive white board) grabbed the attention of the “digital natives” because of its novelty. The technology grabbed students’ attention, mainly because students wanted to use it. They were anxious for their turn to use the resource. The authors concluded that students were ritualistically engaged rather than authentically engaged, because they were not engaged by the content, but instead by the fancy technology. Also, students admitted to not paying attention to other students using the Promethean board, or to the teacher during long presentations. They were waiting for their turn to write on it. When the students had access and control of the technology themselves, they were authentically engaged in the content. In the study, one class of students had access to iPads (Dietrich & Balli, 2014). They described using various applications to demonstrate their knowledge. They were engaged in the content, yet using technology as a tool to “show what they know.” Students also communicated that they enjoyed doing research on topics, rather than listening to a teacher teach the topic. Many students who were interviewed enjoyed using PowerPoint to develop presentations on a topic they had to find information about. They felt they learned more by doing the research than they would have by listening to a teacher talk about it. When students had the opportunity to have choice and control, as well as use what they viewed as real-world technology applications, they were more authentically engaged in a lesson.

Elliot, Wilson, and Boyle (2014) conducted a study in which they examined the relationship that portal-based multimedia-rich resources had with teachers’ practices, as well as students’ engagement and understanding of science concepts.
They specifically studied the Glow Science resources e-learning portal media rich resource for science. The researchers applied a mixed-methods approach which utilized an online questionnaire to obtain a profile of Glow Science users and potential users in order to gather general views on the resources. They conducted individual interviews to explore teachers’ experiences using Glow Science resources and its impact on their competence and confidence. They held focus groups to investigate pupils’ experiences with Glow Science resources and its impact on their enjoyment, engagement, and understanding of science. They also observed teachers’ and pupils’ actual use of Glow Science resources, and its suitability to the learning environment and its effectiveness as an e-learning portal as a platform for delivery. The questionnaire included 26 closed questions (multiple choice, Likert scale, dichotomous), along with a few open ended questions which investigated teachers’ and students’ experiences with multimedia resources. The questionnaire was posted on the Glow Science portal. The results of the survey (n = 120) in regard to perceptions, facilitators, and barriers showed 98% positive perceptions about the quality of videos offered on Glow, 97% of teachers agreed that the content supports science, and 78% agreed the content supports health and wellbeing. The findings also indicated that critical issues preventing usage were: lack of time to access the resources (58%), lack of school IT infrastructure (35%), and film-loading delays due to bandwidth issues (32%). In regard to impact on teaching practice and pupil learning, users (n = 57) suggested that the resources contributed to teachers’ ability to confidently deliver creative instruction. Of the users, 72% agreed with the view that
the resources contributed to their pupils’ learning enjoyment, 56% acknowledged the resources’ “great influence” on improving pupils’ understanding of science lessons, and 53% acknowledged their pupils’ increased engagement from using the Glow Science resources.

The teachers involved in this study found that using the e-learning portal helped their students to understand science content through watching the “eye-catching” videos, which allowed them to see the science concept for themselves, rather than to just read about it. This allowed for higher engagement, and more student enjoyment when learning science concepts. These resources also helped teachers to feel more confident in their ability to deliver science instruction.

Looi, Chen, and Ng (2010) conducted a qualitative study on student interest levels when using an interactive technology called Group Scribbles (GS) 2.0. GS is a collective sharing space which promotes 21st century skills through rapid collaborative knowledge building (RCKB) with peers. The students use virtual “post-it notes” to post their ideas anonymously with their peers. Within GS there is a group board where their notes are seen by their group, and a private board where students may write and prepare their notes before sharing them with their peers. The purpose of this study was to explore the participation and discourse patterns of an elementary grade 5 science classroom in Singapore when using GS. The researchers observed the classroom of 40 mixed abilities, grade 5 students using GS. The lesson taught was about seed dispersal, which the students had never learned about before. The teacher started an introduction session by getting students to self-explore and discuss if it is
more advantageous or disadvantageous to have the parent plant and young plant grow near each other. The GS class was divided into 10 groups of four students. Each student used a small scribble sheet to convey his or her thoughts and ideas in either textual or graphic form in their private space, and then placed his or her posting on the group board to discuss and enhance the ideas and meanings with other group members. They then did a ‘gallery walk’ by visiting all other group boards in GS, and offered comments and suggestions. After, they went back to their own group board, read the comments by other students, and improved on their ideas. The groups gathered many positive comments, and had the opportunity to show them in the class’ interactive whiteboard. Finally, the group members verbally presented their ideas to the whole class.

This lesson was video-recorded and observed by the researchers. Detailed field notes were taken. Morae 2.0 (TechSmith Corporation) was installed in the tablet PCs of eight students who were in two groups, to capture their activities on the screen, as well as to record their facial expressions and verbal talks with each other. The Morae recorder captured audio, video, on-screen activities and keyboard/mouse input during each student’s session. The teacher was interviewed after the lesson.

