

## Universal Design for Learning and Multimedia Technology: Supporting Culturally and Linguistically Diverse Students

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**Abstract:** Universal Design for Learning (UDL) is a framework for designing instruction to address the needs of a range of learners. The UDL guidelines define ways in which flexible options can be integrated into curriculum and instruction. This paper presents three classroom projects that illustrate how UDL was integrated into teaching and learning to support the needs of culturally and linguistically diverse K-12 students. In each project, teachers used readily-available software and created multimedia projects that addressed specific instructional goals, taking into account the needs of the culturally and linguistically diverse students in their classrooms. The paper provides information on how UDL checkpoints are addressed by each project, defining ways in which teachers can use digital media in creative ways to support the learning process.

Keywords: Universal Design for Learning (UDL), English language learners, multimedia

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# Universal Design for Learning and Multimedia Technology: Supporting Culturally and Linguistically Diverse Students

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Universal Design for Learning (UDL) is a framework for designing curriculum and instruction that focuses on the provision of flexible and engaging learning environments. Drawing from research in neuroscience and education, UDL is based on the recognition that predictable and systematic variability exists across the population and that learning environments can be intentionally and proactively designed to address this variability (Meyer, Rose & Gordon, 2013). The Center for Applied Special Technology (CAST) has been instrumental in the development of the UDL framework, defining a set of principles and guidelines for applying them.

In the past two decades, UDL has emerged as a prominent framework in the field of special education, because of its focus on creating inclusive learning environments. However, UDL is relevant not only in special education but is applicable and relevant for the design of flexible learning environments for all learners. K-12 classrooms are increasingly diverse with students from various backgrounds, ability levels and experiences in the same classrooms. Using the UDL framework, teachers can design lessons that build in supports for the range of learners they have in a classroom, including their students with disabilities, English language learners, and typical students. This paper describes how teachers in settings with large populations of culturally and linguistically diverse students (CLD) have integrated UDL into their classroom practices to address the needs of all students and while concurrently providing culturally responsive instructional supports for CLD students.

The three main principles of UDL are to provide 1) Multiple means of representation 2) Multiple means of Expression and Action and 3) Multiple Means of Engagement (CAST, 2012). At its core, UDL focuses on the provision of “cognitive access”, by defining how the learning process can be made more accommodating of the varied backgrounds, experiences, and preferences that students bring to the classroom. Several UDL guidelines focus on the provision of instructional scaffolds for students during the learning process. For example, UDL guidelines suggest ways to support comprehension, activate background knowledge, provide opportunities for practice, support self-regulation and increase authenticity and relevance. These instructional scaffolds can concurrently provide supports for various students, addressing the needs of students with disabilities, CLD students and providing flexible options for all learners.

Technology and media play an important role in the design of UDL-based environments (Rose & Meyer, 2001; Edyburn, 2010). With flexibility inherent to its format, digital environments give teachers the means to represent information in varied ways. Technology tools that we used everyday, such as word processing and presentation software, can be used to provide multimodal options during the learning process. In the multimedia environment, text, visuals, audio and video can be combined in creative ways and provide alternatives to traditional forms of representation and expression. For example, a digital photo placed in presentation software can become a prompt for writing, providing an essential scaffold for learning for a

student who is struggling to generate words and write. Audio and video recording tools provide alternate ways for students to express what they know. Used creatively and thoughtfully, multimedia software available on laptops and mobile devices today can be used to create flexible learning environments, supporting skill acquisition in various academic areas (Skouge, Boisvert, & Rao, 2007; Bryant, Rao, & Ok, 2014).

### **UDL as an instructional design framework**

The three main principles of UDL – representation, action and expression, and engagement - are subdivided into nine guidelines that detail how flexible options can be provided within curriculum and instruction. The nine UDL guidelines are further broken down into 31 “checkpoints” that provide specific guidance on instructional features that can increase access for students (Hall, Meyer & Rose, 2012). A one-page overview of the UDL framework (version 2.0), that illustrates the principles, guidelines and checkpoints, can be downloaded from the National Center for UDL website: <http://www.udlcenter.org/aboutudl/udlguidelines>.

