Gist Education and Learning Research Journal. ISSN 1692-5777.
No. 9, (July- December) 2014. pp. 196-216.

Reflective Articles

Technology-based Biliteracy Centers for the 21st Century Learner[1]

Centros de Biliteracidad basados en el Uso de la Tecnología para el Estudiante del Siglo XXI

Sandra Mercuri and Laura Ramos[2]*
University of Texas Brownsville, Spring Branch ISD, USA

Abstract

The purpose of this reflective article is to present an alternative that incorporates the four language skills in all content areas through technology-based dual-language centers for emergent bilinguals at the elementary level. The authors propose a matrix to plan the centers and include three examples to facilitate language transfer in English and Spanish to foster biliteracy. The planning of the three projects is discussed as well as results from their implementation with elementary grade learners.

Keywords: Language transfer, technology, literacy centers, biliteracy, content development, digital literacy.

Resumen

El objetivo de este artículo de reflexión es presentar una alternativa que incorpore las cuatro competencias lingüísticas (escuchar, hablar, leer y escribir) a las áreas de contenido a través de centros de biliteracidad basados en el uso de la tecnología para estudiantes bilingües emergentes de primaria. Las autoras proponen una matriz para planificar los centros e incluyen tres ejemplos para facilitar la transferencia del lenguaje de inglés a español y viceversa, en aras de fomentar la biliteracidad de los estudiantes. La planificación de los tres proyectos es discutido así como los resultados de su implementación con estudiantes de primaria.

Palabras clave: Transferencia lingüística, tecnología, centros de alfabetización, biliteracidad, desarrollo de contenidos, alfabetización digital.

---

[1] Received: July 15, 2014 / Accepted: October 8, 2014

[2] Sandra.Mercuri@utb.edu, laura.ramos@springbranchisd.com

Resumo

O objetivo deste artigo de reflexão á apresentar uma alternativa que incorpore as quatro competências linguísticas (escutar, falar, ler e escrever) às áreas de conteúdo através de centros de bilateralidade baseados no uso da tecnologia para estudantes bilíngues emergentes de ensino fundamental (de 1ª a 5ª série). As autoras propõem uma matriz para planejar os centros e incluem três exemplos para facilitar a transferência da linguagem de inglês a espanhol e vice-versa em prol de fomentar a bilateralidade dos estudantes. O planejamento dos três projetos é discutido, assim como os resultados da sua implantação com estudantes de ensino fundamental (de 1ª a 5ª série).

Palavras chave: Transferência linguística, tecnologia, centros de alfabetização, bilateralidade, desenvolvimento de conteúdos, alfabetização digital.

Introduction

During this age of academic accountability in American schools, the growing number of students who speak a language other than English present a challenge to educators across the country. Teachers are faced with the difficult task of helping these students develop the academic language needed for school success while learning grade-level specific content connected to district and state standards (Mercuri, 2009; Mercuri and Yarussi, 2014). We borrow the term *emergent bilinguals* (EBLs) from García, Kleifgen and Falchi (2008) who explain that "English language learners are in fact *emergent bilinguals.* That is, through acquiring English, these children become *bilingual*, able to continue to function in their home language as well as in English, their new language and that of school" (p. 6). In order to address the linguistic needs of this growing population of emergent bilingual students, many school districts have implemented dual language programs to provide students, identified as second language learners of English and native English speakers, the opportunity to develop biliteracy skills as they learn academic content in two languages (Hamayan, Genesee & Cloud, 2013; Howard, Sugarman & Christian, 2003). In dual language classrooms, all students are emergent bilinguals because they are all learning in another language as well as in their first language.

Based on the student population, these programs are called one-way or two-way dual language programs. In one-way programs, all students are native speakers of the minority language, for example, Spanish. In two-way programs, approximately half of the students are

native speakers of the minority language and half are native speakers of English. In addition, and based on time allocation and literacy practices, dual language programs could be 50/50 or 90/10. In 50/50 programs, students receive 50% of the instruction in each language. However, in 90/10 models, all students learn to read first in the minority language and English is gradually introduced beginning with 10% in kindergarten and first grade, and up to 50% in fifth grade (Freeman, Freeman & Mercuri, 2005; Howard, Sugarman, Christian, Lindholm-Leary & Rogers, 2007; Mercuri, in press).

Dual language programs have the goal of "preparing bilingual, biliterate, and bicultural students for the linguistic complexities and demands of our global society" (Mercuri, in press, p. 6). While these goals are worthy, putting them into practice is difficult, especially because so much emphasis is given to test results. Even when teachers know what the best approach for teaching EBLs is, they often find themselves following ineffective practices in an attempt to prepare students for tests they are not ready to take (García & Kleifgen, 2010).