The findings of this study suggested that the Group Scribbles program supports a high level of student participation (Chen & Kit-Looi, 2010). In the observed lesson, 38 out of 40 students posted their ideas in the 10 GS group boards. On average, each group contributed six ideas. Other findings included that GS supports instant formative feedback and frequent interaction. GS was used to rapidly
aggregate the input of all students anonymously and to make students’ work visible to all instantly. With the rapid formative feedback from the GS, the teacher saw students’ misconceptions immediately. GS also encouraged improvable ideas. Students were able to immediately comment on others’ ideas, and add to them. The ideas grew and were refined.

From using the Group Scribbles program, students were able to share their ideas anonymously and comment on others’ ideas to improve them, all while receiving instant formative feedback from the teacher. The lesson resulted in high student participation, meaning they were interested and engaged with the material.

Boyce, Halverson, Mishra and Thomas (2014) conducted a study that explored how fifth-grade students interacted with nature using mobile technology during a nature hike series. Fifty-five fifth-grade students from two low-income schools in the Southern USA participated in this study. The researchers aimed to answer: 1. How does the technology plane influence students’ participation in a nature hike? 2. In what ways do students use technology when participating in a nature hike? This study utilized a qualitative approach in order to understand how students experienced the natural world during an environmental nature program over the course of two semesters. The researchers designed an iPad app, titled GO, using the state 2010 science frameworks to guide the app content. They paired the GO app with the iPads’ built in camera and notebook app in order to provide a technology supplement for students to use on their hikes. The GO app followed the same format for both hikes: topic overview for the hike selected, map of 10 stations to visit,
station-specific content, and Look, Listen, and Touch activities for each station. Additionally, the researchers worked with the local environmental center to include a photo field guide of local flora and fauna that was accessible through the GO app. Each hike was about 2 hours, and students were broken up into groups of 6-8 students, with one iPad for each pair of students. Each group was led by a trained naturalist. They stopped at each of the 10 stations, read the station-specific content from the app, participated in the Look, Listen, and Touch activities, and were allowed to take notes or pictures if they desired. After the hike, students had a journaling session, and were able to share with other students about their experiences. Two researchers followed each group to gather data about the experience. One researcher took detailed field notes on targeted students’ experiences, and one took detailed field notes on each group’s experiences. They also took video recording from two stations along the hikes, and conducted individual follow-up interviews with a subset of the participants.

The researchers used all data sources in their analysis. To answer the first research question, they developed an experience profile describing the typical Technology Plane interactions students experienced during each hike. They did this by initially transcribing all audio recordings and field notes from the hikes and individual interviews. Next, a deductive open coding approach to identify instances when key informants interacted with mobile technology during participation in positive, negative, or neutral manners was used. Then, they created a timeline for how students used mobile technology for the duration of the hike, specifically taking note
of changes in use across time. At this point, student profiles that described each of their experiences were created. The researchers reviewed all of the profiles and returned to the data sources to ensure that the understandings were accurate descriptions of the authentic experiences. A constant comparative method to uncover patterns in mobile technology use by student was used. Once themes in the data were identified, the video recordings and interview transcripts to triangulate the findings were used. The researchers used the theme to generate the overall experience profile that encompassed all of the major interactions that were identified that could be expected for a typical visit.

To answer the second research question, the researchers explored the ways students used iPads during the hikes, including the use of the camera, GO app, and notepad. Using field notes from each hike, the researchers first used a deductive approach to code how students were using the iPad supplements that were provided (Look, Listen, and Touch activities, camera, notepad, map, etc.). Next, an inductive approach to code any additional mobile technology uses that had not been anticipated (video recordings, unrelated game activities, audio recording, notepad usage before prompting, etc.) was used. During the second round of coding, the researchers looked for occurrences of self-initiated participation versus naturalist prompted participation using the mobile technology during hike activities. Once coding was completed, the researchers identified patterns in iPad use over time. They triangulated the data using student responses during interviews and video recordings.
The researchers found that students were eager to take part in the hikes because of the technology involved. They wanted to get a chance to play with the iPads. Students acted excitedly to read the text from the GO app at each of the stations they stopped at, they eagerly took photos, and typed notes on the iPad about what they were experiencing. Students were engaged and interacting the entire time. The researchers found that the GO app piqued students’ curiosity to explore the nature more in depth. For some students, the iPad helped them to engage with the wilderness, as well as with their peers. Without the technology, some were unengaged and shy. The researchers observed that the more students used the iPad, the more they opened up and participated fully. The researchers observed the students using the camera app, the GO app, and the notepad app on their provided iPads. On the first hike, the students took many photos (129 per pair) but many of those photos included silly “selfies.” On the second hike, fewer photos were taken (37 per pair), and the photos included more of what the naturalists were holding or showing students. Students were rarely distracted by the iPad, but used it as a resource to look up locations on the map, read different activities, and look up images. Much of the iPad usage was self-directed. Students initiated use when taking pictures or recording video of the naturalists, reading ahead about the next station, using the map to keep track of their location, and reading about animals. Students also completed Look, Listen, and Touch activities through the GO app, and from completing these activities, students were engaged with the natural area around each station. Students minimally used the notepad to take notes.
This study showed that students can use technology to enhance an outdoor experience, and use it to help them engage with the nature in a way they would not have been able to without the technology. They could use the technology to read more information, look at images, and capture images for further investigations. They were both engaged with the technology use, as well as with the natural world around them. The technology did not distract them from the nature, but helped to inform them about the nature they were experiencing.

