(Re)Counting Meaningful Learning Experiences: Using Student-Created Reflective Videos to Make Invisible Learning Visible During PjBL Experiences

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ARTICLE

(Re)Counting Meaningful Learning Experiences: Using Student-Created Reflective Videos to Make Invisible Learning Visible During PjBL Experiences

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This ethnographic case study investigated how the process of learning during a yearlong after-school, project-based learning (PjBL) experience could be documented by student-created reflective videos. Guided by social constructivism, constant comparative analysis was used to explore the meaningful learning that took place in addition to the planned curricula, resulting in an exploration of the intersections of life lessons that include (a) "making learning more real," (b) being "on a mission to change the world," and (c) "you can't control anybody but yourself." Findings from the study indicate that student-created reflective videos can document meaningful learning that is capable of "counting" both as a creative form of self-expression and an alternative form of measuring the learning process throughout PjBL.

Keywords: project-based learning, PjBL, STEM, reflection, alternative assessment

The central contention through writing this article is that the processes that students engage in during educational experiences are equally as meaningful as the end product that they generate. That said, when educators feel pressure to focus their efforts on activities that can be directly quantified as a score in their grade book, is it possible to quantify the subjectivities of process? Can one measure the story of someone's learning? And if so, what really "counts?" From a sociological perspective, Cameron (1958) stated, "counting sounds easy until we actually attempt it, and then we quickly discover that often we cannot recognize what we ought to count. Numbers are no substitute for clear definitions and not everything that can be counted counts" (p. 173). As a construct of this article, I use the term "count" in two separate ways: (a) to qualify the learners' perceived value of engaging in the learning process and (b) to quantify the learning process as a means of formative assessment.

From a constructivist perspective, one of the biggest challenges facing the K–12 educational community is the paradox between outwardly appreciating the subjective learning process, yet inwardly placing value only on the objectives-based standardized curricula (Eisner, 2002; Greene, 1995). The problem herein is that learning processes cannot be quantified on the standardized norm-referenced tests upon which our educational system relies. After all, Bruner (1974) contended that "knowing is a process, not a product" (p. 72).

Project-based learning (PjBL) focuses on active learning in which students explore an authentic driving question or task, inquire and investigate concepts, develop plans, reflectively evaluate solutions, and produce multiple representations of ideas (Krajcik, Blumenfeld, Marx, & Soloway, 1994). Similarly, Blumenfeld et al. (1991) situate PjBL as a comprehensive instructional approach that can motivate "children to think about what they are doing, not just focus on getting it done" (p. 369). Citing empirical research that explores goal orientations in PjBL learning contexts, Blumenfeld et al. (1991) highlighted that when students adopt the notion that "learning is perceived and valued as an end in of itself" (p. 370), they are more likely to be motivated to learn and will engage in higher levels of cognitive and metacognitive stimulation. Despite the growing use of PjBL in K–12 educational environments, many researchers (Belland, French, & Ertmer, 2009; Catapano & Gray, 2015; English & Kitsantas, 2013; Krajcik et al., 1994; Tamim & Grant, 2013) acknowledge the pedagogical difficulties educators could potentially encounter as they implement PjBL, such as measuring learning outcomes over the course of the PjBL learning experience.

In the context of the yearlong PjBL experience that is the subject of this article, this study used student-created reflective videos and a focus group to discover what the students viewed as important learning outcomes beyond the scope of

the curricula. This study is guided by the following essential question: In what ways can student-created reflective videos capture, document, and qualify the value that students place on learning during PjBL experiences?

Social Constructivist Theoretical Framework

By shifting the academic lens and foci toward the process of learning rather than final products, constructivists assert that learning is an ongoing process of meaning making that involves building upon previous experiences through active learning and hands-on discovery (Dewey, 1938). Social constructivists contend that knowledge is constructed through learners' interpretations of their own participation within cultural and social contexts. Vygotsky's (1978) theory of social constructivism added that learning is truly awakened through two phases. First is the social dimension in which the learner engages in experiences with others. This social transference is then embedded within the individual dimension in which the learner internalizes his or her interpretation of the experience. Agreeing with the inherent role of social interaction throughout the learning process, Bruner (1961) highlighted the importance of transference and the internalization of learning on an individual level by noting that "the practice in discovering for oneself teaches one to acquire information in a way that makes that information more readily viable in problem solving" (p. 26).

Wide-Awake Reflections

Greene's (1995) positionality harmonizes with social constructivism by advocating for the importance of self-discovery within a reflective learning landscape. She emphasized the importance of taking part in collaborative social interactions and then individually reflecting in order to make personally relevant meaning. Promoting that learners should be "wide awake" and able to think reflectively upon experiences, Greene (1977) stated that "when provided with opportunity to speak about it, young people often express a desire to overcome their own passivity, their own *ennui*" (p. 15). This seamlessly ties back to Dewey's (1933) concepts of *How We Think*: "Reflection is turning a topic over in various aspects and in various lights so that nothing significant about it shall be overlooked" (p. 58). Learning is not simply actively engaging in the world around you, but it is the purposeful art of wide-awake reflection on that active engagement that allows deep learning to take place.

