Identity Construction Environments: The Design of Computational Tools for Exploring a Sense of Self and Moral Values

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Abstract

We live in a society where concepts of self, community and what is right and wrong are constantly changing. This makes it particularly challenging for young people to construct a sense of self and to identify and develop their most cherished personal and moral values. It also puts pressure on schools and society to help them do so. This thesis explores how new technologies can be used to create environments explicitly designed to help young people explore their inner worlds. I coined the term *identity construction environments* (ICE) to refer to computational tools purposefully designed with the goal of helping young people explore different aspects of the self, in particular personal and moral values.

My contribution in this thesis involves three dimensions: theory, design and empirical research. At the theoretical level, I propose a framework through which people can think and learn about identity as a complex entity embracing multiple and contradictory values. At the design level, I describe an evolutionary process of building and investigating the use of three identity construction environments which are precursors to the one that is at the center of the empirical investigation described in this thesis. The three-dimensional multi-user environment I call Zora engages learners in the design of a graphical virtual city and its social organization. At the empirical level I present two studies of young people using Zora: a multicultural group of teenagers in an intensive summer workshop, and young patients in the Dialysis Unit at Boston Children's Hospital.

Despite their diversity, both populations demonstrated a desire and need to explore issues of identity and values. The first study looks at how teens used Zora to express their sense of self, to create a participatory community to discuss ethical and moral issues, and to explore the relationship between personal identity and moral values. The second study focuses on how pediatric patients used Zora to escape the harshness of the dialysis treatment and to create a network to facilitate mutual support and new kinds of interactions with hospital staff.

This thesis offers a theoretical framework and methodology for education in multicultural, moral and democratic values and for the potential role of computational environments in psychotherapeutic interventions.

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Acknowledgments

Seven years ago I left my home in Argentina with the hope of joining Seymour Papert's research group at the MIT Media Lab. I wasn't a computer scientist, I wasn't a formal teacher, neither was I interested in mathematics or in pursuing developments with the Logo language. I was a journalist, recently graduated from the Communication Sciences Department of the University of Buenos Aires, with experience working with children in non-formal Jewish education. I was fascinated with the nature of knowledge, and with how the computer could help people think in new ways, and specifically, about spirituality and religion.

I was very nervous about my first meeting with Seymour. I wondered how to use my weak English to introduce myself to the bearded man, how to start telling him about my interests and how to hide the fact that I wasn't a math or a computer person. I will never forget that meeting. Seymour smiled and asked if I minded if we went shopping at the grocery store during the interview. I loved the idea. It released some of the tension. While choosing tomatoes and lettuce, we engaged in a wonderful conversation about religion, computers, and education.

For various reasons, it took another three years for me to start working directly with Seymour. In the meantime I did a Masters of Education at Boston University, I learned computer programming and I spent two years at the Media Lab getting my masters degree in the Gesture and Narrative Language Group. During all that time I kept in touch

with Seymour, sharing ideas for projects and receiving his encouragement to pursue my interests –which were seen by some as “weird” in an environment like MIT.

As my doctoral advisor, Seymour wasn’t always present in the everyday life of a student. However, he was there for me when I most needed him: to resolve delicate academic issues at the beginning of my doctoral program, to give me freedom to pursue my research interests, to ask me challenging questions, to push me to explore further into the hardest areas and to be my harshest critic at times when I was feeling satisfied with what I had done. Thanks, Seymour, for all these years and for giving me the chance to learn with you and to think with you.

If Seymour opened the door for me at MIT, Mitchel Resnick was the man that took my hand and guided me inside. He accompanied me through all these years with advice about the small and the big things. He also provided support with the logistics that are the keys to successful research. The best class I ever took in my life was the “Technological Tools for Learning” taught by Mitch in 1994. It opened my mind to a new way of thinking about design and it also allowed me to see how the theories of constructionism were put in practice by a skillful teacher. From then on, Mitch has been a constant role model for me. From Mitch I learned how to think in different ways, how to navigate around the confusion of ideas associated with complex problems and how to express myself better. But also, I learned something about myself. I see in him some resemblance to the kind of mentor I would like to be for my future students. Although I was never officially one of Mitch’s students, he always had time for me. Mitch, you taught me by your example and I will always be grateful for this.

Sherry Turkle is the third member of my committee. I've been working with her since I first came to MIT. It was a natural connection. I had read her book "The Second Self" when I was a teenager in Buenos Aires. At the time, I never imagined that many years later I would become her student and would have the chance to share with her thoughts and ideas, class preparations and breakfasts at her place. Sherry provided me with a connection to the world of the humanities and social sciences and offered answers to hard questions about methodology and evaluation. She encouraged me to push the limits of my own research and to write in a clear and simple way. She has been a wonderful mentor over the years and her foundational work on identity and technology has strongly inspired my own work. Thanks, Sherry, for being there and for your harsh critiques and intellectual challenges.

The last member of my thesis committee is Joe Gonzalez-Heydrich. He is a medical doctor, a psychiatrist at Harvard Medical School and Boston's Children's Hospital. I first met him in the summer of 1997, when I worked as an intern at MERL (Mitsubishi Electric Research Lab) on a project at Children's Hospital. Since that first collaboration we kept in touch and I asked him to become a member of my committee. Joe has been my "angel" at the hospital and my mentor in thinking about the use of computers with psychotherapeutic goals in the midst of traumatic situations and environments. He helped me understand the particularities of the hospital culture, he opened the doors for me to do research with Zora and dialysis patients, and he became a true colleague in designing research methods and evaluations for that specific population. Joe was always ready to

engage in new projects and would read over and over many of my drafts of papers, proposals and thesis chapters. But most important, Joe was always there to talk to when the work with the sick children was emotionally challenging for me. Also, his commitment to the well-being of his young patients constantly reminds me of the importance of taking our research outside the academic ivory tower in a sustainable way. Gracias, Joe, for everything.

My work at MIT wouldn't have been possible without the contributions of smart, cheerful and dedicated undergraduate research assistants (urops). Working with them was one of the aspects I enjoyed most during my experience at the Media Lab. A big thanks to Aaron Arakawa, who implemented aspects of Kaleidostories and did a very first Java prototype with some of the ideas underlying Zora, to Daniel Vlasic who implemented Zora with the Microsoft Vworlds platform and who challenged me to respond to his inquisitive questions throughout the project, to Jon Chu who helped to debug Kaleidostories and assisted me in my work with teachers around the world, and helped me with quantitative data analysis. All three of you, Aaron, Daniel and Jon, have been a pleasure to work with and I hope you've learned from me as much as I learned from you.

A couple of years ago, I had a dream of a project, but I lacked the material means to make it real. Then I met Linda Stone from Microsoft and she believed in my dream. I am grateful to Linda, Lili Cheng and members of what used to be the Microsoft's Virtual Worlds research group, for providing financial and technical support to conduct the Zora project at the hospital. Thanks for your trust in the project and for making it possible.

When one uses technology in the real world, and not only in a lab setting, many people are essential to the project's success. At the hospital, I would like to thank David DeMaso MD, Associate Chief Department of Psychiatry and Professor at Harvard Medical School, the child-life specialist Kristen McGee, the social worker Evelyn Corsini, the chief nephrologist Dr. William Harmon, and the wonderful nurses and staff at the dialysis unit. Also many thanks to Darcy Roches who helped with the interviews and with the statistical data analysis; to the high-school students, Claudia Gerardin and Vitor Cardoso and to MIT pre-med student Matt Pots who helped the young patients to use Zora in the unit.

I am also thankful to the teachers Emilio Martinez, from Spain, Maggie Hugg,from Cambridge, Cecilia Alcalde from Argentina, and Beatriz Agudelo, from Colombia, who enthusiastically participated with their classrooms in different pilot experiences using Kaleidostories. Special thanks to rabbi Sergio Bergman, from Argentina, for making it possible to work with families with the Con-science project in the Arlene Fern community school, for informally advising me throughout my studies at MIT and for encouraging me to pursue the dream of using computers for teaching and learning about identity and human values. Two other people have also played a very special role in giving me wonderful feedback, thoughtful critiques and warm support. Edith Ackermann and Janet Kolodner, thanks for helping my work grow.

At the Media Lab, I thank Justine Cassell, my master's thesis advisor, for showing me the power of using computers to tell and listen to stories. I am also thankful to members of the Epistemology & Learning Group for providing a rich intellectual environment and to Claudia Urrea, Deb Roy, Nitin Sawhney, Mike Best, Claudio Pinhanez, Bakthiar Mikhak, Amy Bruckman, Eleonora Badilla, Ingeborg Endter, David Cavallo and Jacqueline Karaslaniaan for making the Media Lab a place where one can have stimulating conversations, many fun breaks and warm friends.

Many thanks to Alejandro Piscitelli and Anibal Ford, my mentors at Buenos Aires University, who continue to give me their encouragement and their critical perspective, even though I am very far from them. Thanks for helping me grow intellectually and for inspiring me with your hard academic work and your sense of social responsibility in the midst of the adversity of a troubled country like Argentina.

I am grateful to my mother-in-law, Nanny Bers, for editing and correcting the English in this thesis. Thanks, Nanny, not only for offering your kind help with this long document, but also for taking care of baby Tali when unexpected meetings and class duties arose. I would also like to thank my wonderful "mother's group" for sharing the first steps into motherhood. Your constant support made the writing of this thesis much easier. And special thanks to my good friends Paola Arditi and Rebecca Holcombe, for making my life happier as a grad student and a mother; and to my "sisters", Vale Bakalar and Debbie Gutman, for your love and support across time zones.

To my parents, Lydia and Hector, thanks for always listening, despite the distance. I couldn't have done it without your constant love, confidence and encouragement, even in the midst of a difficult medical situation. And to my brother, Santiago, who gave me the peace of mind needed to do my work knowing that he was helping out back at home.

Finally, I would like to thank my husband and best friend, Josh Bers, for everything. For discussing design decisions, implementation details, programming bugs, theoretical issues, data analysis and research paths. For reading and re-reading every single piece of writing many times and for always being there. Joshi, it was wonderful to know that I could always count on you to help with my research and with our baby Tali. Thanks for being the best father and husband I could ever dream of.

"Rabbi Tarfon said: It is not your obligation to complete

the work, but neither are you free to desists from it. "

Pirke Avot 11:21 (Ethics of our fathers)

This thesis is dedicated to my father, Hector Gerardo Umaschi.

Since I was very young, he has always taught me to be proud of

who I am and to fight for a just world, through words and actions.

Papi, te quiero mucho!

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Scenario: One day in the life of Zora

This scenario describes an actual engagement with the Zora identity construction environment by young people participating in a summer workshop*: Axel is a 12-year-old Jewish boy. He connects to the Zora multi-user environment from his home computer. His avatar has his own face*[1]*. Axel is happy because he feels that the virtual home he created in Zora is almost finished. By visiting it others can learn about Axel: the things and colors he likes most, the history of his family and his most loved games. So Axel decides to go around the virtual city and visit some of its public spaces. He quickly navigates through Zora's different temples*[2]*: the Jewish, the Baptist Church, the French Chateaux, and the Sports Arena. He is curious about the Jewish temple, perhaps because it is the space he knows best.*

Upon entering, a virtual rabbi welcomes him with a blessing. "This is clever!", thinks Alex, "I will program my soccer player to welcome visitors to the Sports arena and to throw a ball to my friends". The temple is populated by Jewish symbols and characters created by other Jewish kids participating in the workshop. At first sight, there is a map of Israel, Hebrew letters and a picture of a man praying. Axel navigates around the three-dimensional space and encounters many different objects. He clicks on a silver

[1] An avatar is a graphical representation of the user that can be controlled in real time.

[2] Zora temples are public spaces aimed at displaying information about cultures or interests.

mezuzah[3]*. It tells him a story about the meaning of the prayers it holds. Axel decides to add a television to the temple. Inside it, he puts a snapshot from the movie "Schindler's list" that he found in the web. He associates the value*[4] *"documentation" to the television and defines it as "it is very important to remember history. That way, bad things won't happen again. Holocaust survivors are getting very old now, and if someone doesn't record their stories of what happened, we are doomed to forget and repeat the horrors."*

While exploring the Jewish temple, Axel encounters Sybil, an older girl. They chat via their avatars and she invites him over to her virtual home. She wants him to also add a television there. Sibyl's home is populated by many objects. There is a picture of her best friend, a couple of books, a big tree and a small dog that tells jokes. Sibyl spent a lot of time thinking about what to put in her home. She shows the big tree to Axel and tells him that the real tree is in a forest behind her aunt's house. She went there with her digital camera and took a picture to bring into her virtual home. She loves that tree. As a child she would always dreamed about climbing to the top. While Axel is reading the stories associated with the big tree, the Zora mayor arrives. He says that a member of the community called for a meeting in the city hall to discuss a new issue: the creation of a virtual jail. Sybil and Axel teleport to the city hall. It raises a lot of discussion among the children who belong to the Zora community. Some think that a jail is a waste of effort.

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[3] A mezuzah is a small piece of parchment inscribed with Biblical passages from Deuteronomy, which is rolled up in a container and affixed by many Jewish households to their door frames in conformity with Jewish law and as a sign of their faith.

[4] I use the term "value" to refer to the importance or worth of a quality for an individual and society.

They believe that people should be punished by doing community service. Others are concerned about technical issues such as how to lock prisoners in a virtual jail. After voting, a majority decides that the jail won't be created. Axel is happy with the decision and let's everyone else know that by having his avatar pose with a big smile.

Chapter I- Introduction

We live in a society where concepts of self, family, community and what is right and wrong are constantly changing. This makes it particularly challenging for children and teenagers to construct a sense of self and to identify their most cherished personal and moral values. There is a mounting pressure in schools and society in general to create learning environments that encourage young people to actively explore these issues. This thesis focuses on how new technologies can be used to create environments to help young people explore their inner world. I coined the term *identity construction environments* to refer to computational tools purposefully designed with the goal of supporting young people to explore different aspects of the self, in particular personal and moral values.

The time has come for educators, researchers, practitioners and mental health professionals interested in issues of identity to discover how to appropriate the computer and design their own computational tools to influence new ways of thinking and behaving. For example, in the 80's computers played an important role in re-thinking ways of learning and teaching about math and sciences. Today they can play a similar role in the area of identity and values.

Two big research questions stand behind the work presented in this thesis: What kind of learning environment will afford opportunities for children to engage naturally in exploring and expressing issues of identity, particularly personal and moral values, in a constructionist hands-on way? And how can technologies be used to support this learning process?

A personal motivation: The Sabbath experience

When first thinking about how to design a learning environment that encourages young people to explore identity and personal values, one image came to my mind: the Jewish Sabbath. I am not an observant person nor do I strictly follow the laws and rituals prescribed by Judaism with respect to the Sabbath. However, I find the idea of the Sabbath fascinating. The Jewish philosopher and theologian Abraham Joshua Heschel said that the Sabbath is a "palace in time" in our modern lives: *" [its] goal is not to have but to be, not to own but to give, not to control but to share, not to subdue but to be in accord."* (Heschel, 1951). According to Heschel, the seventh day belongs to the realm of time, as opposed to the realm of space. In a beautiful and simple manner, he explored the many reasons that make the Sabbath a holy day. One of them has been particularly influential for me since I was 15, when I first read Heschel's book: the Sabbath is a time for introspection and reflection. A time for stopping the everyday work and looking back at who we are, how we are feeling and how we are building a caring, just and responsible community.

Heschel's description echoes my own personal experience of the Sabbath. I enjoy going to the synagogue, singing, dancing and reading the psalms. I enjoy closing my eyes and reflecting on the week that went by; and I enjoy, when opening them again, finding myself immersed in a community. I enjoy participating in the social life of the synagogue and contributing to different projects. I enjoy the noise of people sharing ideas, interpreting and discussing the Torah portion of the week; and I enjoy the silence of the personal meditation time. I enjoy reading the already familiar prayers and imagining

generations of Jews, past and present, all over the world, reciting them as well. It makes me think of myself as part of a history and as part of a future. I enjoy the Sabbath as a time of withdrawal from the outside world and immersion in the inner world. For me this immersion takes a very special form. It is not quiet and distant. Instead, vibrant sounds and colorful images populate it. It is not about sitting down in the synagogue and watching the time go by, but about engaging in a very different kind of activity than I normally do during the week. For me, the Sabbath experience is about creativity and reflection, community and self.

When designing a technological environment for learning about identity, all of these images associated with the seventh day came to mind. The Sabbath served me as a powerful “object to think with” (Papert, 1980). It illuminated the kind of experience that I hoped young people would have while engaging with the technology. I wanted kids to enter a very special place, "a palace in time", that would afford them similar experiences to the ones I had when entering the Synagogue: engage in self-reflection, creation, creativity, communication and participation in a community. I hoped children would collaborate with others in on-going community projects and, at the same time, engage in personally meaningful projects. I imagined them entering into "a palace in time" where they would find tools for self-reflection and community building. These tools would go beyond the traditional prayers, words and conversations that I found at the synagogue. I wanted results of quiet introspection and self-reflection to become tangible and manipulable.

How could I design this "palace in time"? How could I create a place, non-existent in the realm of space, that occupies no land, but the hearts and minds of people? I saw the computer as the ideal medium for creating a "virtual palace in time".In my vision, the computer could serve to craft a learning environment that would naturally afford similar kinds of experiences as the Sabbath.As time went by, I stopped talking about the computer in general and I started to think about a particular kind of computer application that I later called *identity construction environments*. After all, if Heschel were alive, I think he would agree with me that the Sabbath was, and still is, an identity construction environment for the Jewish people.

Intellectual roots

This thesis is situated in an intellectual trajectory that started in the 60's with the Logo group directed by Seymour Papert. At the time, Papert was a young mathematician whose ideas about thinking and learning were strongly inspired by his previous work with Jean Piaget in Geneva. He was fascinated with the nature of knowledge, i.e. epistemology, and with the learning process through which people construct this knowledge. Mathematicians, computer scientists, artists, teachers, humanists, social scientists and educators formed the interdisciplinary Logo group, based first at the Artificial Intelligence laboratory at MIT. Although many different research agendas and goals permeated the group, there was a shared vision with at least four pillars. First, the belief in constructionism _the theory that says that people learn better when engaged in the design and building process of personally meaningful artifacts in the context of a learning community. Second, the premium of self-reflection. This means that the best learning experiences happen when people are encouraged to explore their own thinking process

and their intellectual and emotional relationship to knowledge, as well as their personal history that affects the learning experience. Third, the importance of objects to be used as means of developing concrete ways of thinking and learning about abstract phenomena. It is in this context that the computer, as a powerful tool to design, create and manipulate objects both in the real and the virtual world, acquired a salient role in the vision of the Logo group. Fourth, the notion of powerful ideas that empower the individual by affording new ways of thinking, new ways of putting knowledge to use, and new ways of making personal and epistemological connections with other domains of knowledge.

Over time the Logo group produced many different versions of a programming language, based on LISP, aimed at helping young children think in new and concrete ways about mathematics. Different books have been written about the origins of the "language of the turtle", one of the many ways that people used to talk about Logo, and the different intellectual players in that endeavor. For the purposes of understanding the intellectual roots of this thesis, I will only mention Papert's contribution and the work of two of his colleagues. Sherry Turkle started working with him in the late '70s. Mitchel Resnick was drawn towards the Learning and Epistemology Group at the MIT Media Laboratory in the 1980s.

Turkle, a psychoanalytically trained psychologist and sociologist, joined the group to try to understand how new computational ideas moved into the general culture; in particular, how they entered the life of children. While studying the first generation of children using the computer and the physical robotic turtle, she realized that these children were

using the objects as a way of reflecting about their own selves. Turkle came to understand the role of the computer as a "second self" that evokes reflection about our own psychology. Turkle's foundational work is fundamental to the intellectual roots of my own work. I go one step further, and I ask the question how we can purposefully design technology so it will leverage the characteristic of the computers as a "second self". I take an interventionist approach and explore what design features make computers best suited for supporting personal development. This has implications for designing computational environments that can be use in psychotherapeutic and educational interventions aimed at helping people get to know their inner world.