**Motivation**

Bebell and Kay (2012) examined the Berkshire Wireless Learning Initiative, a 3-year pilot program tested by five middle schools in Massachusetts. The pilot program provided every student with a laptop \((n = 1700+/-)\), and equipped the schools with wireless internet. The purpose of the pilot program was to see if the use of 1:1 computing was of value in changing the way teachers taught and students learned. The targeted goals of the pilot were to see if using the 1:1 laptops enhanced student achievement, improved student engagement, improved classroom management, and increased students’ capabilities to do independent research, as well as changed fundamental teaching strategies. The study was conducted with a pre/post comparison group design to examine the effects of 1:1 technology on students and teachers across the five participating schools over three years. The researchers also collected data from two neighboring public schools with similar demographics. Surveys, interviews, and classroom observations were also conducted in addition to the quantitative data collected. The results of this study showed that due to the
implementation of 1:1 laptops, there was increased use of technology by teachers and students, more creative teaching strategies used by teachers, an increase in student motivation and engagement, and a slight increase in student achievement. Teachers in the 1:1 schools used technology in English Language Arts an average of 47 times during the 2007-2008 school year compared to the non 1:1 schools’ average of 19 times. The 1:1 schools used technology during math an average of 20 times compared during the 2007-2008 school year to the non 1:1 schools’ average of 8.5 times. The 1:1 schools used technology during social studies an average of 44 times during the 2007-2008 school year compared to the non 1:1 schools’ average of 8 times. The 1:1 schools used technology during science an average of 34 times during the 2007-2008 school year compared to the non 1:1 schools’ average of 8 times. Pilot students reported using technology across a wide variety of applications with a substantially greater frequency than students of the non-pilot schools. Of the pilot teachers surveyed and interviewed, 62% reported that their teaching had changed for the better due to the 1:1 pilot, and use of technology in their classes; only 10% disagreed. Eighty-three percent of teachers reported that engagement had improved for their traditional students, 84% of teachers reported engagement had improved for low/at-risk students, and 79% of teachers reported engagement had improved for high achieving students.

This study indicated that the use of 1:1 technology in the classroom opened up many doors for students and teachers. This type of technology use was able to lead the way to having a completely student-centered classroom. The use of technology
was able to engage and motivate students to achieve more, which supported the claim that technology increases student engagement and motivation, which in turn enhances student achievement.

Sivakumaran, Garcia, Davis, Jones, Choi, and Dawson (2012) conducted a survey that examined students’ perceptions of technology use in schools. The researchers held a week long technology camp during the summer at the University of Louisiana Monroe for students who were entering 7th, 8th, and 9th grade. During this week, students were exposed to Apple computers and the iMovie software. Students created 15-minute mock news broadcasts about topics that were relevant and interesting to them. After the week, students were given a survey that examined their perceptions of and experience in using the technology. The results found that less than half of the students who participated spent time using computers in school. Only 12.5% had ever used the iMovie software before. When asked how students viewed the use of multimedia as a learning and teaching tool, 100% of the students conveyed they would participate more in class if technology was used as a form of assessment. Overall, student perception was positive about the use of technology as a learning and teaching resource in the classroom to make learning more “interesting and fun”

This study suggested that students wanted to learn using technology. They believed it was interesting and fun to use technological resources to complete assignments or projects. Students wanted to be assessed using technology rather than with traditional methods. When students thought something was interesting and fun, they were motivated and engaged.
Ojose (2009) conducted a qualitative case study to examine the practice of
technology in teaching math and science. The main participants were principals, lead
teachers, teachers, and support staff. Data were collected using interviews,
observations, and archival documents. This study examined a charter high school in
Fresno, CA. The school, the Center for Advanced Research and Technology (CART)
was a technology based school set up for the purpose of exposing its students to
cutting edge technology, relevant to career fields/paths chosen by its students.
CART’s intent was to prepare students with skills that will be applicable to an ever-
changing work environment. The purpose of this study was to gain insight on
promising practices used by CART to implement technology into its math and science
instruction, and to see if these practices resulted in positive educational outcomes.