The Importance of Assessing Reflection During PjBL Experiences

PjBL can authentically encourage deep content learning, problem-solving, and self-directed learning, all of which are often assessed with quantifiable measurement tools that evaluate the end result of the learning that has taken place (Belland et al., 2009). Though the end result is important, many researchers (Blumenfeld et al., 1991; Grant, 2011; Krajcik et al., 1994; Tamim & Grant, 2013) discuss the importance of assessing a variety of learning products in order to properly assess the critical thinking that takes place over the course of PjBL experiences. English and Kitsantas (2013) suggested that the use of formative reflective prompts can positively impact self-regulated learning through "encouraging autonomy and providing an explicit place for reflection at multiple points in a project" (p. 142), which are often documented as written journal entries. Catapano and Gray (2015) recently showed that this type of flexible student-centered learning promotes transferability to other learning experiences and self-directed learning and shifts attitudes toward learning, suggesting that learning can be fun and enjoyable. Similarly, Barak (2012) suggested that allowing scaffolds to support metacognitive and motivational aspects of PjBL, such as the opportunity to reflect by discussing and sharing with peers, impacted increases in self-regulated learning. Despite the positive impact of these verbal-centric reflections, I suggest that PjBL educators should also consider the power of student-created reflective videos as a formative assessment tool in which learning processes can be more thoroughly examined.

The Power of Student-Created Reflective Videos

There is little research on the value of K–12 student-created reflective videos used to document students' perceptions of their own learning processes; however, there is research on how the use of video-aided reflection in teacher preparation can influence reflective practice and self-efficacy (Tripp & Rich, 2012), and how the use of digital video annotation tools can impact reflective practice and develop a sense of ownership throughout the learning process (McFadden, Ellis, Anwar, & Roehrig, 2014).

Goldman's (2007) *Perspectivity Framework* provided a theoretical foundation for digital video to be used as a means to document cultural actions in "bits and segments" and transformed into "meaningful stories and valid results" (p. 15). Similar to literature on social constructivism and PjBL, Goldman's synthesis of research acknowledged Perkins's (1986) view that engaging in design (such as PjBL experiences) allows learners to experience real-world success and come to understand their own knowledge, which is referred to as "knowledge by design" (Goldman, 2007, p. 160). When students are able to create their own inquiry-based videos, they engage a variety of modes (e.g., auditory and visual) and have the potential to showcase diverse perspectives (e.g., multiple participants with multiple views and experiences).

Guided by a social-constructivist framework, I suggest that the use of student-created reflective videos can provide the missing piece to this PjBL assessment puzzle by providing an additional means for documenting learning outcomes. Through capturing, documenting, and meaningfully qualifying what the students view as being important throughout their PjBL learning experience, student-created reflective videos can "count" by contextualizing subjectivities, thereby making the invisible learning process visible.

Methodology

Using a case study method (Glesne, 2011; Merriam, 1998), I used nine student-created reflective videos and one focus group to explore the students' perspective of attempting to capture and document their learning experience throughout a yearlong PjBL project. In order to maintain "the emic, or insider's perspective" (Fetterman, 1998, p. 2), I borrowed constant comparative analysis techniques (Glaser & Strauss, 2012; Strauss & Corbin, 1990), which Glense (2011) stated can be used to engage in thematic analysis and analytic induction. This article reports on initial sampling and did not seek disproving evidence or participants; therefore, the development of grounded theory is not within the scope of this article.

Context of the Study

The yearlong PjBL experience that is the subject of this study focused on an arts-based approach to after-school Science, Technology, Engineering, and Math education (STEM) learning for 200 K–12 students. Students participated as nine teams (each team consisting of a self-selected mixture of students from a regional elementary school, middle school, and high school), which were from a variety of geographic locations, including two teams from San Cristobal, Dominican Republic, one team from Memphis, Tennessee, one team from Bladensberg, Maryland, and five teams from various areas of Houston, Texas.

The specific PjBL task was to design and develop a peer-level creative nonfiction pop-up book that focused on the impact of the "dead zone" within the student teams' regions. Located in various regions around the world, dead zones are marine areas suffering from hypoxia, or a reduction of oxygen levels in water to the point that animal life cannot be sustained (Bruckner, 2011; National Oceanic and Atmospheric Administration [NOAA], 2011; United States Environmental Protection Agency [EPA], 2012). The curriculum developers felt that these themes were natural choices for inclusion in the PjBL experience given the impact of the April 2010 BP oil disaster in the Gulf of Mexico (Dr. Reagan Flowers, personal communication, August 15, 2011).

Participants

This article describes a case study of three students who participated among the larger group of student teams. In order to have a broad representative view of the experience, I asked for three volunteers from different teams (one elementary student, one middle school student, and one high school student) to serve as key informants to provide a genuine emic point of view by participating in one focus group interview upon completion of the yearlong PjBL experience.

Jacob, the Elementary School Idea Guy

Jacob, a third grade student at a lower socioeconomic status (SES) elementary school, enthusiastically joined the team at his school. Because of his love for stories, he decided to become a member of the creative writing group. He was excited about having the opportunity to make a book and spend afterschool time with his peers. With a noticeable stutter and a head full of thoughts and questions, he had found it difficult to interact socially outside of the regular classroom. The collaborative project allowed him to be a popular teammate because of his "smarts" (Focus group, 2012).

Jackie, the Middle School Serious Creative

Jackie, a seventh grade student at a low SES middle school joined the after-school team at her school because she wanted to continue her passion for art. "I got into it because I like art. I really liked making the pop-ups because I like origami." The group decided to split the tasks in half, with half tasked to write the story and the other half tasked to create the illustrations and pop-ups for the writing. As one of the group's most promising artists, Jackie enjoyed the opportunity to "hear what their vision was for the writing and then bring it to life with the visuals."

Serena, the High School Communicative Leader

Aspiring to be an engineer, Serena, a tenth grade student at a science magnet high school in an urban area, joined the team at her school because she saw it as an opportunity to increase her communication skills. "And it's like my momma always tells me, there is going to be a lot of writing no matter what you do." Though she initially did not identify herself as an artist or even as a creative individual, she assumed the challenge, because it was important to her to continue to grow and enhance her abilities for her promising future. "I got better at writing, creating, and drawing. It helps me see that if I keep doing this, it will help me in the future. If I keep being able to communicate with people well, I will be better off later."