These guidelines can be applied to four essential components of curriculum and instruction: goals, materials, methods and assessments. UDL can be applied both to curriculum resources (developed for teachers) and be applied by teachers to lessons that they plan for students. Teachers interested in applying UDL principles to their lessons can find ideas on websites such as <http://www.udlcenter.org/implementation/examples>

The UDL guidelines provide a menu of options that teachers can refer to while designing lessons. Israel, Ribuffo, & Smith (2014) highlight the importance of integrating information about the UDL framework in teacher education. They note that “teacher educators and professional developers must develop purposeful experiences in which the framework is used to manipulate content, revise instruction, and address environmental barriers in the general and special education setting (p. 13). In this paper, we highlight some specific ways in which teachers can consider UDL principles, guidelines and checkpoints while designing instruction, focusing specifically on how multimedia technology can be used as part of creative, UDL-based curriculum and instruction.

### **Culturally and Linguistically Diverse Students**

There is a growing recognition of the ways in which UDL is relevant for culturally and linguistically diverse (CLD) students. The principles of UDL provide supports that are useful for CLD students who are learning in a second language, have immigrated and are assimilating to new cultural systems and expectations for schools, or have varying background experiences that they bring to school (Chita-Tegmark, Gravel, Domings, Serpa & Rose, 2012). Several effective instructional practices that have been identified for CLD students are closely aligned to the UDL principles. For example, the Sheltered Instruction Observation Protocol (SIOP) framework emphasizes the importance of building background and context for students who are second language learners ((Echevarria, Vogt, & Short, 2004). Similarly, the UDL guidelines provide specific guidance on ways to build background. For example, the UDL guidelines suggest that teachers “clarify vocabulary and symbols (Checkpoint 2.1), “promote understanding across languages (Checkpoint 2.4) and “activate or supply background knowledge” (Checkpoint 3.1). The SIOP framework emphasizes the use of scaffolds and instructional strategies that support language development and content acquisition. Related UDL recommend giving students varied

options for their demonstration and expression of knowledge, by “using multiple media for communication (Checkpoint 5.1) and “supporting planning and strategy development (Checkpoint 6.2).

Teachers can creatively integrate these guidelines as well as several others to support culturally and linguistically diverse students in the classroom. This article presents three classroom projects that use multimedia technologies and instructional strategies that are designed to support CLD students. The ways in which these strategies align with UDL guidelines and checkpoints are demarcated in order to give teachers a clear understanding of how the UDL guidelines can be applied when designing lessons and projects.

### **UDL and Multimedia Technology – Classroom Projects**

Hawai‘i is home to a large population of Pacific islanders who have emigrated to the US, often seeking economic or educational opportunities for their families. Pacific islander immigrants are the fastest growing group of immigrants in the state, numbering about 15,000 in 2009 (Johnson, 2012). Schools in the state of Hawaii have a large enrollment of Pacific Islander ELLs whose first languages include Marshallese, Chuukese, and Kosraean (Hawai‘i Department of Education, 2013). These Pacific islanders are from indigenous communities that value their culture, traditions, and language. Children of Pacific islander immigrants often speak their first languages at home and are raised with an awareness and appreciation of their heritage and traditions. In addition to Pacific islander ELLs, classrooms in Hawaii also have students of various other cultural backgrounds including students from various Asian countries (the Philippines, China, and Japan) and Spanish-speaking students from Mexico. As a result, teachers in Hawaii’s classrooms have a wide range of CLD students who speak various languages and come from differing cultural backgrounds. When preparing instruction for students, they need to take into consideration the variation, developing projects that allow students to bring in elements that are relevant for them from their varied backgrounds.

The three projects presented describe how teachers in three schools in Hawaii used readily available multimedia technology to support the language acquisition and to integrate culturally responsive components into instruction for their CLD students. These projects can be relevant for culturally and linguistically diverse students from various backgrounds. Instructional technologies, integrated purposefully with content area classes, can provide engaging ways for students to learn academic content and practice key literacy skills. In the cases presented, teachers sought to integrate cultural components, including the use of first language and cultural connections, as part of the instructional process. The technology-based instructional strategies addressed specific UDL guidelines, creating flexible options for students to engage in learning activities.

#### **Classroom Project #1: Human Rights Project**

Ms. Lee, a high school social studies teacher teaches a unit on the U.S Constitution. Her U.S History class was made up of 18 students, all of whom were English language learners. Students ranged in age from 15-17 years of age and were in 10<sup>th</sup> or 11<sup>th</sup> grade. Most of the students had arrived in the US in the past six years from various Pacific islands and from the

Philippines. The 18 students had varied educational backgrounds, experiences, and levels of English proficiency.

