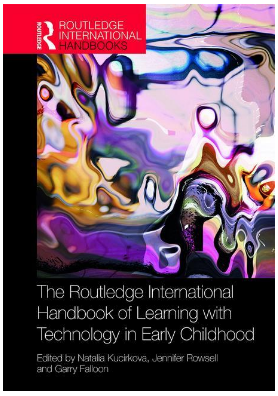

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When technology met real-life experiences

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WHEN TECHNOLOGY MET REAL-LIFE EXPERIENCES

Science curriculum project with technology for low-income Latino preschoolers

Lena Lee

Introduction

The number of ethnic minority children in the United States has grown consistently for the past several decades. In 2014, minorities became the majority in American public schools for the first time (Hussar & Bailey, 2013), and by 2050 more than half of American school children are expected to be from a minority group (Colby & Ortman, 2015; U.S. Department of Education & White House Initiative on Education Excellence for Hispanics, 2011). At present, English-Language Learners (ELL) are 9.3% of American K-12 students (U.S. Department of Education & National Center for Education Statistics, 2016).

Looking specifically at Latino children, their number almost doubled from 1997 to 2013 (Hussar & Bailey, 2013). By 2012, 25% of newborn American babies were Latino, and now these children are one of every five students in public kindergarten enrollment in 17 states (Krogstad & Lopez, 2014; U.S. Census Bureau, 2012). Among these ELL students, 71% speak Spanish as their first or home language (Soto et al., 2015). Despite these facts, however, the teacher population in the United States has not changed as much, as the majority of all public school teachers are non-Hispanic Whites (82%) and females (76%) (Goldring et al., 2013).

As the U.S. Department of Education and White House Initiative on Education Excellence for Hispanics (2011) poignantly indicated, Latino children are not always enrolled in a center-based early childhood education program, despite the fact that they are the largest segment of the American early childhood population. Moreover, there are significant gaps in cognitive skills, such as reading and math, between White and Latino children. However, if the variable of children's social class is added, the gaps are even wider (Garcia, 2015; Garcia & Weiss, 2015).

These demographic changes require that the American educational system more attentively meet the various needs of Latino children, and be more responsive to their cultures and values. One of the important reasons for this requirement is the academic achievement gaps between Latino children and their White counterparts (e.g., Fortuny et al., 2010; Garcia & Weiss, 2015; Reardon & Galindo, 2009). Differences in skill formation emerge early in children's lives, and they are mostly likely to continue over their lifetimes (Heckman, 2008). The project discussed in this chapter is motivated by numerous studies that emphasize high-quality early learning as a critical and effective recommendation for supporting Latino children and their success in education.

Many children in this research project were not only racial minorities, as recent Latino immigrants, but also had a lower socioeconomic status and, therefore, they mostly had more disadvantages due to these dual factors. Their status and circumstances are most likely to cause their parents to participate less in, or engage less with, their school and educational activities because of their work schedules, financial resources, unfamiliarity with the education system, different language, and cultural values and expectations (e.g., Farkas et al., 1990; Hill & Taylor, 2004; McWayne & Melzi, 2014; Suarez-Orozco et al., 2009; Wong & Hughes, 2006). Therefore, it is critical to recognize that these children's experiences, previous learning, interests, and educational goals can vary. That is why this chapter discusses a project that I initiated with the instructional approach of using technology to enhance the learning of Latino preschoolers who were from low-income families or schools. Moreover, the project is a practical venture to inquire how to make these low-income, minority children's learning experiences more effective through a technology-enhanced curriculum in which real-life experiences were involved. As a result, this chapter provides the detailed project procedure, which can encourage early childhood teachers to effectively adopt it in their classrooms.

Theoretical framework

This research project has been grounded in Bourdieusian theories of cultural capital and critical race theories (CTR), as well as the notion of a digital divide in early childhood education.

Cultural capital and critical race theories (CTR)

In early childhood education in the United States, developmental theories and practices have been prevalent for several decades. In particular, developmentally appropriate practices (DAP) have been considered as curriculum guidelines for programs. The DAP, developed by the National Association for the Education of Young Children (NAEYC), had three editions (Bredekamp & Copple, 1986, 1997, 2009). Although DAP was revised, it still did not have enough curriculum discussions and implementations of culturally relevant practices for children who are often marginalized in society, particularly Latino immigrant children. The examples and the assumptions the DAP presented were often based on typical mainstream children who have no issues cognitively, mentally, or socio-emotionally (Cannella, 1997; Cortazar & Herreros, 2010; Viruru, 2001).