The key to long-term success in school for all students is to develop high levels of literacy and proficiency in using academic language (Freeman & Freeman, 2009). For emergent bilinguals trying to develop literacy in a language other than their native language, this process is especially challenging. Keeping the needs of the growing numbers of Spanish-speaking emergent bilingual students in U.S. classrooms in mind, the purpose of this reflective article is to present an alternative to incorporate the use of all four language domains, listening, speaking, reading and writing, in all content areas to foster biliteracy through technology-based dual language centers, also called workstations.

Literature Review

Research shows that the most effective way to teach biliteracy is by teaching language through content (Freeman, Freeman and Mercuri, 2005). In addition, embeddeding language and literacy in interdisciplinary units of inquiry facilitates language transfer (Beeman & Urow, 2012) and acquisition of content knowledge. Furthermore, the use of technology as a learning tool in the 21st century has demonstrated to be engaging and positive to the learning process of all learners (Warschauer, 2006). While the quality of teacher instruction is important, the quality of literacy centers is of importance as well. This section highlights research in the field that supports the technology-based alternative for biliteracy development presented in this reflective article.

Biliteracy and Emergent Bilinguals

While many studies have been done on the literacy development of students learning English as a second language, limited research on the development of bilingualism and biliteracy of bilingual learners exists (Dworin, 2003). Dworin's review of the literature also suggests that there are multiple paths to biliteracy development and that children's biliteracy development is bidirectional. In other words, the relationship between Spanish and English literacy occurs simultaneously and builds from each other when appropriate exposure and instruction occurs. Other researchers in the field (García, 2009; Grosjean, 2010; Reyes, 2012) explain that the development of biliteracy is different from the development of literacy of monolingual students. The common monolingual perspective we found in most bilingual education research does not clearly articulate the development of biliteracy of emergent bilingual students as dynamic (García, Kleifgen and Falchi, 2008). This requires a reconceptualization of biliteracy development of emergent bilinguals in dual language classrooms with a focus on "its potential intellectual consequences where students establish and mediate relationships between two language systems and their social worlds to create knowledge and transform it for meaningful purposes" (Dworin, 2003, p. 182).

Others researchers like Hornberger (2003) explain that bilingualism and biliteracy should be considered as a continua of competencies, and that the relationship between oral and written language is important for biliteracy development and maintenance of competencies in both languages. Her model proposes "an array of continua representing a series of complex, interrelated social dimensions that account for the individual speaker and the context, medium, and content of language use" (Reyes, 2012, p. 309). Moreover, Grosjean (2010) states that the connection between bilingualism and biliteracy is poorly understood, which translates into ineffective classroom practices for emergent bilinguals. More recently, Kabuto (2011) articulates the complexity of biliteracy development by making a distinction between the written form and the structures of the two languages that emergent bilinguals need to be able to manipulate, and the complex social and cultural factors that speakers of one or more languages need to understand as users of the language based on context and audience. Furthermore, Reyes (2012) discusses biliteracy processes in the classroom and more in particular the concept of *interliteracy* (Gort, 2006) as the application of rules of the language individuals know to the language they are learning as part of their writing process. This creative use of both languages by emergent bilinguals allows them to effectively develop

high levels of metalinguistic awareness, which in return supports biliteracy development (Fránquiz, 2012; Gort, 2012; Martínez, 2010).

Technology in the Classroom

There is a new volume of research on digital communication also called "new digital literacies" and the use of new technology for teaching and learning in classrooms (Milton & Vozzo, 2013). Nowadays, the concept of a literate individual includes not only traditional literacies such as reading and writing print text but also reflects the needs of students living and learning in a digital world (Leu, Mallette, Karchmer, & Kara-Soteriou, 2005). Barone and Wright (2008) explain that new literacies include innovative text formats (multiple media or hybrid texts), new reader expectations such as non-linear reading and a new set of activities different from the traditional classroom tasks (website publication; blogs). They also extend traditional literacy practices with comprehension of information on the Internet; effective use of search engines to locate information; communication using e-mail, texts, and chats; and the use of word-processing programs (International Society for Technology in Education, 2007).

As students use technology as a tool for teaching and learning, they are in an active role rather than the passive role of recipient of information transmitted by a teacher or textbook. When these opportunities are provided for students, they actively make choices about how to create, obtain, manipulate, or display information moving from teacher-led instruction to more student-centered education. Similarly, when technology is used the teacher's role changes as well. The teacher takes on the role of facilitator, providing guidelines and resources, moving around the classroom supporting individual students or groups as needed with suggestions to achieve the goals of the activity and appropriate resources to accomplish the task (Kajder, 2005).