Resnick, a physics major and science journalist, was fascinated with theories of decentralization and complexity. In his doctoral work he expanded both the kind of tools that the Logo group was producing and the kind of content and powerful ideas it was approaching. In order to help children develop a "decentralized mindset" and understand complex phenomena that permeates not only scientific theory but also everyday experiences, he designed and implemented a new version of Logo: StarLogo. Amongst many other things, Resnick's work on a different construction kit showed the potential of designing tools with the specific purpose of helping young people learn about ideas that are not always accessible to their age group with traditional media. This served as a strong inspiration for my work and for the design of identity construction environments that help people understand identity as a complex and dynamic construction composed of many diverse and contradictory elements, values among them.

In order to understand the work presented in this thesis it is important to situate it in the continuum constructionism/second self/construction kits, an intellectual trajectory initiated by Papert and followed by Turkle and Resnick. But it is also important to highlight how my work integrates their approaches and makes unique contributions by tackling dimensions that were unexplored by them. For example, I promote the idea that the computer can encourage self-exploration, and I propose that it can also explicitly nurture the individual by providing a framework that supports learning about the self. I also show how the vision of the Logo group, with its belief in constructionism, self-reflection, computational objects and powerful ideas, can be taken into the realm of therapy, spirituality, moral development and questions of personhood.

Contributions of this thesis

This thesis cuts across different disciplines and domains of knowledge. Its contributions fall into three dimensions: theoretical, design and empirical. At the theoretical level, I propose a framework in which to learn about identity, particularly about personal and moral values, with a constructionist approach that engages learners in computer-based design activities. Within this conceptual framework, which I call a *society of self* inspired by the "society of mind" theory of Artificial Intelligence (Minsky, 1984), identity is a complex construction composed of diverse and contradictory values that interact with each other. This resonates with psychological theories, such as object relations, that look at how people take the objects and people around and bring them "inside" as they develop aspects of self (Greenberg & Mitchell, 1983).

In my work, I not only focus on the people and objects that people “bring” inside, but also on the values. The term "values" suggest the importance or worth of something for a particular individual. Therefore, in this framework, learning about values is associated with exploring personal identity and the familiar, socio, cultural, religious and political context in which a sense of self develops. Values anchor us to a tradition and a sense of belonging; the emotional side comes to the fore. This approach goes beyond a purely cognitive perspective that only focuses on moral judgment, reasoning and decision making about values. This thesis proposes a holistic way of thinking and learning about values as aspects of identity. How could this happen? How can we create situations and environments where this learning process is facilitated and made more transparent?

At the design level, I introduce the general notion of *identity construction environments* (ICE), computational tools explicitly designed with these goals, and an example: Zora. This three-dimensional multi-user environment engages learners in the design of a graphical virtual city and its social organization. Identity Construction Environments afford learners to encounter the powerful idea of *society of self* and to develop areas of fluency (e.g. technological, ethical and narrative fluency) to understand it in a more meaningful and rich way.

Zora is a specific instantiation of the concept of ICE. Therefore it embodies general design principles for the implementation of ICE, as well as offers a specific structure enabled by the nature of the computational media I used: a graphical multi-user

environment. In this thesis I also present Zora's design history consisting of three prior prototypes: SAGE, Kaleidostories and Con-science.

SAGE (Storytelling Agent Generation Environment) is an authoring environment that allows users to create their own wise storytellers to interact with by telling and listening to stories. Kaleidostories is a web-based environment in which a community of users is represented by an on-line kaleidoscope. The system encourages children to tell stories about their models of identification and their values. As different narratives are created, the shapes and patterns of the on-line kaleidoscope change dynamically in order to visualize shared values and role models. Con-science is a research program that uses the Programmable Brick[5] and its derivative, the commercially available LEGO Mindstorms, to engage children and their families in the design of computational artifacts that express and represent their most cherished values.

The lessons I learned from the design and study of how children engaged with these prototypes allowed me to identify design principles for ICE and to design the Zora environment. By designing each of these environments, my own thinking about how to approach learning about identity and values became clearer. The progress from SAGE to Zora also reflects how, at each stage, the computational media came closer to the nature

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[5] The programmable brick (now commercialized as LEGO Mindstorms) is a tiny, portable computer embedded inside a LEGO brick, capable of interacting with the physical world through sensors and motors. It extends the child's construction kit by enabling them to build not only structures and mechanisms, but also to program their behaviors.

of the ideas about identity and values that I propose in this thesis. While in SAGE learners were inclined to think about values as a hierarchical system, in Zora learners were engaged in thinking about values as a complex multi-dimensional system that resembles more a dynamic computational network than a static pyramid.

At the empirical level in this thesis I present two case studies of young people using Zora in different settings: an intensive summer workshop held at the Media Lab with a multicultural group of teenagers, and a five-month study with young patients in the Dialysis Unit at Boston Children's Hospital. Despite their diversity in background and context, these populations share a need and desire to explore identity issues. The first case study explores how Zora could help young people from diverse cultural backgrounds to explore their identity while developing a sense of personal and moral values (Bers, 1999). The second case study focuses on how pediatric patients facing hemodialysis used Zora to escape the harshness of the dialysis treatment and to create a network to facilitate mutual patient support and new kinds of interactions with hospital staff. This study also included the analysis of the feasibility and the safety of using the Zora virtual environment with young patients in a hospital setting (Bers et. al, 2001). By comparing both experiences, it becomes clear that both populations used Zora in very different ways to express and explore their sense of self. The virtual cities and the spaces they created strongly reflect their differences.

Intended audience

My thesis can be of special interest to the following audiences:

- **Designers of technological environments.** This group may learn from the design principles informing identity construction environments. Within this community, designers of educational technologies and people working on human computer interaction (HCI) and computer supported collaborative learning (CSCL) may learn from the different design decisions that were made while creating the different computational environments presented in this thesis. In particular, researchers working on multi-user environments and the design of virtual communities might learn from the Zora identity construction environment.
- **Educators interested in moral and character education, civic or democratic education and education for multi-cultural understanding**. These groups may benefit from learning how new technologies can be incorporated into their practice and how these new tools might help them think about the content in new ways. For example, they may discover that identity construction environments offer the possibility of representing holistic thinking about identity and values in a formal way that can be evaluated by looking at both conceptualizations and actions.
- **Researchers and practitioners interested in exploring the possibilities that new technologies offer for personal, emotional, social and moral development.** This includes educators as well as professionals in the area of mental health, such as psychiatrists, psychologists, counselors and social workers. These groups might learn about the potential of identity construction environments to complement therapeutic interventions.

Preview of this thesis

This thesis has eight chapters. The first chapter is an introduction. Chapter II defines the concept of identity construction environment (ICE) and highlights the learning they afford. Namely, the exploration of the powerful idea of *society of self* which identity is dynamically constructed by interacting and contradictory values, and the development of technological, ethical and narrative fluency. It also describes the constructionist approach to learning about identity and values that ICE support and responds to the question of why the computer is a medium of choice for building these environments. Chapter III places my work in the context of related theoretical traditions of identity formation, moral development and constructionist learning. The chapter also describes some of the tools that are used by educators and mental health professionals to help young people learn new things about themselves and their communities: narratives, objects and technology. Chapter IV provides a design history of different ICE prototypes that I designed and used over the last five years at the MIT Media Laboratory (SAGE, Kaleidostories and Con-science), and presents lessons learned with each one. These lessons informed the design of the Zora multi-user virtual environment, the ICE that I focus on in this thesis. Chapter V presents Zora. It describes its technical implementation, the conceptual foundations informing its design and the participatory design method I engaged in prior to implementation. Chapter VI describes the empirical work done with Zora and presents two case studies of young people using Zora: one with a multi-cultural group of teens and pre-teens during a summer workshop and the other with pediatric patients undergoing dialysis treatment at Boston's Children's Hospital. For each case study, I present the methodology of the work, evaluation methods and learning stories as well as open

questions that might inform future work with these specific populations. I conclude the chapter with a discussion comparing the two case studies. In chapter VII, I revisit the powerful idea and fluencies that identity construction environments such as Zora evoke, by using examples from the learning experiences that happened in the two case studies presented earlier. Chapter VIII presents a conclusion. It proposes design principles for future ICE and for activities to happen in these environments. It also summarizes the contributions of this thesis. Chapter IX examines future research directions and reflects on the open research questions that can initiate a new research agenda.

Chapter II- Identity construction environments

Computers are powerful tools for self-exploration. Although they were originally conceived as instrumental machines, computers have another potential. They can serve as a "second self" or a psychological machine _not because they have a psychology but because they provoke us to think about our own (Turkle, 1984). However most computer applications do not engage users in sophisticated learning about the self. I coined the term *identity construction environments* (ICE) to refer to technological tools specifically designed to afford opportunities for exploring identity and engaging in reflection and discussion about personal and moral values. What makes a computational tool an identity construction environment? Below are the five main features that make them distinguishable:

1. They are *specifically* designed to help young people learn about their identity, particularly their personal and moral values. Therefore they present a structure that makes salient certain powerful ideas from these domains of knowledge.
2. In the same spirit as other constructionist tools for learning, they support the active design and creation of computational artifacts. These artifacts are a construct that represents a sense of self and its different aspects.
3. They offer opportunities to engage in storytelling and they elicit narratives about the self.
4. They are designed upon the *society of self* theoretical model, which understands identity as a complex and dynamic construction composed of conflicting values.
5. They support the creation and participation in a community. No sense of self and values develops in a social vacuum.

A constructionist approach to learning about identity and values

In the same spirit as other constructionist tools for learning, identity construction environments help learners to design objects as constructs representing a complex sense of self. During the design and creation process, children develop powerful ideas about identity and explore their personal and moral values. For example, in the Zora environment that I will present later in this thesis, learners can create a personal home and populate it with objects and interactive characters. The created virtual spaces are a "tangible" way to represent the multiple aspects of the self. In the design process, learners explore the idea of a *society of self*, namely the notion that identity is a dynamic construction composed of different elements and not a monolithic unity. In this process, they develop three areas of fluency that I will present in the following sections (e.g. technological, ethical and narrative fluency).

The idea of learning through design, which has been largely used by science education (e.g., Kolodner et al., 1998; Ritchie, 1995; Resnick et al, 2000), has rarely been explored by humanistic educators. The humanities have preferred to engage learners in introspection, reflection and discussion about issues of identity and values. Identity construction environments take the best of both worlds and offer opportunities for learners to introspect, reflect and discuss, as well as tools to become designers and makers of their own projects.

Identity construction environments belong to the family of "construction kits" that engage young people in a hands-on learning experience by designing personally

meaningful artifacts. For example, structural or mechanical construction kits, such as LEGO, have parts from the world of engineering (e.g. bricks, gears, and pulleys). Through the exercise of assembling them, young people can develop knowledge about mechanics. Other types of kits, such as computational construction kits (Resnick et al., 1996) are composed of parts from both the world of engineering and the world of computation (e.g. feedback loops, variables and control structures). For example Lego-Logo supports explorations of powerful engineering, robotics, computational and mathematical ideas.

In the same spirit as these construction kits, identity construction environments also provide building blocks, or parts, that can be put together to form a whole. For example, in Zora, the building blocks are meaningful objects, heroes and villains (models of identification and counter-identification). These building blocks are meant to symbolize different aspects of the self. By personalizing them, associating them with stories and programming their conversational behaviors, children express their sense of self. By putting them together in a virtual space, a major whole symbolizing identity, they explore the different aspects of the self and their relationship to each other. Referring to these aspects of the self as building blocks might be confusing if taken too literally. Aspects of the self are very different from Lego blocks that can be snapped together. However, the notion of building blocks is particularly appealing to me because it emphasizes the nature of identity as a construction made out of smaller parts, and not as a unified coherent whole.

Identity construction environments support both the *expression* and *exploration* of identity and values. Although these words are used interchangeably in everyday life, in this thesis they highlight different things. *Expressing* means to make known to others and to our own selves who we are. For example, one creates a home page as a way to show "This is who I am". *Exploring* means to search through or into our own self in order to achieve personal knowledge and possibly future change. For example, one makes a web-based family tree to learn more about personal roots. Therefore, *exploring* involves deeper introspection and self-reflection. The distinction between *expression* and *exploration* lies in the degree of personal or social transformation that can be achieved using the technology. Depending on the context of their use, identity construction environments can serve to express identity and make known who we are, or to explore identity and search through or into our own inner world and its different aspects[6].

Learning afforded by identity construction environments

What type of knowledge are learners likely to construct when engaging with identity construction environments? In everyday life some call it *knowledge about the inner world*, *self-awareness* or *self-understanding* to refer to mindfulness of one's own personality or individuality. Csikszentmihalyi and Rocheberg-Halton (1981) call it *cultivation* and describe it as *"the process of investing psychic energy so that one*

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[6] Identity construction environments can enable the creation of an artifact that, borrowing Sherry Turkle's vocabulary, can serve as a "second self". This second self is purposefully built and shaped by the first or real self. Think of a busy ego, a first self version 1.0, building a second self 2.0, that will never be released and that only serves the function of feeding back into him. This second self 2.0 can support the passage between who we are and who we want to become.

becomes conscious of the goals operating within oneself, among and between other persons, and in the environment". Howard Gardner (1983) calls it *personal intelligence* and describes it as involving two forms of knowledge intimately intermingled: intrapersonal, looking inward or having a sense of self-knowledge and self-awareness, and interpersonal, looking outward at other individuals and the community.

School standards, which identify the essential knowledge, skills, behaviors and attitudes that should be taught and learned, have different labels for this type of knowledge: personal development, mental health, civics education, social responsibility. In general, standards do not integrate teaching about the self with teaching about life in the community. They split these domains into two different curricular disciplines. For example, in the Commonwealth of Massachusetts, while the History and Social Science Curriculum focuses on civics (i.e. the rights and duties of citizens as participants in the community), the Health curriculum focuses on personal development and social awareness.

Identity construction environments are meant to engage young people in a learning process that integrates personal development with civic education. They support internal transformation towards a whole person with a well-grounded sense of self that participates in community life. This type of knowledge is very hard to assess and evaluate in traditional ways. However, when missing or not- fully-developed, it is easily identifiable since it can lead to asocial or violent behavior and childhood depression. In

the next section I will describe how this kind of knowledge can be described as powerful ideas about the world of identity and personal and moral values.

Powerful ideas supported by identity construction environments

In Mindstorms, Papert writes about powerful ideas: *"When one enters a new domain of knowledge, one initially encounters a crowd of new ideas. Good learners are able to pick out those which are powerful and congenial."* (Papert, 1980) Powerful ideas happen either by evolving personal intuitions or by acquiring and refining concepts already existing in society.

When skillfully used, powerful ideas are very empowering because they afford new ways of thinking. Powerful ideas are powerful in their use, powerful in their connections, and powerful in their roots (Papert, 2000). Below I present criteria summarizing the key features of powerful ideas.

1. Powerful ideas open up new ways of thinking, not only about a particular domain, but also about thinking itself.
2. Powerful ideas serve as organizing principles for re-thinking a whole domain of knowledge and its connections to other domains.
3. Powerful ideas persist over time and have a very broad range of influence by being successful in the marketplace of ideas
4. Powerful ideas, when skillfully used, empower the individual.
5. Powerful ideas evoke an emotional response in people and allow the establishment of personal connections with knowledge.

In the next section I describe the powerful idea of *society of self* that learners are likely to encounter when engaging with identity construction environments (e.i understanding identity as a complex construction, and values as aspects of identity) and the areas of fluency people develop (e.g. technological, ethical and narrative fluency) (see figure 1). In chapter VII, I will revisit the idea of *society of self* and these areas of fluency by showing examples from the two case studies using Zora presented in this thesis.

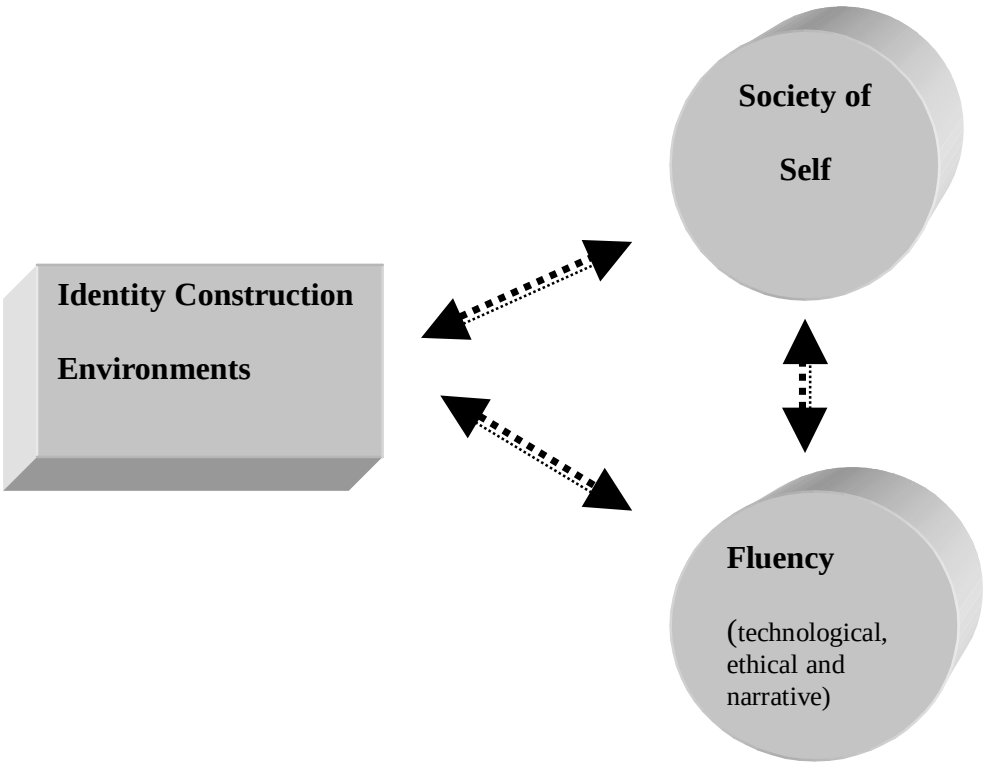

Figure 1: interaction between ICE and powerful ideas

The society of self

Identity construction environments engage young people in exploring identity as a *society of self*, composed of a plurality of co-existent and disparate aspects, Values, among them. The term is inspired by the "society of mind" which presents a model of how intelligence

can emerge from non-intelligence (Minsky, 1984). In the "society of mind" actions and decisions *"emerge from conflicts and negotiations among societies of processes"*, in the *society of self* they also emerge from conflicts and negotiations among different values that we internalize as aspects of our self. The society of mind denies the existence of an intentional unique center, a *"central Self inside the self"*. However it admits that this notion serves us well in practical life. In my approach, I also recognize that a vision of a core sense of self with central agency is critical to living a healthy life (Glass, 1993).

The *society of self* understands identity as a dynamic constructed system in which different and even contradictory elements, values among them, are integrated by an ego capable of unifying an individual's experience and action in an adaptive manner. As I will show in chapter V, Zora embodies the *society of self* model. It provides a structure for young people to create: 1) a virtual home, populated by different objects and their associated values, representing the complex evolving self; and 2) a unique avatar representing the core intentional ego in charge of picking and choosing the different aspects (objects and values) to take into the virtual home.

The notion of a *society of self* as a complex dynamic construction composed by a plurality of aspects resonates with ideas about identity that existed in the culture for some time. However, because of the lack of tools to make them concrete and accessible, young people rarely explored them in an explicit way. For example, postmodern theories of identity have talked about a "multiple populated self" containing a multiplicity of others that may not necessarily harmonize with each other (Gergen, 1991). These are role

models or internal voices that serve as models for action. Objects relations psychoanalysts also conceive of the self as a dynamic system composed by inner objects in constant interaction with external real objects or people (Greenberg & Mitchell, 1983)[7].

