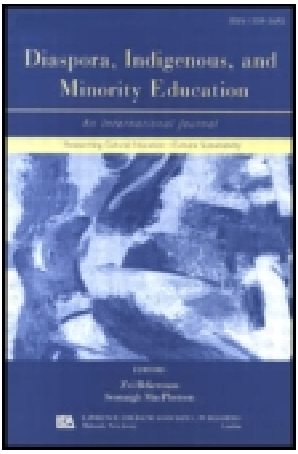

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Livnot U'Lehibanot, To Build and To Be Built: Making Robots in Kindergarten to Explore Jewish Identity

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An important challenge for minority and diaspora populations is how to maintain their community from generation to generation by encouraging positive affiliation among their youngsters. This article reports a technology-rich educational program that addresses this issue in the context of early childhood Jewish education. A central focus in early Jewish education is the strengthening of children's Jewish identity. Although several approaches have been taken to address this goal, this article explores the use of robotics in the context of a kindergarten curriculum focused on the primary question of "Mi Ani?" ("Who am I?"). In the Mi Ani project, kindergartners created robotic artifacts and programmed their behaviors to express their Jewish identity in a dynamic way through the robot's actions.

An important challenge for minority and diaspora populations is how to maintain their sense of identity from generation to generation by encouraging positive affiliation to the community among their young people. One way to address this challenge is by implementing educational programs that engage children in the exploration of identity grounded in the minority culture, yet integrated with the majority mainstream culture.

This article reports on an innovative technology-rich educational program, the "Mi Ani" ("Who am I?") robotics project, that addresses this issue in the context of early childhood Jewish education. Mi Ani engages children in an educational experience that promotes exploration of issues of identity by inviting them to create robotic creatures as alter-egos and program their behaviors in response to both Jewish (minority culture) and secular (majority mainstream) events that happen throughout the academic calendar in an American Jewish day school kindergarten classroom. By using a developmentally appropriate programming

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language developed by Bers and her team at the Developmental Technologies Research Group (DevTech) research lab at Tufts University, called CHERP (Creative Hybrid Environment for Robotic Programming; Bers, 2010a, 2010b), young children learn to build LEGO®-based robots and program them to travel across the secular and Jewish calendar and perform actions to express the child's perspectives, feelings or reactions at those points in time. For example, a child programmed her robot to turn on its lights when reaching the month of December to express the lighting of the Hanukah candles, and a boy programmed his robot to shake and then spun to represent the overwhelming experience of tasting a bitter lemon during their science exploration of citrus fruits during October. Another child created a program to turn the robot's lights on and off in May for her birthday to represent her eyes "lighting up" in excitement.

By programming their robots to perform actions, children are invited to explore their relationship with Judaism through dynamic behaviors, rather than static symbols or objects, as it is done within educational approaches that only use arts and crafts projects. As robots traveled through the academic calendar, children encountered opportunities to express different dimensions of their identity: Members of a classroom engaged in a particular curricular activity (i.e., citrus fruits explorations), members of the Jewish community celebrating holidays (i.e., Hanukah), and personal preferences (i.e., birthday celebrations).

The overarching goal of the Mi Ani project presented in this article is to explore innovative educational programs that, by leveraging on 21st-century skills (such as technological fluency), can promote ways for minorities and diasporas to sustain their communities over time. The primary research question at the heart of this article is, "What affordances do new technologies such as robotics have for young children's ability to express their Jewish identity?" The next sections provide the theoretical background that frames this work, describe the implementation of the Mi Ani program and the technology used, and present examples of the projects done by the children.

JEWISH EDUCATION AND BEYOND

A central focus in Jewish education is the strengthening of children's Jewish identity (Feldman, 1992; Reisman, 1979). In the past 20 years in the United States, due to assimilation and intermarriage, the need to educate children has received renewed attention as a way to address Jewish continuity, and to revitalize, strengthen, and deepen Jewish identity (Bloomberg, 2007). Recent scholarship argues that the primary task of contemporary religious education "is not so much to transmit faith but rather to facilitate the formation of personal identity as a core aspect of contemporary socialization processes" (Vermeer, 2009, p. 201). Moreover, the focus on Jewish identity has expanded from examining only "a person's active involvement in religious and cultural-communal *practices and activities*" to looking at an individual's "self-perception and self-definition as a Jew" (Horowitz, 2003, p. iv).