While this approach seems to have an impact on students' engagement with learning, writing competency and critical thinking (Warschauer, 2006), it also presents some concerns. Hutchison and Reinking (2011) found in their study that teachers felt unprepared to use technology in the classroom. Moreover, they found a disconnection between teachers' beliefs about technology in the classroom and the actualization of their beliefs in their classroom practices and for literacy development. According to Hew and Brush (2007), teachers face additional challenges such as problems with resources (lack of technology, time, or technical support), teacher knowledge and skills (inadequate technological and pedagogical knowledge), and school

leadership (lack of school planning or scheduling). To close this gap, they suggest that teachers and students should be familiarized with the use of different technologies to enhance students' learning and to engage their students with reading and writing e-books to facilitate literacy development beyond the use of printed materials. While Korat and Shamir (2007) explain that teaching strategies to create and to read e-books to students enhances comprehension and understanding of the features of text, other researchers (Bus, Verhallen, & de Jong, 2009) suggest that attractive multimedia richness could divert students from the actual text. Schugar, Smith and Schugar (2013) recommend that teachers demonstrate to students how to apply strategies they use in reading and creating printed texts to E-books in order to make the use of technologies in the classroom purposeful and meaningful for all learners.

Literacy Centers

Walsh (2011) indicates that multimodal literacy "may also include listening, talking, enacting and investigating as well as writing, designing and producing such texts" (p. 12). With the introduction of new literacies approaches, teaching literacy in schools also changes into new digital pedagogies (Carroll, 2011). Digital pedagogies evolve from a constructivist perspective and have as a central tenet the co-construction of knowledge. In addition, they promote higher-order thinking skills as students move from remembering content to gaining a deep understanding of concepts by using blogs, I-phones and I-pads for learning (Kent & Holdway, 2009). Research shows that digital pedagogies could facilitate the development of literacy in the classroom and could be an innovative way to address the biliteracy development of emergent bilingual in dual language classrooms by encouraging browsing, selecting and sampling strategies, incorporating images, sound and interactive elements when creating digital texts instead of the linear process required by the traditional reading and writing of printed texts (Walsh, 2011). This new approach to literacy includes the application of digital literacy practices in learning centers.

While we build from Ford and Opitz's (2002) definition of a literacy center as a "small area within the classroom where students work alone or together to explore literacy activities independently while the teacher provides small-group guided reading instruction" (p. 711), we also consider the importance of teachers' guidance as students work with new digital literacies in the classroom. For that reason, we created our own operational definition of a biliteracy center. A technology-based

biliteracy center is an area within the classroom where students work alone or in small groups to explore literacy activities independently using their linguistic repertoires in both Spanish and English while the teacher provides small-group guided reading instruction or walks around the classroom supporting individual students or groups in their technology-based projects.

In well-developed literacy centers, children have the opportunity to practice important skills needed to become effective speakers, listeners, readers, and writers (Halle, Calkins, Berry, & Johnson, 2003). In addition to learning specific literacy skills, children also have the opportunity to increase knowledge in all curriculum areas, learn about new worlds, and improve social interactions. Gregory and Chapman (2007) also explain that a center should be a collection of materials designed purposely with a goal in mind and should help students 1) enhance or extend knowledge on a skill, concept, or standard, 2) explore topics in different content areas, 3) work at their level of need and be slightly challenged, 4) be creative and critical problem solvers, and 5) be able to manipulate a variety of texts. At each center, students are responsible for their learning as they develop, discover, create, and learn the assigned task at their own pace. Furthermore, they suggest that effective literacy centers should have an accountability component to enhance time on task and improve students' learning outcomes (Reutzel, 2007). The following section aims to apply the concepts discussed in this literature review to literacy centers that focus on the development of biliteracy for emergent bilinguals.

Teaching for Biliteracy through Technology-based Centers

In dual language classrooms, the target is to achieve biliteracy, that is fluency in all language domains in two languages (Freeman, Freeman & Mercuri, 2005), usually English and Spanish. Achieving academic proficiency in one of those languages can positively affect the acquisition of the second language (Cummins, 1981; 2008). In addition, when students use technology, the rigor and relevance of the class activities can be increased. Bigelow and Bokoun (2005) state that having different technologies and allowing student choices facilitates literacy development and engagement. In this context, biliteracy centers are incorporated into daily instruction as a tool towards the development of both languages. This new alternative to biliteracy development presents a matrix that includes traditional literacy centers in addition to activities involving technology and language in context. This matrix serves as a tool to facilitate language transfer in English and Spanish in

elementary bilingual emergent students. Thoughtful planning of each one of the centers is a fundamental step in the effective implementation of this new alternative to biliteracy development. The matrix consists of a table that includes language modality, language objectives, content objectives, for both, the teacher and the student, technology objective as well as vocabulary and scaffold, as shown in Table 1.

Table 1. Planning Table for Dual Language Centers

Title of the Center			
Language Modality			
Content Objective			
Language Objective			
Technology Objective			
Content and Language Objectives for the Student			
Vocabulary			
Scaffolding			

The activities at each center are designed around all content areas. In each content area, there are four activities targeting each one of the language domains: reading, writing, listening and speaking. Finally, the activities include a multimedia component. In other words, students engage in activities using technology to complete their final product. In this way, students are able to produce academic language in meaningful activities purposefully designed to develop biliteracy.