Interviews were the main data collection instrument. The principal, two lead
teachers of technology, three math teachers, three science teachers, and some
administrative staff connected with technology usage were interviewed with open
ended questions about experiences and attitudes in regard to using technology with
their mathematics or science instruction. The researcher observed mathematics and
science teachers during lessons. The researcher also collected and analyzed archival
documents including the school’s charter, curriculum guide, lesson plans of
interviewed teachers, and relevant student work. In order to determine if there was a
positive educational outcome, attendance rates, grades, GPA, and test scores, as well
as state test scores were compared to students at a traditional high school in the
disciplines of science and math. The results of this study showed there was
constructive teaching and learning due to the use of technology, meaning that the learners were actively involved in the learning process of meaning and knowledge construction rather than passively receiving information. The practice of using technology in teaching math and science led to increased student achievement as evidenced by standardized test scores. The practices of using technology led to other positive outcomes like increased motivation, increased attendance rate, increased mean GPA, and fewer behavior problems. Data revealed that the students at CART had a 98.5% rate of attendance compared to the 96.5% attendance rate at a traditional high school. Data comparing the 2003 STAR Exam scores of all students in both CART and traditional high schools showed that the mean score at CART was averaging 780, while it was a mere 650 out of the 800 maximum at a traditional high school. The GPA of students attending CART also increased from year to year. Available data compared the cumulative GPA at the beginning of the school year to that at the end of the 2004-2005 school year. There was a net gain of about 0.16 points in cumulative GPA at CART by the end of the school year.

This study demonstrated that the use of technology in teaching math or science made the content more accessible to students. Technology made the instruction and learning more interesting and meaningful, which in turn allowed student to achieve more. They were more motivated to get themselves to school, immerse themselves in the learning, and succeed.

Liu, Horton, Olmanson, and Toprac (2011) conducted a study that examined middle school students’ learning and motivation as they were engaged in a new media
enriched problem-based learning (PBL) environment for middle school science. The media enhanced PBL environment was called *Alien Rescue*, in which students had to use their knowledge of the solar system to help re-home various alien species to a planet that best supported each individual alien’s survival. In order to accomplish this goal, the students had to engage in a problem solving adventure, gathering information about each alien species’ requirements for life and analyzing species-related factors. They also had to discover critical information about scientific characteristics of the planets and moons in the solar system by researching the provided databases, and collecting direct observations from using simulated probes. The researchers used both quantitative and qualitative measures to collect data on what effect the PBL environment had on the sixth graders’ science learning, if the media enhanced PBL environment motivated sixth grade students, and what the relationship between their motivation and science learning was.

Sixth graders (*n* = 220) from a middle school in a southwestern city in the United States participated in this study. Of those students (*n* = 119) were female, and (*n* = 101) were male. Each student had his or her own computer to use for *Alien Rescue* each day for 45 minutes over the course of 3 weeks. This was a self-paced curriculum, but students were allowed to work in small groups. In order to gauge student knowledge and experience before beginning *Alien Rescue*, students were given a pre-test on their science knowledge before using the PBL environment. Questions were about information the students would be expected to know after completing the curriculum. The Cronbach’s alpha for the instrument was 0.77 for the
pre-test and 0.87 for the post-test for this sample. Each question had four answer choices and one of them was ‘not sure.’ This option was included in order to assess if students were more certain of their answers in the post test. This test was also administered after completion of the curriculum in order to measure any change. The two-factor mixed ANOVA with repeated measure indicated that there was a main effect for the time of testing: $F(1,142) = 320.94, p < .01, ES = 0.69$ and for gender: $F(1,142) = 5.47, p < .05, ES = 0.04$. The correct responses in the science knowledge test increased significantly from pretest to posttest for both male and female students and a small but significant difference was observed between males and females ($M_{\text{male}} = 83.53; M_{\text{female}} = 79.36$). There was not a significant two-way interaction between gender and time of testing. The average gain score from pretest to posttest was 30.31 with $M_{\text{male}} = 28.02$ and $M_{\text{female}} = 31.85$ and the difference between male and female was not statistically significant: $F(1,142) = 1.32, p = 0.25$. The two-factor mixed ANOVA with repeated measure showed a significant two-way interaction between gender and time of testing for the number of unsure responses in the science knowledge test: $F(1,142) = 11.54, p < 0.01, ES = 0.08$. There was a main effect for the time of testing: $F(1,142) = 83.13, p < 0.01, ES = 0.37$ and a between-subjects effect for gender: $F(1,142) = 7.42, p < 0.01, ES = 0.05$. The number of unsure answers reduced significantly from pretest to posttest for both male and female students. This decrease was more dramatic for female students than for male students.