The *society of self* opens opportunities to explore values as aspects of identity. Research on values education has explicitly focused on the relationship between values and reasoning (Lipman; 1988; Kohlberg, 1976), values and personal views (Chazan, 1985; Raths, Harmin & Simon, 1978), values and narrative (Tappan & Brown, 1989; Jhonson, 1993) values and faith (Fowler 1981; Chazan, 1985) values and actions (Blasi, 1983) and values and moral identity (Blasi, 1984; Coles, 1986). While most of these approaches address the topic of identity, the relationship between questions such as "who am I" and "what are the values I hold and cherish" is rarely explored in an explicit way. Identity construction environments explicitly support the exploration of the relationship between identity and values. Objects represent aspects of the self and values are attributes of those objects. Therefore, values are explicitly linked to identity. For example, in the Zora identity construction environment, the process of creating objects that represent aspects

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[7] This group of psychoanalysts further explored Freud's concept of "internalization of objects". They proposed that when interacting with others, we are also interacting with the internalized objects or mental representations of those others that shape our emotional states, beliefs, values and attitudes. Although theorists like Melanie Klein, W.R. Fairbain and D. W. Winnicott had differences in the way they understood the nature of internal objects, they agreed on conceiving the self as a dynamic system composed by inner objects in constant interaction with external real objects.

of the self and defining the values that these objects convey or represent, engages children in thinking about the relationship between identity and personal or moral values.

At a personal level, the powerful idea of *society of self* provides an alternative to monolithic ways of thinking about identity and values which do not take into consideration the personal struggles of living in multi-cultural societies with multiple contradictory values. At a social level, making this idea accessible for young people serves a double educational function: preventing hate crimes based on the fundamentalist belief that there is only one “right” way of being, and consolidating democratic societies.

The notion of a *society of self* is particularly appealing because it brings to the surface two opposite elements that are important in understanding identity: fragmentation and cohesion, multiplicity and a sense of core uniqueness. The use of the temr society brings to mind multiple co-existing elements organized in a persistent, although malleable way. Despite its fragmentation, society, as well as identity, is a cohesive system with stable boundaries between itself and others. The educational challenge is to help young people grapple with this powerful idea and understand multiplicity and inner conflict as an advantage instead of a handicap. In the same way that Minsky wrote that "*The power of intelligence stems from our vast diversity, not from any single, perfect principle"*, the power of a strong and well-grounded sense of self stems from our vast diversity of values and our ego strength to negotiate among them.

Areas of fluency

The concept of fluency was first used by Papert to refer to the ability to use and apply a particular knowledge (in his case, knowledge of technology) in a fluent way, effortlessly and smoothly, as one does with language. (Papert & Resnick, 1995; Cavallo, 2000). Developing fluency involves mastering a subject area and the cognitive processes or habits of mind that empower people to think and behave in new ways. As with learning a second language, fluency takes time to achieve and requires hard work and motivation. The notion of fluency is a powerful idea by itself. Therefore it meets the criteria presented earlier.

1. The idea of fluency opens up new ways of thinking, not only about a particular domain, but also about thinking itself.
2. The idea of fluency serves as organizing principle for re-thinking a whole domain of knowledge (educational theory and practice) and its connection to other domains.
3. The idea of fluency persists over time and has a broad range of influence by being successful in the marketplace of ideas.
4. The idea of fluency, when skillfully used, empowers the individual by helping to clarify cognitive processes.
5. The idea of fluency evokes an emotional response in people and allows the establishment of personal connections with knowledge.

On the one hand, fluency empowers ideas. Being fluent in an area helps one develop a deeper understanding of that area and its important ideas. On the other hand, powerful

ideas develop fluency. Certain ideas are so rich that, in the process of understanding them, one becomes more fluent in ways of thinking and ways to put them to use. Identity construction environments such as Zora create the opportunity for people to develop fluency in the areas of technology, ethics and narrative. Next I will describe each of these three areas of fluency.

Technological Fluency

Seymour Papert coined this term to refer to the ability to use and apply technology in a fluent way, effortlessly and smoothly, as one does with language. For example, one can use technology to write a story, make a drawing or program a complex simulation (Papert & Resnick, 1995). Identity construction environments afford opportunities for learners to develop technological fluency by providing a rich set of tools for them to become designers and programmers of their own computational projects. During this process people are likely to develop new ways of thinking; therefore the computer's role goes far beyond being an instrumental machine. For example, technological fluency provides people with new metaphors to think about identity as a network, or a society of self, composed of diverse and contradictory elements, values among them.

Ethical Fluency

Ethical fluency implies the ability to be fluent regarding ethical and moral issues in which there are responsibilities and consequences. It aims to cultivate a growing sense of responsibility about the actions that we take in the world, thus allowing the passage from the moral thought to the moral deed. In the same spirit as technological fluency, ethical fluency means using and applying ethics in a fluent way to express, explore and realize

ideas. Once acquired, ethical fluency has an impact on ways of thinking as well as behaving since it opens up the possibility of envisioning different personal and community alternatives and their implications. Identity construction environments engage learners in developing ethical fluency by situating them in a context where they can discuss ethical issues and act upon them.

In the same spirit as moral imagination, ethical fluency affords opportunities to engage in role taking about present and future situations (Johnson, 1993). Identity construction environments engage learners in developing ethical fluency by providing a safe virtual space to experiment with "what if" situations and to assume different points of view and sets of values.

Narrative Fluency

Narratives are composed of memories, experiences, knowledge and reflections. They give life to past experiences by making events memorable to others and to us. Following Bruner (1986), by telling and listening to stories we make sense of the world. Therefore, by developing narrative fluency, people not only learn how to use the narrative genre, but also learn how to find and express their own stories. Sometimes we may not even be aware of our own view of the world until we tell stories that illustrate it. The act of storytelling is more than a way of using language to narrate an event. It is a process through which we mold our life, incorporating our knowledge of the world and our personal values and beliefs.

Roger Schank comments with respect to the importance of storytelling to identity formation. *"When people ask teenagers questions in their first job interview or in a college interview, they often give monosyllabic answers, interspersed with frequent 'I don't knows'. One reason for this is that teenagers, unlike adults, haven't got their stories down. They don't know what their stories are, both because they haven't thought about these things before and because their answers keep changing over time. The process of going from not knowing what one's stories are to knowing them and telling them, is what constitutes the process of self-definition."* (Schank, 1990). One of the goals of identity construction environments is to help young people know what their stories are by providing opportunities to develop narrative fluency. This means becoming familiar with the narrative genre, and in particular, with the relationship between storytelling and identity formation.

Computers as media for identity construction environments

Why use the computer to explore identity and values? For many centuries educators, psychotherapists, religious mentors and philosophers have used powerful techniques and tools to help people learn about their inner world. The computer does not, can not and should not replace them, but it can complement them. It can help people to do better what they were doing before and, at the same time, re-think their practice in the light of a new medium that offers new possibilities. Computers can also play an important role with respect to powerful ideas. They can serve to explore, externalize and share powerful ideas and new ways of thinking developed by these ideas. When computers are conceived as constructing material and not only as information machines, they can help people play with these powerful ideas in both a formal and concrete way.

Papert talks about three different roles that computers can play with respects to powerful ideas (Papert & Resnick, 1996). They can be neutral, liberators or incubators of powerful ideas. The *neutral role* refers to the fact that some powerful ideas are independent of the existence of the computer. They were installed in the culture long before the computer entered the scene and continue to exist without having experienced major changes. For example, the powerful idea of metaphor has almost not been affected by the presence of the computer. Computers can also play a role as *liberators*. Some powerful ideas existed before the computer; but the computer liberated them by making them more powerful and accessible to a wide range of people. Papert uses modeling and debugging as examples of powerful ideas that were always in the culture but, with the appearance of computers, got exalted. The third role that computers can play is as *incubators* of powerful ideas. This refers to the small subset of ideas that are really born from the existence of the computer. Ideas that we couldn't get to know without the computer. For example, the idea of programming a computational artifact to behave in certain way.

The computer plays a liberator role with respects to the powerful idea of *society of self* that Identity Construction Environments evoke. For example, the idea of identity as a complex construction existed a long time before the computer (in both psychoanalytical theory and in the everyday experience of people undergoing therapy and other introspective experiences). However, as we will see in the experiences with Zora presented in this thesis, identity construction environments can make it accessible to a

wide range of the public, particularly young people. In chapter VII I will revisit how the Zora identity construction environment liberates this powerful idea.

In this thesis I do not claim that identity construction environments are the only way to access the powerful ideas about identity and values described earlier. Other kinds of environments also encourage their exploration[8]. As I described in the first chapter, in my own life, the Sabbath experience served for me similar purposes. However, using computers to create identity construction environments is powerful because of the uniqueness of the medium to help integrate different activities and to engage in new ways of thinking. The success or failure of the learning experience, though, will depend both on how the identity construction environments are designed and on the social and learning context in which these environments are used.

In the following I describe some of the characteristics of the computer that make it a powerful medium for designing identity construction environments. Some refer to the quality of the computer as a construction material that naturally draws children's attention and leverages their inclination to make things, and others refer to the quality of the experiences potentially afforded by computers.

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[8] Young people have always explored identity and values through face to face workshops aimed at literary or artistic activities, Sunday schools, sports, immersion programs in nature, counseling sessions, secret letters, personal diaries, spiritual meditation, sharing life stories late at night in a cafe, login into a chat room, etc.

- **Role of computer in culture and society.** Young people spend many hours using computer applications for educational, entertainment and social activities. Why not offer them applications that provide the opportunity also to engage in an exploration of the self in a purposeful and conscious way? Nowadays, children can find computer applications that are supposed to help them learn many different things[9]. Why not design computational environments that offer a space and time reserved for introspection and exploration of identity and values?
- **Powerful media for expression**. Computers can be used as a surface to project and express aspects of the self by helping to externalize and act out values, fears and feelings. Thus they can serve a projective or catalytic function with respect to identity. In the same way that an artist chooses flexible and malleable materials that allow for interesting ways of self-expression, learners should also be able to choose computer applications that afford expressiveness. Identity construction environments could be one of them.
- **Powerful media for design**. Computers can be used to design computational objects and their behaviors. Therefore they can support hands-on project based learning by engaging young people in design experiences. For example, in Zora children can design virtual spaces representing themselves, and therefore explore

[9] I say, "supposed to help them learn" because the reality is that they do not always succeed. Part of the problem is not the quality of these applications but the theoretical framework upon which they are designed. For example, most of the educational CD-ROMS aimed at helping children read, write, learn to type or to do math, only engage them in a dry drill and practice exercise, instead of engaging them in a thinking process where new ways of understanding evolve.

powerful ideas about identity and personal values. Although computers are not the only material aimed at helping people design their own projects, they have three characteristics that makes them unique. First, the designed objects can be dynamic, thus exhibiting different kinds of behaviors that engage people in thinking about both physical and mental phenomena that are not static. Second, projects can be improved over time by debugging them. The word "debugging" has a positive meaning, sometimes missing in the concept of fixing something. This is very important because a sense of self does not get constructed following a straight path. Computers support this kind of gradual construction and deconstruction. Third, computers can be used to keep records of the different versions that get constructed at each stage, thus highlighting the role of dynamic change with respects to identity.

- **Supporting communities**. Networked applications allow the formation of a community of people who share similar concerns or issues. This enables social support networks as well as learning communities. These communities are not only virtual. Computers might help to augment the possibilities of interactions of face-to-face communities. For example, people can engage in types of experiences that are very hard to achieve in a face-to-face way. Once people become familiar with new ways of thinking and interacting in the safety of on-line environments, they can later transfer the experience to the face-to-face world.
- **Powerful media for discussion**. The computer, particularly when it is networked, supports discussion of ideas in both synchronous and asynchronous ways. This is

very important while exploring issues of identity and values. Confrontation of multiple points of view helps to form people's own perspective on things.

- **Powerful media for collaboration**. An important aspect of exploring values is not only to do it in an analytic way but also to live and act accordingly. The networked computer allows people to collaborate together in projects in very different ways than in face to face situations.
- **Learning continuum home-school**. In order to explore identity and values long-term engagement in an activity is needed. Computer applications provide the opportunity to break the separation between the learning that happens at school and at home by providing a continuum. At the simplest level, they allow students to work on the same project anywhere. But most interesting, they make it possible to engage different protagonists in the child's life (i.e. teachers, parents, siblings, etc.) in the learning experience.
- **New possibilities for evaluation and assessment**. Researchers and educators traditionally have had a very hard time evaluating how people are learning issues of identity and values. Habits as well as patterns of thinking and behaving need to be taken into consideration. It is very hard to observe continuity and coherence between how someone is feeling, talking, thinking and doing things in the world. Computers provide the possibility of making this task easy by logging everything that is said and done in the virtual world. By analyzing these logs, it is possible to reconstruct and evaluate the experience and to observe changes over different periods of time.

Chapter III- Foundations

Both abstract theories and concrete tools inform the design of identity construction environments such as Zora (see figure 2).

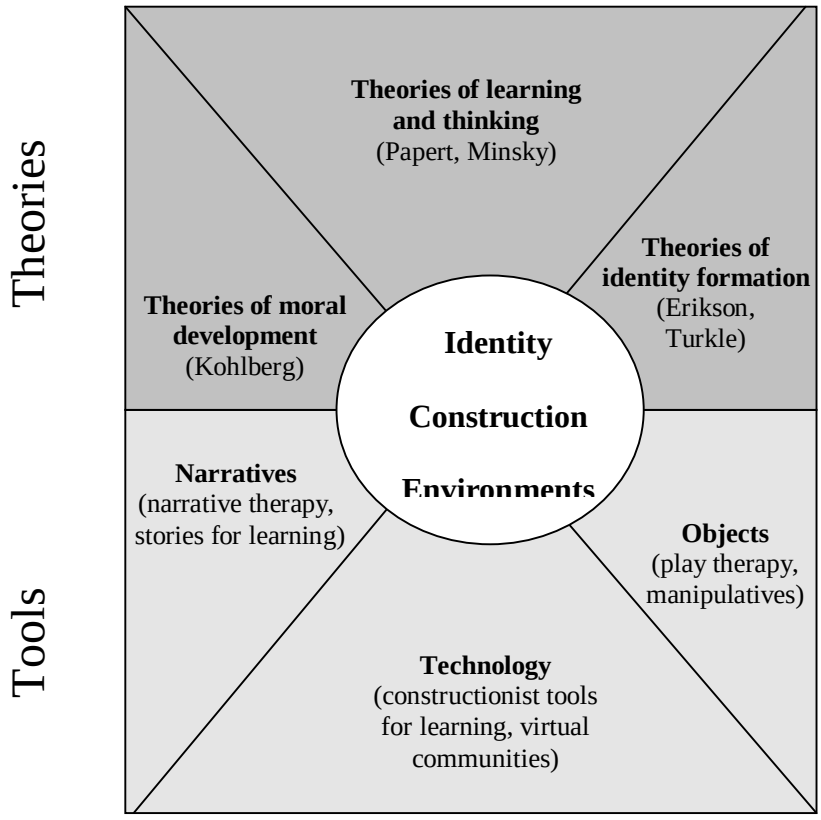

Figure 2: Identity Construction Environments foundational work

In terms of theories, foundational work includes Papert's constructionist learning theory (Papert, 1980) and Minsky's society of mind (Minsky, 1984), theories of identity formation (Erikson, 1950), and of particular importance, Turkle's work on identity and technology (Turkle, 1984,1995), and Kohlberg's theory of moral development in a just community (Kohlberg, 1982). In terms of tools, identity construction environments

integrate the use of objects and narratives with learning technologies and virtual communities. In the next sub-sections I will present each of these components.

Theories

Constructionism

The design of identity construction environments is based on the constructionist philosophy of education which asserts that people learn better when they are engaged in building their own personally meaningful artifacts and sharing them with others in a community (Papert, 1980). By constructing an external object to reflect upon, people also construct internal knowledge. Constructionism has its roots on Piaget's constructivism. However, while Piaget's theory was developed to explain how knowledge is constructed in our heads, Papert pays particular attention to the role of constructions in the world as a support for those in the head. Constructionism takes an epistemological perspective aimed at understanding the nature of how learning happens but also an interventionist perspective aimed at producing a change in the way people learn. For this purpose it uses the computer as a powerful tool to support new ways of thinking and learning.

Within constructionism, some research has looked at how immersive computer learning environments can support discussion of personal and cultural values. In these experiences, technology drew people into a higher level of mutual respect and collaboration, and an increasing sense of autonomy, interpersonal awareness and self-confidence (Bisaillon, 1989; Hooper, 1994; Bers & Urrea, 2000). While this research made used of general purpose programming environments such as Logo and the LEGO

Mindstorms robotic kit to learn about identity and values, my research on identity construction environments focuses on the use of technology specifically designed with these goals in mind. For example, in Zora, learners create a virtual city with spaces populated with dynamic objects embodying aspects of identity. By describing these objects with narratives and values they engage in reflection about personal and moral values.

One of the tenets of constructionism is the need of a community of learners to share projects and explore ideas. Some research has focused on face-to-face learning communities (Falbel,1989;Shaw 1994; Pinkett, 2000) while others have explored different forms of on-line learning communities (Bruckman 1998; Evard 1996). A constructionist approach to communities maximizes each individual's opportunities for learning, creative expression and content production and, at the same time, provides a support network. For example, identity construction environments such as Zora take advantage of this and engage learners in the creation of a participatory *micro-community* in which personal and moral values are developed and put to test through behaviors.

I use the term *micro-community* to refer to a safe, dedicated space in which to experiment with new ways of thinking and behaving, and to engage in introspection and self-reflection. This word is inspired by Papert's use of the term *microworld* to refer to a safe, protected and experimental space that serves as an incubator of knowledge. For example, the LOGO language was meant to be a micro-world to explore ideas about geometry and think in new ways about mathematics. Micro-communities have two distinguishable

features. First, the number of members is relatively small; therefore issues of social organization and democratic participation can be tackled without the problems encountered by large virtual communities (Kollock & Smith, 1996). Second, in contrast with virtual communities in which members might or might not meet face to face for social purposes, micro-communities encourage members to have regular face-to-face interactions as part of the learning experience. Micro-communities help face-to-face communities to become stronger and more functional.

The society of mind

The "society of mind" (Minsky, 1988) has inspired my approach to both understanding identity as a dynamic construction composed of conflicting aspects or values and to designing identity construction environment for young people to grapple with this notion. The "society of mind" theory proposes the mind as a collection of many small processes, called agents. These agents can only do very simple things. Yet when they join in societies, it leads to intelligence and complex behavior. In his book, Minsky wrote: "*The power of intelligence stems from our vast diversity, not from any single, perfect principle. Eventually, very few of our actions and decisions come to depend on any single mechanism. Instead, they emerge from conflicts and negotiations among societies of processes that constantly challenge one another*" (Minsky, 1986 pp. 308).

Minsky used the "society of mind" model to explore how intelligence can emerge from non-intelligence. I use it as a metaphor to explore how identity can be conceived as a *society of self*, composed of a plurality of co-existent and disparate aspects, values among them.

The society of mind theory inspired my work by helping me:

1. Understand **identity as a system**, an interacting group of elements forming a unified whole.
2. Understand **identity as a dynamic system** that evolves and changes over time according to the interactions between its inner elements.
3. Understand **identity as a constructed system.** A core sense of self (or ego) can consciously incorporate and integrate elements into this system, thus constructing it.
4. Understand **values as elements** of this system.

Theories of Identity Formation

The design of identity construction environments draws from the research of Erik Erikson in identity formation (Erikson, 1950; 1968) and from work of Sherry Turkle on technology and identity (Turkle, 1984; 1995). Erikson studied the process of identity formation in healthy personalities. Instead of focusing on pathologies, he focused on the growth and crises of identity during the different stages of the life cycle. He looked at adolescence as a critical time for the formation of a sense of self. Thus his work is particularly relevant to the research presented in this thesis. Erikson studied the interplay between the psychological and the social, the developmental and the historical, the cognitive and the affective. This integrated view of identity informs my work. In his vision, identity is characterized by a tension between differentiation and identification: the need to find boundaries between self and others, and the need for integration into a major whole consisting of family, culture and society.

For example, in Zora, learners can explore this tension by designing virtual autotopographies, or spatial representations of identity composed of collections of symbolically significant objects (Gonzalez, 1995). These autotopographies can be of two types: personal homes and public spaces called "temples". The personal homes contain objects evoking the uniqueness of the individual's design and reflect his or her core sense of self. Therefore by constructing these personal homes, learners explore Erikson's differentiation process involved in identity formation. The public temples contain objects focusing on a specific culture, religion or interest. Their public nature refers to the fact that, although their design is initiated by one individual, other members of the Zora community can also contribute to the space. By constructing the public temples, learners explore the process of integration into a culture and society.