In this article, we present and discuss three examples of dual language centers from a one-way second grade dual language classroom. The classroom is in a Title 1 school (Title I provides federal funding to schools that have low poverty levels. The funding is meant to help students who are at risk of falling behind academically) that serves about 450 English language learners; 77% of them are Spanish speakers but only 288 students are enrolled in the one-way dual-language program. In this one-way dual-language classroom, students have access to an array of technology. I-touches are multi-purpose touchscreen-based electronic devices designed to reproduce audio and digital animations. They connect to the internet via Wi-Fi. Some of the applications allow the user to record and edit audio. Net books are portable, small, light-

weight computers that include a web camera and microphone. Active boards are interactive whiteboards with a large screen that connects to a computer and projects the content from the computer screen. They can project pictures, videos, or special interactive presentations called flip charts. Active votes are accessories of the active board that allow the users to select responses in a multiple option format. A listening station is an area in the classroom that includes a recorder or an audio player where students can practice their listening skills. Some of the materials in this station may include songs, poems, audio books, etc.

The 18 students participating in these centers are between eight and nine years old. There are eight boys and ten girls and all come from low socio-economic homes. All students have been in the school since kindergarten and therefore have been exposed to the dual language program. The following section presents three technology-based centers with a focus on biliteracy development. The first center, A book about, aimed at developing writing in English. The second center, Flip with a twist, targeted the acquisition of oral language in both, English and Spanish. Finally, Poster with Glogster pointed towards reading comprehension in Spanish.

Technology-based Dual Language Centers for Biliteracy Development

A book about. This center focused on the development of writing in English, specifically the spelling patterns of verbs tenses ending in *–ing*. At the same time, the students were studying a unit about bird behaviors in science and the concept of multiplication and division in mathematics. In this center, students were asked to create word problems using the vocabulary acquired in science (See Table 2 below). This center had several steps. First, students were given a book with multiplication and division word problems to analyze the sentence structure of the problems. Second, students focused on verb endings and noted the spelling patterns in a sentence strip. Third, the students created their own word problems in a paper-based book that was finally transcribed into the website Storybird.com. This website allowed students to create their own personalized e-book with colorful illustrations. In addition, the website allowed the students to design the format and structure of their book including font, color, page design and illustrations. Once the books were published, the class became part of a club of readers and writers. Students consumed, produced, and commented on the materials available in the website in the format of a conversation in the page of the author of each e-book.

Table 2. Planning table for A book about

A Book About			
Language Modality	Writing Generalize learned spelling patterns when writing work.		
Content Objective	Math Texas Essential Knowledge and Skills (TEKS) Work with equal groups of objects to gain foundations for multiplication. Use addition to find the total number of objects…and write an equation to express the total as a sum of equal addends.	Science The student knows that living organisms have basic needs and behaviors that must be met for them to survive within their environment.	Technology Create original products using a variety of resources. Communication Collaboration Format digital information including font, attributes, color, white space, graphics Technology Operations and Concepts Opening an application and creating, modifying, printing.
Language Objective	World-class Instructional Design and Assessment (WIDA) English Language Development Standards: ELD or Spanish Language Development (SLD) English Language Proficiency Standards (ELPS) Write using newly acquired basic vocabulary and content based grade-level vocabulary; Narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired.		
Content and Language Objective for the Student	Write a math story, you must include: Birds and their behaviors Equal groups Verbs ending in –ing Once you finish your story you can write it in Storybird.com.		
Vocabulary	Sum Addend Multiply Equal Groups Repeated addition	Birds behaviors	
Scaffold	Color-coded verbs in sentence strips List of verbs		

Flip with a Twist. This center focused on the production of oral language in English and Spanish. Originally, the idea of flipping a classroom requires the teacher to record videos about a topic to be learned at school. Flipping the classroom is an instructional approach that has the goal of reducing the lecturing time from part of the teacher

in the classroom. The educator is to lecture students through videos that are to be watched by students as assignments at home. In this way, students come to the classroom with questions and are ready to work on the activities about the topic of study while the teacher uses the time helping and answering the students' questions. However, the limits of this approach widens in homes where the access to technology is limited. In addition, although the teacher is no longer giving lectures in the classroom, the role of the students can be limited in matters of language, background, schooling, and other factors, especially for emergent bilinguals (Bergmann & Sams, 2012).

For this reason, in *Flip with a twist*, the emphasis is no longer on the teacher as the lecturer but on the students. The emphasis at all times is on the students' language acquisition as well as their academic achievement. In this center, the activity was modified in a way that students could record themselves explaining a topic in math in both languages, English and Spanish. In addition, the material was recorded in Spanish for parents. This home integration was helpful for those parents who sought to help their children with their math homework at home. The center integrated math and speaking. More specifically, the students used this center to practice grade-level content area vocabulary in context and to internalize academic vocabulary and mathematical processes in English and Spanish. The students used their notes, textbook, manipulatives and a camera.