Students were also given a motivation questionnaire. Fifteen items from the Intrinsic Motivation Inventory (IMI), a seven-point Likert scale with 1 being not at all
true and7 being very true, were used to assess students’ motivation. In this study, four subscales on a five-point Likert scale were used because of their connection to the research questions and their Cronbach’s alpha values were computed for this sample: interest/enjoyment (four items, alpha = 0.95), perceived competence (four items, alpha = 0.84), effort/importance (three items, alpha = 0.87), and value/usefulness (four items, alpha = 0.92). This instrument as a whole had an alpha value of 0.95 and was administered after the students completed the curriculum. Once students had completed the curriculum, they were also asked open ended questions in order to assess their view on their experiences. The ANOVA analyses showed students’ total motivation scores as well as scores in each subscale were above the mean, and there was no significant difference in the total motivation scores between male and female students: $M_{\text{male}} = 3.60; M_{\text{female}} = 3.75$, $F(1, 130) = 0.97, p = 0.33$, as well as in each subscale of motivation scores. The multiple regression analysis, examining the relationship between students’ motivation scores and their science knowledge posttest scores, controlling for the effect of the pretest scores, showed a significant moderate $R^2$ of $0.26$, $F(2, 129) = 23.17, p < 0.01$. Students’ motivation score was found to significantly predict their science knowledge test scores: $b = 5.43$, $t(129) = 2.6, p < 0.01$.

Approximately 180 students responded to the six open-ended questions. The prevalent perception of the PBL environment was positive. In answering “‘Tell us how much you liked Alien Rescue more than other science activities [on a scale of 1–5]? Why?’” 32% ($n = 56$) of the students responded ‘‘very much,’’ 29% ($n = 52$)
responded “much,” 26% (n = 47) responded “somewhat,” 6% (n = 10) responded “not much,” and 7% (n = 13) responded “not at all.” That is, 61% of the sixth graders liked Alien Rescue more than other science activities. Among the reasons why they liked this science activity over the others, “fun” at 45% (n = 67) was again the top reason. Other reasons given for why they liked it included being on the computer (16%, n = 24), learning from it (14%, n = 21), the game-like experience (7%, n = 11), disliking other science activities (5%, n = 7), the graphics (4%, n = 6), the control it gave them (3%, n = 5), and various other reasons (6%, n = 8).

Overwhelmingly, students were engaged and motivated to help rescue the aliens. They wanted to find the planet that would perfectly suit their survival needs. Students persisted, and solved complex problems, while having fun. They learned much more about the solar system by participating in the PBL environment than they would have with their text books because they were engaged and motivated to solve the problems. The learning came naturally because they were invested in finding the aliens the best home.

Summary

There are many studies that have been conducted on the effect of technology utilized in instruction, and they all overwhelmingly suggest that technology has a positive effect on student engagement and motivation. The literature strongly suggests when students are engaged and motivated to learn, they are more successful, and produce greater quality work. The incorporation of technology into science instruction interests students. When students are interested, they are motivated to
participate. When students participate fully in an activity, they are engaged, and when they are completely engaged, they learn and retain knowledge. This project aims to help teachers incorporate technology into their science instruction to promote student engagement when learning science concepts.
CHAPTER III
DESCRIPTION OF THE PROJECT

Overview

The development of this project is due to Manteca Unified School Districts’ commitment to “going digital.” In the district, every student, k-12, has access to a Panasonic 3E hybrid tablet. The Intel Education Lab Camera and SPARKvue software are preloaded onto the devices, and the attachment tools (snap on microscopes and temperature probes) are supplied at each school site. Both programs offer an engaging way to incorporate technology into science instruction, yet primary teachers viewed them as technology meant for the upper grades. Teachers never received any training on how to use the programs, or the tools to go with it, and there were no searchable resources on the internet.

Logistics and Design Considerations

In considering a solution for this issue, a need for an archive of resources geared toward the primary grade levels was apparent. In moving forward with the idea of creating an archive of resources and lessons that primary teachers could easily implement using the Intel Education Lab Cam or SPARKvue software, along with the attachment tools, a decision had to be made about where and how these resources would be housed and accessed. Through working with the Manteca Unified School District Technology Coordinator, the idea of creating a Microsoft OneNote digital notebook emerged. When going digital, the district implemented OneNote class
notebooks, and invested in a great deal of training for teachers on how to use and navigate OneNote. Due to the exposure from the trainings, the push to implement and utilize OneNote, and the fact that all employees of the district have access to it, OneNote was chosen to house the resources, lesson plans, and videos created for this project. In order for primary teachers to use the OneNote to help them incorporate technology into their science instruction, the layout of information had to be carefully considered. It was important that the OneNote be clear, organized and easy to navigate. In OneNote, there are sections that look like tabs across the top of the page, and in each section there are pages. Each section, or tab, was labeled for each of the functions of the two programs: Microscope, Time Lapse, SPARKvue, Pathfinder, and Motion Cam. Within each section, six pages were created: Buttons and Function, Step by Step Instructions, Kindergarten Lesson Ideas, 1st Grade Lesson Ideas, 2nd Grade Lesson Ideas, and 3rd Grade Lesson ideas. In order to make learning how to use these programs worth teachers’ time, it was important to include lesson ideas for each grade level, for each included function of the programs. In the spirit of multiple intelligences, videos of various lessons were also included for teachers who are visual learners, or those teachers who want to see a lesson in action before trying it out themselves.