Erikson wrote that a *"sense of identity provides the ability to experience one's self as something that has continuity and sameness and to act accordingly"* (pp 42). Therefore while designing identity construction environments such as Zora, it is important to provide opportunities for learners to engage in reflection while creating their virtual autotopographies, and actions while participating in a community setting.

Sherry Turkle's research applied Erikson's theoretical framework to the study of how people use MUDs (multi-user domain) and other examples of computer mediated communication on the Internet as a *"social laboratory for experimenting with the constructions and re-constructions of self that characterize postmodern life"* (Turkle, 1995). For example, she borrowed his notion of "moratorium", a time of constant

experimentation, interaction and reflection in the adolescent's life, and proposed that virtual worlds can provide spaces for this moratorium. Zora does not only offer a space for moratorium but it also has a framework with design features that encourage young people to explore further and engage in a learning experience about the self. These design features are described in chapter V.

Theories of moral development

The term *values* suggests the importance or worth of something for an individual. There is extensive research in philosophy and sociology which addressees what values are and how they have evolved in society. This is beyond the scope of this thesis, since the main focus is not values *per se* but values as components of identity. Therefore, the focus is on how psychology has come to an understanding of values.

Jean Piaget 's work is directly relevant to contemporary theories of moral development and constructionist theories of learning. He studied the way children play games in order to learn more about their beliefs about right and wrong and their application of rules when playing (Piaget, 1965). According to Piaget, all development emerges from action; that is to say, individuals construct their knowledge of the world as a result of interactions with the environment. In the same way, they construct knowledge about morality, which is not learned by simply internalizing the norms of a group, but by a developmental process that involves personal struggles to arrive at fair solutions.

Extending Piaget's work on moral judgement in the child, Lawrence Kohlberg understood moral development to be the result of an increasing ability to perceive and integrate

social experience through taking diverse roles and encountering different perspectives. He identified six stages of moral development that start with value judgements of a highly egocentric form (i.e. what I like is what is good), followed by a decentering process (i.e. something is good because it is good for somebody else). The final stage is reached when abstract moral principles develop (i.e.I don't kill because killing is bad) (Kohlberg, 1976). The assumption behind this approach, as well as that of Piaget, is that there is a universal progression from a concrete to an abstract way of thinking about moral issues.

Although Kohlberg is most well known for his psychological model of stages of moral development (Kohlberg , 1976), he has greatly contributed to the field of moral education by proposing the just community model (Kohlberg, 1985). This approach proposes that the involvement in participatory democracy, social institutions, group decision-making and self-government is critical in shaping the individual's moral development. My work draws on this aspect of Kohlberg's research. In the same spirit as Coles (Coles,1986) I focus on the moral lives of children rather than on their moral thinking.

As revisionist work on Kohlberg proposed, much of the unexplored promise of the Kohlbergian project lies in the just community model instead of in the stages model (Reed,1997). While designing Zora my goal was to provide an environment to support the formation of a virtual just community. Zora involves learners in the creation of a participatory micro-community where they can put to test personal and moral values through actions and conversations. For example, In Zora's City hall people engaged in

powerful conversations about dilemmas as well as in the actual development of a just community in which values are not only a matter of analysis and reflection but also of everyday action and behavior (Kohlberg, 1985; Hickey & Scharf, 1980).

In my work I do not advocate Kohlberg's stages of moral development. The assumption behind this approach is that there is a universal progression from a concrete to an abstract way of thinking about moral issues. For example, Kohlberg understands "justice" as the key concept (or value) that an individual develops when engaging in higher stages of moral judgement. A hierarchical pyramid in which certain values, such as justice, are placed on the top represents Kohlberg's underlying way of thinking about values. This is exemplified by the way Kohlberg sets up moral dilemmas and asks people to reason about them.

Critiques of the idea that the highest stage of development involves abstraction and logical reasoning emphasized the validity of different thinking styles (Papert, 1987; Turkle & Papert, 1992) and showed a difference in the way in which men and women reason about morality (Gilligan, 1982). While Kohlberg and Gilligan engaged in a theoretical debate with two radically different perspectives on moral judgement, they shared the hierarchical way of thinking about values. While Gilligan's work began with a critique of Kohlberg's stages, she ended up putting "caring", instead of "justice" at the top of a pyramid.

Hierarchical views have been hard to escape, but the conceptual frameworks and the material situations associated with computers (e.g. networks, Internet, etc.) are very hospitable to non-hierarchical ways of thinking abut values. For example, identity construction environments offer the possibility of thinking about values as forming a dynamic network, namely the *society of self*, instead of the pyramid concept which ranks values in hierarchical order according to their importance to an individual. In this dynamic network nodes or agents (representing values) become active and powerful as guides to action, according to the context in which the individual is situated. This supports a kind of discourse about values that brings to the surface the complexities of an heterarchical system and the problems associated with it.

For example, Zora supports the co-existence of a plurality of thinking styles by providing two design features representing the pyramid and the network approach to values. In the spirit of the pyramid approach, learners can enter their values and corresponding definitions directly into the collaborative values dictionary tool, thus exploring values as universal abstractions disconnected from particular instances. Or, in the spirit of the network approach, they can assign values and definitions as attributes of their objects, thus exploring values in a more concrete way, grounded in experiences and behaviors.

Tools: bridging the divide between education and psychotherapy

My work integrates educational and psychotherapeutic initiatives that understand identity as a complex issue worthy of serious study. In the United States there is a great divide between two types of interventions. On the one hand, educational interventions are mostly aimed at issues of multiculturalism (which limit identity to ethnicity) or character

formation (which limit identity to morality) and do not focus on personal psychological issues. On the other hand, psychotherapeutic interventions are rarely conceived as a learning process that would benefit. The general perception is that therapy serves to "fix" what is not working and therefore it is only for people with pathologies.

Unfortunately, this view ignores the fact that psychotherapeutic interventions usually have an holistic focus on identity and provide tools to engage in a learning process about the self from which everyone could benefit. Identity construction environments help bridge the divide between educational and psychotherapeutic interventions. Three types of tools, generally utilized in these domains, inform their design: narratives, objects and technologies for learning.

Narratives: their role in identity formation and moral development

Identity construction environments such as Zora are inspired by the use of storytelling in very different forms of therapy (Wigren, 1994; Rosen, 1982). For example, narrative therapy understands identity as constructed through the stories we tell and re-tell about our lives and proposes interventions aimed at helping people generate alternative stories to find new meanings (White & Epston, 1980).

Narratives serve at least three vital functions: cognitive, emotional and social. At the cognitive level, narratives are fundamental constituents of human memory that provide a distinctive way of ordering and understanding experience (Bruner, 1986). Research has shown that new experiences are interpreted in terms of old stories and generalized story scripts (Schank & Abelson, 1995). Second, at the social level, the tales that one knows

and can tell define the social group or culture to which one belongs (Turner, 1980). Myths, legends, and traditional tales provide a sense of continuity between generations as well as models for human behavior (Campbell, 1988). While, in early childhood personal stories play a role in the social construction of the self (Miller et al, 1990), in adulthood they help to establish coherence in people's lives (Linde, 1993). Last, narratives play an important emotional function. As Anna Freud (1965) and others have shown, through the verbal-play experience of storytelling, people can find not only recreation but also self-cure. Therefore, from cognitive, social and emotional standpoints it is important for young people, and adults, to have a place to tell their story. Identity construction environments can provide such a place.

Narrative also plays an important role in understanding moral development (Tappan & Brown, 1989; Jhonson, 1993). It has a long and universal tradition in programs aimed at moral and character education. Stories such as fairy tales or myths, and biographies of historical and religious figures are used to introduce universal human values and role models to children (Bennett, 1993; Coles 1989). In some cases, storytelling's potential has been augmented by the use of computation. For example, Roger Schank's research group, at the Institute for the Learning Sciences, has used stories to design ASK systems, a form of hypermedia in which the user provides questions and the experts, represented by the ASK system, provide the answers in the form of stories about moral dilemmas (Schank,1994; Berman, 1995).

Objects to introspect with

Objects have both an instrumental function (what they can do) and an evocative function (what do they mean), and are a very rich material to work with. Play therapy has paid particular attention to the role that diverse objects play in children's exploration of their identity. For example, they have used puppets, marionettes, arts material and diverse toys that engage children in symbolic enactment to express their feelings and explore their sense of self (Barnes, 1996). Inspired by this tradition, identity construction environments engage learners in the design of personally meaningful objects. In particular, Zora's use of objects has been inspired by work looking at the meaning of the most cherished objects that people put in their homes (Csikszentmihalyi & Rochberg-Halton, 1981). These objects not only have a decorative function but they also say a lot about people's value system and personal identity. In Zora, the objects that young people put in their virtual homes are meant to represent aspects of the self and are explicitly associated with personal and moral values.

In education there is a long-standing tradition that shows the potential of using "objects to think with". For example, Montessori and Fröbel designed a number of "manipulatives" or "gifts" to help children develop a deeper understanding of mathematical concepts such as number, size, and shape. In the same spirit, "digital manipulatives" seek to expand the range of concepts that children can explore, particularly dynamic processes, by embedding computational power in traditional children's toys such as blocks, beads, and balls, (Resnick et al, 2000).

My work explores the potential of using objects to help people think and learn in new ways about identity and values. Zora integrates the use of virtual objects and narratives by borrowing the object-oriented programming paradigm. Within this, computational objects are modeled after real-world objects in that they have attributes and behaviors which allow them to communicate with other objects and people.

The object-oriented metaphor is particularly useful in providing ways of thinking about values in concrete ways rather than as abstractions. It highlights the relationship between identity and personal and moral values. For example, in Zora, the question "Who am I? " is answered by the objects that learners decide to put in their virtual spaces: a flag of their parents homeland, a picture of their best friends, a soccer ball, a piece of their favorite cake. All these objects represent fragments of important aspects of the self. The question "what are my cherished values?" is answered by the value attributes associated with those objects. For example, the value "honoring your ancestors" linked to the flag, the value "friendship" associated with the best friend's picture, "productive exercise" to the soccer ball and "health" to the cake. While making an explicit decision about which objects would become part of their virtual homes, and what kinds of values they convey, learners engage in introspection and self reflection.

Technological Tools for Learning

My work is deeply influenced by research on the design of constructionist learning environments (Resnick et al 1996). These environments support two types of connections required by constructionism to bootstrap learning: personal connections — children can design projects following their interests; and epistemological connections —new ways of

thinking are encouraged. These key aspects inform the design of identity construction environments. Learners can explore new ideas about identity and values in connection with their personal interests and motivations. They can also use tools to become designers of their own projects. In chapter V, I will present the tools that Zora offers.

Research on networked learning environments also inspired my work. These afford quick access to a wide range of information and resources as well as communication mechanisms to conduct research in a collaborative way and engage in critical debate (Songer, 1996; Scardamalia & Bereiter, 1994; Pea et al. 1994; Edelson, 1999). While most of this work is aimed at reproducing the characteristics of a community doing scientific inquiry, identity construction environments are more in line with virtual communities that enable new expressions of social life and support networks (Morningstar & Farmer, 1990; Kollock & Smith, 1998; Rheingold, 1993; Donath, 1996). Although this research informs the design of Zora, the research presented in this thesis does not study collaboration or the evolution of virtual communities and on-line identities. The choice of a multi-user environment that enables the formation of community was specifically aimed at providing a social context for exploring identity and personal and moral values.

Chapter IV- Preliminary designs

In order to develop new ways of thinking about identity and values and designing interventions for learning about these issues in a constructionist way, reading theory is not enough. Therefore, over the last five years I designed and tested three prototype projects, SAGE, Kaleidostories and Con-science. In this chapter I will describe this foundational work and I will highlight lessons learned that lead to the design of Zora, the identity construction environment that I will focus on in my thesis. By designing each of these environments, my own thinking about how to approach learning about identity and values became clearer (see figure 3). The progress from SAGE to Zora also reflects how, at each stage, the computational media came closer to the nature of the ideas about identity and values that I propose in this thesis.

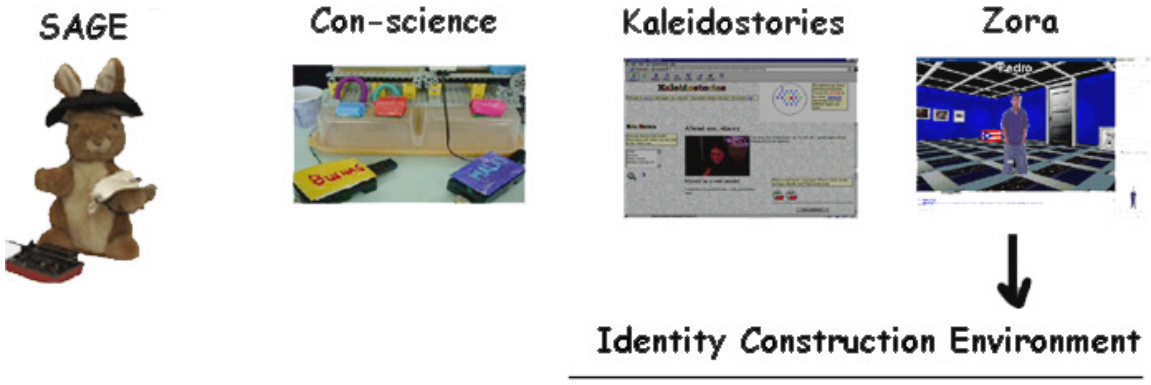

Figure 3: each new design makes clearer ideas about identity and values.

SAGE: children as designers of storytellers and story listeners

SAGE is an identity construction environment that enables children to create their own wise storytellers to interact with by telling and listening to stories. Children can design wise storytellers, embody them in a programmable interactive stuffed toy, and engage with them in conversations by expressing their feelings in a playful context. They can program the conversational interaction between storyteller and potential users as well as create the database of comforting stories offered by the storyteller in response to user's problems. I designed SAGE as part of my master's thesis under direction of Prof. Justine Cassell (Umaschi, 1997).

The LISP-based SAGE architecture has three modules:

- **Computation module**: parses the user's story to extract nouns and verbs, expands these keywords and performs a match between the user's personal story and a comforting story in the database that deals with similar themes.
- **Authoring language**: serves to design the interactive characters, the conversational flow between user and storyteller and the database of stories offered by the system in response to the user's story. The graphical user interface allows children to create conversational flows in a similar way that they engage in pretend role play games, by planning *who* will say *what*, and *when*, while arranging objects in the conversational structure window.
- **Interface**: is the layer through which a user communicates with the system, composed by the computer screen and a programmable interactive soft toy that behaves as the storyteller's assistant. The toy, which can be programmed by the

children, moves its ears, shakes its body and blinks its eyes to indicate attentiveness and (see figure 4).

Figure 4: The interactive stuffed rabbit

Becoming sage by using SAGE

We conducted several studies to examine children's interactions with the sage storytellers, and their ability to build their own meaningful characters. Our earliest research showed that children engaged deeply with sages that we had designed, such as a Hasidic Rabbi and a Buddhist scholar (Umaschi, 1996). When interacting with them, children revealed aspects of their inner lives and the problems they face everyday. For example, below is an extract from a conversation log between a ten year old and the Hassidic Rabbi:

```
SAGE: You know Abrahem , a story is more than a story...a story has
power. Nu, what is your story? what is in your mind ?
USER: Once I was learning math and I could never understand it.
SAGE: Oy vey... go on, Abrahem.
```

USER: I kept on trying and trying, but no matter how much I studied I could not get it.

SAGE: I see Abraham ... what else do you have to share with this old rabbi?

USER: I have the same problem with English, Hebrew and all other subjects.

SAGE: Oy va voy, Abraham let me see if this rabbi understands. Once you were learning math and you could never understand it. You kept on trying and trying, but no matter how much you studied you could not get it. You have the same problem with English, Hebrew and all other subjects. Is this right?

USER: yes

SAGE: Your situation reminds me of a story. Remember that there is power in the stories. The Gerer Rabbi said: "Exile contains redemption within itself, as seed contains the fruit. Right work and real diligence will bring out the hidden reward. Abraham, do you see the point of this story related to your own story?

USER: yes, so now I see that I just have to keep on trying no matter what.

SAGE: I hope it was helpful. Zie gezunt, be well. May the Lord, Source of Life, bless you Abraham with peace, and may you find your inner peace. Amen.

In research done for my master's thesis I showed that fourth and fifth graders used the tool to create storytellers as projections of themselves or their role models, and to communicate their deepest thoughts with parents or adult figures (Bers & Cassell, 1998). For example, they designed their own meaningful storytellers, such as Mother Nature,

Shaquille O'Neil and the Big Orange Fox (Bers & Cassell, 1998). In building a sage, children designed that person to whom they wished they could turn with their problems. They also played with different notions of self, by creating or imitating the narrative voices they wanted or needed to hear.

Using SAGE they were able to design and model abstract structures needed and used in both programming and storytelling. In order to do so, they created, manipulated and put together narrative building blocks such as speaker turns, scripts and communicational actions. This allowed them to explore the conversational storytelling genre while observing other people's interactions with their storytellers.

In later research, I explored how SAGE could be used for therapeutic purposes with sick children who are particularly in need of telling the stories of their lives. I used SAGE in the cardiology unit of Boston'sChildren's Hospital for a period of three months and, as a result, I produced design recommendations for environments to be used in hospital settings (Bers et al, 1998). Young patients used SAGE to tell personal stories and create interactive characters, such as Mrs. Needle, as a way of coping with cardiac illness, hospitalizations, and medical procedures.

For example, Damian, a 16 year old patient created "Mr. Tape." He created the conversational structure, the scripts that "Mr. Tape" says, and also the stories that he tells. After, he interacted with the character and invited other people in the Cardiac Unit to play with him. This is a saved log of Damian's interaction with Mr. Tape.

SAGE: Hi my name is Mr. Tape. What is yours?

CHILD: Damien

SAGE: Well hello, Damien, my name is Mr. Tape. I am very sticky, as you probably may know, a lot of children don't like tape because when you have to take it off it hurts. Some Kids like me to put me anywhere, like the face, hands, just for fun. Do you like tape?

CHILD: no

SAGE: I am sorry, why don't you like me. Does it hurt you?

CHILD: sometimes, yes

SAGE: Well, I am good for taping things up that are broken and I come in different Kinds. I try to do the best I can with making things back to normal. So, Damien, how old are you ?

CHILD: 16

SAGE: You are lucky to be able to live that long. My life expectancy is only two to three years. Some people use me up fast and sometimes I am forgotten in the junk drawer. I get pretty lonely in there. Would you like to hear my story?

CHILD: yes

SAGE: When I am used as medical tape I am the number 1 user for nurses and doctors. I go on IVs and wrap things up. I am good to write on for the nurses to put on IV medication. You can use me just about everything in the hospital but I am not very sticky for heavier objects. I could be colored on and used for decorations for Kids that are very bored. Some people just throw me around and drop me which hurts my feelings, I can't pick them up and drop them, but I thank them for using me as their number one choice. Well it was nice talking to you, maybe you will talk to me again and listen to my story. Bye

The research done with SAGE showed that children in very different situations used the tool to explore aspects of their inner lives through the creation of stories and storytellers. Children developed self-knowledge by looking inward and expressing their feelings. However, SAGE did not support deep exploration of the conflicting aspects of identity. The design of the tool, composed by narrative building blocks, such as speaker turns, scripts and communicational actions that children could create and put together, engaged them more in thinking about the nature of conversational storytelling than in the nature of identity.

The design of SAGE did not engage children in the process of identification and differentiation from a community. In order to design interactions in which other people could successfully participate, users were invited to decenter or move out of the phase of egocentrism where one cannot differentiate somebody else's point of view from one's own. However, this is only the most basic form of relating to others and the community. Since intrapersonal knowledge cannotdevelop isolated from interpersonal knowledge (and vice versa), I decided to design a second generation of identity construction environments that would engage young people in both learning about themselves and learning about others in a community.