This center also had several steps. First, students in groups of three selected a topic of their choice that was already learned in the class. Second, they used information from different sources and planned a storyboard. In the storyboard, they sequenced the concepts and transitions to be used to explain the math concept in the language of their choice. Third, they divided the roles of director, camera operator and presenter. The director was in charge of supervising the flow of the video, making sure that the presenter included all the components that were mentioned in the storyboard. The camera operator recorded the presenter, and the presenter presented the mini-lesson using manipulatives and other materials selected by the students. Finally, students took turns and switched roles. In this center, students were motivated and eager to record themselves. The use of a camera allowed the students to work together and plan toward a common goal: presenting a mini-lesson about a math concept. Below is the planning table for this center.

Table 3. Planning Table for the center *Flip with a Twist*

Flip with a Twist			
Language Modality	Speaking Create a math problem orally using different sentence types.		
Content Objective	Math Addition with regrouping in the ones place	Science The student knows that living organisms have basic needs and behaviors that must be met for them to survive within their environment.	Technology Collect, analyze, and represent data using simulations. Use a variety of input, output, and storage devices.
Language Objective	ELPS Speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired.		
Content and Language Objective for the Student	In the following center you will select a topic of your choice in math. You will have to read and select the materials that you need in order to create a math show. Your math show must include: A title for the show Math objective Important words Manipulatives 1 example with a solution		
Vocabulary	Varies according to the students choice	Birds' Behaviors	
Scaffold	Story board Tripod for camera Videocamera or cam recorder		

Poster with Glogster. The focus of this center is the development of writing through reading. Through research and reading with a purpose, students were able to apply their first and second language. The students were asked to create a poster about the hero or patriotic figure of their choice. In order to accomplish this task, the students needed to complete several steps. First, the students were briefly introduced to the lives of several heroes of the United Stated through short videos. Second, a list of heroes was presented, and in bilingual pairs, the students chose the person that they would like to learn more about. Third, after selecting their hero, the students received guidelines specifying the components of their research project. Fourth, students found written materials about their historical figure online and in books from the library. Then, in pairs students decided what information was relevant to their guideline and took notes accordingly. Students prepared

a draft that included the information that they wished to present. During their research and exploration of sources, the second graders in this class discussed with their partners, read different sources and wrote their notes in their first and second languages. In small groups, students helped each other editing their notes making corrections as necessary. Once the written components were ready, students looked for pictures in a database. Finally, they used their images and edited documents to create a poster that was posted and presented to their classmates.

Table 4. Planning Table for *Glogster*

Glogster			
Language Modality	Reading		
Content Objective	Social Studies History Historical figures, patriots, and good citizens helped shape the community, state, and nation	Language Arts Literacy Common Core State Standards English Language Arts Participate in shared research and writing projects (read a number of books on a topic to produce a report). Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather.	Technology Research and Information Fluency. The student acquires and evaluates digital content. The student is expected to: Use search strategies to access information to guide inquiry; Use research skills to build a knowledge base regarding topic, task, or assignment; and Evaluate the usefulness of acquired digital content.
Language Objective	English Language Proficiency Standards Reading Use visual and contextual support and support from peers and teachers to read grade-appropriate content area texts, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language.		
Content and Language Objective for the Student	Research the life of one of the national héroes in the course textbook, the library or internet and make a report about your choice in glogster.com		
Vocabulary	Varies according to students' choice		
Scaffold	Conferencing during guided reading and writers' workshop.		

Discussion

The research discussed in the literature review section supports different aspects of each one of the technology-based dual-language literacy centers examples described in this paper. As Warschauer's study (2006) suggests, the implementation of these innovative technology-based centers enhances students' learning and motivation and represents one of the many paths to biliteracy (Dworin, 2003). For example, in E-book projects like *A book about*, students have an active role as they make choices about how to create, obtain, manipulate, or display information on the digital text (Kajder, 2005). The storybird.com website allowed students to be creative with the format or layout of their final product. For instance, students had the choice of placing their text at the bottom, top, or sides of the page by dragging a textbox. In the same way, they could select the type and size of picture that would fit their needs. By having this choice, students were able to use their time efficiently, develop their creativity and improve their digital literacy skills needed in the 21st century globalized world.

These types of center activities facilitate the acquisition of both languages by considering biliteracy development as a dynamic process (García, 2009; García, Kleigfen and Falchi, 2008) where students read and write in different languages to collect information and have the choice to create a product in either language for an audience that also can access the information in both languages, or to facilitate access to content like in *Flip with a Twist.* This process explains the potential intellectual advantages that emergent bilinguals could achieve by mediating the two languages and their social worlds to construct knowledge (Dworin, 2003).