Another consideration was not all Next Generation Science Standards (NGSS) for each of the grade levels correlated with each of the functions of the programs. In order to incorporate all of the functions for each of the grade levels, McGraw Hill’s Reading Wonders English Language Arts curriculum was used to pull texts and
essential questions that could be correlated with functions from the programs. This integration with language arts will result in students making connections across the curriculum.

**Factors in Implementation**

In order to share this OneNote with teachers in Manteca Unified School District, and allow them to download their own personal copy of it to edit and make notes in, Docs.com was chosen to host the OneNote and allow access to teachers. Docs.com is a website where people can share Microsoft Word, Sway, Excel, PowerPoint, OneNote, and PDF documents for free. A profile is made, and the link can be shared so that anyone with the link can download the content. The original document, in this case the OneNote, stays intact, but the downloaded version can be edited by the user. The link to the profile where the OneNote for this project will be hosted will be shared on Manteca Unified School District’s Employee Resources Page within the Teacher Technology Center. Teachers may visit the Teacher Technology Center to view the link to Docs.com and download the Intel Education Lab Camera/SPARKvue K-3 Resources OneNote. The link to download the OneNote for this project is http://docs.com/sarah-guidry.

**Overview of the Timeline and User Access to the Project**

The first task in creating the OneNote was to learn the functions of the Intel Education Lab Camera and SPARKvue software in order to teach others how to use them. Through exploring the functions and utilizing the attachment tools (snap on microscopes and temperature probes), it became clear which functions would be
appropriate for primary grades. The Kinematics and Universal Logger functions were not included in this project. The Kinematics function measures the velocity and density of vertical or horizontal movement (think pendulum swinging). The data output for the function is far above a primary grade level. The Universal Logger function digitizes any radial, analog, or liquid-in-glass display tools. The primary grades do not have access to or use for such tools.

Once the functions to be included were selected, screen cast videos of each function were made using Screencast-o-matic.com in order to show and explain to teachers how to use each of the functions. The next step was to take a close look at the NGSS to see which standards correlated with which functions, and for which grade level. Once standards were matched with functions of the programs, the lesson planning could take place for each grade. If a grade did not have an NGSS that connected with one of the functions of the programs, the use of the English Language Arts curriculum came into play. Texts from McGraw Hill’s Reading Wonders were pulled, and essential questions from each unit were considered to see if they could be supported with use of the Intel Education Lab Cam or the SPARKvue software. In order to make the lesson plans look appealing and interesting, Glogster.com was used to make posters of the information included in each lesson. Once there was a concept or standard for each grade level, for each function of the programs, lessons plans were developed. Select lesson plans were then implemented into a classroom of second and third grade students. Lessons were also implemented with kindergarten and first grade students; the second and third grade students acted as “buddies” helping the younger
students to use the technology. Video of these lessons were recorded, and all content was loaded into the OneNote under the appropriate section and page. The OneNote was uploaded to Docs.com, and the link to the profile was shared with the teachers in the district through an email from the Technology Coordinator. The link is also displayed on the Employee Resources Page, under the Teacher Technology Center. Teachers are able to download their own copy of the OneNote so that they may edit, add notes, include their ideas, thoughts, or reflections on what worked, and what didn’t work for them in a certain lesson. The original OneNote stays intact on the Docs.com website. Screen shots off all content within the OneNote is included in Appendix A.

**Evaluation**

The outcome of this project is a digital notebook of lesson plans, lesson resources, and resources to help teachers learn each of the programs’ functions. In moving forward, teachers will be able to comment on the OneNote through Docs.com, and will be asked to do so in order to provide feedback on what is helpful, what would be helpful if added, and what is not working so that the OneNote may be revised. Teachers who utilize the OneNote will also be asked to video their own lessons, or give their opinions on what could be added to the OneNote to help teachers. If there are new ideas on how to use these programs in the primary grades, those ideas could be shared to make the OneNote more robust and useful. Credit will be given to teachers who submit their own lessons for the functions to enrich the OneNote’s content.
REFERENCES
REFERENCES


# APPENDIX A

## INTEL EDUCATION LAB CAMERA/SPARKVUE RESOURCES K-3RD

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Getting Started

Lab Camera

Getting Started with Lab Camera

Lab Camera is an education platform that provides students with a tool for conducting scientific experiments and simulations using the Lab Camera's built-in camera.