Kaleidostories: a web-based system for visualizing community patterns

Kaleidostories is a web-based identity construction environment to explore role models and values. It runs in an NT Java-based Web-server and it is implemented in Java (Bers, 1998). Every participant in the community is represented by a geometrical figure in the

kaleidoscope displayed in the right top corner of the screen. Its color and shape changes according to how many role models and values are shared between the logged user and the other participants. The patterns visualized on the kaleidoscope are generated run-time by queries to the database. The kaleidoscope allows visualizing community patterns of shared role models and values (see figure 5).

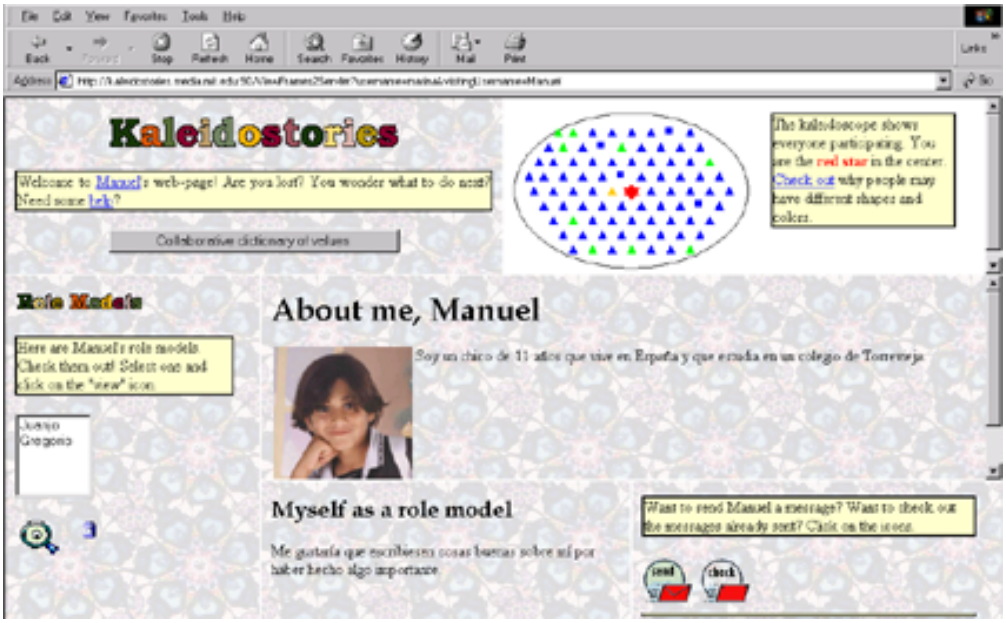

Figure 5: Each child is represented by a red star with a growing number of points. The star changes its shape according to how many role models are shared between the logged user and the other participants. The color of the star changes according to the number of shared values.

The system guides users in the creation of a personal on-line portrait with narratives about the present _ who am I? _ and narratives about the future _Who or what do I want to become? It also guides them in the creation of role models. Children can either choose their role models from a library or create their own and add them to the already existing

list. The system invites them to write stories that involve their role model's biographical information as well as narratives of personal identification, such as "why did I choose this person as my role model?" and "what are his or her values that I admire from him or her?" The system also invites users to link role model's stories with particular values and to define those values in a collaborative values dictionary (see figure 6). This dictionary has all the values that the Kaleidostories community holds as a group, as well as the personal definitions that each individual creates. At any point, children can look at the kaleidoscope and browse through the creations of other participants as well as send messages to each other.

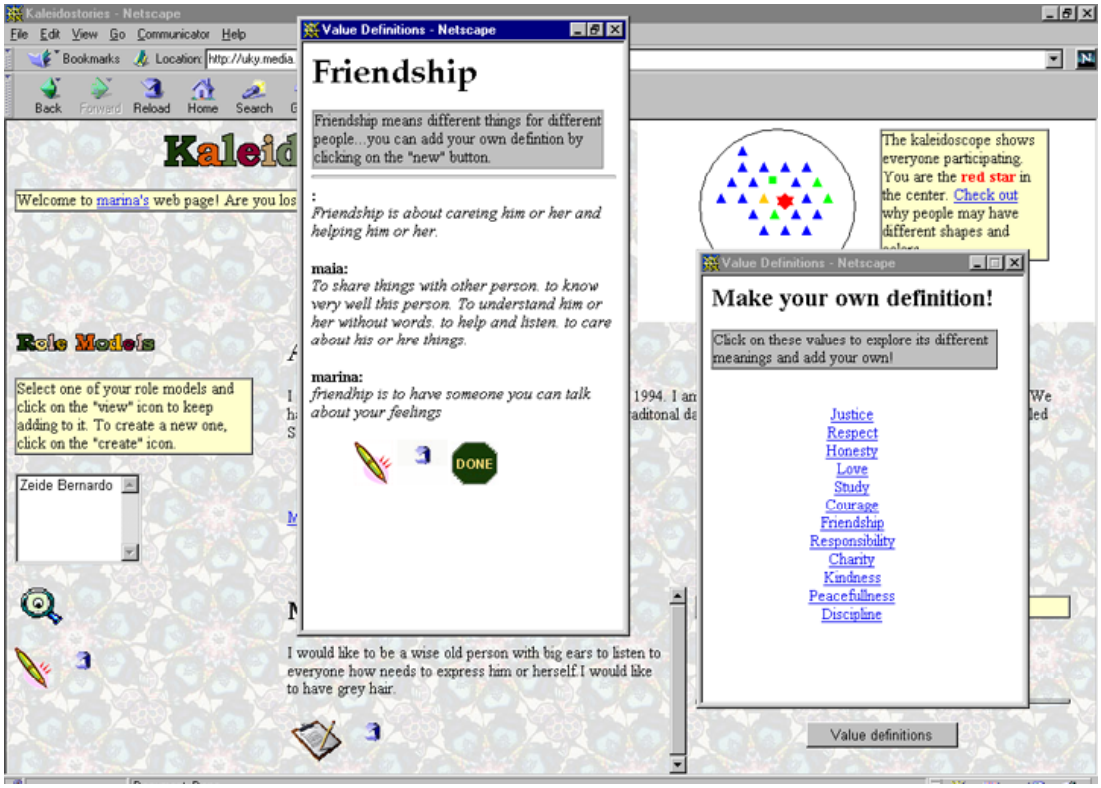

Figure 6 shows the collaborative values dictionary

The Kaleidostories identity construction environment was designed to engage children in a variety of both on-line and off-line learning experiences:

- **Introspection**: children use multimedia to create on-line portraits of themselves including stories, pictures, links to other web-sites, etc.
- **Outward exploration**: children reach out to their families and communities to find role models and create their portraits. They tell stories about them, photograph their favorite objects and make links to relevant web sites. The stories written by the children must reflect the characteristics (values) that they most admire in their role models.
- **Grounding**: the system has a library of abstract universal values (such as friendship, justice, responsibility, etc.). Children can add their own values to the library as well as link them with definitions that ground those abstract concepts to concrete situations.
- **Visualization**: children can explore each other's role models and compare values and definitions while using the kaleidoscope to visualize community patterns.
- **Communication**: children can contact each other and engage in a-synchronous communication about both the process and the products within the Kaleidostories experience.

Sharing stories across the world

I conducted two different four-month on-line pilot studies with Kaleidostories. First, a study with three bilingual sites (Spanish/English) in different parts of the world: a small bilingual class in a Cambridge public high school, an elementary school class in Torrevieja, Spain and a youth group from a Jewish Sunday school in Buenos Aires, Argentina. The total number of participants was 49: 45 children between 10 and 17 years old, 3 teachers (one per site) and myself as a researcher. Second, a pilot study with only Spanish speaking sites: the same elementary school class in Spain, two rural schools with Internet connection in Colombia and a high school class in Argentina. In this second

study the number of participants was 83: 77 kids between 10 and 17 years old, 4 teachers (one per site), myself as a researcher and a project assistant.

During both studies, although all the sites were participating in the same Kaleidostories experience, every local teacher decided to use the tool in a different way and with different goals. For example, the teacher in Cambridge integrated Kaleidostories into her "Spanish Literature and issues of adolescence" class. She focused on writing stories about role models in Spanish, a language which most of her students spoke very well but were not very comfortable writing. The teacher in Spain was a technology teacher. His students learned very fast how to use the tool and produced the most amount of material. This teacher decided to focus on the values dictionary and did an in-depth work with his class writing stories to express their most cherished values. The Argentinean high school teacher who participated in the second study taught psychology and sociology. She used Kaleidostories as a way to help her students ground their theoretical readings in a concrete personal experience. For example, as a final assignment, she asked her students to write a paper reporting how the on-line community evolved over time and what kinds of narratives of personal and social identity emerged.

In both studies children added their own personal role models to the library and very rarely used already existing ones. For example, sports players, popular singers and movie stars as well as family members, friends and well-known figures such as Mother Teresa of Calcutta were chosen as role models. Children also added their own values and definitions to the collaborative values dictionary. Friendship and love, in both studies,

emerged as the most popular values with the major number of definitions. Some definitions were simple, such as *"Friendship is easy: two people meet and they become friends"* and others were more complex: *"They say that friendship is to be friends and that is it. But, the true friendship is to be faithful to your friends, in the good and the bad, and never betray them. In my opinion, true friendship is too demanding to be able to achieve it"*.

In order to evaluate the experience I used a mixed qualitative and quantitative methodology. In the follo-up-interviews, most of the participants said that they enjoyed best the experience of communicating with others with similar ideas but from very different countries thus exploring differences and similarities between their role models and values.. Kaleidostories provided a framework that encouraged reading and writing as fundamental tools for communicating with others. Therefore, as stated by the Cambridge teacher who participated in the first study, and as shown through her student's productions, it helped bilingual learners to find a meaningful activity through which to express themselves in writing to an engaged audience of peers. The following story about one of her students is a good example.

Juan is a 17-year-old recent immigrant from a poor village who did not yet speak English and who had severe problems writing in Spanish. Juan didn't need to write in his previous life in El Salvador, neither was he willing to make the effort to learn. He also had many discipline problems in school. With a lot of effort and many spelling mistakes Juan became very involved with Kaleidostories. It presented for him the challenge of learning to use computers and, at the same time, allowed him to open up about aspects of

his inner life that he wouldn't share during regular school activities. Juan's kaleidoscope had lots of different colors and geometrical shapes representing the role models and values that he shared with others. As Juan became popular in Kaleidostories and exchanged more e-mails with users around the world he started to care, for the first time, about his poor spelling because it was a barrier to being understood. He asked the teacher and his classmates to correct his writing. As time went by, he started writing more complex stories and he eventually became an expert user of the computer. Juan's development of narrative and computational intelligence helped him become a more confident learner and he does gained self-esteem. Juan's case shows how Kaleidostories fostered a social context that helped a teen change his sense of identity.

Kaleidostories lacked the capability to include direct, synchronous communication through real-time chat. It also lacked the flexibility to express a more complex sense of self, in which other aspects beyond role models were explored. One of the most successful design features of Kaleidostories was the collaborative values dictionary. However, it only supported the expression of values as narratives and did not afford users the opportunity to put to test those values through actual behaviors in the community.

Kaleidostories' design was not enough to facilitate the passage from knowledge to action, from identity expression to identity construction. Although there was a sense of community, represented by the changing patterns of the kaleidoscope, the tools for self-organization and forums for discussion were missing. This is essential to form a responsible community in which values are developed not only as narratives but also

through action. This lack is in part due to the fact that Kaleidostories did not exploit the potential of computation, as it did of story telling. It limited computation to networking and visualization. On a different note, Kaleidostories was not fun enough to engage participants to use it on their own for a long a period of time. Issues of identity and values need a long time to be explored in depth. A big effort from the teachers was needed in order to engage students and keep them on track.

Con-science: families and teachers exploring robotics and values

Both SAGE and Kaleidostories are identity construction environments especially designed to explore identity and values. However, a broader range of technologies can be successfully used for this purpose when deployed with an appropriate methodology in a suitable learning environment. Con-science is a research program designed by Claudia Urrea and myself to integrate learning about values and identity with learning about robotics and technology (Bers & Urrea, in press). Within Con-science we conducted two experiences in very different learning environments particularly concerned with exploring identity and values. The first one, with families in a Jewish School in Buenos Aires, Argentina, and the other in a morality summer camp in a digital art museum in New York City. In both cases we used the Lego Mindstorms, a commercially available robotic invention system inspired by the MIT programmable brick (Resnik et al, 1996).

In this thesis I will only briefly describe the first pilot project that took place during September 1998 in the Arlene Fern Jewish Community School in Buenos Aires with fourth and fifth graders, their parents and teachers. The school is a value-centered learning environment that emphasizes educating the family and the community, not only

the children. The timing of the workshop was carefully selected to overlap with the Jewish High Holidays, a period of ten days in which the community gathers to celebrate the Jewish New Year and the Day of Atonement. The school organizes activities for the whole family and engages them in making creative prayers about meaningful aspects of Jewish identity and the values of the Holidays. Traditionally the tools used for these prayers are words, either narratives or dramatizations. What would happen if they could also use objects to express their values and identity? And what if these objects were computationally augmented, supporting the design and building of interactive robotic artifacts as a way to express identity and values in a dynamic way? What are the challenges of utilizing the constructionist methodology and computational construction kits in the context of value-centered learning environments? These were some of the questions that motivated the Con-science research.

Parents and children worked together using the technology to explore values and identity in different ways: 1) to represent symbols, 2) to represent values and 3) to evoke reflection and conversation about the meaning of values. The use of the technology to represent symbols treated values in a shallow way by equating them with symbols (see figure 7). People who used the technology to represent values, felt that robotics objects were not enough to convey meaning, so they created stories that explained their representation of the chosen value. People who used the technology to evoke reflection and conversation treated values in a more elaborate way and designed projects to engage other members of the community to experience the complexity of the chosen values. In the same spirit as other constructionist activities, the Con-science program allowed

people to build internal knowledge about identity and values by creating external dynamic artifacts.

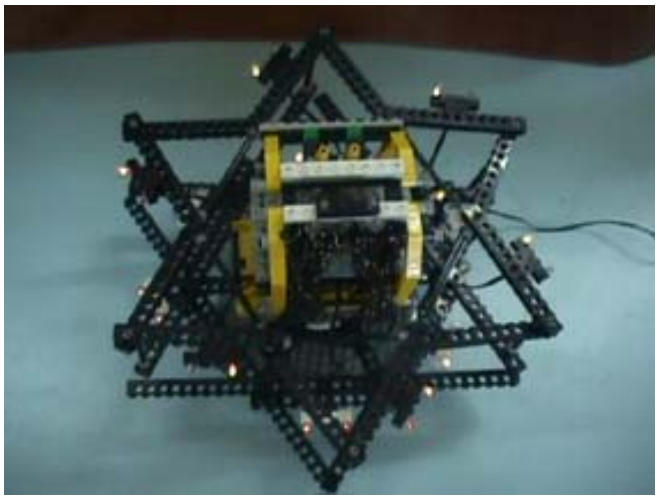

Figure 7 shows the maguen David or Star of David, a Jewish symbol

However, while observing the conversations that people had with each other while building their projects, I realized that most of them were about the different design features of the Lego Mindstorms building blocks and how to combine them. Since the pieces of this construction kit are mostly sensors, motors and gears, they engaged in discussion about engineering and physics. Intervention on our part was needed in order to foster explicit discussion about identity and values, while the process of building and designing was happening. We decided to incorporate in a new set of low-tech building blocks, cards with the values of the High Holidays that people could combine with their other pieces. Of course, these cards were not as rich, in terms of meaning and evocative powers, as the other building blocks. Most of the self-motivated talk about values and identity amongst the participants happened before they started to build their projects,

while choosing a value, and at the end of the process, when showing off their projects to the community and receiving feedback.

From this experience I learned that identity construction environments need to include building blocks particularly designed to evoke powerful ideas and conversation about identity and values during the design and building process, and not only during the planning and debriefing stages. What are the design features of these identity building blocks? What kind of intrinsic properties and behaviors should be used to define them? Some of these questions will be explored in the next chapter where I describe the narrative-based properties of the building blocks that I designed for the Zora virtual environment.

Chapter V- The final design: Zora

The experience of designing, implementing and testing in the real world the three projects described in the previous chapter, SAGE, Kaleidostories and Con-science, was useful in identifying design principles to guide Zora's implementation. Zora instantiates the five design principles that distinguish identity construction environment. In this chapter I first present an overview of what Zora is. I briefly introduce the Microsoft's VWorlds platform upon which it was implemented and specify how Zora modifies it. Then I describe the conceptual foundations that were the origins of Zora's design features and the learning activities these features afford. Finally I present the participatory design method that led to Zora's design and two first pilot studies conducted with young people and senior citizens.

What is Zora?

The name Zora was inspired by one of the imaginary cities that Italo Calvino describes in "Invisible Cities": *"This city is like a honeycomb in whose cells each of us can place the things we want to remember: names of famous men and women, virtues, numbers, vegetable and mineral classifications, dates of battles...So the world's most wise people are those who know Zora."* (Calvino, 1972). The goal was that by engaging with Zora users would become wiser by getting to know who they are.

Zora is an example of an identity construction environment. Therefore it embodies the six ICE design principles presented in the second chapter:

- Zora is *specifically* designed to help young people learn about their identity, particularly their personal and moral values. Therefore it presents a structure that makes salient certain powerful ideas about these domains.
- In the same spirit as other constructionist tools for learning, Zora supports the active design and creation of computational artifacts. These artifacts are a construct that represents a sense of self and its different aspects.
- Zora offers opportunities to engage in storytelling and elicits personal narratives.
- Zora is designed upon a theoretical model that understands identity as a complex and dynamic construction composed of conflicting values (i.e. a society of self).
- The constructionist learning theory, theories of identity formation and moral development informs Zora's design.
- Zora supports the creation of and participation in a community. No sense of self and values develops in a social vacuum.

Zora is a three-dimensional multi-user environment[10] that provides the tools for learners to design and inhabit a virtual city. People can build objects, characters and spaces as constructs representing a complex self, as well as a virtual community in which personal values are realized and put to test. Users are graphically represented by avatars with the owners' image. An avatar construction kit allows users to design their own avatars and their corresponding graphical gestures (i.e. sleep, smile, upset, etc). They can navigate around the virtual city by either "teleporting" from one room to the other using a pop down menu or going through the portals in each room. They can converse with others in

[10] In a graphical multi-user environment several users can interact with each other in real time. Users feel immersed in an artificial space containing representations of data, programs and other users.

real-time through a graphical chat system and construct the city's private and public spaces: personal homes, community centers and temples. Temples are shared public spaces that represent cultural traditions or group interests. They can design the walls, the ceiling and the floor with any texture or image they want. For example, they can import a digital picture of their favorite wallpaper.

Zora is an object-oriented environment, meaning that users can make new artifacts by cloning existing ones and inheriting its attributes and behaviors. Figure 8 shows Zora's initial inheritance model. It grows as users create their own objects.