The *A book about* project is an example of the new literacies that could be included in the classroom for teaching and learning and, more in particular, for biliteracy development. In *A book about,* students were able to apply science, math, and language concepts in context and through meaningful activities that represent the digital worlds most of them are familiar with (Leu, Mallette, Karchmer, & Kara-Soteriou, 2005). In addition, the Storybird.com website promoted the use of the written and oral language of the students in both languages. The main component of Storybird.com is images without text. These images stimulated the students' language production in the language of their choice. Although their final product in the example discussed here was in English, students use both languages to analyze and construct their story. Moreover, the website allows students to type stories in English and/or Spanish.

Furthermore, the advantage of this center was that the teacher could measure the progress of students over time. Because the e-books worked as an e-portfolio, the teacher and students could go back to the website to review and assess students' language acquisition (Cummins, 1981). While E-books are different text types from printed materials, they can be read and written using the same strategies that we use with more traditional printed materials (Schugar & Schugar, 2013). This is particularly important for e-books that will be uploaded to the classroom site and will be available to all classmates as optional reading materials across content areas. Additionally, students are able to share their book not only with their classmates in their class but with peers in other nations once it is uploaded. For this reason, the number of readers was greater in digital books than in paper-based books.

Finally, Storybird.com engages students through an extensive collection of artwork available to them. This visual repertoire kept students motivated because they analyzed and selected the images that they considered aligned with their text. Even the most reluctant writers had an inner motivation to create an e-book that would carry the images of their choice. However, this rich selection of artwork affected the performance of a few students who would spend more time looking at the images than writing their stories. At the same time, once the students selected an image, their choices would be limited. That is, the artwork belonged to a specific folder and artist in Storybird. The students could not use more than one folder per book. Therefore, their selection became restricted to the images of one artist per book. Regardless of this limitation, Storybird.com made the written experience more relevant because it provided students with a real world experience. The students became self-published authors by writing, designing, and sharing their e-books. They lived the writing process and were able to see a digital book almost identical to the books they read in the classroom, with the only difference that this book was digital.

A closer look at the *Flip with a Twist* project demonstrates that students at this center could use an array of oral and written competencies in both languages based on the audience to demonstrate content knowledge. This exemplifies Hornberger's continua of biliteracy (2003) as students apply their knowledge of the selected topic of a discipline and use all their linguistic competencies in both languages. For monolingual Spanish-speaking or English-speaking parents, students can develop Spanish and English videos to promote home-school connections while at the same time enhancing their biliteracy development (Kabuto, 2011).

In the example presented in this paper, the students planned and delivered a lesson in a video that worked as a preview and review of the material to be studied for an audience beyond the classroom (Mercuri, in press). In this way, the videos served as a preview activity for first graders, or as a review for students in the same grade level. As a preview, students from first grade explored the materials that they would be covering in the future. As a review, second grade students clarified and reaffirmed their learning at home or in the classroom. In addition, this center served as a home-school connection because parents could access the videos in the language of their choice, and therefore, they could better help their children in the school assignments. In sum, authentic activities like video recording allowed students to have an audience in their classroom, school and beyond. Because students knew that their videos would serve as a tool to teach students and adults, they made sure that their message was clearly transmitted. For this reason, it was through collaboration that the students listened to and corrected each other's mistakes when necessary. In addition, students were aware that once the video was recorded, they would not be able to modify their words. For this reason, the students relied on reviewing their recordings consistently before selecting their final version. This use of both languages for academic purposes fosters high levels of metalinguistic awareness enhancing emergent bilinguals' biliteracy development (Gort 2012; Fránquiz, 2012).

Lastly, the analysis of *Poster with Gloster* showed that the students were able to demonstrate high levels of bilingualism and biliteracy by using their linguistic skills in both languages (Reyes, 2012). Glogster allows students to develop their reading and writing skills as if they were part of a cycle. Students at the beginning had to read to collect the information necessary to create their poster. Then, after they published their poster, they read other posters from other classmates. In this way, the process of reading and writing became part of a repetitive sequence where reading and writing skills were developed. Students used conventions and capitalization with care because they were aware that their product would serve the need of informing other students about their heroes. This goal allowed the students to become writers who had the readers in mind. Through this process, languages were not kept separate, but rather students were able to select and navigate in the language of their choice. García (2014) refers to this skill as *translanguaging*, that is, the ability to generate new meaning and understanding as students use both languages to accomplish the task. By reading in both languages, students enriched their language acquisition and proved their comprehension through writing in their

language of choice. Technology was part of the students' learning process not only as a part of a final product, but also as an embedded element throughout their research process through new digital literacies (Milton & Vozzo, 2013).

The alternative to traditional centers discussed in this paper presents a path to teaching for biliteracy. In all three examples students were able to extend their literacy skills in both languages and to learn the content of the content areas (Halle, Calkins, Berry, & Johnson, 2003; Gregory and Chapman (2007). In sum, based on these classroom examples, the use of technology-based biliteracy centers have the potential to facilitate the acquisition of both languages and content knowledge of emergent bilinguals in both types of dual language programs, 50/50 and 90/10.