As part of the unit on the Constitution, Ms. Lee focused on the importance of the Bill of Rights. One challenge she faced when teaching about the Bill of Rights was the complex and abstract nature of the concepts around individual rights. Students could read the textbook chapter, but due to their limited English proficiency, they did not comprehend the concepts at a deeper level. Ms. Lee realized that she needed to make the concept of individual rights more relatable to her students to help them understand the magnitude and importance of the Bill of Rights. She referred to the UDL guidelines during the lesson planning process and identified several ways that she could provide supports for language and comprehension (UDL Guidelines 2 and 3), add options for expression and self-regulation (UDL Guidelines 5 and 6) and increase the relevance of the concept for students and vary the level of challenge (UDL Guidelines 7 and 8).

Ms. Lee decided to give her students the opportunity to develop their own understanding of “human rights” based on their knowledge, experiences, and background. Rather than impose the terminology of the textbook chapter, she wanted her students to derive their own definition of human rights and to articulate the importance of individual rights and freedoms. Ms. Lee hoped to give the students a way to define human rights for themselves and consequently make connections to the historical circumstances that led to the development of the Bill of Rights in the U.S Constitution.

To address their varied levels of English proficiency, Ms. Lee decided to start with visuals rather than words. She asked students to work in pairs to find photos on the internet that depicted human rights issues. Ms. Lee generated key words with the whole class of students and asked them to use those keywords to search for pictures related to the rights of individuals. Students found pictures of protests and demonstrations, which led to a discussion about why people fought for their rights. Through this process, students began putting words to the images they found on screen and developing their definition of “rights.” Ms. Lee guided the process by having small group and whole class discussions about the photos they found, leading students to discuss the importance of individual rights and freedoms and the role of the government in securing these rights.

After the students had a working definition of the concept, Ms. Lee encouraged students to examine human rights in their own countries. Many of the students in her class were from the Republic of the Marshall Islands. The Marshallese students were interested in looking up information and photos related to the nuclear testing that was conducted in their home islands and the impact it had on their people. They downloaded photos and wrote sentences about the nuclear testing, the long-term health impact caused by the radiation, and displacement of islanders that impacted generations of their people and families. Ms. Lee asked students pairs to organize their photos and sentences and to discuss the human rights issues involved with the nuclear testing.

Students worked in pairs to organize photos, write sentences and create a narrative. After creating a storyboard, they imported the photos into desktop editing software (Apple iMovie) and

recorded themselves reading each sentence out aloud, thereby creating a simple multimedia project. Their end product was a short video describing their impact of nuclear testing in their islands. Their project is archived on this webpage: <http://eslstrategies.prel.org/eslstrategies/multimedia.html> (Click on *High School Civics Project: Mour Im Mani Life and Culture*).

After each student pair had created their projects, Ms. Lee had a small classroom “film festival” during which students watched each other’s projects. Students asked questions about the issues presented in the projects and made connections to the importance of individual rights and the role of government. The students began to make connections between the issues of human rights in various countries to the importance of the Bill of Rights. In this way, Ms Lee was able to connect contemporary global issues of relevance to her culturally and linguistically diverse students to her U.S history lesson. Several students extended these concepts and made connections to their rights as immigrants to the United States, noting the importance of the Constitution in guaranteeing the rights of immigrants.

The process of creating and sharing these multimedia projects allowed students to make connections with their own background and heritage and to express information that was important for themselves and their families. In addition, Ms. Lee supported specific learning needs for the students. The process of making the project supported vocabulary development, built background knowledge, gave students opportunities to practice writing and oral expression and allowed them options and choices as they created their end product. Table 1 notes how the project met several UDL checkpoints in relation to learning objectives for the students. For the group who made the project about nuclear testing, the end result was especially personal to them since the circumstances of their own immigration to the US were directly related to the nuclear testing. Due to the effects of nuclear testing, their grandparents and parents had had to leave the atoll from which they came, and generations of their extended family had immigrated to the US. Their multimedia project supported the learning objectives for the students in multiple ways. The students not only developed their language skills and their understanding of historical content, but were able to create a project that gave them an opportunity for authentic expression of events relevant to their own lives.

