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Digital storytelling: facilitating learning and identity development

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Abstract This study examines how digital storytelling facilitated students' reflection and learning in a project-based year-end middle school capstone program. It also explores how students expressed their voices, identities, and emotions using the multimodal resources available in digital stories. Using qualitative case study methods, the study draws on interviews, observations, and artifacts to analyze two focal cases. It uses a framework derived from Systemic Functional Linguistics to analyze the digital stories. The findings show how two students used text, images, sound, animations, emojis, and other resources to present and remix messages about the subject matter and about themselves. One student enacted a teacher role as she presented to a group of third graders. The other enthusiastically engaged with peers through a culinary project that used math in cooking, in which he shared a Salvadoran pancake from his home country. The study shows how embedding digital storytelling projects in a school curriculum can engage learners with a wide range of expressive resources while also enhancing students' motivation, creativity, identity development, and connection with others.

Keywords Digital storytelling · Identity · Learning reflection · Multimodality

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Introduction

Rapid developments in technology and computer-assisted authoring systems have made new approaches to education possible. These technologies allow teachers and learners to create complex, multimodal texts, which integrates two or more different semiotic systems (Kress 2003; Kress and van Leeuwen 2006; The New London Group 1996). Multimodal communication engages learners in the use of digital tools to construct texts in multiple semiotic modes—including writing, images, and sound and allows learners to construct texts that communicate more richly (Jewitt and Kress 2003). There is increasing interest in engaging students with digital multimodal composition, focusing not only on language proficiency as it is traditionally conceived, but also on the strategic use of multimodal resources (Hafner 2015). Incorporating multimodal meaning-making more fully into K-12 education is crucial in the twenty-first century. Multimodality connects to students' lives outside of school, and it can increase students' motivation, identity development, and mastery of digital literacies (Kim and Vorobel 2017).

Digital stories (DS) are 2- to 5-min narratives created with a variety of multimedia components such as images, figures, audio, video, and animation (Gregori-Signes 2014). The availability of computers at school, together with advanced, low-cost, user-friendly multimedia editing software (e.g., iMovie, Movie Maker, WeVideo), makes DS a powerful learning tool which can communicate complex content and emotions across a range of modes. DS can engage students in critical reflection on their own experiences, develop their digital literacy skills, help them learn subject matter from the curriculum, and entice students to participate actively in learning. The subject matter of DS can vary from content knowledge of formal education to personal experiences (Robin 2008). Literacy development, especially second language development, can be facilitated by DS—when second language learners create digital stories to show their learning progress (Chrisholm and Trent 2013; Rahimi and Yadollahi 2017). Students are often asked to take videos or photos of their experiences and make digital stories out of those materials (Chrisholm and Trent 2013). Sometimes digital stories are also used for assessment.

In order to take advantage of digital stories' educational potential, we created the "Incorporating Digital-storytelling to Empower All Students" (IDEAS) program in a parochial school in the northeastern United States. IDEAS was a capstone experience for students in the final three weeks of the academic year, using project-based learning and digital storytelling to review subject matter from the 6th and 7th grade curriculum. Students' digital stories were designed to narrate their experiences in the project-based learning of the capstone program. That is, they created DS to tell the story of their learning experiences across the three-week capstone.

We gathered data in order to find out whether digital storytelling enhanced students' reflection on subject matter as part of this project-based review at the end of the academic year. We looked for instances of reflective learning, in which students made connections between subject matter they learned during the semester,

and we also documented the development of digital literacies and storytelling skills that might be useful for them in the future. In addition to helping students learn academic content and skills, digital stories can be powerful vehicles for students to connect their own experiences to the subject matter, and for them to articulate their own voices and identities. We systematically explored how focal students' digital stories facilitated the articulation of student voices and allowed them to draw on and develop their identities.

Literature review

Past research has shown how digital stories allow students to demonstrate and reflect on their learning as they create projects (Kim and Mannion 2018). By using digital stories to communicate their understandings of the subject matter, as well as their identity development, students are also able to articulate their voices and experiences while composing their stories (Kim et al. 2019). In this section, we review relevant literature that has informed our inquiry.

Multimodality and digital storytelling (DST)

Kress and van Leeuwen (2006) describe how the semiotic modes of writing and visual communication ways of expressing even similar meanings. Different media use different tools and achieve different effects, even when they are communicating similar content. Learners can explore these different affordances and learn the strengths of the various modes of communication. Walsh (2006) discusses how multimodality also allows learners to use more than one mode to communicate by synchronizing modes, sending messages by combining media in artful ways. In research on this process, Hafner (2013, 2014, 2015), for instance, examined videos of multimodal composition done by university students in an English as a second language setting. He discusses "remixes, mashups, and parodies" (Hafner 2015), creative blends that students created in multimodal projects using various resources, and he explores how students use digital tools to construct multimodal texts. Employing two or more semiotic modes allows students to create meanings which become more than the sum of the parts.

Digital storytelling is an important type of multimodal composition that is being used increasingly in educational contexts (Yang 2012). These stories allow students to select and learn diverse media tools as they create multimedia products to communicate their own experiences (Kim and Mannion 2018; Hull and Katz 2006). Digital storytelling also offers students opportunities to learn about and reflect on their own lives, at the same time as they learn to use multimedia tools and learn about subject matter. The reflection facilitated by digital storytelling has two related benefits: it facilitates reflection on and learning of subject matter, and it also facilitates reflection on and development of student identities and voices. Dewey (1933) defined reflection as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the

further conclusion to which it tends" (p. 9). In a more contemporary account, Moon (1999) describes reflection as "a form of mental processing with a purpose and/or anticipated outcome that is applied to relatively complex or unstructured ideas for which there is not an obvious solution" (p. 23). While producing multimedia projects like digital stories, learners are able to reflect on and display their knowledge of the content as well as their own developing identities. Because it facilitates these two types of reflection, digital storytelling is "becoming a promising transformative technology-supported approach for enhancing learning" (Yang and Wu 2012).