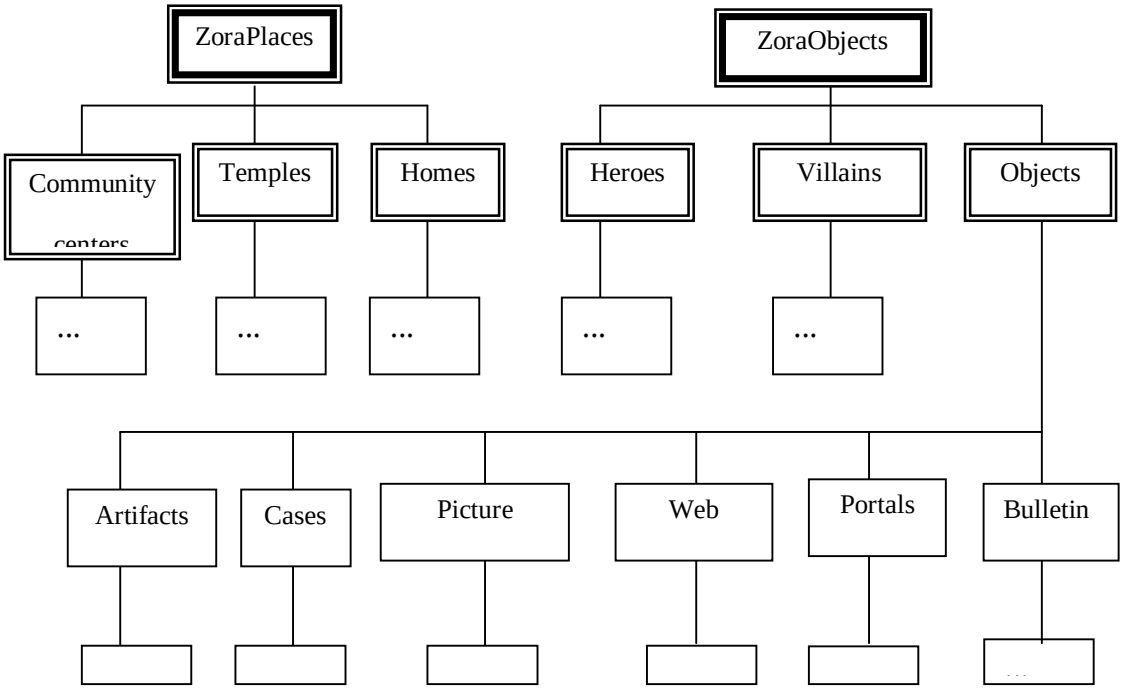

Figure 8: Zora's inheritance model

The Zora system seeds all objects with three different kinds of attributes that need to be personalized by the children. The *presentation attributes* determine their graphical appearance and motion. The *administration attributes* determine who owns the object and therefore who can edit it, and who has permission to decide if the artifact can be cloned. The *narrative attributes* (i.e. textual descriptions, stories, values and conversations) structure a way of thinking about objects that highlights their potential to carry ideas. Users can write stories and associate them with keywords to be used while programming a conversation for the object, as well as write values and associate them with definitions. Figure 9 shows the Zora interface.

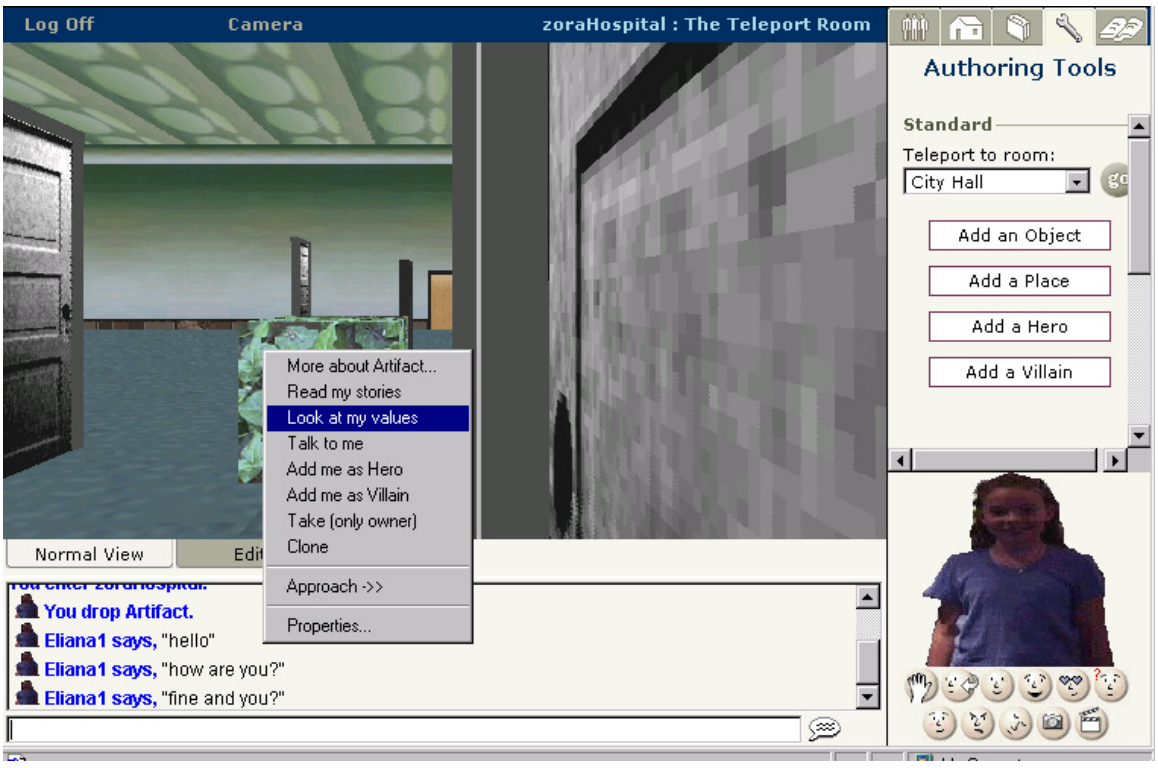

Figure 9 shows Zora's interface using the Vworlds platform

Zora's implementation

Zora is implemented using Microsoft's Virtual Worlds research platform, a software development kit for building persistent online distributed multi-user environments. It provides synchronous and asynchronous communication, object persistence, web integration, and customizable user interfaces. (Vellon et al, 1995).

The platform is based on a distributed client-server architecture. The persistence and replication of property changes is handled automatically by the platform to free the developer from having to deal with lower level details. The platform is composed primarily of COM objects, as well as some ActiveX Controls and the server executable. Virtual Worlds was developed mostly in C++ for use on personal computers running Microsoft operating systems. All of the sample user interfaces to the platform are written in Dynamic HTML with the intention of running under Microsoft Internet Explorer versions 5.0 and newer.

In order to understand how Zora and the Vworlds platform fit together and the particularities of Zora's implementation, four concepts need to be made clear:

- **Zora is a world created with the Vworlds platform**. The platform was implemented with the goal of supporting developers to create their own virtual worlds without dealing with lower level details. So far different companies and research labs have created different worlds with the VWorlds platform (see http://research.microsoft.com/vwg/#projects).

- **Zora implements new objects, properties and methods to meet the particular content needs of an ICE.** Zora implements the base class ZoraObject with three children objects: Objects, Heroes and Villains. Of the six children that Objects have, four new ones were implemented (Artifacts, Cases[11], Bulletin Boards, Picture frames) and two borrowed from VWorlds standard objects (Web pages, that establish a web link to a website, and room portals, which allow navigation from one room to the other). All of these have the following properties: Description, Motion (a simplified version than the original one in VWorlds), Pictures, Stories, Values and Conversation. The objects only differ from each other in their 3D shape. For example, "Picture Frame" defaults to a flat rectangular shape (a picture frame that users can place on the walls and personalize with their own pictures) and "Artifact" defaults to a gray cube with four faces that exhibit the pictures of objects chosen by the users to populate their spaces.
- **Zora modifies the Vworlds user interface.** Since Zora is an identity construction environment, its interface was augmented the with particular features such as a collaborative values dictionary, the narrative-based objects' attributes, the conversational behaviors for objects, the possibility to add heroes and villains to the avatar's profile and a modified avatar's profile. For example, an avatar can add a hero or villain to his or her list of models of identification by selecting the "Add me as a hero/villain" from objects' menus that pop up with the right-mouse click. When a new model of identification is added, it gets automatically incorporated into the

[11] Cases are a type of object with the shape of a pyramid. In the same spirit as legal cases, they are aimed at helping people discuss a particular topic and reach agreement about it.

corresponding list in the avatar's profile. We created a global list of heroes and villains that is accessible from the conversational programming language. So when users create a conversation for their objects, they can program things that in English read like: " if the visiting avatar and I (the creator of the object you are conversing with) have the same heroes then you should say "hi, I think that we have something in common", otherwise you should say "bye"".

- **Zora offers an authoring layer easy enough for children to use.** Although the Vworlds platform offers an authoring client with tools that allow users to build and manipulate 3D virtual worlds, this needed to be modified in major ways. First, in order to keep it simple for children most of the command line style script interface tools were replaced with direct controls. The tools for 3D model manipulation, lighting, mesh color and texture control were simplified and new features were added so that children could upload their own pictures, instead of only using the available library.
- **Zora offers tools for researchers and teachers to evaluate the learning experience.** In order to evaluate, the experience the Zora system logs, with date and time, everything users say or do on-line. Analysis of system logs is a well-known practice in research on computer-mediated communication (Herring, 1996). By analyzing the log, the researcher or teacher can re-construct what happened on-line during any period of time. However, so much information can be confusing. A Zora log parser was implemented in order to parse the system logs according to the specific needs of each project. The Zora log parser organizes the information in an easy-to-read format and gives control to the researcher of the variables to retrieve and display

as separate categories (see figure 10). The format of the parsed logs is organized by actions performed by a participant (such as visiting a place, creating an artifact, cloning/taking an artifact, reading stories, reading values, writing descriptions, writing stories, writing values, writing definitions, creating heroes, creating villains) and by interactions occurring in particular virtual places.

Figure 10 shows the Zora log parser.

Conceptual foundations of Zora's system design

Identity construction environments are specifically designed to afford exploration of identity, particularly personal and moral values. In the design world, the term "affordance" refers to the attributes of *the thing* that determine how *the thing* could possibly be used (Norman, 1988). When *the thing* is a technological learning environment, like Zora, "affordance" not only refers to usability but also to content to be

learned. Three questions need to be asked of Zora's affordances: First, what are the conceptual foundations upon which it was designed? Second, how can it be used for learning? Third, to what specific content does it give access to learners? In this section I respond to these questions by highlighting the conceptual foundations that guided Zora's design, the design features that supported learning, and the kinds of activities learners engaged in while using Zora. The following table summarizes the structure of the remainder of this section (see figure 11).

Conceptual foundations	**Design features**	**Afforded activities**
Constructionism	Authoring tools	Learners as designers
	3D space	Creating and navigating an aesthetically pleasant place, as the ones children are used to in video games.
Identity as a complex construction	Object-oriented system	Creating and cloning objects representing aspects of self, and others.
	Virtual places	Designing virtual places as spatial representations of identity (virtual autotopographies) and engaging in introspection.

	Avatar's profile	Creating virtual profiles as textual representations of identity. Learners taking pictures of themselves expressing different emotions and creating their biographies, values and heroes and villains.
Exploring values as aspects of identity	Narrative attributes of objects	Defining the values that objects carry and specifying the meaning users attribute to the objects. Anchoring values to concrete experiences
	Conversations	Programming interactions for their objects and engaging in perspective taking.
	Collaborative values dictionary	Entering values and definitions. Thinking about values as abstract universal principles

Need of a community to develop sense of self and values	Multi-user environment	Creating a virtual community for reflection and action.
	Multiple modes of interaction	Chatting, gesturing, using bulletin board, face-to-face.
	Cases	Creating and discussing cases, fostering a participatory community.

Figure 11: Conceptual foundations of Zora's design and afforded activities.

Conceptual foundation: Constructionism

- **Authoring tools:** In order to engage in constructionist learning, learning by designing, Zora users need easy-to-use authoring tools to build their virtual city. Since Zora's mission is to help people explore their identity and values, users need to be able to import and create their own personally meaningful pictures and objects representing aspects of the self. Zora therefore is seeded with object types important for the exploration and expression of identity such as empty templates of positive and negative models of identification, called heroes and villains, either people or symbols. Figure 12 shows a snapshot of the Zora authoring tools used to design the virtual city. As shown in the class inheritance model in figure 8, users can create four different types of objects: virtual places, objects, heroes and villains. Although in terms of the underlying computational system and their attributes, objects, heroes and villains are the same type of computational object, it was important to present them distinctly to

the learners. The rationale underlying this design decision was to highlight the fact that the objects and the models of identification created in Zora represent diverse aspects of a complex identity and they affect us in both positive and negative ways.

Figure 12: tools for designers

- **The use of 3D**: One of the tenets of constructionism is that learners need to naturally engage with their building materials to explore the content matter. In Zora, the use of 3D serves such engagement purposes. The three-dimensionality and the navigation around Zora provide an aesthetically pleasant environment that has similarities with popular video games. The intent was for users to see Zora as a captivating game with which to engage for long periods of time rather than viewing it as educational software. This long-term engagement is essential to explore identity and values.

Conceptual foundation: Identity as a complex construction

- **Object oriented system:** Zora is an object-oriented environment where users can make new artifacts by first cloning existing ones and having them inherit their attributes and behaviors and then personalizing them. The object-oriented metaphor says that objects have characteristics or properties that define their identity. The properties of objects set the structure that define the object and the kind of learning experience users have when encountering the object. For example, if objects have attributes that set their motion, the learner most probably will be thinking about direction, speed, X and Y coordinates. In Zora, objects have properties that, besides defining their shape and functionality, also specify the meaning or personal and moral values that people assign to them (see figure 13). For example, when a fifteen year old assigned the value *"wealth"* to a picture of a dollar and wrote *"I say that money is the symbol of material wealth. Its powers are vast but limited only to the material world"*, he was thinking about the meaning that money carries. When other children clone the object, its values attributes are inherited but their definitions are not. Thus objects become collective repositories of meaning. This design decision was made because of the opportunities for new ways of thinking about values that object oriented systems afford. For example, the notion of inheritance provides a nice metaphor to think about how personal and moral values are passed along from generation to generation but in each one they get re-instantiated, hence re-appropriated and imbued with new meanings according to the new context.

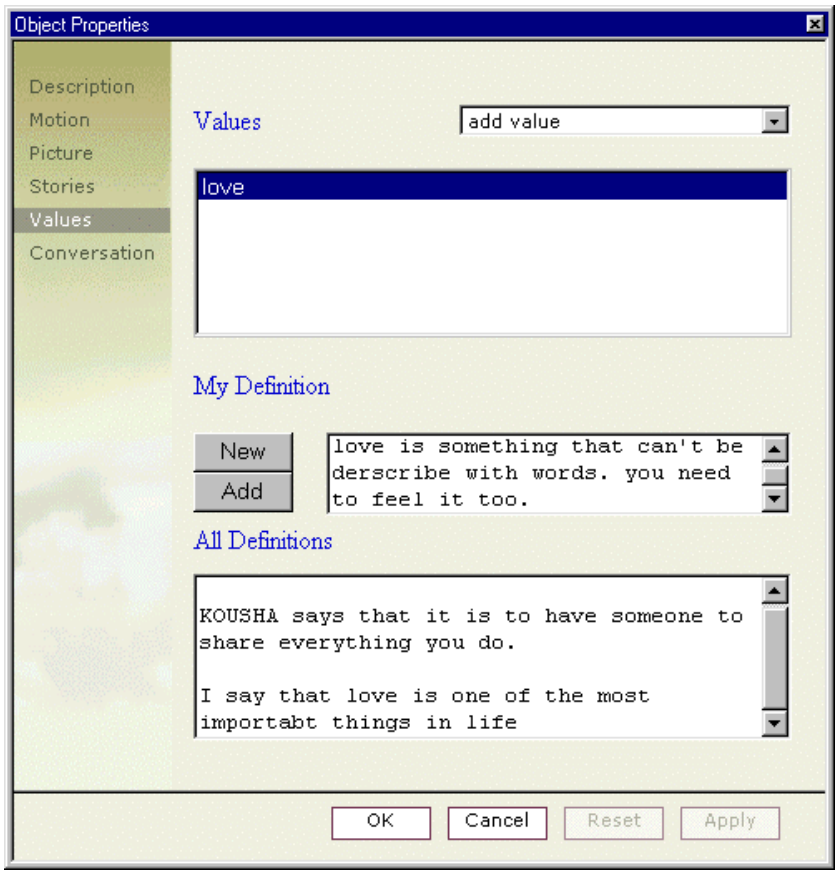

Figure 13: interface to create a value attribute associated to an object

- **The virtual places:** It was a design decision to include among the tools for building the virtual spaces three distinct templates: personal homes, community centers and temples. Although the underlying system architecture is the same for all three, having them as separate categories engaged learners in different thinking processes about their identity. While creating a personal home, users think about designing a virtual space that contains different aspects of the self. The personal home displays those objects and characters that kids believe to be indicative of who they are. While creating a virtual temple, children design a space that represents cultural traditions or group interests which are familiar to them. While creating community centers, they think about the need of social institutions for

community life to flourish. For example, one of the girls working remotely created a Junk shop to drop objects that *"no one wants around but no one wants to delete*". This space became very popular (by the end of the workshop it had 33 objects) and was regulated by a law that said that it could never be too full. It became a community space for informal social interactions. While the City Hall was invested with a sense of "important business", the Junk shop was a space to get together and chat in an informal way. Learners can personalize their virtual places by selecting different textures and colors for the walls, floor and ceiling.

- **The avatar's profile:** The avatar's profile is a textual representation of identity that contains an autobiography, links to the user's personal values and their definitions, and links to the user's heroes and villains (see figure 14). It also provides access to the avatar construction kit so users can customize the graphical appearance of their avatars by importing their own pictures. This kit allows the design of avatars with body gestures expressing different emotions. The rationale behind the creation of the avatar profile was to display in an integrated way different aspects of the user's identity. At the same time, it allows users to quickly access information about each other.

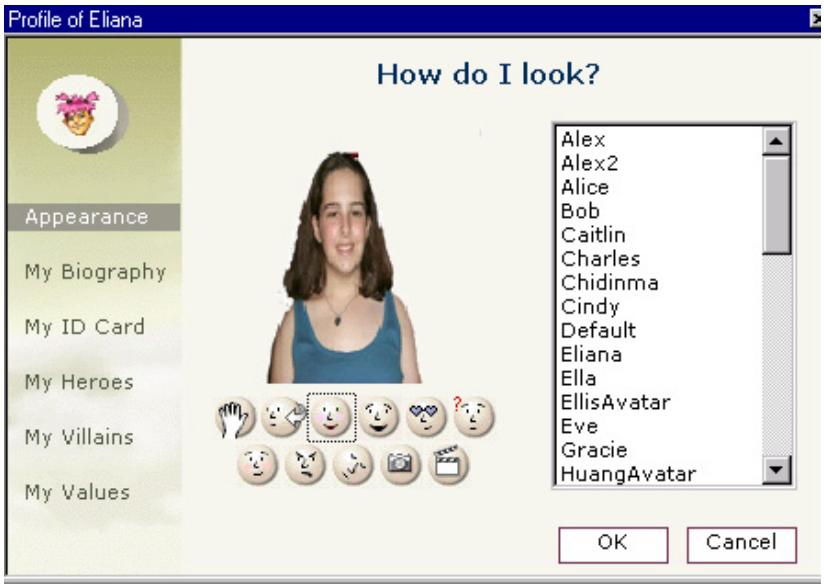

Figure 14: The avatar's profile

Conceptual Foundation: Exploring values as aspects of identity

- **The narrative attributes of objects:** Since narrative plays an important role in the construction of identity (Polkinghorne, 1988), and the development of personal and moral values (Tappan & Brown, 1989; Johnson, 1993), the attributes that define the meaning of Zora objects are narrative-based: stories, values and conversations (see figure 15). The rationale behind this design decision was to foster thinking about objects in terms of what they mean and their relationship to personal values and identity, and not only in terms of their aesthetics and functionality. For example, a twelve-year-old created the hero "Anne Gunning" and wrote the following story about her: *"Ms. Gunning is the Nicest Gym teacher in the whole school. She is also my Basketball and Softball coach and she never gets mad. She always tells me to try my best and reach my goals in sports. She's Great."* She also attached to her hero the value *"pride"* and defined it as *"Pride is when u feel good about yourself and feel that*

you have no need to be afraid. Feeling good about yourself makes yourself feel really good inside." This young girl used narrative (both in the story and in the definition of the value "pride") to convey how her hero helps her feel proud about herself. Therefore, while creating the narrative attributes for her character she engaged in a thinking process about what Ms. Gunning means to her and not only what she does for her.