Benefits:

- Improved student engagement and motivation
- Easy-to-use interface
- Accessible to a wide range of students

Getting Started:

1. Download the Lab Camera application.
2. Open the application and follow the on-screen instructions.
3. Connect the camera to the computer and ensure the camera is recognized.

Features:

- Enhanced visualization of experimental data
- Real-time data collection and analysis
- Accessible to STEM students and educators

Access to Lab Camera:

- Download the Lab Camera application from the official website.
- Follow the on-screen instructions for installation.
- Connect the camera to the computer and ensure it is recognized.

Lab Camera is an education platform that provides students with a tool for conducting scientific experiments and simulations using the Lab Camera's built-in camera.

Main Features

- Lab Camera allows students to conduct experiments and simulations using the Lab Camera's built-in camera.
- The camera can be connected to a computer and used to collect and analyze data in real-time.
- Lab Camera provides a user-friendly interface that is accessible to a wide range of students and educators.

Main Screen and Elements

- The main screen includes several elements that can be accessed through the menu bar.
- These elements include data collection, analysis, and visualization tools.
- The main screen also includes a menu bar that provides access to additional tools and features.

Lab Camera is an education platform that provides students with a tool for conducting scientific experiments and simulations using the Lab Camera's built-in camera.
Click [here](#) to play the video.
Click [here](#) to play the video.
2nd Grade Lesson Expose

2-PS1. Matter and Its Interactions

- This is a lesson you can do with 2nd grade students to explore the properties of rocks and minerals. You can substitute the rocks and minerals for other objects, such as leaves, stones, petals, rocks, and others. The recording sheet mentioned in the lesson page.
Click here to play the video.
3-LS3 Heredity: Inheritance and Variation of Traits

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (Clarification Statement: Fertilization is the combination of sperm and egg cells. Chromosomes in organisms other than humans.) (Assessment evidence: Assessment does not include genetic mechanisms or interference and prediction of traits. Assessment is limited to ex-novo examples.)

You can use this lesson with 3rd graders to explore how parts of different plants of the same species can be alike, but not the same as each other. You can use young plant parts and small plant parts of the same species to explore this concept, or just use parts from different adult plants of the same species. You can easily find these plant parts in your neighborhood, at a park, at school, or in your backyard. The recording sheet mentioned is found on the resource page.
Click [here](#) to play the video.
1st Grade Lesson Ideas

1-ESS1 Earth's Place in the Universe

1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted. (Grades K-2) Students observe and describe patterns in the sky. They use these observations to predict future events. For example, students might observe that the sun rises in the east and sets in the west. They use this pattern to predict future positions of the sun. Students might also observe that the moon changes shape over time. They use these observations to predict future phases of the moon. Students might observe that the stars appear to move across the sky each night. They use these observations to predict future positions of the stars. Students might observe that the sky appears to be a dark shade of blue during the day. They use this observation to predict the color of the sky at night. Students might observe that the sky appears to be a dark shade of blue during the day. They use this observation to predict the color of the sky at night.

1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. (Grades K-2) Students observe and describe patterns in the sky. They use these observations to predict future events. For example, students might observe that the sun rises in the east and sets in the west. They use this pattern to predict future positions of the sun. Students might also observe that the moon changes shape over time. They use these observations to predict future phases of the moon. Students might observe that the stars appear to move across the sky each night. They use these observations to predict future positions of the stars. Students might observe that the sky appears to be a dark shade of blue during the day. They use this observation to predict the color of the sky at night. Students might observe that the sky appears to be a dark shade of blue during the day. They use this observation to predict the color of the sky at night.

You can use this lesson to allow students to observe the patterns of the sun and moon. It will allow them to see the change happen right in front of their eyes, rather than all of a sudden seeming it has changed from night to day. It will allow them to describe this pattern in a much more meaning full way. Make sure you have the device plugged into the charger overnight. The device will die and the recording will be pointless if you don't. You will also need to have some sort of light source during the night. I use a flashlight. I have left a time lapse on for 3 days with no problems, so it is very doable to have it on all night long. You could even leave yours on over the course of 2-3 days to allow students to see the pattern repeat. The recording sheet can be found on the resources page.
2. Interdependent Relationships in Ecosystems

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to asking one question at a time.]

This is a lesson you can do with 2nd grade students to explore the concept of what plants need to survive. Students will help you to plan an experiment, and observe a time lapse of one plant receiving sunlight and one plant without any sunlight over the course of 3-4 days. By watching the time lapse, the students will get to see the changes for each plant happen right in front of their eyes, and be able to come to a conclusion about whether or not plants need sunlight to survive. The recording sheet mentioned is on the resource page.

3rd Lesson Ideas

3-LS1 From Molecules to Organisms: Structures and Processes

3-LS1-1. Living systems are physical systems with unique characteristics that make them different from the physical systems of non-living nature. [Assessment Boundary: Assessment is limited to asking one question at a time.]