In analyzing the process of design, Kress (2003) introduces two concepts—*transformation* and *transduction*—as essential elements for a designer to act agentively. Through transformation, designers take actions to reorganize and rearrange elements within a mode to create new meanings. Through transduction, designers reshape semiotic resources across modes to deliver meaning. For instance, tones, stress, and intonation can be manipulated in speech; colors and lines can be manipulated in images; and tempos, rhythms, and melodies can be manipulated in audio mode (Yang 2012). Students in the project were encouraged to engage both in transformation and transduction.

Learners' identities in digital stories

When creating a digital story, students have an opportunity to select, represent, and highlight features that matter to them and to build personal connections into the story (Nelson 2006). Particularly for immigrant students, digital stories offer opportunities to explore their personal experiences and cultures, while they also learn subject matter and improve their oral and written language skills in English (Vinogradova et al. 2011). In this way, digital stories can help foster identity development and the articulation of student voices.

Gee (2000) defines identity as "being recognized as 'a certain kind of person' in a given context" (p. 99). Similarly, Lam (2000) defines social identity as the enactment of membership in particular social groups and discourse communities. In everyday life, people use multimodal semiotic resources to participate in "way[s] of acting, interacting, feeling, believing valuing, and using various sorts of objects, symbols, tools, and technologies—to recognize yourself and others as meaning and meaningful in certain ways" (Gee 2005, p. 7). Having an identity, communicating and participating in a recognizable way, makes one a member of a community (Kim and Vorobel 2017). Norton (2013) extends this idea by describing imagined identities and imagined communities. Imagination can extend engagement and interaction with the world and create new types of community. Kanno and Norton (2003) point to various "groups of people, not immediately tangible and accessible, with whom we connect through the power of the imagination" (p. 241). They offer examples from second language classrooms, focusing on language learning identity. When learners imagine themselves as members of imagined communities, these affiliations can affect both their learning trajectories and their sense of self.

Norton (2013) shows how middle school students can extend their imagined communities and thus develop their identities by creating digital stories. Students can

create and share their own digital stories in ways that illustrate the communities they belong to and the significance of their identities. Their digital stories show which communities matter to them and how their experiences with these communities are meaningful. When learners imagine themselves to be members of imagined communities, they both reinforce their affiliations with such communities and create opportunities for learning about digital tools, subject matter, and self. Creating digital stories is a form of art, and as such it offers students opportunities to imagine new worlds and express their own voices.

Articulating identities with voice and emotion

Gee (2000) describes various kinds of identity—biological, institutional, discursive, and affinity-based. He describes how "learning in semiotic domains recruits one or more modalities (e.g., oral or written language, images, equation, symbols, sounds, gestures, graphs, artifacts, and so forth) to communicate distinctive types of messages" and helps establish these identities (p. 1). Lam (2000) illustrates this empirically, showing how learners develop identities by practicing literacy while enacting a particular social role and membership in a group. Kress (2000) provides a similar account, arguing that "an adequate theory of semiosis will be founded on a recognition of the 'interested action' of socially located, culturally and historically formed individuals, as the remakers, the transformers, and the re-shapers of the representational resources available to them" (p. 155). People use multiple semiotic modes to communicate and to become members of communities. Gee (2000), Lam (2000), Kress (2000), and others show that establishing an identity has always involved multimodal communication. Now educators have powerful digital tools to help students do this in ways that help them learn subject matter and technological skills at the same time as they articulate their identities.

The concept of "voice" is crucial to analyzing how this happens (Sperling and Appleman 2011). Voice as a pedagogical concept has been widely used to assess L2 learners' language and identity development. Lam (2000) defines voice as "the construction of roles and identities through discursive choices" (p. 458). Bowden (1999) describes voice as "a metaphor that has to do with feeling-hearing-sensing a person behind the written words, even if that person is just a persona created for a particular text or a certain reading" (pp. 97–98). Voice has been used to understand authors' intentions and distinctiveness (Shahri 2018; Sperling and Appleman 2011). Voice has also been used to study learners' self-representation (Ivanic and Camps 2001), as well as to study learners' connections to imagined communities and the relationship between readers and authors (Phares 2002). Learners' voice in second language learning is influenced by the imagined identities which learners project for themselves using the target language (Kanno and Norton 2003; Norton 2006). Language learners have opportunities to develop different voices by emphasizing different aspects of their situations and their experiences (Shahri 2018).

There are multiple voices in any text (Bakhtin 1986), because all texts are embedded in heterogeneous social environments. Explaining Bakhtin's theories, Sperling and Applman (2011) describe how voices "exist in a chain, in an ongoing dialogue

that entails language and that reflects language use. Voice reflects one's assimilation, reworking, and accentuating of other voices" (p. 74). Development, according to Bakhtin, is a process of bringing together and juxtaposing one's own and others' voices (Bakhtin 1981). An individual develops a distinctive voice over time, as he or she speaks through others' voices and ultimately combines these other voices into a distinctive voice of his or her own. This is a lifelong project, but it is important for students to have opportunities to bring together components that articulate incorporate others' voices into a composition that begins to articulate their own. As they tell digital stories or create other multimodal compositions, students can use the process of voicing to begin developing and expressing a sense of who they are, and thus to articulate their position in relevant social worlds.