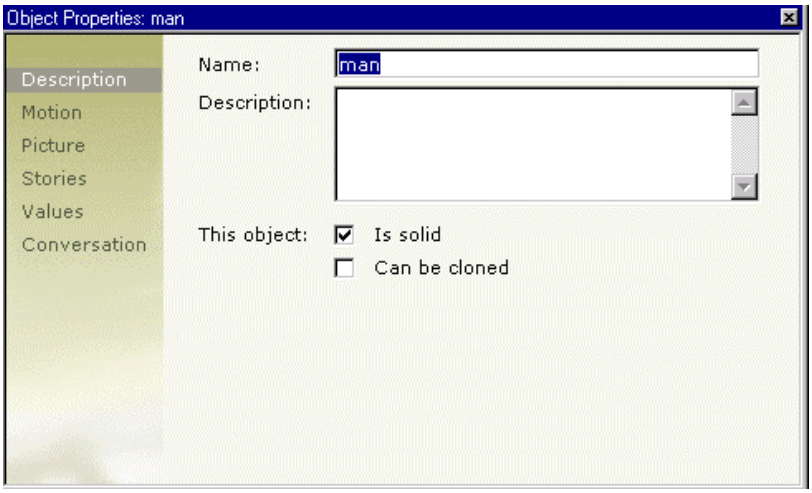

Figure 15: The five properties of objects, heroes and villains displayed on the menu on the left

- **Conversations:** In constructionist graphical virtual environments like PetPark (De Bonte, 1998) users can define how their objects behave in the world by programming their motion and animations. In Zora, however, users can program objects to engage in conversations by describing the underlying turn-taking rules between user and object. They can also define the stories to be told by the object in response to certain input (see figure 16). While programming interactive conversations, learners engage

in perspective taking, or seeing the world as others do. Understanding other people's motivations and actions is a fundamental mechanism for broadening one's perspective and recognizing that events can be understood through multiple points of view (Selman, 1980). As shown in previous work done with SAGE (Bers & Cassell, 1998), designing conversations allows children to decenter and move out of the phase of egocentrism where one cannot differentiate somebody else's point of view from one's own. In Zora the learner becomes a "protean self"[12]. Namely, his or her identity maintains its sameness and inner stability, represented by the avatar, but at the same time takes different roles and points of view by talking through different characters, or objects, that he or she has programmed. The programming language helps learners to create interactions between their characters and users. For example, they can program interactions that in English read like: " if the [visiting avatar] and I [the creator of this object] have the same heroes in the avatar's profile list, then *say 'hi, I think that we have something in common and tell* [story 1], otherwise say *'bye'*". The programming language gives flexibility to users to program scripts (what is said by the object) and to control the types of interactions (complexity of the branching). In order to explicitly support the exploration of identity, the language is seeded with variables such as "shared heroes", "shared villains" "shared values" and "stories from database". Users can use these variables, and create new ones, as well as use commands such as "tell story" to design their automated conversations.

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[12] Robert J. Lifton uses the word "protean self" (after Proteus, the Greek sea god of many forms) to refer to the fluid transformations and shifting of personalities, while maintaining a core sense of integrated self.

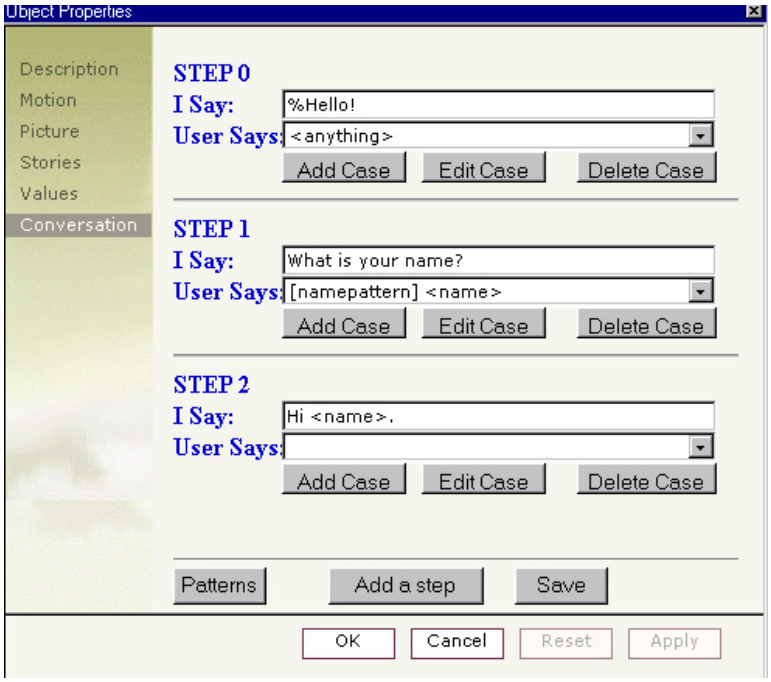

Figure 16: the programming interface to design conversations

- **The collaborative values dictionary:** The dictionary is a compendium of all the personal and moral values, and their multiple definitions, held by the Zora community. At the beginning of a Zora experience, the dictionary is empty. As learners populate the virtual city with objects and characters and define the values and definitions associated with them, the dictionary starts to fill up (see figure 17). The collaborative values dictionary was designed to allow users to 1) browse its content and easily visualize clashes between different definitions for a same value in order to trigger interesting conversations and reflections, and 2) enter new values and definitions independently from grounding them in objects in the virtual world. The dictionary engages users in an abstract way of thinking about values by disassociating them from any specific instance or object. In contrast, if learners want to associate an

object with a particular value and its definition, they can do it by using the object's properties window interface shown in figure 15. For example, in the experience reported in this paper, the values dictionary of the city had 37 values with a total of 95 definitions. The most popular were "entertainment" with 8 definitions, "love" with seven definitions, "communication" and "productive exercise" with five definitions each.

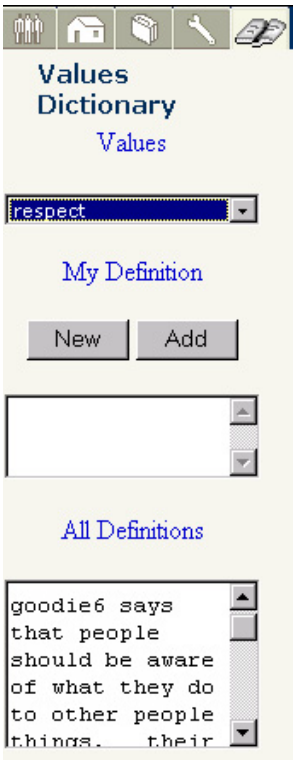

Figure 17: The collaborative values dictionary

Conceptual Foundation: Need of a community to develop a sense of self and values

- **A multi-user environment**: The rationale behind designing a multi-user environment was to provide a social context that encourages self-exploration and introspection, as

well as interactive behaviors in a social context. Both introspection and participation are needed in order to learn about identity and develop personal and moral values. A sense of self doesn't develop in a vacuum but through constant interaction with others in a community. As shown by research on moral education presented in section 3.3, only in the context of a community can learners go beyond treating values solely as matters of reflection but also as matters of behavior. Hence the choice of a multi-user environment that supports the formation of community.

- **Multiple modes of interaction:** In Zora communication is both synchronous (learners converse with each other via a graphical real-time chat system using both text and gestures) and asynchronous (learners post messages, read and write text stored in their artifacts and the values dictionary). Real-time chat facilitates exchanging points of view in discussions in a dynamic way. Communicating through gestures makes the experience more engaging and provides a different channel of expression, particularly of emotions. By communicating with each other children not only express their sense of self and values, but also learn how to exchange opinions and debate in a respectful way.

- **The cases:** The notion of a "case" was introduced in Zora in order to help users ground the on-line conversations in concrete artifacts. A "case" is an object representing an event or circumstance to be discussed and agreed upon by the community members. In the same spirit as legal cases, they require community members to take action to resolve them. This kind of participation in a learning

environment serves as a model of the larger political community in which the child will later participate as an adult. Zora presents new cases as an empty template with a default shape of a green pyramid. Users can make new cases and personalize them both in the way they look as well as in the content they convey. For example, in Zora's City Hall, children created different kinds of cases. Most dealt with setting up the social organization of the virtual city, such as *"I think that people should not change or put things in other peoples rooms. Unless they have permission" or "Anyone should be able to drop anything anywhere, but with a consequence. This should be like breaking a law, punishable by imprisonment of one hour".* Other cases were about controversial current events reported in the newspaper[13]. These cases fostered thinking not only about the Zora micro-community but also about society at large. In Zora, the non-structured discussion of cases is a key element for forming a participatory community.

A participatory design experience

Once the conceptual foundations for Zora were specified, the design process could begin. My choice was to engage in a participatory design experience. The fundamental principle of the participatory design philosophy is that active collaboration of the users in the development process of a computer system contributes to successful design and

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[13] In the workshop reported in this paper I took a child-centered perspective, therefore the only cases to be discussed were those created by the young participants. However, in a different type of experience, where the teacher or facilitator has a more active role, it might be interesting to seed the Zora virtual city with controversial cases to foster debate.

integration of the system with the human activities. This approach incorporates users, not only as experimental subjects but also as key members of the design team. Therefore it implies discussion, criticism and compromise between users and system developers. This process gives designers new and better ways of gaining an understanding of the user's everyday practices. When participatory design happens in a work environment, research suggests that it be expected that users will be more willing to accept and use the system and efficiency and productivity will improve (Schuler, & Namioka 1993). Similarly, when participatory design happens in the learning environment involving teachers as well as students, it is expected that the system will be better integrated into the curricula and thus the learning experience enhanced.

In order to design Zora I engaged in a participatory design experience that included different design partners. I started the process by running a two-day workshop with a small group of students and their teacher from a public high school in Boston. The context was a comparative religion course. During this workshop we did not use the computer but instead used arts and crafts materials. I told participants that the goal was for them to build a city with different temples representing the religions they had studied in their class and to populate them with objects and characters belonging to those religions. Each student had to make a stick figure representing him or herself to move around the city and engage in conversations (i.e. an avatar). I also asked them to build their homes, as well as any other spaces that they thought the city needed (see figures 18 and 19). While students and teacher were building the city, I videotaped their activities and conversations and observed their interactions around the material. For example, once

they created their characters and placed them in their temples, did they play with them as in a puppet show or did they ignore them? Were the students creating temples representing their own religions? Where were they finding the information needed? What kinds of conversations were they having while building the different spaces of the city? Were there any conversations about the nature of the organization or government of the city? If conflict arose, how was it resolved? What kind of activities were they proposing for the city and its inhabitants?

Figure 18 : Working with paper

Figure 19: The Greek Temple and Gods

The goal of this workshop was to engage in a participatory design experience by testing the concept of building a city and receiving feedback from students and teacher before final implementation of Zora. The students engaged deeply in creating a virtual city composed of a Jewish, a Hindu and a Greek temple with stories and characters, as well as symbols and relevant current news taken from newspapers (see figures 20 and 21). By the end of the workshop I shared with the participants my goals and asked for suggestions about what kind of activities and design features a computer system should have with the goal of designing a virtual city to explore not only issues of religion, but of identity in

general. Feedback from this experience allowed me to refine Zora's design and to implement suggestions given by both students and teacher.

Figure 20: In the process

Figure 21: The city

From this experience I learned three main lessons that informed Zora's implementation:

- **Self-initiated activities**: All the students agreed upon the importance of having autonomy to choose which activities to engage in. For example, they wanted to decide which spaces to build and what kinds of conversations to have. They did not want the teacher interfering.
- **Creativity**: Students enjoyed using very different art materials to create their spaces. They liked having lots of time to play with the materials and to choose their own way to make their homes and temples. They stressed the fact that in high school there is not much time to engage in creative design projects.
- **Role-playing**: Students became very involved in role playing with their avatars and characters. Although at the beginning they did it with some feelings of embarrassment for being "old" and playing with "puppets", they very soon forgot the presence of both the teacher and myself and took the role-playing game seriously.

Two pilot studies

The participatory design experience described earlier provided good insights for implementing a first version of Zora. Once the system was completed, I ran pilot studies to observe how different populations would use Zora and to see what they needed in order to have a successful experience. I conducted two very small pilot studies of five hours each. One with a group of young people and another with a group of senior citizens called SilverStringers (Turpeinen, 2000). This group has been working since 1996 with the News in the Future Consortium at the MIT Media Lab using internet-based technology to create their own on-line newspaper. I chose this particular group because they have some resemblance to patients at the hospital, a population I was hoping to work with for one of my case studies (see chapter VI)[14]. They have physical impediments that make their use of the keyboard and mouse difficult, they get tired easily, they have low level of energy, and they need a lot of guidance and help.

The SilverStringers built a small city with a Paradise, a library, a children's den and a computer room (see figure 22 and 23) The young people built a VideoGame Room, a TV room, a horse room, a stadium and a music temple as well as many other places that were started but never finished. The experience of these two groups using Zora was very

[14] Ideally I would have liked to do this very first experience with patients but it is not possible to conduct a quick pilot at a hospital without going through the Committee on Human Subjects and filling out a lot of paperwork. At that stage of Zora's design I wasn't ready to do a formal study. I just wanted to observe how people would use it.

different both in terms of their relationship to the technology, and in terms of the kinds of activities and conversations they engaged in.

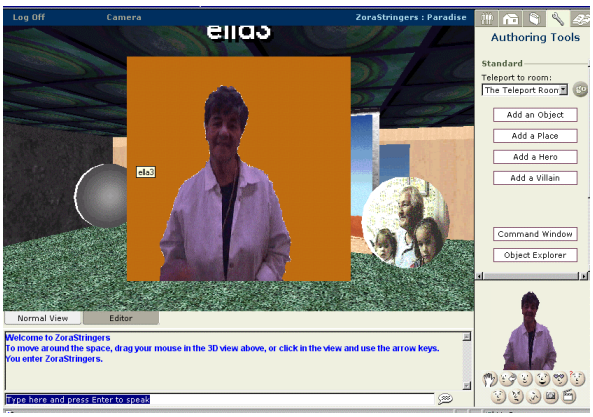

Figure 22: Paradise and its creator

Figure 23: The SilverStringers

Since senior citizens do not belong to the video game culture so navigating in the 3-D space was confusing for them. They also had a hard time getting used to the on-line chat. They needed a lot of one-on-one help to understand the menus and windows and to be in control of the tool to do what they wanted. Neither of these things was a problem for young people testing Zora.They created many more objects and spaces than the SilverStringers and had longer conversations. In terms of content, the SilverStringers were very self-reflective in writing personal stories for their objects and thoughtful definitions for the values they associated with those objects. For example, a woman spent a long time looking on the Internet for a comfortable chair to put in her virtual room. She wrote a story about how chairs need to be well designed so she could sit on them for long periods of time without hurting her back. She attached the value "family" to the chair and explained that comfortable chairs help the family to sit together during mealtimes so that

they can share stories. Without much prompting from me, the SilverStringers started to use Zora in a very introspective way. Also, since they had experience organizing themselves when writing their on-line newspaper, they immediately thought about the social organization of Zora and how to go about resolving problems should the need arise.

In contrast, the young people using Zora created many spaces without finishing most of them. The novelty of the 3D graphics and the flexibility of the tool to import their own pictures fascinated them. They wrote very short stories and almost no values for their objects. They all said that they needed more than five hours to create a virtual home that would really be theirs. They also said that they did not see the point of discussing matters about organization of the virtual community because there was not such a community. They were more interested in testing the potential of the tool and pushing its limits, than in engaging in a self-reflective experience or in creating a virtual community. They did not need help to learn the technical aspects of Zora, but to engage in the types of activities its design affords.

From these short pilot studies I learned two things. First, people with lack of familiarity with computers in general and with physical and mental limitations (such as difficulties moving their hands due to age or an IV, and problems concentrating for long periods of time due to age or medical condition) need a lot of help when using Zora and have a steep learning curve. Therefore, when working with hospital patients it would be important to have a person helping them most f the time, at least at the beginning of the experience

until they feel comfortable with the environment. Second, young people need less time to learn the technology and can do it on their own, but need more time to engage in self-reflective experiences. Therefore when working with the students in the summer workshop I would need to structure the workshop in such a way as to allow both time to play with Zora and test its limits and time to "take it seriously".

Chapter VI- Zora's empirical work

I conducted two pilot experiences in which young people used Zora: an intensive summer workshop held at the Media Lab with a multicultural group of teenagers, and a five-month pilot study with young patients in the Dialysis Unit at Boston Children's Hospital. Despite their diversity in background and context, I chose these populations because both share a need and desire to explore identity issues. The first study explored how Zora could help young people from diverse cultural backgrounds to explore their identity while developing a sense of personal and moral values (Bers, 2001). The second case study focused on how pediatric patients facing hemodialysis used Zora to escape the harshness of their medical situation and to create a support network to facilitate mutual support among patients and new kinds of interactions with hospital staff. This study also included the analysis of the feasibility and the safety of using the Zora virtual environment with pediatric patients in a hospital setting (Bers et. al, 2001).

Case 1: a multi-cultural group of teenagers using Zora

The decision to use Zora in the context of a summer workshop held at MIT, instead of in a classroom or with participants' login from home, was based on a reality. Zora makes special demands on time and technological infrastructure that are not always available in schools and homes in a reliable way. As computers become cheaper and bandwidth for network becomes bigger, this won't be a problem in the future. I did not want learners experiencing technical difficulties that hinder the nature of the engagement with Zora. And I did not want to deal with the bureaucracy of schools that do not know under which

curricular discipline to include Zora. Therefore, I chose to do a pilot study with reliable equipment at MIT and with freedom in terms of content matter.

The study

The goals of this intensive summer workshop, held at the MIT Media Lab, were to find out if Zora could help young people to explore their identity while developing a sense of personal and moral values, and if so, to determine how Zora afforded this particular kind of learning.

Participants in the Zora summer workshop were recruited through postings in different e-mailing lists. Interested candidates had to complete an application form with open-ended questions about their background, including their knowledge and use of computers (see appendix I). They also had to write about themselves and their potential interest in the workshop. The goal of students submitting an application was to obtain a self-selected and highly motivated group. It was made explicit to them that the goals of the workshop were "*learning about computers as well as exploring issues about youth identity*".

I selected a diverse group of 11 children between ages of 11 and 15 years old to participate in the workshop. The selection process favored people from diverse cultural and religious backgrounds, gender balance, and the quality of the submitted biographies. I did not favor grammatically correct or well-structured stories, but personal and introspective ones. Previous computer experience was not a factor for selection, but participants were required to have access to e-mail.

The selected population for the workshop was very diverse: five girls and six boys, two African-American, two Asian American, one Latino, one Iranian and five White-American, one Baptist and one Jewish. Six of the participants were inner city students attending private schools. Selecting a diverse population served two purposes. First, the educational goal of conveying to participants that in order to explore issues of identity and values, different voices need to be represented. Second, to observe if diversity would generate interesting discussions during conflicts, and how motivated participants would navigate those conflicts.

Eight of the participants came to the Media Lab and three of them worked remotely from their homes and met face-to-face only on the first and last days of the workshop. All participants were subscribed to the workshop mailing list. Parents were also subscribed to a parent's mailing list and were invited, on the last day of the workshop, to an open house. As shown in previous research, engaging parents is very important in any learning process, but particularly when exploring issues of identity and values (Okin & Reich, 1999; Bers & Urrea, 2000).

An older child, whom I will call Elisa (names of workshop participants have been changed to protect privacy), served as a mentor and helped to informally coordinate the activity. Elisa was only one year older than the oldest of the participants, but she had good social and technical skills and had had previous experience with Zora. Her role in the workshop was to mediate between the children and myself and to act as a peer mentor by showing the others some projects that she had done before. Since one of my goals was

to observe how children would use Zora, I did not want to influence them by participating directly in the virtual experience. Elisa became the 12th participant in the workshop, delegating the role of helping with technical issues to the new children who quickly became Zora experts.

Methodology of Work

The workshop lasted three weeks. We met three times a week for three hours each time at the MIT Media Lab. During the first week, we played warm-up games aimed at helping the participants get to know each other. Everyday we would take a half-hour break for tea and cookies. The idea of the tea was to informally engage participants to evaluate the workshop experience in a day-to-day basis. The workshop followed a flexible syllabus that helped Elisa guide the activities. The children worked on their projects at their own pace without the need to comply with the activities planned in the syllabus (see figure 24).