Table 1  
*UDL Guidelines addressed by Human Rights Multimedia Project*

Principle I: Multiple Means of Representation	<p><b>Guideline 2: Provide options for language, mathematical expressions, and symbols</b></p> <ul style="list-style-type: none"> <li>• Process of finding photos and developing an understand of the concept helps to clarify – students develop and define their understanding of key terms related to human rights (2.1)</li> <li>• Multimedia projects promote understanding across languages; students can choose to use English and their first language or include translations if they wish (2.4)</li> <li>• Students illustrate concepts through multiple media (2.5)</li> </ul> <p><b>Guideline 3: Provide options for comprehension</b></p> <ul style="list-style-type: none"> <li>• Process of developing the multimedia project activates background knowledge (3.1)</li> </ul>
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	<ul style="list-style-type: none"> <li>• Highlights critical features and big ideas (3.2)</li> <li>• Clarifies abstract and complex concepts by highlighting key ideas (3.2)</li> </ul>
Principle II: Multiple Means of Action and Expression	<p><b>Guideline 5: Provide options for expression and communication</b></p> <ul style="list-style-type: none"> <li>• Students compose using multiple media (5.1)</li> <li>• Multimedia software provides multiple tools for composition (5.2)</li> <li>• Students practice skills to create the final project; they build fluency in written and oral expression (5.3)</li> </ul> <p><b>Guideline 6: Provide options for executive functions</b></p> <ul style="list-style-type: none"> <li>• Guides goal setting by giving students an open ended task with a clear product (6.1)</li> <li>• Supports planning and development (6.2)</li> <li>• Students manage information and resources to create end product (6.3)</li> </ul>
Principle III: Multiple Means of Engagement	<p><b>Guideline 7: Provide options for recruiting interest</b></p> <ul style="list-style-type: none"> <li>• Promotes choice and autonomy – student directed project (7.1)</li> <li>• Optimizes relevance, value and authenticity since students decide what and how they want to present information about their own interests and home cultures (7.2)</li> <li>• Minimizes threats and distractions by allowing students to develop project over time; students can edit and revise project (7.3)</li> </ul> <p><b>Guideline 8: Provide options for sustaining effort and persistence</b></p> <ul style="list-style-type: none"> <li>• Emphasizes process and effort (8.2)</li> <li>• Provides a range of demands, and a range of possible resources, allows all learners to find challenges that are optimally motivating (8.2)</li> <li>• Project emphasizes the importance of practice and effort (8.4)</li> </ul>

### **Classroom Project #2: Video Self Modeling for Literacy**

Ms. Jung, the literacy specialist at an elementary school observed the struggles of an English language learner in a 4<sup>th</sup> grade classroom. Tiare, a 9-year old whose parents had moved to Hawaii from the island of Samoa, read well below grade level. While her peers read chapter books, she read picture books at a 1<sup>st</sup> grade level. Tiare was clearly embarrassed by the fact that she was unable to read the same types of books as her peers. Her cheery demeanor changed and she appeared more sullen and withdrawn whenever the teacher announced independent reading time. During the 20 minutes set aside for independent reading, her classmates chose books from the classroom library, while Tiare selected her book from a box of lower grade-level readers.

Ms. Jung decided to try the video self modeling strategy to help Tiare with her reading skills and to give her the opportunity to read chapter books. Video self modeling is a strategy whereby an individual practices a target skill on video that they may not yet have attained independently (Dowrick, Kim-Rupnow, & Power, 2006). During the videotaping process, the individual is provided with scaffolds to achieve the target skill. The scaffold is edited out when the final self model video is created. The edited video only shows the individual performing the target skill successfully. The individual watches him or herself on video performing a target skill fluently. Studies on VSM have shown that watching oneself perform a skill successfully engenders a sense of self efficacy and helps students achieve target skills in both academic and

behavioral domains (Hitchcock, Dowrick & Prater, 2003; Bellini, Akullian, & Hopf, 2007; Buggey, 2007; Shukla-Mehta, Miller, & Callahan, 2010).

Ms. Jung was aware that the process of creating a self modeling video would address several UDL guidelines. By working one-on-one with Ms. Jung to create this project, Tiare would receive graduated levels of support to build fluency through practice (UDL Guideline 5) and support for language and vocabulary development (Guideline 2). The development of the VSM project includes a focus on providing mastery oriented feedback (UDL Guideline 8) and on building a student's sense of self-efficacy (UDL Guideline 9). Table 2 denotes how several UDL guidelines and their related checkpoints are addressed by this project.