There is limited research on students' expression of their identities, voices, and emotions in digital stories. There is almost no research exploring how students creatively use multimodal resources to reflect on their curriculum-based learning and how digital storytelling can simultaneously facilitate identity development. To fill this gap, we examine a year-end capstone program that used digital storytelling to help students engage with the academic curriculum while also offering opportunities for self-expression. By analyzing the digital stories from the Capstone Program, our study explores how students creatively used DS to express their identities, voices, and emotions while using multimodal resources in the capstone project, at the same time as they were also reviewing subject matter and learning language. We asked the following two research questions:

(1) How do students use multimodal resources to reflect on their learning and their capstone experience in the digital storytelling project?
(2) How are students' identities expressed and developed through the composition of digital stories?

Method

The IDEAS project

The study took place in a pre-K through eighth grade Catholic school in the Northeastern U.S. The school offers a rigorous curriculum and an education that fosters development of the whole child. The Incorporating Digital-storytelling to Empower All Students (IDEAS) project was designed to help middle school students engage in reflective, project-based learning by creating digital stories. In situated social sign-making processes (Kress 2003), designers utilize multimodal semiotic resources to create and deliver their intended meanings. In IDEAS, learners were encouraged to serve as active designers, shaping and reshaping ways of presenting messages by combining semiotic resources to create meaning.

These students had learned a relatively standard middle school curriculum across the academic year. The capstone took place in the final three weeks, in the spring. The year-end capstone project asked 6th and 7th grade students to connect content they had learned during the semester to real-life experiences by creating a project

and using digital storytelling to narrate the process of creating that project. Students picked their topics, with guidance from teachers, from the following seven subject matter areas: (1) engineering and urban gardening, (2) teaching and exploring with virtual reality, (3) math in cooking, (4) caring for our common home through sustainability, (5) who do you want to be, (6) psychology, and (7) arts. Each student made his or her own choice and then had three weeks to create a project using content from the curriculum, combined with their own experiences. There were three stages: preparation and doing the project, enhancing the subject matter learning through creation of the digital stories, and a final presentation and celebration. During the preparation, students were encouraged to participate in various activities (e.g., field work on an ecological project, designing and executing a work of art). Learning and creation included both reflection on their projects and creation of their own digital stories. The celebration included presentations by all students and sharing their projects with peers, parents, and educators. The program offered an opportunity for active learning in an area that they were passionate about. The digital storytelling offered a space for reflection and further learning.

Together with teachers, we encouraged the middle school students also to use multimodal resources in order to articulate an authorial voice and present their identities through multimodal stories. English learners in particular can demonstrate and project their identities through the intentional use of multimodal semiotic resources by expressing changes in emotional stances, demonstrating different voices, and enhancing audience attention and comprehension (Yang 2012). We encouraged students to use these design features of digital stories both to represent the subject matter that they learned and to articulate their own voices and identities by telling a story about their experiences.

Focal cases

We used purposeful sampling to select two students (Merriam 2009), from among 18 who completed the capstone project. We selected participants who were willing to participate in the study, who completed a project on time, and whose projects were selected by peers for presentation at a final showcase event.

The selected projects were created by students we call Jesús and Marney. Jesús, a 6th grader, was born in El Salvador and was brought to the US at the age of two. His father is Greek and his mother is from El Salvador, so both Greek and Spanish were spoken at home. He enrolled in the "Math in Cooking" topic area. He used the "Voicethread" authoring program for his project. He created a Salvadoran pancake which the class was subsequently able to eat. Marney, a white 7th grader, was born in the US. She was enrolled in the "Virtual Reality" topic area. She created a "Story of the Stars" using WeVideo.

Data collection

Data collection included (1) classroom observations, (2) informal conversations with students, and (3) the digital stories themselves. Two research team members were

assigned to the two classrooms. Each observed the three-week year-end capstone program every day and took fieldnotes during their observations. Research team members also had informal conversations with participants twice a week. Each team member chatted with the participant for 10–15 min in the classroom, focusing on their experiences with the project. Sometimes participants also asked for technical help with the software. The main data source used for this study was the DS themselves, which we supplemented with additional data to provide better background knowledge of the context and students' composition processes. During the project, participants reflected on and journaled about their digital story plans and experiences. The participants digitally recorded reflections on their project development. Each participant also took photos and videos to illustrate their experiences with the project. The participants selected videos and photos, and combined them with music they found online, compiling them into narratives they wrote themselves. They completed the final digital stories using VoiceThread (https://voicethread.com/).

Data analysis

We focused on two participants' digital storytelling products. We transcribed the digital stories using methods of multimodal transcription (Baldry and Thibault 2006; Jewitt 2006). Following Baldry and Thibault (2006), one co-author viewed the two videos created by the focal participants multiple times and examined the meaning communicated by different multimodal resources. For each slide, the following elements were analyzed: action, text on screen, other visuals, sound, and meaning. The analysis focused on the students' meaning-making by examining the combination of modes, in which each mode played a role and no one mode was privileged over the others (Iedema 2003). The other co-author then rechecked the two videos and verified coding regarding the above-mentioned elements. Using a constant comparative method (Strauss and Corbin 1990), we analyzed the data in an iterative and holistic manner and made comparisons across the two participants. As a result, we identified three distinct ways in which students used multimodal resources to construct meaning and convey emotion: (1) orchestrating text, image, and sound; (2) adopting cartoons and emojis, and (3) remixing culture.