Data Sources and Collection

Data were composed of two sources, including student-created reflective videos from nine teams and one focus group of three students. Staggering the completion of the

data sources throughout varying stages of the academic competition provided a thorough look into the PjBL experience. For example, student-created reflective videos were produced prior to the competition, and the focus group was conducted at the culmination of the competition.

Student-Created Reflective Videos as Data Sources

In addition to the primary PjBL task, each of the nine teams produced one student-created reflective video (resulting in nine total videos), in which they were to reflect on (a) concepts and content related to the PjBL topic, (b) processes of engaging in the PjBL experience, (c) the final product, and (d) how the experience might impact the future. These student-created reflective videos provide an account of their metacognition/thinking throughout the PjBL experience and were a means of virtually demonstrating to the judges how their final pop-up book artifact was intended to be read through and interacted with. Each team video was to be four minutes or less in length and turned in for initial analysis the week prior to the competition.

Focus Group

Three student participants from different teams volunteered to participate in the focus group, which took place at the culminating competition on March 31, 2012 and lasted approximately 90 minutes. As shown in Table 1, I used a semi-structured, retrospective format that consisted of a combination of survey questions, detailed questions, and open-ended questions. Following the interview questions, each of the

three students guided me through the student-created reflective video that their team had created.

Analysis

To engage in thematic analysis, I used constant comparative analysis, which involves three levels of coding that include (a) *open coding* to breakdown and categorize the data, (b) *axial coding* to make connections between categories, and (c) *selective coding* to validate the relationships (Glaser & Strauss, 2012; Strauss & Corbin, 1990). Data analysis took place in four phases. First was an analysis of the student-created videos, second was an analysis of the focus group, third was a reanalysis of the student-created videos, and fourth was a collaborative analysis with two peer debriefers.

Analysis of Student-Created Reflective Video

I transcribed the student-created reflective videos from all nine teams (a total of nine videos) and used Goldman-Segall's (1998) digital ethnography approach of *points of viewing* video content to guide my transcription process. This involved properly recording the verbal cues and the visual cues that took place simultaneously throughout each video, using descriptive notes for each scene (or idea) that detailed of the visual imagery (e.g., still images, video clips, subtitles, visual effects, transitions) as it occurred with the narrated audio (e.g., voice, script, pacing, volume) and the background soundtrack (e.g., mood, music, sound effects, tempo, volume). Figure 1 shows how the initial transcription of the student-created videos considered the multimedia overlays that constructed and communicated each idea.

Table 1. Focus group questions.

| Topics	Questions
Process	1. What process did you use to engage in the PjBL experience? 2. What was the sequence of activities? Discuss them in in the order that they took place. 3. How long did the process take (from idea to finished product)? 4. Did you have to start over or redo something? Why?
Creativity	1. How many different concepts/ideas did you have and how did you narrow them down to one concept/idea? 2. What problems did you encounter and how did you solve them? 3. What would you do differently next time?
Structure	1. Who did which tasks (roles) and why? 2. Who determined the roles? 3. Where did your team work on the PjBL experience?
Reflection	1. What do you think was the best part of the PjBL experience? Why? 2. What impact will this experience have on the school community and the community at large? 3. How does the final artifact reflect your own skills?
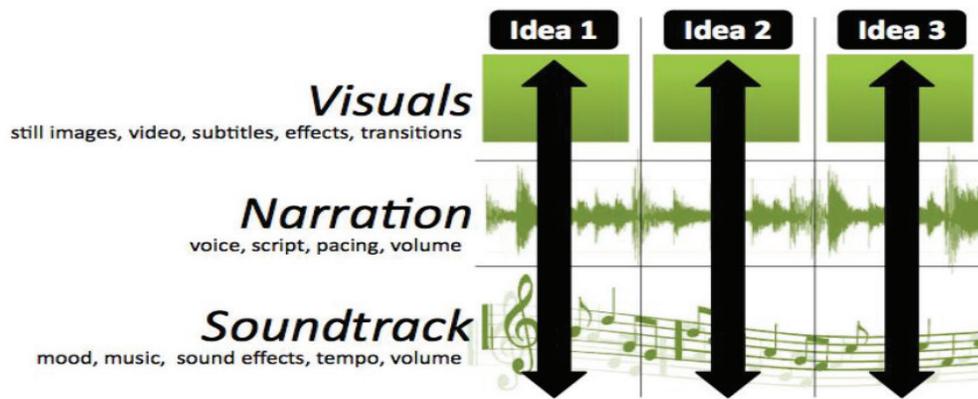
Figure 1. Communication of ideas through multimedia layers.

Simultaneously, I used open codes from this initial viewing of the student-created reflective videos, which consisted of instances specifically related to the reflective prompt and interesting in vivo codes (direct quotes) because they "honor children's voices and ground the analysis from their perspective" (Saldaña, 2011, p. 48). The open codes are listed in Table 2.

Analysis of Focus Group

I transcribed the entire focus group verbatim using Microsoft Word. Similarly, with the initial viewing of the student-created reflective videos, I used open coding to conceptualize and categorize the data, keeping special attention to semi-structured topics that framed the focus group questions and the in vivo codes that stood out. The open codes are listed in Table 3.

Reanalysis of Student-Created Reflective Videos

After completing the focus group and having the student participants talk me through the student-created reflective video produced by their team, I compiled the open codes from each data source (see Tables 2 and 3). I then reanalyzed each of the videos more thoroughly, particularly looking for connections to what was pointed out during the focus group. To make connections between the data using axial coding, the second full cycle of analysis generated the categories shown in Table 4.