Ms. Jung worked one-on-one with Tiare during the 20 minutes of independent reading time over the course of several weeks. They went to the library and Tiare selected a chapter book she would like to read. Ms. Jung ensured that the book is at an instructional level for Tiare, a reading level that she could attain with support. An essential aspect of the video self modeling strategy is to select target skills that are within the individual's reach with support, even if the individual is not yet able to achieve them independently. Ms. Jung used an echo reading strategy to help Tiare achieve a fluent reading of passages in the book. She set up her laptop in front of Tiare and asked Tiare to sit in front of the built-in webcam. She recorded the echo reading process, capturing video of Tiare repeating each sentence after her. Ms. Jung later edited the video, removing the portions that had her own voice and leaving in only the portions in which Tiare was reading. This edited video depicted Tiare reading the book fluently by herself.

During the echo reading process, Ms. Jung read a sentence and then asked Tiare to repeat after her. She was able to model various aspects of fluent reading, including elements of prosody such as intonation and pacing. Tiare enjoyed emulating her teacher and reading with her. In addition to addressing reading comprehension, Ms. Jung addressed other aspects of reading proficiency, such as vocabulary and comprehension. After they read a passage for about 10 minutes, Ms. Jung stopped to clarify the concepts they had read. They discussed key vocabulary and Tiare answered questions to demonstrate her comprehension of the passage. Ms. Jung made this fun by asking questions about what the characters in the book are doing. She also asked Tiare to give her opinions on the action taking place in the story. This allowed Tiare to develop reading fluency skills and have her the opportunity to reflect on the passages she had just read, learn key vocabulary, and clarify questions. Ms. Jung also encouraged Tiare to use her first language and translate certain words. Tiare had fun teaching Ms. Jung some of the key vocabulary words in Samoan. This process helped Tiare reinforce the meaning of the English words, by making connections to her first language.

Once they were done with the day's 20-minute reading session, Ms. Jung sent Tiare back to the classroom and edited the video she has just recorded. She edited out the portions with her voice and retained only the portions of Tiare reading. The final edited video depicted Tiare reading the book independently. This process of creating a video self modeling project is detailed in the article *Do It Yourself: Video Self Modeling Made Easy* (Rao, Hitchcock, Boisvert, Kilpatrick, & Corbeill, 2011). The article, which includes step-by-step directions and instructional videos of how to do this process, can be accessed online at



<http://www.cec.sped.org/Publications/CEC-Journals/Teaching-Exceptional-Children/TEC-Plus/Video-Self-Modeling-Made-Easy>.

When Tiare was shown her edited video, she was delighted to see herself reading a chapter book. She worked with Ms. Jung during several independent reading periods to continue this practice, developing her reading fluency and self confidence. Over time, Ms. Jung had captured video of Tiare reading the whole book “fluently.” At the end of her video, Tiare summarized the story in her first language for her grandparents who speak limited English. She is very excited that her family will see her reading this book and that she can address them directly through the video as well. Tiare clearly took pride in showing her video to friends and to her parents, showcasing her ability as a fluent reader of a chapter book.

Table 2 specifies how the process of creating the project provided many instructional scaffolds for the student in accordance with several UDL guidelines and checkpoints. She was given the opportunity to practice and was guided towards mastery. The process of creating the VSM video was engaging for Tiara and she benefited by herself as a proficient reader. In addition, the integration of first language and the option of sharing the video with family provided an authentic and relevant context for reading.