Although this study presents an educational program to promote exploration of identity among Jewish kindergarten students, many minority populations also aspire to transfer their heritage to future generations; thus, lessons learned from this research might have wide applicability. The communal affirmation by Jews worldwide of the centrality of the state and land of Israel creates a diaspora identity that has parallels with other ethnic minorities. For example, aspects of this are evident in Ignacio's study of Filipino Americans (Ignacio, 2005). Ignacio described a diasporic identity, whereby "many second-generation immigrants define their ethnic identity against the memories of the homeland and against the images of the homeland and the stories of the people who have traveled there" (p. 45).

Ignacio (2005) argued that Filipino-Americans must negotiate how they identify membership in their diasporic culture. On the Filipino Internet newsgroups that Ignacio studied, the participants "draw mostly upon the Philippines and the United States, common history, and lived and imagined experience to construct Filipino identity" (p. 45). The process of constructing identity must be managed by any individual as they mature, but a member of a minority group faces the more challenging task of continually negotiating between the mainstream majority culture and minority ethnic identity.

In the Mi Ani project, children had to negotiate between choosing meaningful events in both the secular and the Jewish academic calendar. Children were instructed to only select three events to represent with their robot's behaviors. Their choices expressed their own perception of themselves as kindergarten students in a Jewish day school in an American city. Whereas some choices were strongly related to "being Jewish," such as programming a robot to play a Hanukah song while turning its lights on and off to symbolize candle lighting, others were about life in kindergarten such as a robot spinning around showing happiness for the release of the butterflies they had been studying since the month of May.

Early childhood Jewish education has developed different approaches for supporting children to explore their sense of identity (Krug & Schade, 2004; Vogelstein, 2008). As opposed to later Jewish education, which is often focused on cultivating Judaic skills or content knowledge, early educators lead their students "to feel, to understand, to live, and to love Judaism" (Wolf & Nowak, 1991, p. vii). Although several strategies have been taken to address this goal, this article explores the use of new technologies—most specifically, robotics—in the context of a kindergarten curriculum focused on the primary question of "Mi Ani?" ("Who am I?"). As today's children are immersed in a digital world, there is a need to develop educational programs and interventions that take advantage of the full potential of high-tech.

Mi Ani is the culminating year-end project for a kindergarten class at JCDS, Boston's Jewish Community Day School. Whereas in the past children have used art materials to create displays of their unique ways of being Jewish, using a photographic timeline and pictures of children's work to reflect their learning and growth throughout the school year, in this article, we report an experience that incorporates the use of robotics to the already existent Mi Ani unit. This project introduced children to robotics as a medium to express their sense of Jewish identity in new ways. Most specifically, by engaging children in programming the robot's behaviors, it promoted them to think about the kinds of actions they engage in as Jews in the context of a kindergarten classroom. Robots become alter-egos performing different behaviors as they travel throughout the secular and the Jewish school year.

In the Mi Ani project, 22 kindergartners built robotic artifacts and programmed their behaviors. Because the medium of robotics allows the display of actions, as opposed to static facts, children chose to create robots enacting behaviors that were related to their different ways of being both Jewish and American in kindergarten. For example, one student programmed his robot to spin to represent lighting the Hanukkah candles when it reached the month of December, whereas another programmed hers to roll back and forth, mimicking rolling out dough for Passover matzah in the month of April, and a different student programmed her robot to stop along the timeline at November, spinning to represent eating turkey on Thanksgiving.