By assuming one type of childhood as universal, the DAP embedded specific social values and cultural capital (Bourdieu, 1986) with insufficient implications of, and attention to, a wealth of knowledge and caring, culturally responsive teaching, and pedagogy for the students who do not have these values and capital in common (e.g., Gay, 2000; Ladson-Billings, 1995; Moll et al., 1992; Soto, 2005). Social values and cultural capital can be constructed through 'the processes and practices of everyday life' (Morrow, 1999, p. 746).

According to Bourdieu (1973, 1986), cultural capital is often obtained through *habitus*, which are predispositions and values formed from children's experiences and environments in their early years. For instance, children acquire cultural capital from their parents and merge it into their knowledge, language, and behaviors, including interaction patterns. While the degree of cultural capital varies with social class, the educational system assumes everyone has cultural capital in common, and as their standards (Bourdieu 1973, 1986). As a result, if children have less familiarity and abilities to understand and use 'educated' language and learning experiences in school that came from the dominant culture in society, there is a significant possibility for them to have fewer advantages and successes in an education system (Bourdieu, 1977). Several studies have indicated children's cultural capital positively correlated with their academic performances in education (e.g., Ball, 2003; Cheadle, 2008; DiMaggio, 1982; Gaddis, 2013; Gillborn, 2005; Raffo et al., 2010; Rothstein, 2004; Strayhorn, 2010; Sullivan, 2001; van de Werfhorst & Hofstede, 2007).

As critical race theory emphasizes, the experiences of marginalized students, including Latino children, challenge the discourses that discount their cultures and their schooling, that function to maintain the hierarchical social and economic powers (e.g., Ladson-Billings, 1995; McLaren, 1994). Therefore, it is important to present a more comprehensive challenge to traditional curricular structures, processes, and discourses that often isolate diverse students by developing a curriculum from knowledge that originates from the various groups of people (e.g., Matsuda, 1991; Solórzano, 1997; Yosso, 2010). Social experiences and realities vary, depending on each individual, and many minority students' experiences and realities in education and society have been ignored (Delgado, 1989; Delpit, 1988). The school experiences and curricula, which often do not include the minority students' educational goals, knowledge, and culture, make the students socially, politically, and economically marginalized, while their counterparts are preparing to assume mainstream power (Cookson & Persell, 1985).

This research project has sought to reflect some of the major principles of a critical race-based curriculum in developing a science curriculum for Latino preschoolers that recognizes the centrality and intersectionality of race and inequality in education, challenges dominant ideology, has a commitment to social justice, and centralizes diverse students' experiential knowledge (Freire, 1970; hooks, 1987, 1992; McIntosh, 1989; Nieto, 1992; Sleeter & McLaren, 1995; Solórzano & Delgado Bernal, 2001).

Digital divide

As is well-known, many children increasingly use technology and digital media in contemporary society. However, young children from low socioeconomic status (SES) families, minority children, and children whose parents have a lower level of educational attainment have a lower likelihood of having a computer at home (Rideout & Hamel, 2006). This phenomenon is the so-called digital divide (U.S. Department of Commerce, 2000). Children from low-income families and different ethnic groups, such as Black and Hispanic groups, obtain fewer advantages from technology use at home than their counterparts for two main reasons: (1) lack of good technological resources, including parental support and schools, and (2) insufficient knowledge of appropriate use (Attewell & Battle, 1999; Lee, 2015; Vigdor & Ladd, 2010). These challenges to learning with technology at home and in schools tend to lead to learning gaps between these children and children from high-SES schools and families (Wenglinsky, 2005).

Given the fact that low-income children may have little or no access to the latest technologies in their homes, early childhood settings, schools, or communities, educators should consider that this digital divide can cause the early discrepancy of academic and social experiences between these children and their counterparts. Moreover, high-quality interactive uses of technology can bring forth learning and creative advantages for children who were born in the technology era. When technology is combined with skillful teaching and complementary curriculum resources, this combination can accelerate learning and narrow the achievement gaps between children from low-income families. More effective technology use can also offer extra motivation for students to concentrate on their tasks throughout science content learning because of their excitement and engagement with the tablets, which they love to use. Many students do not view this as tedious learning; instead, they viewed it as playing (Lee, 2012). As a result, using technology was helpful, particularly for the low-achieving students who often failed in such traditional instructional tasks as worksheets and paper-and-pencil tests (e.g., Darling-Hammond et al., 2014; Flumerfelt & Green, 2013; Ortman, 2016). As the children were encouraged to work with digital media, this project aimed at improving their initiative in learning and, eventually, success.