You can use this lesson to make plant growth real for students. It will allow them to see the change happen right in front of their eyes, rather than all at once. When you have changed the way of the plant, it will help them to describe the life cycle of a plant in a much more meaningful way. The growing of your students is up to you, as well as how you want to manage losing devices plugged in, as long as you do. The device will not be used in the recording, as it is not possible for me to turn it off. A device should be plugged in to a 2nd grade educator.
Click [here](#) to play the video.
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SPARKvue Batteries and Paintings

![Image of SPARKvue Batteries and Paintings]
Click [here](#) to play the video.
Click [here](#) to play the video.

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**3rd Grade Lesson Ideas**

- The NGSS incorporates Crosscutting Concepts that show up throughout the standards and across the grades. A major crosscutting concept is cause and effect relationships, and how they are routinely identified and used to explain change. This concept could be used to explore changing the temperature of a given item. Students can explore the cause-and-effect relationship of adding heat to, or cooling water, and then explain that relationship. Many other materials or liquids could be used with the same concept.
Click [here](#) to play the video.
Kindergarten Lesson Ideas

- Our new English Language Arts/ELD curriculum, McIlvain Hill Reading Workshop, has many science concepts embedded into the reading and writing. We can use OneBigDeal's online science modules to help students make connections across the curriculum. You can use the Option C Can Function to answer the Essential Questions. "How do baby animals solve?" from the Reading and Writing Workshop book, Unit 1, Week 2.

- On the Move

![Image of animals moving]

(Created by: TIM)

- If you're not sure how to begin, you can use this activity as a get off the chair, or ask another classroom that may have a teacher to set up the lesson and record it.

1st Grade Lesson Ideas

- Our new English Language Arts/ELD curriculum, McIlvain Hill Reading Workshop, has many science concepts embedded into the reading and writing. We can use OneBigDeal's online science modules to help students make connections across the curriculum. The story "A Pig on a Cliff" is used in the 1st grade Reading and Writing Workshop book, Unit 1, Week 1.

![Image of pig on a cliff]

(Created by: TIM)

- You can also ask students to write creative stories about the characters before sharing the mentor text. Record and then have the students write their stories. Make sure you add a name and then ask students to give speech in order to answer the Essential Question.

- If you do not have access to cheap paper, you can use the mentor text that students will report on, and ask students to write their stories on a cheap piece of paper and then type them up to submit the Okto.

2nd Grade Lesson Ideas

- Our new English Language Arts/ELD curriculum, McIlvain Hill Reading Workshop, has many science concepts embedded into the reading and writing. We can use OneBigDeal's online science modules to help students make connections across the curriculum. This text, Exhale and Exhale, is out of the 2nd grade Reading and Writing Workshop book, Unit 1, Week 2. You can use the Option C Can Function to observe the eggs hatch, and chicks emerge.

- Student may then compare and contrast an adult chicken with the chicks. Check out the process of hatching eggs in your classrooms here. You can purchase an incubator here. This is something you could make a Donor's Choice project for as well.
3rd Grade Lesson Ideas

- Our new English Language Arts block curriculum, Statewide 3rd Grade Reading, includes many lessons aligned to the reading and writing standards. You can use many of these concepts throughout your 3rd grade day. One of the 3rd Grade Reading and Writing Workshops books, called "The Harvesting Chat," is a great place to start. This book can help students practice listening, speaking, and writing skills. You can use these strategies and skills to analyze butterflies and their life cycle. The book contains information about the life cycle of the monarch butterfly and how it gets from its egg to its adult form. You will learn about the butterfly's unique life cycle and how it is adapted to its environment.

Lesson Resources

Kindergarten Recording Sheet (Motion Cam)

The monarch butterfly emerges from its chrysalis each night.

1st Grade Recording Sheet (Motion Cam)

The monarch butterfly emerges from its chrysalis each night.
Click [here](#) to play the video
Pathfinder Shop by Shop Instructions

Kindergarten Lesson Ideas

- Our new English Language Arts ELA curriculum, Kindergarten Reading, makes Core knowledge concepts embedded into the reading and learning. We can use any of the Core knowledge concepts embedded into the Kindergarten Reading and Writing Workshop Book, Unit 1 & 2. You can see Mrs. Riddle's Place where teachers have embedded concepts embedded into the Kindergarten Reading and Writing Workshop Book, Unit 1 & 2. You can see Mrs. Riddle's Place.

Fit your lesson ideas.
Lesson Resources

Kindergarten Recording Sheet (Pathfinder)

1st Grade Recording Sheet (Pathfinder)

The student's path was

The student's path was
### References

All screenshots that include information about SPARKvue came from Cider House Tech.


All screenshots that include stories or texts from McDaw Hill Reading Wonders came from their Connect Ed website.


All Intel screenshots that explain each of the functions came from the Intel Education Lab Camera Intel® Education User's Guide