For decades, educators have used stories and art materials to help young children explore issues of identity. In the work presented in this article, we use robotics, engineering and computer programming. We are inspired by the potential of the computer to become a "second self" or "psychological machine," not because it has a psychology of its own, but because it provokes us to think about our own sense of self and identity (Turkle, 1984). Previous research has shown that, when children are given the opportunity to use technology to create their own meaningful projects, they also engage in thinking about their own identity as a process, as opposed to a fact (Bers, 2001; Bers & Bergman, 1998; Bers & Urrea, 2000). This mirrors current scholars' understanding of identity as a continuously evolving process undertaken over the course of an individual's life (Arnow, 1994; Charmé, Horowitz, Hyman, & Kress, 2008; Horowitz, 2003). Identity is not a stamp put on our forehead by our ancestors, but a dynamic concept. We are not born "being" but we "become." The Mi Ani project provides a toolset, aligned with the technological 21st century, to explore and express a sense of identity as a dynamic process grounded on actions.

To understand children's perception of their own identity, it is necessary to interpret identity in their own terms. The Mi Ani project allowed us to observe the kinds of actions children programmed their robots to perform and the different meanings they assigned to events in both the Jewish and the secular calendar. The robot's behavior, as programmed by the child, provided a window that enables a deeper look into how children see themselves and what is most important for them.

Although much research on ethnic identity has focused on its evolution in adolescents (cf. Phinney, 1993), young children have an emerging sense of their own religious, racial, or cultural identity. In early childhood, children begin to identify with a particular group, such as "Catholic" or "Jewish," for example, and begin to associate particular behaviors with that identity (Cole et al., 2005, pp. 369–371). The Mi Ani program provided a venue for children to explore those behaviors by programming robots as "alter egos."

THEORETICAL BACKGROUND: EXPLORING IDENTITY AS A LEARNING PROCESS

In this article, we conceive the exploration of identity as a learning process. And we understand that the best learning experiences happen when children are provided with the tools and support mechanisms to become producers, as opposed to consumers, of their own knowledge and projects (Bers, 2010a, 2010b).

This approach is grounded in the constructionist theory of learning, developed by Seymour Papert. In the late 1960s, Papert became a pioneer in understanding the potential of computers to facilitate "learning by doing" in a Piagetian tradition (Papert, 1993). In this approach, knowledge is never the result of a passive activity of receiving information, but of an active engagement with the world through manipulation of artifacts and interactions with people and contexts. Furthermore, Papert claimed that computational environments that allow children to build, to design, to construct and to produce—such as robotics—can facilitate the construction of knowledge (Bers, 2008a). Constructionism asserts that people are likely to create new ideas when they are actively engaged in making external artifacts that they can reflect on and share with others; and these ideas are not only about computer science and engineering, but also about identity, about

"Who am I?" (Bers, 2001; Bers & Urrea, 2000; Horn, Bers, & Jacob, 2009). The constructionist theory of learning puts forward the notion that computers are not only instrumental machines but also expressive, epistemological tools that can bring new insights into our own thinking. In the Mi Ani project, robotic technology enabled children to create tangible representations of themselves that facilitated self-reflection about their identity.

Constructionism shares with other educational approaches, such as "learning by designing" (Kolodner, Crismond, Gray, Holbrook, & Puntambekar, 1998), "design education" (Ritchie, 1995), and "design experiments" (Brown, 1992), the tenet that design-based activities are powerful ways for students to engage in learning by applying concepts, skills and strategies to solve authentic problems that are relevant and personally meaningful (Resnick, Bruckman, & Martin, 1996). Whereas in early childhood education there is a strong tradition of engaging children in making objects, machines, and tangible models with low-tech materials, constructionism has paid particular attention to newer technologies that engage children in design-based activities. Papert (1993) thought of computers as "'objects to think with," where there is an intersection of cultural presence, embedded knowledge, and the possibility for personal identification" (p. 11). In particular, he argued that digital technologies as "objects to think with" present unique learning opportunities because of their inherent ability to make abstract concepts concrete and to appeal to a wide variety of interests and learning styles (Bers, 2008a, p. 22). In a later section, we explore the particular technology (i.e., robotics) that was used in the Mi Ani project.