In order to examine how students' identities were expressed and developed through the digital storytelling project, we analyzed qualitative data such as the transcripts of the DS and individual interviews from the two participants (Lincoln and Guba 1985). We used coding categories derived from the literature and also pursued open coding. The second phase of the analysis involved axial coding, in which codes related to each other are put into subcategories and then combined to form new thematic categories. We reviewed emerging concepts and clustered them with similar concepts. At the third stage, we compared emergent themes. We triangulated across data sources, compared the coding across researchers, and identified robust patterns (Kim et al. 2019). We focused on participants' comments about the goals, the audience, the community of practice, and the artifacts they used to complete the capstone project, as described in the interviews. We also examined the diverse images they adopted or adapted in the DS videos. Our analyses of the digital stories were

based on a framework that we have developed, adapting concepts from Systemic Functional Linguistics (Kim et al. 2019). We triangulated across the multiple source of data, and we also conducted member checks and critical-friend readthroughs of the paper, to increase the trustworthiness of the analyses (Lincoln and Guba 1985).

Results

We found that the students effectively utilized multiple resources in their digital stories (e.g., text, image, music, narration) to reflect on their capstone experiences and deepen their learning about the subject matter. We also found that they expressed and to some extent developed their identities through the project.

Creative use of multimodal resources

Marney, a 7th grader, was enthusiastic about her capstone experience, which involved her teaching 3rd graders about stars. Her video was organized by dates (which she labeled "phases"), with multiple slides illustrating what she did each day of the capstone project. Appendix 1 gives an overview of her use of multimodal resources and the meanings each of these came to have. Jesús, a 6th grader, created a video to reflect on his positive experience with the cooking capstone project. As in Marney's, his video was organized by date (with these again labeled as phases). Each slide focused on what the student did each day of the capstone project. Appendix 2 provides an overview of the use of multimodal resources and the meanings achieved in Jesús' DS. After analyzing the two cases using a constant comparative method, we identified three themes regarding the use of multimodal resources.

Orchestrating text, image, and sound

Marney's case

Marney orchestrated multimodal resources (e.g., text, color, images, sound) in her video to reflect on her teaching experience. For example, as shown in Fig. 1, the background of golden light beaming in the sky on the cover page blends harmoniously with

Fig. 1 Screenshot of the cover page of Marney's video

the title "Story of the Stars." The use of the Serif Gothic font, the one used for the captions in the "Star Wars" movies, indicates the student's great enthusiasm for this astronomical project and her desire to engage her audience. In Marney's words, "I gave it like a really cheesy title.[…] I love Star Wars.[…] I actually used Star Wars font." As she reported in the interview, the slide "was a little about mythology, so I wanted to give them a picture of Orion's Belt… just a picture of the goddess of Austerian… cuz that's sort of what I was talking."

She also combined multiple images and photos to show her engagement in the capstone project. In addition to adopting the online images of space and the stars, Marney included in her DS multiple photos taken during the capstone project, such as a photo of her planning a lesson and a photo of her third-grade students excited at using the instrument to watch the sky. In particular, the pictures of complicated math problems and question marks and a photo of flashcards that she had made for the lesson illustrated Marney's efforts to prepare the lesson. Moreover, she presented ongoing evaluation of her lesson, as shown by a self-assessment chart that showed how long the lesson should last vs. how long what she planned actually lasted.

Marney also added music to her Digital story, which blended well with the visuals. She combined her eloquent narration with pleasant music, leading to a nice effect. She recalled in the interview: "umm… usually images alone is kinda boring so usually I add some like background music in the background." She added that the music is thematically relevant, and "really ties to the theme of teaching and the theme of stars like … astronomy and stuff."

Jesús's case

Like Marney, Jesús successfully used multimodal resources to convey his passion and engagement in the capstone project. He combined online images and the photos taken of himself in his DS, including a picture of a calculator, a picture of dollar coins, a photo of ingredients in his shopping cart, a photo of flour and sugar, a photo of the Salvadoran pancake the group made, and a photo of the bake sale.

Jesús also applied color effectively in his cooking video. The colors of fire (i.e., red, orange, and yellow) became the main palette for his video—making the pictures and texts more coherent—and these colors coincide with the cooking theme and the student's passion for cooking. Jesús' narration, with good pace and calm posture, indicated his commitment to and success in cooking.

He was projecting himself into the role of a cook. By presenting images of himself engaged in the same activities as professional cooks, and by describing the productive and supportive conversations he had had with a professional chef as part of his project, Jesús was trying on this new identity that he aspired to.

Adopting cartoons and emojis

Marney's case

The use of cartoon characters and emojis effectively showed the student's changing emotions over the course of the project: from anxiety in the beginning, (as represented by a sad emoji) and agitation in the middle (represented by the image of Finn and Jake from the cartoon named "Adventure Time," where they are freaking out) to happiness and a sense of accomplishment toward the end of the project (represented by a smiling sun, happy/smiley emojis, and a happy Minion). Table 1 shows sample images from Marney's video, indicating her changing feelings. In addition, her changing intonation and tone, as well as the pace of her speech, worked together with the visuals to communicate her changing emotional states.

In an interview, Marney commented on her use of cartoons to express emotions. In her words: "well, sometimes when I just don't really know how to express it, I just pretty much type the feeling into the search bar and it comes down with all these really awesome pictures and I just pick my favorite one." For example, "where I was explaining how I was kina freaking out, I used this picture." She added, "I was happy, I was done with everything. I actually had this picture of a minion haha, he was really cute…This [video] is sort of a summary of my feelings too."