To further validate the relationships between the data, I generated selective codes in which I noted that students were highlighting life lessons they took away from the PjBL experience. From that, I saw that these lessons could be subcategorized into the ability to see connections, possess empathy, and the development of a practical work ethic (see Table 5).

Collaborative Analysis with Peer Debriefers

To triangulate my analysis, two peer debriefers, both doctoral students trained in data analysis procedures and whom were not otherwise involved in the study, independently reviewed the data and were asked to identify major codes (themes and patterns) on their own. Both peer debriefers were blind to

Table 2. Open codes for first viewing of student-created reflective videos.

Reflective Prompt Codes	In Vivo Codes
• Concepts and content related to the PjBL topic • Process of engaging in the PjBL • Final product • How the experience might impact the future	• "Helping others" • "Inform the community" • "Brings it to life" • "Make it more real"

Table 3. Open codes for focus group.

Topical Codes	In Vivo Codes
• Process • Creativity • Structure • Reflection	• "A group of one" • "Staying on task" • "Being part of a team" • "My future" • "Help nature" • "Choose people who are good for you" • "Connections" • "Troublemakers" • "It makes no sense to waste time" • "You can't control anybody but yourself" • "Anything that you're going to do involves words" • "Resourcefulness" • "Problem-solving"

the participants' identities. The three of us met to discuss the codes collectively, upon which we agreed on the following as the final cycle of selective codes were generated to provide more practical constructs within the three main life lesson themes (see Table 6).

Table 4. Axial codes for student-created reflective videos and focus group.

Team Structure	Self-Awareness and Altruism	Process	Multiple Literacies and PjBL Learning	Life Lessons and Work Ethic
• "A group of one" • "Staying on task" • "Being part of a team"	• "My future" • "Help nature" • "Helping others" • "Inform the community"	• "Brings it to life" • "Resourcefulness" • "Problem-solving" • "Make it more real"	• "Anything that you're going to do involves words" • "Connections"	• "Choose people who are good for you" • "Troublemakers" • "It makes no sense to waste time" • "You can't control anybody but yourself"

Table 5. First version of selective codes.

Life Lessons in Seeing Connections: "Make it more real"	Life Lessons in Empathy: "A mission to change the world"	Life Lessons in Work Ethic: "You can't control anybody but yourself"
• "Make it more real" • "Anything that you're going to do involves words" • "Connections" • "Brings it to life" • "Resourcefulness" • "Problem-solving"	• "My future" • "Help nature" • "Helping others" • "Inform the community"	• "You can't control anybody but yourself" • "A group of one" • "Staying on task" • "Being part of a team" • "Choose people who are good for you" • "Troublemakers" • "It makes no sense to waste time"

Table 6. Final version of selective codes.

Life Lessons in Seeing Connections: "Make it more real"	Life Lessons in Empathy: "A mission to change the world"	Life Lessons in Work Ethic: "You can't control anybody but yourself"
• Communicating creatively • Maximizing verbal words • Leveraging visual images • Applying scientific interactions	• Wide awake to the world • A desire to "inform the community" and "teach others"	• A group of one . . . all on his own • "It makes no sense to waste time" • "You can't control anybody but yourself" • "Oh, I got this"

Findings

Guided by social constructivism, the following themes represent the intersectionality of life lessons that the students qualified as "counting" during this PjBL experience: (a) making the learning more real by seeing connections, (b) getting inspired to change the world by developing empathy, and (c) acknowledging that you can't control anybody except yourself.

Life Lessons in Seeing Connections: "Make it More Real"

Being "wide awake" to see the connections between multiple experiences and multiple contexts is a foundation of social-constructivism (Bruner, 1961; Greene, 1995; Vygotsky, 1978). Greene (1977) asserted that it is when "those who can attend to and absorb themselves in . . . the imaginative mode of awareness" are engaging in truly meaningful learning (p. 16). Embracing this vision requires multiple ways of seeing, which in the context of this study involves representation of an understanding through communicating creatively, maximizing verbal words, leveraging visual images, and applying scientific interactions.

Communicating Creatively

As shown in the reflective videos, many students acknowledged their engagement in the writing process and the many aspects of creativity and design within verbal communication. Drafting and story development was one skill area in which students acknowledged improvement. Jacob

noted, "rereading and revision taught me how to visualize and make the characters have more conversations together." When asked why he wanted to use a conversational narrative in his creative nonfiction writing, he said it was "to help the story make more sense and for there to be more creativity in the book. The conversations also helped to transition to other things to help explain things better just like in real life." Through rereading and creatively revising his writing, Jacob was able to create richer explanations that transitioned and added to the overall effectiveness of the story.

Maximizing Communication with Verbal Words

Serena poignantly summarized how engaging in the collaborative design process of the PjBL experience allowed her to learn a variety of valuable lessons. Serena acknowledged her multidisciplinary accomplishments in relation to how it can help her achieve her prospective goals to pursue engineering:

> As I get older I see how important it is to do these types of things. Being able to communicate and write is going to help me with my future. I've never helped make a book before! I look at that and I'm like, wow! I can't believe I did that. If I keep working on communicating and writing then I can be so good at this in my future.

Bringing the Words to Life by Leveraging Visual Images

As Jackie eloquently defined it, the visual components of the project "allowed the words to come to life." But this goes beyond the clichéd phrase that "a picture is worth a thousand words." The ability to communicate through visual images allows students to meaningfully make connections across modes and also reinforces transdisciplinary habits of mind such as critical thinking and problem-solving. Many of the teams utilized complex visual supplements in their final projects, including hidden doors and movable charts to further explain information to the reader. Jacob demonstrated this within his team's reflective video:

> On this page we have hidden windows [*he demonstrated how to lift the flaps of the large picture to unveil the picture inside*]. When you open both sides the picture shows you how algae is transformed into gas you can put in your car [*he closes the flaps*].