Developing an authentic, early childhood, technology-supported curriculum is important, because it can be a means for promoting social justice and equity in education by opening some possibilities for these children to overcome the digital divide and achieve their educational goals (e.g., Lemke et al., 2009; Melhuish & Falloon, 2010; Ritchie & Gutmann, 2014). The project the chapter discusses was an attempt for social justice by highlighting the need for developing a curriculum for Latino immigrant children. As a result, the rationale underlying the project was to support minority, low-income preschoolers who often do not have sufficient opportunities and resources to participate in the same range of community and world experiences. Moreover, the rationale underscored the significant influence of cultural capital on children's learning in that this author is keenly aware that the minority, low-income, preschool children's range of richness in their academic and experiential learning is not comparable at formal school entry and through their lives as their counterparts, particularly their White peers.

Science curriculum project for low-income Latino preschool children

Contexts

This project was conducted in low-income preschool programs (ages three to five) in a Midwestern urban school district. The project had two sites with Head Start Programs (12 classes with three main teachers) and one public school preschool site (four classes with two main teachers) in which many students were ELL children, special-needs children, or children with behavioral issues.

Each class was a half-day program with 15 to 17 students. One Head Start site had two classes with only Latino children (100%) whose families were recent immigrants. Some of them (20% to 25%) had undergone or were undergoing the process of the Individual Education Program (IEP), and the other Head Start site had some ELL students (15% to 20%) and some students with behavioral issues (20% to 25%). The public school preschool site had fewer ELL students (15%) than the Head Start sites and more students with IEPs (25% to 30%). Most parents of the ELL students had limited English-language proficiency. This chapter focused on the two classrooms with all Latino children (100%) whose families were recent immigrants.

Project description

This project is part of a larger project exploring low-income families' children and their learning, and has been conducted since 2014. The project's curriculum approaches and ideas have evolved since the project started with continual attempts to create a more meaningful and effective curriculum for the children to the greatest extent possible. This chapter discusses the curriculum of a classroom for Latino children's science learning with technology and experiential learning for a year. In the project, one pre-service teachers participated to support me. I visited the classroom two to three times per week through the year and spent a couple of hours there per visit. The main teacher and the assistant teacher of these classes had bachelor's degrees in education or child development associate (CDA) credentials, and the main teacher was fluent in Spanish. Their level of teaching experience ranged from four to six years, and they were both female. Each class had 17 students.

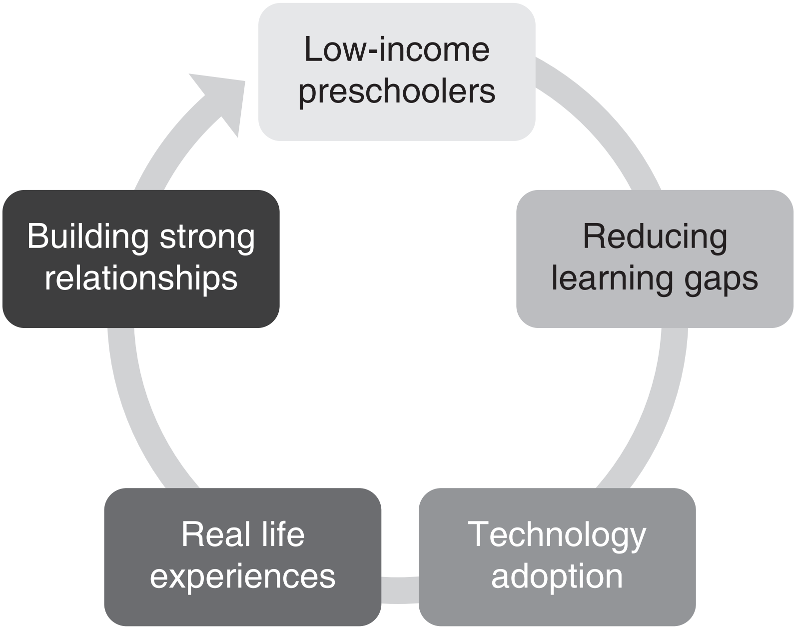

Figure 24.1 Project's rationale

The project had two practical objectives and the activities were set up to reflect the project's rationale of technology-enhanced science curriculum with real-life experiences (see Figure 24.1):

1 To support technology-enhanced experiences that improve children's learning interests, scientific understanding, and social knowledge and skills.
2 To provide socio-cultural knowledge-based learning to foster the educational experiences of children and connect their learning with technology and real-life experiences.