Jesús's case

In Jesús's case, he used cartoons to help convey his meaning and emotions across the cooking project. For instance, he expressed very positive emotions toward cooking by adopting a cartoon angel smile, a cartoon of a happy girl with cookies with red hearts and dream stars around her, and a cartoon of a tiny cook with a large boiling pot. Table 2 provides some illustrative examples.

These visuals nicely blended with his narration to show his positive emotions. He said that "Mr. Jaehnig always brightens up my day when I see him….He also made me feel that I can accomplish my dreams and get into culinary school." These words are juxtaposed with an image of an angel smiling and a photo of the bake sale. He highlighted Mr. Jaehnig's angel smile to convey the teacher's generous and loving heart, showing his positive evaluation of both his teacher and the project.

Remixing culture

One striking feature of Jesús' video is his effective remixing of elements from pop culture. Knobel and Lankshear (2008) describe how to "remix means to take cultural artifacts and combine and manipulate them into new kinds of creative blends" (p. 20). We identified multiple examples of *transformation* and *transduction* in the students' multimodal composing. Within the visual mode, as depicted in Fig. 2, Jesús remixed a photo of three students by giving them three different cartoon character heads and three national flags in their bodies, which indicated the student

Table 1 Marney's use of cartoons to convey changing emotions in the DS project: cartoons and emojis

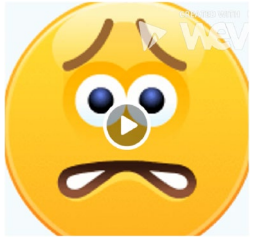
	Phase in the video/narration	Emotions
	1:45 (min) Thursday: "When Thursday came I got really worried so I took a deep breath and figured out my goals for the day. I needed to shorten my video, finish my flashcards, fix my game and go through my lessons to work out any case."	Anxiety
	2:00 Thursday: "And luckily, I finished my stuff just felt good about my practice presentation on Monday."	Satisfaction
	2:37 Monday: "Until I was told that my lesson was over 30 min long Then I started getting really nervous."	Nervousness

Table 1 (continued)

	Phase in the video/narration	Emotions
	2:39 Monday: "The lesson was tomorrow, and my lesson was too long, and I didn't have time to fix it! I really started to freak out."	Freaking out
	3:10 Tuesday: "I presented to the third grade, and it went great! The kids were fascinated and they all were having a lot of fun. The kids loved it [..]. And I only went one minute over."	Happiness
	3:36 Wednesday: "For these days, I just worked on my video. I hope you enjoyed it."	Happiness

Table 2 Jesús's use of cartoons to make meaning and convey emotions

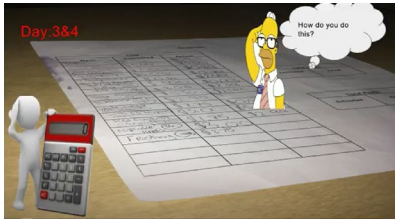
Cartoons	Phases	Meaning and emotion
	1:04 Day 3&4: "we were doing calculations for how much the little portion could go to 36 people. We had to use calculators to find the precise answer."	Questioning
	3:12 Day 9: "we had the bake sale. We got around 124 dollars. Many faculty and other parents and kids bought our goodies, so I would like to thank everybody for coming to the bake sale, and most of all Mr. Jaehnig who bought all the ingredients and supported us by giving us his angel smile."	Conveying appreciation
	3:38 "I joined this capstone because I have loved to cook ever since I have been very little. I planned that when I grow up, I can go to *Le Cordon Bleu* Culinary school."	Fulfilling dream, happiness

Fig. 2 Remixing in Jesús's video

Fig. 3 Remixed chef image in Jesús's video

collaborators' ethnic identities. Working across modes, he remixed the photo of the finished product by overlaying the gold text "YUM," conveying his love of food and sense of accomplishment. His DS also used images from a video game called "Cooking Mama."

Throughout his video, Jesús showed his passion for cooking and his respect and admiration for the cooks who gave him lessons and helped him achieve his goal. For instance, as depicted in Fig. 3, Jesús took a picture of a smiling chef and added a golden halo on the chef's head and a golden candle in the cake. He used the halo to

show the gratitude and reverence he felt toward the chef, the owner of a local bakery who helped him. The halo presupposes sacredness, and this communicated something about how Jesús felt about chefs and cooking. Such remixing conveyed his appreciation of the cook and his positive feelings about a cooking career.

Identity expression and development

The DS projects engaged the students' cultural backgrounds and personal interests. While creating their stories, the students drew upon cultural background knowledge. The students were able to express and develop their identities through their digital stories.

Marney's case

Marney's video clearly represents the work that she did to take on a teacher identity. She was energized by the opportunity to step into a teacher role, and she communicated this energy in her DS. Figure 4 captures her lesson as shown in her DS. She indicates in her narration that she wanted to captivate the children and share her passion for outer space with younger students. Marney worked hard to prepare for the lesson and she thought carefully about the audience for her lesson, by considering the appropriate difficulty level and creating fun activities. As she recalled in the interview, "I try to make my slides kid-friendly […] Yeah, the kids love that, the sponge bob and everything." She continued, "I checked a kid's dictionary. I guess it sort of teaches me how to translate things into younger person language." Assuming the role of teacher, she also tailored the presentation to the younger students by avoiding complicated issues and making a simplified version of the lesson. She asked herself throughout the DS project: "Are my contents too hard? Lessons too long?" Furthermore, she used multiple artifacts that teachers commonly use for instruction: videos, lesson planning sheets, games, presentation slides, and handmade flash cards. As a result, she reached her goal of delivering an engaging and informative lesson. As she exclaimed in the DS video, "the kids are fascinated and they all had a lot of fun," and "now I feel confident about my teaching."