Making it More Real by Applying
Knowledge of Scientific Interactions

Science and the environment were deeply rooted in the PjBL experience from beginning to end as teams were assigned to research and inquire about the "dead zone" phenomenon. By exploring the environmental topic of the dead zone and the biological effects it has on living organisms, such as sea

turtles, students were able to fully explore facts and propose actual solutions. Their increased exposure to the topic enabled them to become immersed in a world that they previously did not know much about. To their surprise, the formerly unknown topic was intertwined within their local community at many personal levels.

> When I first started off, I didn't know what the dead zone was at all. No knowledge what so ever [*she shakes her head*]. And now, I know a lot about it. I know that it's caused by algae and nitrogen and that we can do a lot to stop it.

This honest reflection of learning about the "dead zone" was echoed in many team videos, in which the students expressed surprise when they learned of the everyday common causes and the fact that there are hundreds of dead zones throughout the world. Students unexpectedly discovered that the Gulf of Mexico was the most notorious region for dead zones, which was the local area of research for many participants. She noted, "Being able to learn about it, write about it, draw about it, it helped make it more real. And you can't have science without the words, without the stories." What was at first a foreign concept to grasp became *more real* throughout the PjBL experience as students began to uncover the layers of meaning around them.

Life Lessons in Empathy: "A Mission to Change the World"

Upon completion of most project-based learning assignments that deal with the environment, students tend to feel a genuine desire to reverse the damage that human consumption has caused on the earth. The opportunity to inquire into the impact that dead zones have had on their own communities allowed student participants to personally empathize with the situation. According to a meta-analysis that includes 14,000 college student participants over the course of 30 years, Konrath, O'Brien, and Hsing (2011) asserted that the need for developing an empathetic lens is even more crucial today because the technology-driven society appears to have contributed to an increase in narcissistic perspectives of our youth. As Greene (1995) has stated from a social change perspective, it is important for individuals to be among the crowd and then be able to look inside one's self to develop personally relevant meaning. Additionally, it is also important to be "wide awake" to their relationship within the crowd that they are among.

Wide Awake to the World

Attempting to broaden her experiences, Jackie was intrigued to learn more about the scientific concepts that were the focus of the PjBL experience. Though a good student at school, the opportunity to bridge art and science proved to be a fulfilling experience for Jackie:

For me, it was a great learning experience because I had never thought about all of this stuff. I didn't know anything about the sea turtles and their environment or how the oil spill and other pollution affected them. They were so hurt and I felt so bad [*animated tone to express emotion*]. It really made me look at what I need to change to help nature. I learned that there are programs that I can enter to help out. Really, I guess you can call it a mission [*sounds more like a question*]? A mission to change the world [*she smiles*].

A Desire to "Inform the Community" and "Teach Others"

Moving beyond the personal statements of wanting to save the planet, students articulated a desire to be active change agents by informing their community and teaching others in order to create real action. Most of these sentiments were woven within the creative nonfiction writing of the collaborative books; however, poignant statements were interjected throughout the reflective videos. Jacob stated simply, "I hope this book shows the community the importance of not polluting our water," while Serena echoed, "hopefully, this book will inform the community about how it is important to keep the earth clean so the turtles can stay alive." On a more philosophical level, Jackie emotionally stated the following:

> We always talk about ourselves just as human beings and we set ourselves above the other living things. But we forget that our actions have serious consequences and that our home also belongs to the other living things.

Regardless of the level of passionate statements, there was much agreement among teams that they had high hopes for their book to be used to inform and teach children within their school community.

Life Lessons in Work Ethic: "You Can't Control Anybody but Yourself"

Serena stated, "I notice the people who work hard and are good at their jobs. You might not know that person but you see how hard they work and they like the way that you work, so we could be great partners." The collaborative design experience not only allowed students to identify teammates with desirable work ethic and talent, but also serendipitously foster friendship among the teammates:

> The partner that I worked with, I had never gotten to know her before and now we are like the best of friends and we're always talking. This [experience] made me choose my friends a little better, so that life [lesson] is good.

A Group of One, All on His Own

As the PjBL experience continued throughout the year, some of Jacob's teammates were unable to continue working on the various challenges in the after-school setting due to time conflicts and/or moving to other communities. Because of this realistic setback, some of his creative writing group members were needed to replace the roles in the other groups so that the school's team could continue to participate in the yearlong PjBL experience. He explained, "At first there were 3 people, but then one left and then the other one had to go do another group. So that left me doing most of it from my school." Luckily, Jacob's teacher stepped in to assist him with realizing his ideas that he had originally brainstormed with his group members. Jacob enjoyed being a part of the writing process because he "liked starting the rough draft off" and eventually seeing it in the final copy form. With the support of his teacher, Jacob was able to overcome the challenges of being shorthanded and created a respectable product inspired by his ideas and personal creativity.

"It Makes No Sense to Waste Time"

Yearning to find inspiring opportunities with serious peers, Jackie joined the team to see if she could find a place where she felt that she fit in:

> I have to be honest; most of the people in my school are very childish. They kind of act a fool and don't take anything seriously. I want to work with serious people. People who know that they want to get it done and figure out how they are going to get it done. Because I really do not like wasting time. I feel like that is useless. You only have one time to do something. Time is very limited, so you can't waste it because you only have one life to live. It makes no sense to waste time.