Both objectives and their implementation are discussed in the next section.

Project objectives and details

Supporting technology-enhanced experiences

I used digital media, iPads in particular, in the project. I visited the classroom with a pre-service teacher, and played a series of game applications that dealt with scientific concepts during the learning center time. Starting with the iPad application games, I aimed to keep young children engaged with their learning and to promote the interactive element with my pre-service student. This pre-service teacher played an assistant role to support children's learning with me by facilitating a small group and paying sufficient attention to each child. In using the iPad games, I took a social development approach and could scaffold each student as a More Knowledgeable Other (MKO) Vygotsky (1998) indicated in his work (Lee & Tu, 2016). Meaningful learning occurs best when young children actively interact with an MKO, who can model and offer appropriate guidance for solving problems when they are in the Zone of Proximal Development (ZPD). Therefore, the role of the MKO is critical for children not only to acquire and explore knowledge and information with the iPad games, but also to be supported in an encouraging learning environment (Vygotsky, 1998).

Moreover, TeachSmart®, a smartboard for young learners, was used in this class. This board was used not only for teaching science concepts with music and movements, but also for building emergent literacy with the science content. For instance, when I taught a science concept, plants and planting, I used several web-based sources such as educational animation shows and music from YouTube that dealt with the plant and planting to make their learning more fun and visualized. While I was playing the shows through the smartboard with the pre-service teacher, I could also assess the children's learning very effectively by pausing the shows and letting them recall what they have learned. Furthermore, I used this smartboard for early literacy development. From the beginning of the semester, all children who attended wrote their names every day on the classroom attendance sheet. This format of the attendance sheet became virtual on the smartboard as the semester went and their writing ability was more stable. Because they could erase what they wrote and rewrite on the smartboard, many children were not afraid of their misspellings or emergent handwriting skills. Writing their names from the paper to the smartboard allowed them to use a different medium for early literacy. Children could also easily see their progress throughout the semester, as could parents, because I saved their writings on the computer and printed out whatever was needed.

Providing socio-cultural knowledge-based learning

In the aforementioned discussion, cultural capital of children can be formed from their early experiences and environments, and provide rich contexts of learning as socio-cultural knowledge is critical for young children (Bourdieu, 1986). Given the importance of contextually based learning, I implemented the content knowledge of science – in particular, plants and planting – into relevant class activities. This implementation also aimed to connect the children's classroom learning with printed materials (i.e., books) and technology, to hands-on, real-life experiences. Following this process, the children could adopt the 5E Instructional Model: Engage, Explore, Explain, Elaborate, and Evaluate (Bybee, 1997; Bybee & Landes, 1990). They could connect their learning from technology to that of real-life experiences in various settings, by recognizing there are multiple ways of learning science concepts, and applying them.

Engage

This stage had started as they learned the basic information about plants and planting by using printed materials and technology. However, I wanted them to be more motivated and curious in developing their interests, and to learn more about actual planting. I asked the children, 'What do you think we will need to plant actual seeds in a pot?' and they discussed and asked more questions among themselves, and to me. The class made a list of things for planting (e.g., seeds, soil, water, trowels, pots, etc.) and offered some other comments, questions, or concerns, such as, 'Can I paint the pot?', 'What seeds do we need?', and 'Where should we keep them?'. After the discussion, the class decided on pot painting, chose pea seeds to plant, and found a sunny corner in class to keep the pots.

Explore

After the initial discussions, the children started to plant their seeds. Each child had his/her small pot and painted it, and then planted their seeds. I divided the class into three groups. I modeled each step of planting and each group followed the steps. Whenever extra support or questions arose, I, or the pre-service teacher, helped or answered. Since this activity was collaborative, each group of children needed to be patient, attentive, and supportive of one another. In addition, they commented on each other's pot designs or discussed with their peers what step they needed to do. When they finished planting, the children moved all pots to the sunny classroom corner. Two child volunteers and I watered the plants.