References

Barone, D., & Wright, T. E. (2008). Literacy instruction with digital and media technologies. *The Reading Teacher, 62*(4), 292-302.

Beeman, K. & Urow, C. (2012). *Teaching for biliteracy: Strengthening bridges between languages.* Philadelphia, PA: Caslon Publishing.

Bergmann, J., & Sams, A. (2012). *Flip your classroom. Reach every student in every class every day.* Alexandria, VA: ISTE; ASCD.

Bigelow, T. P., and Vokun, M. J. (2005). *What choice do I have? Reading, writing and speaking activities to empower students.* Portsmouth, NH: Heinemann.

Bus, A. G., Verhallen, M. J. A. J. & de Jong, M. T. (2009). How onscreen storybooks contribute to early literacy. In A. G. Bus & S. B. Neuman (Eds.), M*ultimedia and literacy development: Improving achievement for young learners* (pp. 153-167). New York: Routledge.

Carroll, J. (2011). From encyclopedias to search engines: Technological change and its impact on literacy learning. *Literacy Learning in the Middle Years, 19*(2), 27-32.

Cummins, J. (1981) *Bilingualism and minority language children.* Ontario: Ontario Institute for Studies in Education.

Cummins, J. (2008). Teaching for transfer: Challenging the two solitudes assumption in Bilingual Education. In J. Cummins and N. H. Hornberger (Eds.), *Encyclopedia of language and education* (2nded). Boston, MA: Springer Science.

Dworin, J. E. (2003). Insights into biliteracy development: Toward a bidirectional theory of bilingual pedagogy. *Journal of Hispanic Higher Education, 2*(2), 171-186.

Ford, M. & Opitz, M. (2002). Using centers to engage children during guided reading time: Intensifying learning experiences away from the teacher. *The Reading Teacher, 55*(8), 710–717.

Fránquiz, M. (2012). Traveling on the biliteracy highway: Framing biliteracy from students' writings. In E. B. Bauer & M. Gort (Eds.), *Early biliteracy development: Exploring young learners' use of their linguistic resources* (pp. 132–156). New York: Routledge.

Freeman, D., & Freeman, Y. (2009). Effective Reading Instruction for English Language Learners. In Z. Han & N. Anderson (Eds.), *Second language reading research and instruction: Crossing the boundaries* (pp. 102-116). Ann Arbor, MI: Michigan University Press.

Freeman, Y., Freeman, D., & Mercuri, S. (2005). *Dual language essentials for teachers and administrators*. Portsmouth, NH: Heinemann.

García, O. (2009). *Bilingual education in the 21st century: A global perspective.* Malden, MA: Basil/Blackwell.

García, O. (2014). Countering the dual: Transglossia, dynamic bilingualism and translanguaging in education. In R. Rubdy & L. Alsagoff (Eds.), *The global-local interface, language choice and hybridity* (pp. 100-118). Bristol: Multilingual Matters.

García, O. and Kleifgen, J. (2010). *Educating emergent bilinguals. Policies, programs and practices for English language learners.* New York: Teachers College Press.

Garcia, O., Kleifgen, J., & Falchi, L. (2008). *From English language learners to emergent bilinguals.* Research Review Series Monograph, Campaign for Educational Equity, Teachers College, Columbia University.

Gort, M. (2012). Evaluation and revision processes of young bilinguals in a dual language program. In E. B. Bauer & M. Gort (Eds.), E*arly biliteracy development: Exploring young learners' use of their linguistic resources* (pp. 90–110). New York: Routledge.

Gregory G. H. & Chapman, C. (2007). *Differentiated instructional strategies: One size doesn't fit all.* Thousand Oaks, CA: Corwin Press.

Grosjean, F. (2010). *Bilingual: Life and reality*. Cambridge, MA: Harvard University Press.

Halle, T., Calkins, J., Berry, D. & Johnson, R. (2003). Promoting language and literacy in early childhood care and education settings. *Child Care and Early Education Research Connections.* New York: National Center for Children in Poverty.

Hamayan, E., Genesee, F. & Cloud, N. (2013). *Dual language instruction from A to Z: Practical guidance for teachers and administrators.* Portsmouth, NH: Heinemann.

Hew, K.F., & Brush, T. (2007). Integrating technology into K-12 teaching and¨learning: Current knowledge gaps and recommendations for future research. *Educational Technology Research and Development, 55*(3), 223-252.

Hornberger, N. H. (Ed.). (2003). *Continua of biliteracy: An ecological framework for educational policy, research, and practice in multilingual settings.* Clevedon, UK: Multilingual Matters.

Howard, E. R., Sugarman, J., & Christian, D. (2003). *Trends in two-way immersion education: A review of the research* (Report No. 63). Baltimore, MD: Center for Research on the Education of Students Placed At Risk.

Howard, E. R., Sugarman, J., Christian, D., Lindholm-Leary, K. J., & Rogers, D. (2007). *Guiding principles for dual language education* (2nd ed.). Washington, DC: Center for Applied Linguistics.