Even though Jackie still encountered the occasional "troublemaker" or "people who acted a fool," she continued to do her part and learn as much as she could from the experience. This dedication to real-life lessons proved that Jackie was wise beyond her years and that the experience of engaging in the PjBL experience offered her more than just an opportunity to explore the connections between art and science—it allowed her to explore personal awareness and real-world work ethic. "For me it helped me to learn how to work with the right people. I was actually surprised by the people who acted a fool. I was like 'why are you just sitting there.'"

In the focus group Jackie later expressed how her observations of fellow team members allowed her to reevaluate her own friends:

> You gotta be strong and choose people who are good for you. I learned that from some of the people that I

thought were my friends . . . they laughed at me when they saw me doing all of this work, "Aw, you're a goodie goodie because you do all of your work in class, blah, blah, blah." And uh, [*frustrated look on face*] it taught me that I have limited time in school so I can choose people who will help me or people who will hurt me.

"You Can't Control Anybody but Yourself"

Much like Jacob and Jackie, Serena learned firsthand the importance of a good work ethic and acknowledged its importance in school and the real world. Communication and collaboration were characteristics that Jackie felt were incredibly important for both herself and her peers to possess:

> My engineering teacher, he'll always put us in groups for projects and assignments. We're like, "uh, group work again?" And he says, "yes because that's how it is in real life." He always says, "in life you're going to have to work with other people, so just get ready for it."

The logic of group work and the value of being able to collaborate with others came easily to Serena. Because of her seemingly logical perspective, much like Jackie, Serena struggled to understand why other teammates did not view group work the same way. She explained, "I mean, this is your job just like in the real world. It's going to constantly be a job. I mean if you can't control yourself or focus on the task then you're going to have problems in life." Serena added to the sentiment by sharing that lacking self-control eventually wastes the energy of others:

> If you don't communicate in class when there is time to actually work on it and then you want to go home and text or email, I don't see how that is going to get the work done. I think it is laziness if you don't actually use the time that you are given in class. That's just a waste of everyone's energy.

Her realistic perspective coupled with her ability to observe others' skills and potential enabled Serena to be a natural leader among her team by always striving for success. Her self-proclaimed motto was to "just make sure you pick the right [teammates] by paying attention to what they do." Seeking others who shared her perspective, dedication, and possessed diverse skills and talents, Serena noted that, "if you communicate right and the other person communicates right, then the job will be done."

"Oh, I Got This"

Inspired to liken the PjBL experience to the lessons of her engineering teacher, Serena drew practical connections from her recent experiences to her aspirations for the future. When given the opportunity to reflect upon these recent experiences, Serena proclaimed that, "it shows me how creative and responsible I can be." Seeing challenges and new obstacles as opportunity for growth and improvement showcased Serena's personal awareness and ability to build her knowledge and potential.

> If I keep learning how to build things and think about things then I will be so good at engineering in my future. Now when I see a challenge I'll think, "oh, I got this" because I've learned how to figure things out and make it happen to get the job done.

Discussion and Implications

All too often, students and teachers alike are in a race to complete their tasks as the precious minutes of the K–12 school day tick away. Task completion and the resulting finished product are important; however, students are more likely to be motivated for lifelong learning if they perceive the value in the learning process that takes place as they complete the task or product in question (Blumenfeld et al., 1991; Krajcik & Blumenfeld, 1994). By allowing students to reflect upon their learning process and to actually reassess what they have experienced, students in this study personally (re)conceptualized relevant meaning from their own experiences both as part of the collaborative group and as individuals (Dewey, 1933). As such, it is important to discuss how students can "count" by qualifying the value of their learning processes and to discuss how educators can "count" by quantifying the learning process in order to show students that their learning process is valued in addition to the final PjBL artifact.

"Counting" as Qualifying the Learners' Perceived Value of the Learning Process

Guided by a focus on students' perspectives, this study inquired into participants' self-discovery of their own learning processes within a collaborative PjBL experience as they reflected upon which aspects of the learning experience they expressed to be truly important. Through the use of student-created reflective videos, students were able to "count" their learning experiences by qualifying the perceived value of engaging in the process. Multiple ways of knowing and experiencing the same PjBL structure were valued through focusing on individual actions and feelings, effectively reinforcing that "learning is perceived and valued as an end in of itself" (Blumenfeld et al., 1991, p. 370). The student's reflective proclamation highlighted the fact that both cognitive and metacognitive benefits were woven into the learning process, and that the finished product was not the sole source of value, but instead they focused on the life lessons they took away from the experience.

Cognitive Benefits

The findings indicate that the students who participated in this study shared instances of learning that are in line with the processes involved in transdisciplinary abilities (Mishra, Koehler, & Henriksen, 2011), which include integrative thinking through researching and brainstorming, experimentalism and optimism with critical thinking and problem-solving, and collaborative decision-making and collaboration. These processes and abilities are a cornerstone of PjBL and recognized as valuable twenty-first-century skills by a variety of national education organizations (e.g., International Society for Technology in Education [ISTE], National Art Education Association [NAEA], National Council of Teachers of English [NCTE], and National Science Teachers Association [NSTA]).

Due to the nature of the context of this after-school PjBL experience that used an arts-based approach to STEM learning, interdisciplinary connections were authentically woven into the experience. Students contended with multimodal explorations through a balance of verbal words, visual images, and scientific interactions to create a peer-level, creative nonfiction pop-up book about a science topic. Through hands-on exploration that began with inquiry and then culminated with the final production of the creative product, students noted how they were able to make connections between concepts, subjects, and modes of representation. This is clearly in line with Dewey (1933), who stated that "learning, in the proper sense, is not learning things, but the *meanings* of things" (p. 177). This ability to be critical of experiences is what Greene (1995) referred to as "sense-making," in which individuals are aware of what is around them through multiple lenses and are capable of interpretations that produce meaning. To be able to "see beyond what the imaginer has called normal" allows for new perspectives. This is important because "imagination is the one [cognitive ability] that permits us to give credence to alternative realities. It allows us to break with the taken for granted, to set aside the familiar distinctions and definitions" (p. 3).