Table 2

*UDL Guidelines Addressed by the Video Self Modeling Project*

Principle I: Multiple Means of Representation	<p><b>Guideline 2. Provide options for language, mathematical expressions, and symbols</b></p> <ul style="list-style-type: none"> <li>• Teacher can reinforce and clarify vocabulary as part of reading process (2.1)</li> <li>• Echo reading process clarifies syntax and structure (2.2)</li> <li>• Project promotes understanding across languages (2.4)</li> <li>• Illustrates concepts through multiple media (2.5)</li> </ul>
Principle II: Multiple Means of Action and Expression	<p><b>Guideline 5. Provide options for expression and communication</b></p> <ul style="list-style-type: none"> <li>• Project uses multiple media for communication (5.1)</li> <li>• Student builds fluency with graduated levels of support during reading and recording process (5.3)</li> </ul> <p><b>Guideline 6. Provide options for executive functions</b></p> <ul style="list-style-type: none"> <li>• Process guides appropriate goal setting for student (6.1)</li> <li>• Facilitates managing information and resources (6.3)</li> <li>• Enhances capacity of self monitoring of progress (6.4)</li> </ul>
Principle III: Multiple Means of Engagement	<p><b>Guideline 7. Provide options for recruiting interest</b></p> <ul style="list-style-type: none"> <li>• Student chooses the books she will read (7.1)</li> <li>• Process of working one-on-one to build fluency minimizes threats and distractions (7.3)</li> </ul> <p><b>Guideline 8. Provide options for sustaining effort and persistence</b></p> <ul style="list-style-type: none"> <li>• Project emphasizes process and effort (8.2)</li> <li>• Project emphasizes the importance of practice and effort (8.4)</li> </ul> <p><b>Guideline 9. Provide options for self-regulation</b></p> <ul style="list-style-type: none"> <li>• Promotes positive expectations and builds self-efficacy (9.1)</li> </ul>

\*\* NOTE: Alignment with the UDL checkpoints are noted in parentheses after each bullet point.

### **Classroom Project #3: Multimedia Books in Pacific Languages**

Mr. Mura is the librarian at a school that has a large population of English language learners from various different cultural and linguistic backgrounds. He made it his personal mission to find books that represented the diverse backgrounds of the students. He was able to find children's books written in the languages of some of the children at his school, such as Ilocano, Spanish, and Chinese. However, he had much less success finding books representing the cultural and linguistic backgrounds of some students. The school had a large population of students from various Pacific island nations and states, who spoke distinct and different languages such as Pohnpeian, Chuukese, Marshallese, and Samoan. Mr. Mura talked to several teachers at the school out find out what the greatest needs were for the young Pacific islander students. The teachers identified a need for books that could help in family literacy efforts, simple readers they could send home with parents to encourage them to read at home to their children.

Mr. Mura considered how he could integrate the UDL principle of providing multiple means of representation to address this need. He realized that there were many English-language audio books in the library but none in the languages of his students. Mr. Mura decided to create a set of reading materials in various Pacific island languages. By integrating text, photos, and audio, he realized he could develop multimodal resources that supported language learning (UDL Guidelines 1 and 2), creating both text-based books and audio files that accompanied them using simple multimedia software he had on his computer. He would personalize these resources and make them relevant and engaging for the students and their families (UDL Guideline 7) by using first language and Pacific island images and themes.

He recruited a few colleagues who enjoyed children's literature and together they wrote several simple children's stories. He included a few colleagues who were of Pacific islander background and some of the stories included simple Pacific island legends. Once they wrote the simple stories, Mr. Mura took digital photos of the illustrations drawn by some of the more artistic teachers in the group. He typed out the story in a Word document, with one illustration on each page. In this way, the team created a set of short storybooks, 8-10 pages long. After creating these short and simple books, Mr. Mura identified parents who could help them translate the books into various languages. Using the English language book as the template, the teachers and parents created various versions of each book in Samoan, Pohnpeian, Marshallese, Chuukese and other languages represented by the parents. The parents enjoyed participating in this activity and helping to create these classrooms resources for their children.

Mr. Mura knew that having an audio accompaniment to each early reader would be an easy and useful multimedia enhancement to this project, giving teachers a way to integrate first language reading activities into the classroom even if they did not know the first languages of their students. Parent volunteers recorded themselves reading the short stories in their home languages. Mr. Mura used Audacity, a free software application, to record and create the audio files. On the school website, Mr. Mura added a page for his Pacific language readers, posting both the text and audio versions of stories in several Pacific languages as well as English. He also printed copies of the text versions, laminated them to place them in the school library, and

put the audio files on several iPods and tablets in order to have a listening station where students could read and listen to the books. The Pacific Language Early Reader website (<http://earlyreaders.prel.org>) is an example of a website that showcases a set of books created using simple multimedia tools.