Fig. 4 Screenshot of Marney's live lesson

In the interview, Marney revealed that her affinity for a teacher identity originated with experiences teaching her younger brother, as the oldest sister in the family. In her words: "I teach my brother stuff, he knows the ABCs before he even got into school, so I feel sort of accomplished." She continued to explain her passion for teaching, "I always wanted to be like a teacher, and like when I was going to second grade, my kindergarten teacher invited me back to my old school and it was like, come help out!…I just wish we have more time to teach, like if we had an hour to teach, I would have like the best presentation in the world. I'm so excited, but we only have like 20 min."

She also described how this capstone project strengthened her desire to become a teacher.

> I've been drifting farther and farther away from teaching for a while now, and I feel like now I'm more close to the idea of being a teacher of some sort. Now I'm drifting more towards teaching because I haven't taught like for a while, and I'm back into it...it's like YES! I'm back! I think this makes teaching more fun for me because I really really like teaching and most why I like learning, is because like I can later share with people. So, since I already know a lot about this topic, umm, I could skip the learning part, just go right to the fun part.

Mornie had rewarding experiences earlier in her life, teaching her younger brother, and she had thought about teaching as a career. Her capstone experience, and the opportunity to reflect on it through her digital story, increased her commitment to this plan.

Jesús's case

Like Marney, Jesús clearly expressed and developed his identity through the DS project. His video clearly communicated his great passion for cooking and his engagement in the imagined community of culinary experts. Jesús revealed in his video that he had a career goal of becoming a cook. He stated: "I had love for cooking ever since I had been very little…when I get to do that, I get to really like, express

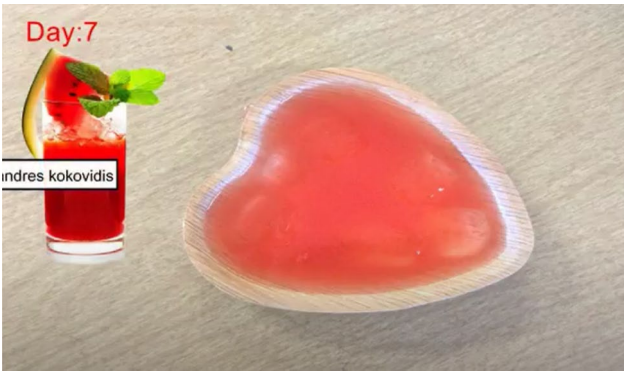


Fig. 5 Watermelon juice shown in Jesus's DS project

myself through cooking." His enthusiasm for cooking was reflected, for example, in the photo of red watermelon juice and a heart-shaped bowl on the table (see Fig. 5). As he reflected on the choice of items for his digital story, he had an opportunity to further develop his aspirations to be a cook.

Jesús indicated that he aspired to attend *Le Cordon Bleu* Culinary School in the future. He used discourse where other cook's words, actions, and dispositions were becoming his own. As he recalled in the video, "I learned pretty neat cooking tips in Daniel's Bakery." Moreover, Jesús drew on the artifacts used by cooks, such as recipes, calculators, and math tables for his project.

Jesus' decision to cook Salvadoran pancakes was related to his cultural heritage in El Salvador and to his grandmother in particular. As he noted in the interview, "The thing that inspired me to make them is that in El Salvador, we have the Pupusas, and they're basically tortilla stuffed with meat. So I want to take, um, I wanna change it, so I came up with the recipe for these pancakes and they came out well, and they're sweets so I want to put like the flavors of El Salvador into the pancake." He also expressed in the interview that he selected this cooking project because of his grandmother. "She's always been there for me, she's always taught me how to cook, and so I wanted to make something for her." Jesús modified the existing Salvadoran savory recipe by integrating American flavor. He explained "I decided to make it sweet, and then I put a strawberry and some whip cream on top, and I think it just blended all the flavors together… The strawberry gave it a special touch, cause like it was sour and sweet at the same time." He added, "I sort of make it different because I wanted them to be fluffier, cause usually they're hard and, like, unfluffy. So I decided to put some extra milk, some cream and some caramel, and I added that and made it fluffy." His explanation shows how he was able to be creative with the project, modifying the recipe in significant ways. He is quite reflective and self-aware here, able to articulate his goals and the modifications. This reflection was facilitated by the digital storytelling process. The project gave him an opportunity to combine his Salvadoran heritage and his positive feelings for his mother's culture with his desire to produce food that his American classmates would like.

Discussion

This study has shown how embedding digital video projects in the school curriculum can not only engage learners with a wider range of expressive resources, but can also enhance students' motivation, creativity, and authentic interaction with an audience (Hafner 2015). The study contributes to the literature by illustrating students' creative use of multimodal resources in a curriculum-based digital storytelling project while examining the identities, voices, and emotions they developed through the project.

The study reinforces the New London Group's advocacy for multiliteracies pedagogy that encourages a wide range of linguistic, cultural, communicative, and technological resources, in a way that can help students better engage in learning and prepare for a rapidly changing global world. Digital storytelling as described in this paper exemplifies how a new technology can provide a critical frame to encourage

teaching and learning, in a way that draws on cultural and linguistic diversity (New London Group 1996). We also illustrate Kress' (2003) argument that students can use multimodal semiotic resources available in their repertoires to create their intended meanings by taking actions through "transformation" and "transduction." The two students rearranged semiotic resources within a mode to create new meanings (transformation). For instance, within the visual mode, Jesús transformed the photo of three students into one with three different cartoon character heads and three national flags on the bodies, to display their ethnic identities. At the same time, both students reshaped semiotic resources across modes to deliver intended meanings (transduction). For example, to convey her changing emotions across the capstone project, Marney deployed two different modes (speech and visuals) successfully—the properties of pitch and tone in her project blended well with the emojis and the cartoon characters to reveal her emotions.