By engaging children to use new technologies to design, program and construct their own projects, constructionism supports the development of technological fluency, or the ability to use and apply technology in a fluent way, effortlessly and smoothly for many different purposes, as one does with language, thus the choice of the word *fluency*, as opposed to *literacy* (Papert, 1993). One is fluent in French when one can read a book, write a letter, have a street conversation, and, eventually, start to "think" in French. Similarly, one is fluent with technology when one can find new ways of using computers in a creative and personally meaningful way. For example, to make an animated birthday card, to compose a digital song and to create a neighborhood Web site or a robotic creature (Bers, 2010b) are all examples of technological fluency. Technological fluency is about promoting competence and confidence in the technological domain.

Although the need to promote technological fluency is widespread, when developing educational programs and interventions aimed at promoting exploration of identity, this is not enough. In a digital era in which technology plays a role in most aspects of a child's life, having competence and confidence to use computers might be a necessary step, but not a goal in itself. Developing character traits that will serve children to use technology in a safe way to communicate and connect with others, and providing opportunities for children to make a better world through the use of their computational skills and new ways of thinking, is just as important. Those are the goals of the Positive Technological Development (PTD) framework developed by Bers (2012). PTD examines the developmental tasks of a child growing up in our digital era, and provides a model for developing and evaluating technology-rich educational youth programs that promote positive youth development (Bers, 2010a).Educational interventions informed by the PTD framework promote children to use technology to engage in positive behaviors, such as content creation, creativity, communication, collaboration, community-building, choices of conduct, that will ultimately lead to a life of thriving (Bers, 2006, 2012). The PTD framework guided the design of the Mi Ani project, as children were involved in all of these six behaviors. Children created their own robots and programmed their behaviors, used their creativity to decide the aesthetic look of the robots and decide the path of its travel, communicated with classmates and engage in collaborative teamwork, presented their final projects to family and friends during an open house as a way to build community, and engaged in choices of conduct throughout their work on the project, as they had to make decisions in terms of resources and time allocation, as well as positive or negative classroom behaviors that would or would not be conducive to successful projects.

THE MI ANI PROGRAM

The Mi Ani project is an attempt to provide a responsive program to the challenge faced by minorities and diasporas that was described in the introduction: How do they maintain a sense of community from generation to generation by encouraging positive affiliation among their youngsters? This innovative educational program, seeks to provide a venue for children to express and explore their identity while engaging with 21st-century skills. Therefore, the question to explore is what are the affordances of new technologies such as robotics, for young children's ability to express their Jewish identity? A better understanding of this question would justify the decision to invest in expensive materials such as robotic kits and computers in the kindergarten classroom, and in professional development time for teachers to master the engineering and programming involved.

The Mi Ani project described in this article took place in a kindergarten classroom at JCDS, a pluralistic Boston area Jewish Day School. The school is philosophically committed to intentional pluralism, meaning that it actively embraces children and families with a wide range of Jewish expression, practice, and belief. According to a school publication, "Families span a wide spectrum of Jewish beliefs and practices: Orthodox, Conservative, Reform, Reconstructionist, Israeli, traditional, post-denominational, unaffiliated, and secular" (JCDS, 2010). Pluralism at the school extends beyond variations of Jewish religious affiliation. For example, the school's curriculum embraces differentiated instruction, celebrating the diversity of learners represented within the school's community.

We chose to work with JCDS because it allowed us to observe how children immersed in a deeply and consciously Jewish school culture were able to find their own voices for expressing their Jewish identity and navigate their relationship with the surrounding secular and majority world. Children in kindergarten are typically going through the process of defining their sense of self, making ethnic identity exploration both appealing and appropriate for their personal development. By age five or six children have a concept of their own religious identity enabling them to explore its meaning further (Elkind, 1964).