Metacognitive Benefits

Having the opportunity for sensemaking or constructively looking more closely and reflecting upon experiences, students in contexts such as this collaborative design experience were able to more deeply seek meaning in their world. This is similar to Bruner's (1960, 1974) and Greene's (1977, 1995) notion that humans are intrinsically curious beings who crave creative and meaningful expressions throughout their daily lives. As opposed to the monotony that the test-driven society has enforced upon children by seeing the world as a series of "small" quantifiable patterns, Greene suggested a

"big" world where particularistic details and narratives are enlarged to explore and enrich our understanding of experiential learning.

In the context of exploring one's own community, this PjBL experience allowed students to develop empathy, which was expressed through a variety of altruistic statements. Through research and inquiry, students created peer-level, creative nonfiction books to inform their school community, and even extended that with a desire to inform and teach the community at large about how they could come together and reverse the damage that the dead zone had caused in their area.

This altruistic inquiry naturally extended into life lessons, which included collaboration, communication, creativity, and work ethic. These themes were repeated throughout the students' stories as they expressed the importance of a strong work ethic, intrinsic motivation, effective communication, managing diversity, and ultimately how to learn from every experience in order to enhance one's future. As suggested by the presentation of the findings in this article, student-created reflective videos allowed these students to reflect upon and identify the big life lessons that they will undoubtedly transfer into future experiences.

"Counting" as Quantifying the Learning Process Through Formative Assessment

In this article I have pointedly stated that I, much like many other social constructivists, feel that the educational system places more value on quantifiable products and less value on ways of capturing and documenting the processes that birth such products. Though I prefer to place more emphasis on the unique qualities of subjective accounts of personally meaningful learning, I also see the value of attempting to find a way to actually count these subjective learning experiences by quantifying the learning process as a means of formative assessment to show students that process and product are equally as meaningful.

A Proposed Rubric for Evaluating K–12 Student-Created Reflective Videos

Based upon the results from this study, I suggest a need for an assessment tool that can attempt to quantify the learning process documented by the student-created reflective videos. Goldman (2007) did not formally address ways to assess these artifacts; however, she referred to Heider's (2006) development of a tool that measures the components of valid and authentic ethnographic film, which was based on his work as a visual anthropologist, yet has not been tested in K–12 contexts and arguably contains terms that many K–12 students and teachers would not understand (see Appendix A). Though it provides excellent criteria to consider the individualized points of viewing throughout the learning process,

I suggest a revision to Heider's (2006) *Attribute Dimensions of Ethnographic Video Rubric* by categorizing each criterion into subcategories that are actionable from an instructional standpoint.

Schwartz and Hartman (2007) framed this type of video-making in an educational context as a type of performance-based assessment for preservice teachers, which is situated around four common learning outcomes, including (1) engaging, (2) saying, (3) seeing, and (4) doing (p. 337). Their model also aligns learning targets, assessments, and genres to provide a holistic view of the value of a reflective video experience. This approach could provide a foundation to explore ways in which K–12 educators could use student-created reflective videos to assess both the process and the product in PjBL. The incorporation of terms used by Schwartz and Hartman (2007) allow an educator to more easily present a rubric to set expectations as well as to attempt to count the reflective and ethnographic elements suggested by Heider (2006). Table 7 shows a proposed rubric for assessing student-created reflective videos in K–12 learning experiences.

How to Integrate SCRV into Learning Experiences

Student-created reflective videos are a practical way to allow students the flexibility of creativity to make a personally meaningful media production, which has the capacity to not only allow for reflection, but also for the communication of rigorous measureable criteria within a project-based learning experience. Given the ubiquitous nature of video production tools (i.e., camera phones, handheld video cameras, free video editing software, and the ability to freely upload the finished video to the Internet), this performance-based assessment is a practical balance of creativity and rigor. This type of creation allows students to be the ethnographer of their own learning experience while they inquire into both their learning process and how the creation of their artifact meets the goals and objectives of the PjBL experience. After all, in the K–12 context, educators should place emphasis on the process because students need these types of experiences in order to develop and practice viable real-world skills to become better prepared for life (Goldman-Segall, 1998, 2004, 2007; Kearney & Schuck, 2005).

Conclusions

Findings from the study indicate that student-created reflective videos can be an authentic and meaningful opportunity for students to visualize their own metacognitive growth, which cannot easily be quantified through traditional assessment means (i.e., multiple-choice tests). Effectively recounting their experience, students authentically communicated what they understood as "counting" throughout their learning process to qualify the value their places on learning during this PjBL experience. This study maintained that presenting students with the opportunity to engage in inquiry-based video-making of the process that they went through during PjBL activities allowed them to authentically and formally address the value they placed on their learning experience and effectively made it count.

In the design world, the effectiveness of a product ultimately resides in the opinion of the consumer or client. The same is true in the world of education, in that the effectiveness of student learning traditionally rests on the objective assessment of the student's final product—the way in which said learning can be counted—both to qualify the value of the experience and to quantify the process. However, education is in fact in the business of enhancing student learning, not necessarily in the production of perfect products. Learning is a process that is unique to each individual. So a paradox exists in that traditional educational assessment of an intangible process is very difficult; therefore, process typically goes unmeasured and therefore goes uncounted. It is far easier for an educator to create analytic rubric criteria for obvious measureable outcomes than metacognitive processes that can be manifested elusively in a variety of ways. In an age when criterion-referenced tests are the assessment of choice, students deserve not only an alternative means to display their academic worth, but also an opportunity to formally reflect upon their own process throughout the academic experience, thus creating the cycle of lifelong learning. If assessed in a meaningful manner that does not strip them of their personal meaning and/or limit their creative expression, student-created reflective videos can count by both (a) qualifying the value of the students' learning experience and (b) quantifying the process for the educator who is tasked with documenting learning outcomes.