The findings also support Hafner's (2015) observations about remix practices. We identified three kinds of remix in our study: (1) Mixing sources/chunking: the students combined a multimodal artifact of their own (e.g., narration and photos) together with artifacts created by others (e.g., cartoons, emojis); (2) Mixing modes/layering: Jesús appropriated visual images from the internet and combined them with texts, and Marney added a music track to her narration; and 3) Mixing cultural resources/intercultural blending: The students combined cultural artifacts (e.g., cartoon characters) with their narration to convey their emotions or evoke a relevant discourse community for the audience.

This multimodal composing project enabled the students to express their voices and identities effectively, in a way that a pen-and-paper writing project cannot do. As Lambert (2007) reminds us, one's own voice is a key component of a digital story, and these voices can draw on individual identities. In our study, Jesús bore in mind a desired *imagined community*—in his case the culinary community—while creating his digital story. He identified with this community by articulating his goal of entering a culinary school, interacting with role models like the chef, appreciating the teacher as someone who strongly supported him in achieving the career goal, and displaying artifacts related to cooking. He used multimodal resources effectively to establish his imagined identity and engaged others who would support him as part of that imagined community. Marney behaved like a teacher, drawing on her knowledge of and positive feelings toward teachers and their daily work. Her use of lesson plans and other characteristic features of teaching demonstrate how she had been indirectly apprenticed into a certain way of understanding the role and identity of a teacher (Lave and Wenger 2017).

Our study also responds to research on the role of learner affect, like that by Yang and Wu (2012). Multimodal resources allow powerful expression of learners' emotions. Images can trigger diverse associations and emotional responses (Rossiter and Garcia 2010). And the symbolic use of colors can help establish both visual and emotional coherence during narration (Hodge and Kress 1988). For instance, Jesús drew on the visual mode, supplemented by narration, to convey his great enthusiasm about the culinary career that he aimed for. The colors of fire (i.e., red, orange, and yellow) in his project, together with other visuals noted above, helped display his passion for cooking. His positive emotions were

also demonstrated through multiple photos/images—the photo of the bakery store owner with a broad smile, candles on the cake and a golden halo on her head, the photo of red watermelon juice in a heart-shaped bowl, and an image of "an angel smile." Marney, in contrast, largely drew on various emojis and cartoon images to reveal her changing emotions—e.g., the image of Phil and John freaking out to show her worry at the beginning of the capstone project, and the smileys and the cheerful Minion to show her happiness towards the end of the project.

Pedagogical implications

We have shown how digital storytelling can be a useful pedagogical tool and how it can engage learners in flexible and creative ways. As our study shows, the creation of these multimedia projects offered spaces for reflective learning (Moon 1999), as the students went through the collected resources (e.g., pictures, images, information) to reflect on what they had learned and to think about the most salient points in their project (Kim et al. 2019).

Digital storytelling tools offer affordances for learning, through their various multimodal features. The tools can stimulate students' motivation for learning. Teacher–student relationships can be improved through the process of narration, as teachers gain more understanding about students' experiences and situations (Choi and Yi 2016). In addition, digital storytelling allows students to reflect on their learning experiences and articulate their identities as members of a discourse community. Digital stories also provide powerful means for evoking the author's and the audience's emotions. Especially for English Language Learners, multimodal tools lower the language barrier, such that they are able to share personal stories in a powerful, more accessible way (Crowder et al. 2013; Hull and Katz 2006).

In addition, creating digital stories highlights students' creativity and allows them to claim ownership of their learning. Students identified themselves as authors who can reach a wide audience and worked hard to complete their projects. Once learners create and publish their digital stories, they can send their projects easily by posting links or putting the product up on a website. In our study, students from multiple classrooms came to watch other groups' published digital stories. With these extended audiences, the learners celebrated their publications and showed appreciation for their peers' work as part of a productive learning community.

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Appendix

See Tables 3 and 4.

Table 3 Analysis of multimodal resources in Marney's case

Action/text	Other Visual	Sound	Meaning
Capstone Project introduction "Story of the Stars—A Third Grade Lesson" *Color* Black *Font* Serif Gothic	Sunshine in the sky as background -*Color*: Golden	Music	Engaging lesson
Phase 1 What happened in Day 1 "Tuesday, June 6" *Animated text*		Music	
Phase 1.1 Decide on the lesson topic and conduct research	Photo of the author and a classmate in the Classroom; Picture of the Space *Color* Purple/blue Picture of a Star *Color* Orange/red	Narration (Clear and energetic voice); & Music	Passionate author Meaningful lesson topic—the star
Phase 1.2 Prepare for the lesson	Photo of the author typing in her classroom (other classmates included) Picture of complicated math problems Picture of an HP laptop with a shot of a smiling sun and "sun facts for kids." Picture of a group-mate in a lower elementary classroom	Narration & Music	The author works hard preparing for the lesson and attends to the audience for the lesson, considering the difficulty level and creating fun contents
Phase 2: What happened in Day 2 "Wednesday, June 7" -Animated text		Music	
Phase 2.1 Know the specific audience	Photo of class assignment for each capstone group on the white board *Audience* third-grade students	Narration & Music	Audience assigned: third-grade students

Table 3 (continued)