For the purposes of this study, *identity* is broadly defined as the particular attitudes, preferences, and meaningful experiences represented by children through the full range of media available to them. This definition matches a broader trend in the world of Jewish identity scholarship toward understanding identity as one's own "self-perception and self-definition as a Jew" (Horowitz, 2003, p. iv), thereby respecting people's various modes of understanding themselves and their Judaism. Moreover, this definition meets the developmental needs of young children, who may not yet grasp theological or communal aspects traditionally identified as part of a Jewish identity. By understanding children's Jewish identity through their conception of themselves and their meaningful experiences, this project enables a deeper look into their mental representations of themselves as Jews immersed in a secular culture (Libman, 2011).

Although teachers in the kindergarten classroom had implemented the Mi Ani project in the past by using art materials, such as providing children with opportunities to draw their own challah covers and make paintings or plasticine creations about themselves as Jews or about the symbols of the different Jewish holidays, this experience introduced a new element: robotics and programming. The curriculum that formed the foundation of the Mi Ani project was implemented in two stages. First, children were introduced to the robotic technology by participating in the TangibleK robotics curriculum developed by the DevTech Research Group at Tufts University (Bers, 2010b). This curriculum teaches computer programming and engineering concepts and provides a structured way for children to put those concepts to use by engaging them in different activities. Once children had mastered the basics of the programming and building robots, the second part of the curriculum focused more specifically on the Mi Ani project. Whereas the TangibleK curriculum encourages cognitive development in such areas as logical and sequential thinking (Kazakoff & Bers, 2010), the overarching project goal for the Mi Ani project was not only to engage children in learning about robotics, but also to observe the kinds of expressions of identity that children would engage in when provided with the robotics medium.

The kindergarten teachers participating in this program were trained on the TangibleK curriculum and worked in a collaborative way with the research team to integrate robotics into the Mi Ani project. As a first step children reflected on their experiences during the year, guided by their teachers during open circle times coming up with a timeline consisting of different events during the academic year that were meaningful to them (see Figure 1). Each child chose three moments in the year as "stations" at which his or her robot would stop and perform an action. For example, one child programmed his robot to stop along the timeline at November, spinning to represent eating turkey on Thanksgiving, whereas another programmed her robot to sing at December to

FIGURE 1 A section of the timeline of the kindergarten year (color figure available online).

represent singing Hanukkah songs, and a different one to shake to express excitement because their classroom was studying butterflies. Children decorated the robots to represent themselves, using art materials to depict their interests, and their characteristics. For example, one child decorated her robot with drawings of all her favorite sports, whereas another molded a clay image of herself that she attached to the top of her robot. Each child programmed his or her robot to travel alongside the timeline stopping at three points in time to perform different actions, demonstrating children's own understanding of significant moments of their experience throughout the year. A video of the Mi Ani project can be found here: http://ase.tufts.edu/DevTech/MiAni.asp

In terms of research methods to gather data to answer our research questions, students were interviewed following an open-ended protocol to understand what they were trying to accomplish through their robotic projects, and what stories about themselves were they trying to tell through their robot's behaviors. As children showed the researchers their robots, questions such as, "What is this robot doing? Why did you make it spin or shake or beep?," were asked. The computer code or program for the robots was also analyzed to evaluate the children's technological proficiency and videos were taken to see them in action. Because researchers worked together with the classroom teachers in implementing the curriculum for the Mi Ani project, ethnographic data regarding the experience was available to the research team as they participated as active members in the classroom.

In terms of assessments, before the kindergarteners began their final Mi Ani projects, they were required to demonstrate knowledge about robotics and programming by completing challenging tasks presented by a teacher or member of the research team. Students received stickers on note cards (which we called *engineering licenses*) for successfully completing such tasks as building a sturdy robot, connecting wires correctly, creating a working program, and uploading the program to the robot. To avoid biases in the study, we wanted to make sure that all students knew how to program their robots so they could freely choose to express themselves through the robot's behaviors without this expression being obstructed by lack of technological knowledge. As we see later in the article, some children chose to create robots to express their feelings of being Jewish, whereas others to express actions that a Jewish individual performs.