This set of Pacific language reading materials became a much-used resource both by teachers and parents. Classroom teachers enjoyed having books in various languages to use during classroom read aloud activities. Parents were pleased to have books in their first language that they could read at home. For some parents, the option to read the book in their first language and in English became a shared literacy activity that allowed them to learn English language in the process of reading with their children. For some parents who had low literacy skills, the audio files also provided an essential support, allowing them to go through the pages and listen to the book with their children. Table 3 illustrates how these instructional materials address several UDL guidelines.

Table 3

*UDL Guidelines Addressed by the Pacific Multimedia Books Project*

Principle I: Multiple Means of Representation	<p><b>Guideline 1. Provide options for perception</b></p> <ul style="list-style-type: none"> <li>• The multimodal format of the audio books provides options for auditory and visual information (1.2 and 1.3)</li> </ul> <p><b>Guideline 2. Provide options for language, mathematical expressions, and symbols</b></p> <ul style="list-style-type: none"> <li>• Audio books clarify vocabulary (2.1)</li> <li>• Promotes understanding across languages (2.4)</li> <li>• Illustrates concepts through multiple media (2.5)</li> </ul>
Principle II: Multiple Means of Action and Expression	<p><b>Guideline 4. Provide options for physical action</b></p> <ul style="list-style-type: none"> <li>• Digital format of books provide assistive technology options. Students with disabilities can access books on computer and use tools for access such as text to speech.</li> </ul> <p><b>Guideline 5. Provide options for expression and communication</b></p> <ul style="list-style-type: none"> <li>• Uses multiple media for communication (5.1)</li> </ul>
Principle III: Multiple Means of Engagement	<p><b>Guideline 7. Provide options for recruiting interest</b></p> <ul style="list-style-type: none"> <li>• Students build literacy concepts using books in their own language (7.1)</li> <li>• Brings first language into school setting, increasing relevance and authenticity of literacy learning (7.2)</li> </ul>

## Discussion

Multimedia technologies provide a natural drawing board for creative projects. Project-based learning and digital storytelling are commonly used in schools, however teachers are not always aware of the scaffolds and supports that can be built into these projects to address specific student needs. Teachers can benefit from an increased awareness of how skill acquisition can be supported through the deliberate design of multimedia projects. More important than the end product, the processes of creating multimedia projects can incorporate various scaffolds for students who need extra support. The UDL framework provides ideas for scaffolds and options that can be integrated into the learning process to support the needs of CLD students.

Teachers regularly create lesson plans that describe their instructional objectives and detail the ways in which they will implement the lesson and assess students. UDL provides a menu of ideas and options that can be incorporated into the lesson planning phase. Using the UDL framework, teachers can consider how to build in flexible options that support varied students, applying the guidelines to the lesson objectives, instructional strategies and assessments. For example, for the English language learner who struggles to express their knowledge in written format, the option to orally narrate their thoughts in a multimedia project provides an alternate way for them to demonstrate their understanding. Teachers can also use the multimedia project as an assessment of what their students have learned, providing an alternative to traditional written tests of knowledge.

In the case of VSM projects, students are provided with powerful models and scaffolds to build skills. The projects require minimal technology; a laptop with free video editing software such as Apple's iMovie or Microsoft Movie Maker will suffice. Studies conducted on VSM interventions have demonstrated gains in reading fluency for ELL students (Hitchcock, Dowrick, & Prater, 2003). Teachers have also use the VSM strategy with culturally-relevant texts, giving students the option to select texts related to their home countries. Students report greater engagement when they are able to read texts that they select and to which they feel a connection (Boisvert & Rao, 2014). In addition to literacy skills, studies have examined VSM's potential to target behavioral and social skills (Bellini, Akullian, & Hopf, 2007; Buggey, 2007; Shukla-Mehta, Miller, & Callahan, 2010) and affective skills such as self-confidence (Greenburg, Buggey, & Bond, 2002.)

The research base on UDL-based interventions is currently emerging and growing as researchers examine student outcomes related to the use of UDL-based curriculum and instruction (Rao, Ok, & Bryant, 2014). Studies that examine the efficacy of UDL-based methods and multimedia demonstrate that the provision of multiple means of representation and expression provide useful supports and scaffolds for students as they learn academic content in areas such as social studies and science (Basham, Meyer, & Perry, 2010; Hitchcock, & Rao, 2013). Future research can further determine how UDL-based lessons address specific outcomes for learners, specifying the ways in which the guidelines can be applied to address the needs of culturally and linguistically diverse students.

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