Action/text	Other Visual	Sound	Meaning
Phase 2.2 Continue working on lesson plans	Photo of the author planning a lesson Photo of the author creating slides with stars Photo of the laptop with a screen showing stars Photo of flashcards made for the lesson Picture of three question marks Picture of a sample quiz item: How hot can the sun get at its core? (15 points) Self-assessment chart: how long the lesson should last vs. How long the one the student planned actually lasted	Narration & Music	The author works hard and carefully monitors the process—e.g., applying effective strategies, self-questioning, and time-managing
Phase 3 What happened in Day 3 "Tuesday, June 8" *Animated text*		Music	
Phase 3.1 Try to accomplish the goal	Picture of Emoji: worried face Picture of an HP laptop with a screen showing a smiling sun and "sun facts for kids" (repeated) Photo of flashcards made for the lesson (repeated) Chart of a Game for four Teams (Colors: green, red, blue, yellow) Photo of the author and a classmate in the classroom (repeated) Picture of a Happy smiley on the beach	Narration & Music	The author does her best to complete the lesson plan. She is happy

Table 3 (continued)

Action/text	Other Visual	Sound	Meaning
Phase 3.2 Still worrying about the lesson presentation	Picture of three question marks (repeated) Picture of complicated math problems (repeated) Picture of bored students in the class Cartoon of a nervous man	Narration & music	The author continues to question and evaluate her lessons
Phase 4: What happened on Day 4 "Monday, June 12" -Animated text		Music	
Phase 4.1 Do rehearsal with capstone group	Photo of conducting presentation for capstone group (with the stars on the whiteboard) Photo of attentive students using instruments to watch the sky Photo of a presentation slide of a quiz item Self-assessment chart (repeated) Cartoon of a nervous man (repeated)	Narration & Music	The audience shows great interest and the author continues to monitor the lesson planning process
Phase 4.2 Worry about the lesson delivered to 3rd graders Animated text: Tuesday, June 13	Self-Assessment Chart (repeated) Cartoon of a nervous man (repeated) Cartoon characters Finn and Jake freaking out (from "Adventure Time")	Narration & Music	Finding her lesson is still too long, the author remains worried

Table 3 (continued)

Action/text	Other Visual	Sound	Meaning
Phase 5 Deliver the lesson to 3rd grade students Tuesday, June 13 *Animated text*	Emoji of worried face (repeated) Photo of the author typing in her classroom, with other classmates included (repeated) Photo of the author presenting in the 3rd grade class Photo of presentation continued with the star on the screen of the whiteboard and attentive kids Photo of a sample slide: a game Cartoon of a happy Minion	Narration & Music	Although she is a little worried prior to the lesson, the author teaches the lesson successfully
Phase 6 Continue to deliver the lesson to 3rd grade students Wednesday, June 14 *Animated text*	Photo of third-grade kids excited at using the observation instrument Photos of the author presenting in the 3rd grade class with attentive kids *(Different angles)*	Narration & Music	The author calmly and confidently delivers the lesson and it is a great success
Phase 7 Make the video "June 15–20" *Animated text*	Screenshot of a WeVideo dashboard Emoji of a happy smiley	Narration & Music	The author enjoys making this reflective video

Table 4 Analysis of multimodal resources in Jesús's case

Action/text	Other visual	Sound	Meaning
Capstone Project introduction (Cover page) "Cooking Capstone" (color: red)	Remixed image of three people with three different cartoon character heads (and three national flags on the bodies) Foreign language fonts A cartoon of a girl with sandwiches in her hands A cartoon of a tiny cook with a large boiling pot (Colors: red, orange, yellow)	Narration (Good pace and calm posture)	The author loves cooking and enjoys the cooking capstone project
Phase 1 What happened in Day 1 "Day 1" (Color: red)	A picture saying YUM (color: orange/yellow) Photo of the Salvadoran pancake the group made	Narration	Decide on the dessert to make and show the audience the finished food
Phase 2 What happened in Day 2 "Day 2"	Photo of the store owner (broad smile, with candles on the cake and a halo over her head) (Color: Yellowish/golden)	Narration	Show admiration for the bakery owner
Phase 3 What happened in Day 3 and Day 4 "Days 3 & 4"	Photo of the worksheet on a desk Picture of a person with a calculator (Colors: red and gray) Cartoon of the Simpsons thinking hard (Color: yellow)	Narration	Consider how to calculate ingredients for the recipe and divide the pancake to share it among many people
Phase 4 What happened in Day 5 "Day 5"	Photo of ingredients in the shopping cart Picture of dollar coins (color: yellow)	Narration	Spend money on the ingredients
Phase 5 What happened in Day 6 "Day 6"	Photo of flour and sugar	Narration	Start making the pancake by mixing ingredients
Phase 6 What happened in Day 7 "Day 7"	Photo of red watermelon juice and a filled heart-shaped bowl on the table	Narration	A guest visits and demonstrates how to make juice

Table 4 (continued)

Action/text	Other visual	Sound	Meaning
Phase 7 What happened in Day 8 "Day 8"		Narration	Continue making pancake
Phase 8 What happened in Day 9 "Day 9"	Photo of a bake sale Cartoon of "an angel smile"	Narration	The bake sale is a great success. Thank the helpful people
Phase 9: What happened in Day 10 "Why I joined the capstone"	A cartoon of a happy girl with cookies, red hearts and dream stars around her	Narration	The author shows his love for cooking and expresses his hope to attend a culinary school
Phase 10 Thanks to Mr. Janeck	Photo of Mr. Janeck	Narration	The author conveys appreciation for his teacher, who helped him on the way to realize his dream

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