THE ROBOTICS TECHNOLOGY

This section describes the robotics technology used in the Mi Ani project, by focusing on the developmental appropriateness of such a technology in a kindergarten classroom. Whereas in the early days of personal computing there was lively debate over the developmental appropriateness of using computers in early elementary classrooms (Clements & Sarama, 2003), today the pressing question in no longer *whether* but *how* we should introduce technology (Bers, 2008a; Clements & Sarama, 2002).

We are surrounded by technology. Yet, in the early grades, children learn very little about this (Bers, 2008a). Just as it is important to begin science instruction in the early years by building on children's curiosity about the natural world, it is as important to begin engineering instruction and the development of technological literacy by building on children's natural inclination to design and build things, and to take things apart to see how they work (Petroski, 2003).

Robotics is a wonderful platform as it taps into what is unique to our human-made world today: the fusion of electronics with mechanical structures (Bers, 2008a). Robotics provides opportunities for young children to learn about the world of technology in a playful way by inviting them to build their own projects, such as cars that follow a light, elevators that work with touch sensors, and puppets that can dance and play music (Bers, 2008a). Young children can become engineers by playing with gears, levers, motors, sensors, and programming loops, as well as storytellers by creating their own meaningful projects that react in response to their environment (Bers, 2008b). Robotics can also be a gateway for children to learn about applied mathematical concepts, the scientific method of inquiry, and problem solving (Rogers & Portsmore, 2004). Moreover, robotics invites children to participate in social interactions and negotiations while playing to learn and learning to play (Resnick, 2003).

Robotics involves more than just constructing physical artifacts. To bring robots to "life," children must also create computer programs—digital artifacts that allow robots to move, blink, sing, and respond to their environment. Previous research has shown that children as young as four years old can understand the basic concepts of computer programming and can build and program simple robotics projects (Bers, 2008a; Bers & Horn, 2010; Bers 2012; Cejka, Rogers, & Portsmore, 2006). However, young children need to work with interfaces that are developmentally appropriate. The robotics-based programming language utilized in the Mi Ani project, called CHERP, is such a tool and was developed by Bers and her DevTech research team at Tufts University (Horn, Crouser, & Bers, 2011). Rather than writing computer programs with a keyboard or mouse, the CHERP system allows children to instead *construct* physical computer programs by connecting interlocking wooden blocks (see Figure 2).

The blocks contain text and icons depicting a particular programming command, as well as a TopCode, or a circular black and white symbol. Children use a camera connected to the computer to take a picture of their program and then upload it to their robot. Alternately, children have the option to program using a graphical interface in which they connect icons depicting these blocks'

FIGURE 2 The CHERP tangible programming language (color figure available online).

FIGURE 3 The CHERP hybrid programming language (color figure available online).

images on a computer screen, transmitting the program in identical ways. Children can transition back and forth between these two interfaces, allowing them to program using either or both, as they choose (Bers & Horn, 2010; see Figure 3). The hardware children used is the commercially available LEGO robotics kit called MINDSTORMS®.

The LEGO MINDSTORMS kit is composed of a tiny computer embedded in a specialized LEGO brick, called RCX (Robotic Command eXplorers), which can be programmed to take data from the environment through its sensors, process information, power motors, and control light sources to turn on and off (see Figure 4). The RCX brick is programmed using the CHERP language.

ROBOTICS AS AN EXPRESSIVE MEDIUM

Early childhood educators have long recognized the power of providing children with a variety of media "to express themselves" (Bredekamp, 1991, p. 72). Experiences with visual art, dramatic play, music, and physical activity have long been valued in the early years, when children's language and literacy skills are still developing. The pioneering work of the Reggio Emilia school system in Italy has deepened this emphasis within the world of early education, understanding children's self-expression as a process that occurs through a multitude of diverse channels, called the "Hundred Languages of Children." At Reggio Emilia, "the visual arts are integrated into the work simply as additional 'languages' available to young children not yet very competent in conventional writing and reading" (Katz, 1994, p. 27). Their approach emphasizes the role of these

FIGURE 4 The RCX programmable brick with wheels, motors, and sensors (color figure available online).

different "languages" in enabling children to communicate their learning and ideas, in addition to their conventional role of allowing children to express their feelings and explore creatively.