Explain and elaborate

Every morning after the children came into the classroom, they noticed their plants in the corner and naturally went to observe if the seeds had sprouted or the plants had become taller or bigger. The children took turns in the role of 'plant keeper' and watered them regularly with the teachers' or my support. They offered a brief weekly report on how the plants were progressing during their morning circle time. During this report time, they often described their understanding of planting stages and the parts of the plant (e.g., plants, seeds, leaves, stems, and peas) in Spanish (e.g., *plantas, semillas, hojas, tallos*, and *arvejas*). Then, I told each word in English with the English vocabulary card I created to make it easy for them to associate their Spanish vocabularies to those in English. These words, with corresponding photos, were also posted on a whiteboard. Therefore, a child who might not remember them could use this as a reference.

In addition, several children posed questions about the plants they had been exploring. For instance, they had a new question of why one plant was smaller than the others, or why some seeds took more time to bud by comparing and contrasting their plants to their peers' plants. When they were asking questions, they checked every component for a plant and thought carefully about what made each plant grow at a different pace. The children also shared information and ideas with their peers and their teachers. At the end of the planting process, they went on a field trip to a farm where they saw various plants, trees, and fruits. There, they tried to apply their knowledge and learning from the seed growing experience to the trees and flowers.

Evaluation

When the children talked about the plants based on their observations and learning experiences through using digital media, the hands-on activities, and the field trip, their understanding of the planting process was assessed effectively. The assessment was not done only once after completing all lessons. Instead, it happened frequently while they were learning, without them noticing it. As a result, the assessment was a continual and fun process in which both the students and I got involved. For example, when I used a YouTube video of a plant through TeachSmart, I stopped it at certain points to pose a question about their understanding. By using this non-formative form of assessment, I gathered more meaningful and individualized evidence of each child's learning process.

Conclusion

This chapter discussed a project for a comprehensive science curriculum design with technological and hands-on activities. Considering the increasing number of Latino children in the United States, the project was developed for Latino preschool children whose families were not only racial minorities as recent Latino immigrants but also had a lower SES. The project was driven by a serious effort to meet the educational needs of these young Latino children and be more attentive and culturally responsive to their learning. The project endeavored to connect to their improvement in academic learning and offer more opportunities to have experiential learning.

One meaningful evaluation of the children's improvement was shown when I conducted a parent survey written in English and Spanish. They mentioned how much they appreciated all the work I did. They said, 'My son talked about science a lot!', 'She kept asking if I knew a plant grows every day little by little', 'She has had a lot of questions about the environment lately!', and 'He [her son] wanted to get some more books about science'. Similar comments were in a parent survey I conducted at the end of the semester. They even mentioned the children's improved English vocabulary when they talked about science-related topics. Due to this, they said, 'I studied English as well with them'. Many families talked about 'school stuff' at home, which was related to one of the project's goals of 'providing socio-cultural knowledge-based learning to foster the educational experiences of children' with learning through digital media that was relevant to real-life experiences.

As mentioned earlier in this chapter, given the importance of cultural capital, culturally relevant teaching approaches, and the digital divide in developing a curriculum for Latino immigrant children, it is important to reflect on, and include, their experiences, previous learning, and interests into their educational goals. Therefore, the project was an attempt to understand how to make these low-income Latino preschoolers' learning experiences more meaningful and effective through technology and hands-on experiences.

By applying a comprehensive curriculum with the use of digital media as a part of the everyday classroom, I certainly recognized effective and successful science improvements. The young children's active participation with the instructions, high level of independence, and ownership of learning in the classes were clearly evidenced. The teachers in these classrooms told me that these students' academic performance for the year improved more than many other classroom children in the area on the Brigance, which is one of the assessment instruments for children in the Head Start programs.

I strongly believe that the technology-enhanced curriculum with meaningful hands-on activities can lead young children into having a more active engagement in, and responsibility for, their learning. Despite its short time and small student number, this project was a great example in showing this possibility. I aspire to make this curriculum development project a practical example to support low-income minority children so that early childhood classrooms become a crucial place to provide educational activities that obtain equity and social justice for all.

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