Future Research

The development of grounded theory was not within the scope of this article because this is a report on initial sampling that did not seek disproving evidence or participants. Additional case studies could explore how students can use student-created reflective videos to qualify the value of their learning that arises beyond the scope of the PjBL goals and objectives in a variety of content areas, such as mathematics and science. Future research might formally examine ways in which student-created reflective videos can be evaluated as a meaningful multimedia formative assessment using the suggested rubric (see Table 7) and draw comparisons with results from performance-based assessments using product-centered rubrics that are specific to PjBL outcomes.

Table 7. A proposed rubric for evaluating K-12 student-created reflective videos.

LEARNING OUTCOME	CRITERIA	NEEDS IMPROVEMENT (0 points)	SATISFACTORY (½ point)	EXEMPLARY (1 point)
Engaging: *Technical Structure*	Basic Technical Skill (video editing)	the technical issues are distracting	technical skill is appropriate	technical skill is exceptional
	Appropriateness of Sound (voice, music, sound effects)	sound editing is distracting	sound editing is appropriate	sound editing is exceptional and adds to quality of video
	Appropriateness of Visuals (images, video clips)	choice of visuals are distracting	visuals are appropriate	visuals are exceptionally relevant and add to quality of video
	Appropriateness of Communication (ideas, thoughts, flow)	communication is distracting, redundant, and/or unrelated to project	communication is reasonable	communication is exceptionally clear and delivered consistently
Saying: *Topics of Discussion*	Topic 1	no acknowledgement	some attempt to discuss	thorough discussion
	Topic 2	no acknowledgement	some attempt to discuss	thorough discussion
	Topic 3	no acknowledgement	some attempt to discuss	thorough discussion
	Topic 4	no acknowledgement	some attempt to discuss	thorough discussion
Seeing: *Ethnographic Perspective*	Student as Focus (unique view from student perspective)	student's presence and/or perspective ignored by video	some attempt to represent student's presence and/or perspective	student's presence and/or perspective appears in most components of video
	Whole People (people and community culture represented in video)	people in video are not unique to the experience; the people are faceless masses	some attempt to represent the actual people	actual people are represented in depth and creates a sense of the culture
	Whole Acts (activities and events represented in video)	the activities represented are generic and/or unclear	some attempt to represent the actual activities	representation includes beginning, peaks, and ends of actual activities
	Whole Places (places and locations represented in video)	places represented are generic and/or unclear	some attempt to represent actual places	actual places are represented in depth and creates a sense of the place where events occurred
Doing: *Behavior*	Acknowledgement of Various Distortions (explanation of the limitations of the video)	no acknowledgement	some attempt to acknowledge	fully acknowledged
	Time and Continuity Distortion (representation of time and sequences)	no sense of time frame or sequence of events	some attempt to show actual sequences in chronological order	actual sequences preserved in chronological order and/or in real time
	Inadvertent Distortion of Behavior (accidental misrepresentation)	several cases of accidental misrepresentations	very few cases of accidental misrepresentations	no cases of accidental misrepresentations
	Intentional Distortion of Behavior (purposeful misrepresentation)	several cases of purposeful misrepresentations	very few cases of purposeful misrepresentations	no cases of purposeful misrepresentations

Note: This rubric is inspired by Heider's (2006) Attribute Dimensions of Ethnographic Video and Schwartz and Hartman's (2007) A Space of Learning for the Use of Designed Video.

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Appendix A.

Heider's (2006) Attribute Dimensions of Ethnographic Video (p. 16)

CRITERIA	1 POINT	2 POINTS	3 POINTS
Ethnographic Basis	Uninformed by ethnography	Fairly informed	Deeply shaped by ethnographic understanding
Relation to Printed Materials	No printed materials	Fairly well supported by printed materials	Fully integrated with printed materials
Whole Acts	Fragmentary bits of acts	Some whole acts	Beginning, peaks, and ends of acts
Whole Bodies	Excessive fragmented close-ups	Some whole bodies	Maximally necessary whole bodies
Explanation and Evaluation of Various Distortions	No acknowledgement in film or print	Some attempt	Fully adequate
Basic Technical Competence	Distracting incompetency	Reasonable competency	Exceptional quality
Appropriateness of Sound	Inappropriate	Moderate narration	Natural synchronous sound
Narration Fit	Redundant overly wordy, unrelated	Narration related fairly well	Originally demystifying and relevant to visuals
Ethnographic Presence	Ethnographer's presence ignored by film	Ethnographer's presence mentioned	Ethnographer shown interacting and gathering data
Contextualization	Isolated behavior shown out of context	Gestures toward contextualization	Well contextualized
Whole People	Only faceless masses	Some attempt to represent the people involved	Develops feeling for an individual
Time Distortion	Temporal sequences rearranged	Condensed time	Real time
Continuity Distortion	Single sequences constructed out of shots from many actual events	Some attempt to show actual sequences	Actual sequences preserved
Inadvertent Distortion of Behavior	Extreme	Moderate	Minimal
Intentional Distortion of Behavior	Extreme	Moderate	Minimal

Note: This rubric originally contained only nine levels of performance that were weighted in the middle. It was modified to provide three scoring options for each criterion (shown in gray).