Just as artistic media, such as painting, music, and clay have long been recognized as "languages" for children to express their ideas and learning, robotic technologies hold similar capabilities. Every expressive medium presents children with unique affordances of the materials for self-expression, and robotics is no exception. Robotics, in contrast with traditional artistic media, allows expressing dynamic ideas through programming the movements of the robots. The material lends itself to present actions and behaviors, as opposed to static images or symbols. Its integration of tangible physical construction, artistic design, and sequenced programming offers children unique expressive opportunities and challenges. Moreover, unlike other modes of expression that involve motion, such as dance, robotics projects can result in a visible object or artifact that can be manipulated and that illustrates children's learning and change over time.

In the spirit of Reggio Emilia, which strives to make learning visible by documenting children's learning process and its products, working with robotics provides opportunities for celebrating and sharing the tangible projects of learning (Bers, 2008a, 2008b). Robotic technologies, thus, hold the capability to become another children's language. They provide them with a creative way to express dynamic concepts through a tangible object that facilitates self-reflection.

The experience described in this article, although focused on providing a "language" for identity expression and exploration among young Jews, has relevance for other ethnic groups as well. As children reflect about the kinds of actions that describe them as Jews through both the Jewish and the secular calendar and their major holidays and events, they are looking to identify themselves with the minority group, as well as to integrate with the majority mainstream culture. As children pick and choose actions and behaviors for the robots to perform as they encounter these events, the shopping cart metaphor proposed by Nagel (1994) becomes "a useful device for examining the construction of ethnic culture" (p. 162). According to Nagel, "ethnic culture . . . is composed of the things we put into the cart—art, music, dress, religion, norms, beliefs, symbols, myths, customs" (p. 162). By creating robotic representations of themselves that behave in certain ways as they encounter a secular or Jewish milestone in the calendar, young children undergo the process of "loading their shopping cart." The dynamic nature of the robotics programming language allows for expressions of actions and experiences, as opposed to only static symbols or facts. Examples of this are provided in the next section.

IDENTITY AS A DYNAMIC CONCEPT EXPRESSED THROUGH THE ROBOTS

As the Mi Ani projects demonstrated, children made and programmed robots to express their personal experiences in Jewish life. Their robots, as alter egos, represented their ways of participating in events, rituals, and curricular activities. For example, in preparation for Passover, the kindergartners pretended to be Israelite slaves in Egypt by building a tower out of blocks. When reflecting on this activity, one child chose to program his robot to express his feelings about it. He explained:

> This is pretending to be a slave in March. I did [program my robot to] "begin, spin, end," because I was spinning and trying to throw the block up on the right place of the tower. That's what I tried to do.

Some children represented an entire experience through the synecdoche of a single action, such as a child who programmed her robot to turn left and right repeatedly several times in succession, to mimic the motion of her hands sewing pillows for the Passover Seder. Other children extended this concept further, representing their personal experiences through a sequence of connected commands illustrating their actions through an entire event. One girl, for example, programmed her robot to describe her experience at Hanukkah from start to finish: singing Hanukkah songs, lighting the candles, and showing the candles' lights turning on. She explained:

> Then it [the robot] goes forward once, it sings, it shakes, and it puts its light on for doing—for Hanukkah. . . . First it sings before it lights the candles, then it lights the candles [which is the] first shake, then it turns its light on, because it lighted the candles.

This child expressed her experience not simply through the lens of one symbolic action, but as a sequence of actions that together created a scene depicting her overall Hanukkah experience. She used the robotic medium to represent her actions during Hanukkah candle lighting.