Hutchison, A., & Reinking, D. (2011). Teachers' perceptions of integrating information and communication technologies into literacy instruction: A national survey in the United States. *Reading Research Quarterly, 46*(4), 312-333.

Kabuto, B. (2011). *Becoming biliterate: Identity, ideology, and learning to read and write in two languages*. New York: Routledge.

International Society for Technology in Education. (2007). *ISTE's educational technology standards for students.* Retrieved from: www.iste.org/Content/Navigationmenu/NETS For Students 2007standards/htm.

Kajder, S. (2005). Not quite teaching for real: Preservice secondary English teachers' use of technology in the field following completion of an instructional technology methods course. *Journal of Computing in Teacher Education, 22*(1), 15-33.

Kent, P. & Holdway, M. (2009). Interactive whiteboards, productive pedagogies and literacy teaching in a primary context. *Literacy Learning: The Middle Years, 17*(1), 21-15.

Korat, O., & Shamir, A. (2007). Electronic books versus adult readers: Effects on children's emergent literacy as a function of social class. *Journal of Computer Assisted Learning, 23*(3), 248–259.

Leu, D. J., Mallette, M. H., Karchmer, R. A., & Kara-Soteriou, J. (2005). Contextualizing the new literacies of information and communication technologies in theory, research, and practice. In R. A. Karchmer, M. H. Mallette, J. Kara-Soteriou, & D. J. Leu, (Eds.), *Innovative approaches to literacy education: Using the Internet to support new literacies* (pp. 1-10). Newark, DE: International Reading Association.

Martínez, R. A. (2010). Spanglish as a literacy tool: Toward an understanding of the potential role of Spanish-English codeswitching in the development of academic literacy. *Research in the Teaching of English, 45*(2), 124–149.

Mercuri, S. (2009). *Supporting bilingual learners: Literacy practices through science.* Saarbrucken, Germany: Lambert Academic Publishing.

Mercuri, S. (In press). Teachers' reflective practice: Implementing the preview/view/review structure as a tool for learning. In Y. Freeman, & D. Freeman (Eds), A*dvances in research in teaching: Research on preparing inservice teachers to work effectively with emergent bilinguals.* Bristol, UK: Emerald Books.

Mercuri, S. & Yarussi, N. (2014). Using an interdisciplinary unit as macro scaffold to Support older emergent bilinguals' academic literacy development. In P. Spycher (Ed.), *The common core state standards in English language arts/literacy for English language learners: Grades K-5.* Series: The Common Core State Standards and English Language Learners. Alexandria, VA: TESOL.

Milton, M., & Vozzo, L., (2013). Digital literacy and digital pedagogies for teaching literacy: Pre-service teacher's experiences on teaching rounds. *Journal of Literacy and Technology, 14*(1), 72-97.

Reutzel, D. R. (2007). Organizing effective literacy instruction: Differentiating instruction to meet the needs of all children. In L. Gambrell, L. Morrow, & M. Pressley (Eds.)*, Best practices in literacy instruction* (3rd ed.) (pp. 11–29). New York, NY: Guilford Press.

Reyes, Ileana. (2012). Biliteracy among children and youths. Reading *Research Quarterly, 47*(3), 307–327.

Schugar, H. R., Smith, C. A. & Schugar, J. T. (2013). Teaching with interactive picture EBooks in Grades K–6. *The Reading Teacher, 66*(8), 615–624.

Walsh, M. (2011). *Multimodal literacy: Researching classroom practice.* Newtown, NSW: PETA.

Warschauer, M. (2006). *Laptops and literacy: Learning in the wireless classroom.* New York: Teachers College Press.

Authors

***Dr. Sandra Mercuri** is an Associate Professor at the University of Texas, Brownsville. She teaches courses in bilingual education and biliteracy. Her research interest is on academic language of the content areas, the development of scientific literacy and the effect of long-term professional development on teachers of English learners. She provides training for teachers nationwide and presents at national and international conferences Dr. Mercuri has also published articles in professional journals in Spanish and English. Dr. Mercuri is the author of the book titled *Supporting Literacy through Science.* She has also co-authored the books *Closing the Achievement Gap* and *Dual Language Essentials* with Drs. Yvonne and David Freeman and *Research-based Strategies for English Language Learners* with Denise Rea.

***Laura Ramos** is a bilingual teacher in Houston, Texas. She has eight years of experience teaching in the upper and lower grade levels in dual language programs. She is interested in language acquisition, educational technology and biliteracy. She received her Master's of Education in Bilingual Education and ESL in the University of Texas at Brownsville and holds a Bachelor's Degree in Communications and Media. She presents regularly at international, national, and state conferences including TESOL (Teachers of English of Speakers of Other Languages), TABE (Texas Association of Bilingual Education) and La Cosecha Dual Language Conferences.