Other children, by contrast, used the robotic medium to express their experiences primarily in terms of emotions, programming robots to perform commands that represented their reactions to significant moments during the year. Children used commands such as "shake," "sing," and "spin" to express emotions such as happiness or excitement that characterized their dominant reactions to some events. One child, for example, represented himself sewing pillows for the Passover Seder by expressing his excitement leading up to the sewing, his preparation for it (sitting down in his chair) and his engagement in it (concentrating):

> [My robot is] spinning because it's excited to sew, I love sewing. It goes forward to sit down in its chair, and then the light goes on because it's concentrating.

By programming his robot in this way, this child represented his experience as a story integrating both his internal experience and his external actions. The dynamic medium of robotics enabled children to represent their experiences by demonstrating their actions and emotions within a given moment, displaying aspects of their personal identity that are salient in their kindergarten lives in a Jewish day school.

Overwhelmingly, most of the 22 children participating in the program chose to use the robots as a medium to express their personal experiences as opposed to static symbols from the Jewish tradition, as they had done in previous years in which the Mi Ani project was implemented by using only art materials. Both quantitative and qualitative analysis of student's robotic projects revealed that, as compared to previous projects, such as designing a challah cover or making drawings, children primarily used their robotic programs to represent their own experiences through actions, emotions, or a combination of the two (Libman, 2011). During interviews, children spoke about their robots as an alter ego. As children described the meaning of their robots' actions, it became clear that the robots were conveying the children's personal experiences with Judaism.

These representations can be explained as a product of the combination of the robotic media and the Mi Ani curriculum. The curriculum, which framed the robotics projects in terms of the timeline of the academic calendar, encouraged children to consider their experiences throughout the year, likely contributing to the preponderance of representations of their robot alter ego undergoing these experiences. Yet, at the same time, the uniquely dynamic nature of the robots was pivotal in enabling children to create representations of themselves as active participants engaged in these experiences. In particular, the capacity of the robots to perform multiple sequential commands encouraged children to present the story of their actions and emotions throughout an entire experience, at times even conveying changes in themselves over time. The technology was, thus, essential in facilitating children's ability to represent themselves as active agents in their experiences.

CONCLUSION

The work presented in this article was motivated by our goal to understand what affordances new technologies, such as robotics, have for young children's ability to express their Jewish identity. The work with robotics in the Mi Ani project provided an opportunity for children to explore their Jewish identity through dynamic forms of expression of actions and behaviors that define them as Jews experiencing events throughout the secular and Jewish calendar. Children's robotic projects expressed their understanding of themselves as actively engaging in Jewish practices. Rather than representing their Judaism through static religious symbols such as a Hanukkah menorah, Shabbat candles, or a Jewish star (which are commonly found when children are presented with other expressive media, such as art materials), children's robotic representations of their Jewish identity predominantly displayed them engaging in actions: lighting Hanukkah candles, rolling out matzah dough for Passover, or singing Hebrew songs.

The prevalence of this type of expression of Jewish identity can likely be attributed to the dynamic nature of the robotic media, which led children to represent themselves as actively engaging in Jewish rituals and events. As such, these representations reflect a concept of children's Jewish identity actively constructed in firsthand experience with Judaism rather than received passively in the classroom. Robots allowed children to express themselves not only as "being" Jewish, but also as "doing" Jewish things. At the same time, as children were asked to program their robots to respond to only three events in their academic experience that were especially meaningful, children had to negotiate the different kinds of choices they would make to depict themselves as part of a Jewish minority in a larger context of a kindergarten classroom in mainstream America.

This pilot study shows the potential of robotic technology as a crucial "language" in facilitating children's expression of their self-concept. Robotics enabled the children to showcase an understanding of themselves as active agents in their Judaism, highlighting a dimension of their identity gained from personal experience that might not otherwise have found expression.

In our multicultural world, programs such as this one, which offer children opportunities to explore and represent dynamic notions of identity, present educators and researchers with a lens into young children's conceptualization of their identity. Although the experience described in this article was carried out with a Jewish population, this project could be replicated and extended with a wide range of cultural, religious, or ethnic groups. Livnot U'Lehibanot. As children build their robots, they are building themselves, both in a metaphorical and in a literal way.

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