Day	Activities planned in the syllabus
1	Filling out a **pre-questionnaire**, warm-up **games**, give out **design notebooks**, 15' **Zora demo**, making an **avatar** (intro to digital camera, Photoshop and Zora's avatar construction kit).
2	Warm-up **games**, finishing up the **personal avatar**, making the **avatar's profile**, **visiting an example** of a virtual home, building a personal **virtual home.**
3	**Finishing up** the virtual home, looking at the **values dictionary** and adding definitions, meeting in **City Hall.**
4	**Visiting** each other's virtual homes and giving presents, **visiting an example** of a

	temple, building **temples**, meeting in **City Hall.**
5	Finishing up the **temples**, meeting in **City Hall.**
6	**Visiting** each other's temples and giving presents, meeting in **City Hall.**
7	**Finishing up** virtual homes and temples, meeting in **City Hall.**
8	Revising avatar's profile, meeting in City Hall.
9	Leaving a **legacy** to future inhabitants of the city, meeting in **City Hall**, **group evaluation, preparing** for the open house, o**pen house** for family and friends.

Figure 24: activities programmed in the syllabus to help the coordinator

The methodology used in the workshop focused exclusively on a child-centered approach to learning. One of the research questions originating this work was to find out to what extent an identity construction environment, such as Zora, would engage children in exploration of identity and personal and moral values (see figure 25). Therefore, the presence of an adult with background knowledge about this area who would behave as coach or guide was explicitly avoided. As the workshop evolved, participants proposed new activities. For example, they discussed and voted on rules to organize community life. Children working remotely were able to connect during any day and time, as well as during the workshop hours.

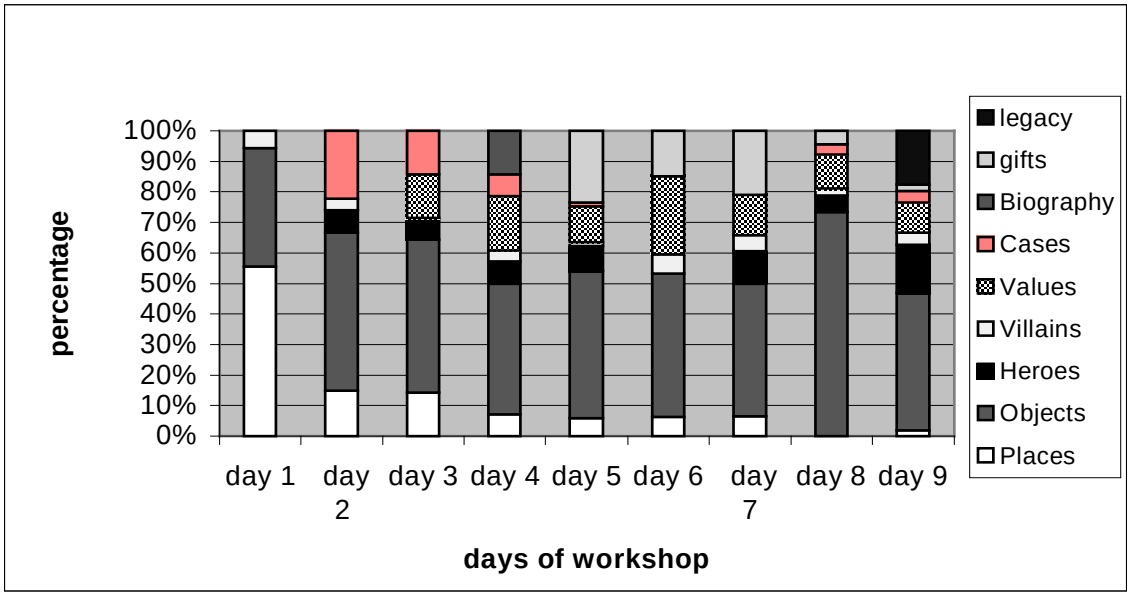

Figure 25: longitudinal distribution of creations by workshop participants

Participants had a personal computer with Photoshop and the Zora client, and one diskette to use with the digital cameras. They were also given a design notebook to write down ideas, sketches and problems for the entire the duration of the workshops. They could take home the design notebooks and document some afterthoughts. There was videotaping throughout the workshop.

Overall, participants created a total of 33 virtual places divided into 12 personal homes and 19 public temples, such as the Jewish temple, the Sports arena, the Video game room and the Dinosaur hall, and two community centers, the City hall and the Junk shop. Most of the participants created an average of two temples and one personal home, with the

exception of one of the children working at home who created ten virtual places but did not finished any of them.

During the last day of the workshop, every participant left a legacy with advice for future Zora users in the entrance to the city, the Teleport room. Legacies can be grouped into three categories. Those giving advice about technical issues, such as *"Using the editor and moving things is hard because you might want to move a picture frame but you move the wall. Be careful*". Those giving advice about how to design expressive artifacts and places, such as "*Really think about your rooms when you build them. Make sure you personalize them and that the color and everything is really you".* And those about how to handle social issues in the community, such as *"Zora is all about organization and cooperation… We had many discussions and great thoughts. Zora was great and we learned many things… Organization and cooperation helped us a great deal. To the new user: have fun!".*

Methodology of evaluation

I used an ethnographic approach with a natural observation method, analysis of system logs and design notebooks, pre and post-questionnaires and a final extended personal interview. In the same spirit as the ethnographer who immerses him or herself in a village to understand how its inhabitants live and think (Geertz, 1973), I immersed myself in the Zora virtual city designed by this group. My goal was to try to understand how they used the environment to explore issues of identity and personal and moral values. In order to

avoid what Papert calls "technocentric questions", the evaluation was centered on what young people did with Zora and not what Zora did to them (Papert, 1987).

Learning stories

In this section, I report and analyze how Zora was used and what the participants learned by engaging with the system. I focus on four learning stories of projects done by participants in the Zora workshop. These stories do not show the complete range of projects that can happen in Zora. Rather, they are intended to provide a representative sampling of how and what young people learn when they are engaged in using the Zora identity construction environment. Each of the following subsections presents a participant's experience with one particular aspect of Zora regarding their learning about identity and values.

Virtual autotopographies: spaces for exploring identity

How did learners explore their sense of identity using Zora? How did they express Erickson's tension between differentiation from others and integration into a major social group? Young people designed virtual autotopographies, i.e. personal and public spaces in which they grouped together aspects of the self.

Pablo: "you can *see* that I am Latino"

Pablo was born in the United States but he describes himself as being from Puerto Rico and Colombia, his parents' homelands. He belongs to a Catholic Church and goes to mass every week. He likes being outside in nature, to act in plays at school and talking to

people. He is a very articulate thirteen-year-old. He loves computers because he can use them to communicate with people. He is funny and witty and has a sweet and kind manner. Pablo is very big for his age and most people think that he is older than he really is. He is very proud of that. A few years ago, Pablo earned a scholarship that enables him to attend a private suburban school. Pablo comes from a low-income family and has to travel far in order to get to school. But he likes it. He says that he feels special and lucky.

During the workshop Pablo designed a virtual house with different shades of blue, his favorite color. He worked very hard to display a careful spatial arrangement of objects. On the right side, he put the favorite presents given to him by other participants: a map of Colombia and a picture of two puppies. On the left side, at the same distance from each other, are pictures of his family, his pets, his jewelry and his favorite landscapes (see figure 26). At the surface level, Pablo's virtual home seems almost identical to other homes in popular graphical multi-user environments. But there are several differences. Pablo was completely in charge of designing his house. He chose the colors and textures of the walls to give the space its own particular feel. He also made important decisions about what kinds of objects and characters would inhabit it.

Pablo frequently used the term *personalization* to describe the process of designing his virtual home. For example, *"A nice way to personalize [my virtual home] and make it really mine was to put pictures of my family because they really mean a lot to me. Choosing which picture to put was a personal thing. I mean, it was a way to think about*

the things and people I really care about... I don't mind if other people come and take a look at those pictures, but I put them up for myself."

While designing his home and choosing meaningful objects, Pablo engaged in a process of introspection. Although Pablo became one of the most popular participants in the workshop, while working at the computer he was always silent and very concentrated. He did not want to be interrupted, and he often arrived a half-hour before the beginning of the workshop to have more time to work on his home.

In contrast with other graphical multi-user environments, in Pablo's virtual home there is no furniture or objects that serve solely a physical function. Instead they each serve a symbolic function. They represent aspects of Pablo's identity. Pablo's home is a virtual autotopography, a spatial representation of identity composed of symbolically significant objects. Virtual autotopographies give materiality and concreteness to intangible aspects of the self such as Pablo being Latino, his emotional relationship with his family back in Colombia and Puerto Rico, and his love of nature and the color blue.

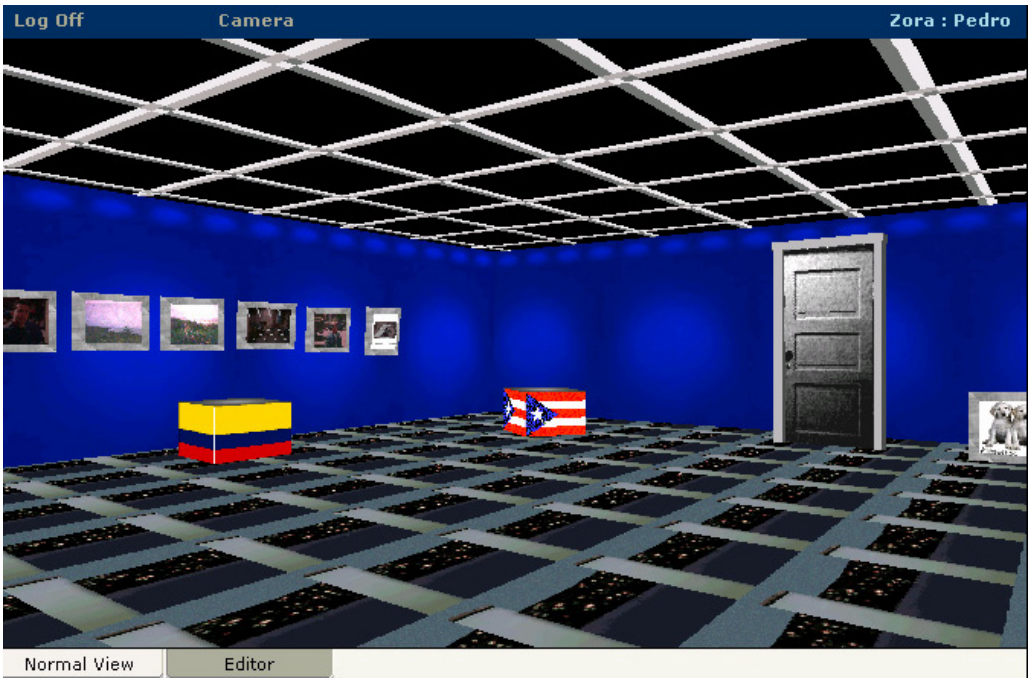

Figure 26: Pablo's virtual home with blue walls and ceiling

Pablo worked very hard in "personalizing" his virtual home. He spent the duration of the workshop refining it, trying different matching colors and adding and deleting objects. Pablo treated every object, not as a unit by itself, but as a component of a major whole. He was as interested in the relationship between objects as in the objects themselves. Pablo thought about the objects in his virtual home in terms of elements of a coherent system (i.e. his identity) and not in isolation. For example, he put flags from both Puerto Rico and Colombia, his parents' homelands, bracketing pictures of himself with his relatives. He moved stuff around many times and calculated exact distances between flags instead of the "looks good" method. Pablo used the spatial location of objects to amplify or mirror an aspect of his identity, his cultural heritage, that he also chose to highlight while creating his avatar's textual profile: *"My name is Pablo, I'm 13 and live in*

Boston. My dad was born in Puerto Rico, and my mom is Colombian. Even though I was born in Boston I consider myself to be either Puerto Rican or Colombian."

Over time Pablo re-configured his virtual autotopography according to his evolving perceptions about identity. For example, by the third week of the workshop he realized that he had put too many singers in his virtual home. So he decided to make the "Salsa and Merengue temple" and move them over there (see figure 27). In Zora, virtual temples are shared public spaces that represent cultural traditions or group interests. In contrast with personal homes, which are private collections of objects, temples are public groupings of objects that share a specific content or theme. Virtual temples are extended autotopographies that engage kids in looking outward and finding cultures and subcultures they identify with. By creating the "Salsa and Merengue temple", Pablo's hope was that others who also shared a taste for that kind of music would help him populate it. He compiled a list of his favorite 34 singers and musicians, who, at first sight, were all Latinos, just like him.

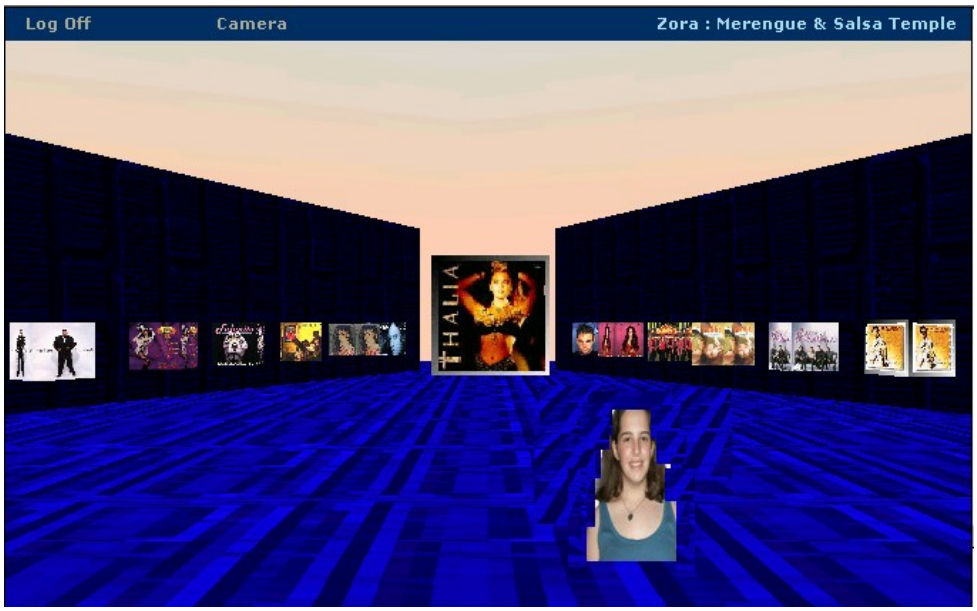

Figure 27:The Salsa and Merengue temple created by Pablo

As Pablo used the Internet to do research about their lives, he realized that it wasn't very clear what the word Latino meant. As he explained in one of the tea breaks, the hardest task for him was deciding which singers were to be defined as Latino. His first attempt was based on the language they use to sing. However this led him to the problem of how to categorize some of them who do not sing in Spanish but are originally from Latin America and others who sing in Spanish but are not Latino. At this point, Pablo asked the question "what does it mean to be Latino?" and explored an aspect of his identity that particularly troubles him. As he later shared during one of the virtual City hall meetings, Pablo goes to a private school where he is part of a Latino minority and he struggles hard with issues of segregation. However he is very proud of being Latino and he feels it makes him special and different.

During the final interview, when Pablo was asked what he learned during the workshop, he said, *"I don't feel that I learned particular skills, although I learned how to use Photoshop, Zora, and the computer better. But what I learned most was how to think about different things in different ways and how to express myself a little bit better through objects like the flags and everything I put in my room. If you go there, you can really tell who I am,* ***you can see it****. I guess I learned how objects can say a lot about a person. You can* ***see*** *that I am Latino."* [emphasis his].

Elisa: the personal meaning of Judaism

Elisa, the mentor, is the daughter of a rabbi. She goes to a Jewish school and much of her identity is linked to Judaism. She lives in a wealthy part of town and is very proud of her Jewish heritage. She wears Jewish symbols around her neck and likes to read and write in Hebrew. She is very driven, independent, and outgoing. She loves to talk about herself and has many friends. She has strong opinions about what is good and bad and she is not shy about sharing them with others. Elisa's role in the workshop was to be a peer mentor. She followed a daily syllabus, but she knew that participants were free to ignore her guidelines. She was in charge of helping children with technical difficulties and making them feel comfortable with each other. She started the workshop by making sure everyone knew she was different, that she was the mentor. But as time went by, she gave up that role and became just one more of the participants. She became good friends with some of the kids and worked on her own projects with a lot of enthusiasm. She rarely helped children out with technical problems and handed that task to some of the boys

who were very fast learners and became more knowledgeable than her. Her learning story can be used to demonstrate how mentors, and teachers, can become learners too.

Elisa started out by building a virtual temple instead of a personal home. She wasn't the only one to do so. Other participants, like Michael, also started by building a temple, such as the TV room with most of his favorite shows. Elisa created a Jewish temple containing objects, such as a Jewish prayer book, a picture with her name written in Hebrew, and an Israeli flag, as well as heroes like Steven Spielberg and her dad who is a rabbi (see figure 28).

Figure 28: the Jewish temple built by Elisa

In Elisa's Jewish temple, every single object had very personal stories attached to it as well as descriptions aimed at teaching others about Judaism. For example, the *kippah* has

the following description *"Leather or cloth skullcap worn on the head to both show and feel closer connection to God through the body".* It has the following associated story "*I live in the USA, and so I don't normally see Jews just walking down the street in a non-Jewish environment. Even if I did see one, I wouldn't know because Jews look the same as everyone else. That's why I love when I see someone in a kippah. They enable me to know if they are Jewish just by looking at them. I know it is not much, but whenever I see random people wearing kippot I feel closer to them. I know that being Jewish is just as important for them as it is to me."* While building her Jewish temple, Elisa did research about what kinds of objects best express Judaism, and especially her particular vision of it. This is very important for her. She doesn't want to absorb Judaism from her environment. She wants to re-create it and appropriate it in her own way.

Elisa's learning experience went beyond the typical project-based learning experiences in which students are asked to do extensive research on a particularly meaningful topic, yet they sometimes miss a deeper personal connection to the subject (Barron et al, 1998). While designing her Jewish temple Elisa learned more about Judaism, but even more important, she was able to reflect about what Judaism means for her. She had time and a space reserved for reflection and introspection. Zora's design helped her in this process by inviting her to associate personal values and stories to objects, in addition to providing standard information. Furthermore, most of her objects have two or three stories associated with them as well as many values and definitions.

As the workshop progressed, both Pablo and Elisa explored aspects that composed their identity and some of the ideas associated with the *society of self*. Both engaged in a process of self-reflection while designing their virtual autotopographies. This introspective exploration is very similar to the kind of "working through" issues of identity that Sherry Turkle, borrowing from Erikson, describes as a moratorium, or a time of constant experimentation and reflection in the adolescent's life. The process of self-reflection that Elisa and Pablo engaged in has some resemblance to what happens during therapeutic interventions and meditative or religious experiences. However, during the experience with Zora, the products of self-reflection became tangible, dynamic and manipulable.

Pablo and Elisa, as well as the rest of the workshop participants, put a lot of effort into having in their virtual autotopographies a collection of objects and stories representing aspects of the self. Therefore, their virtual autotopographies are constructs representing personal identity as a complex construction or *society of self*. In general, this way of thinking about identity is not part of the school curriculum and only becomes available in specific college level courses. However, as shown by Erikson's work, it is early on, during adolescence, that children engage in the quest for identity. Therefore it is at this critical stage of their life cycle that they would strongly benefit from having a rich set of conceptual and material tools to explore the complexity of identity.

A participatory micro-community in the virtual City Hall

In order to develop a sense of identity and personal and moral values, participation in a community is needed. On the one hand, the dynamic process of identifying with and

differentiating from others is essential to form a coherent sense of self. As Erik Erikson points out, *"no ego can develop outside of social processes that offer workable prototypes and roles"* (Erikson, 1950). On the other hand, extensive research suggests that the involvement in participatory democracy, social institutions, group decision-making and self-government are critical in shaping individual's moral development (Kohlberg, 1985).

Zora provided the opportunity for users to develop a participatory micro-community, i.e. a safe space reserved to experiment with ways of thinking and behaving needed to function in a community. In the experience described in this paper, the micro-community is different from traditional virtual communities, such as those created in chats and MUD's, because individuals have both on-line and real-time face to face interactions. How did learners create a micro-community in Zora? How did they participate in its self-government? What are the differences from and similarities to the model of a face-to-face just community proposed by Kohlberg? These are some of the issues that I will address in this learning story.

Learners created a virtual City Hall as a space for the community to gather and talk about issues relevant to its social organization. The Zora system was seeded with a template of a City Hall, which they decided to use. They also decided that the cases that community members wanted to discuss with others needed to be placed there for later discussion. For example, during the second day of the workshop children discovered the need to create laws to make living in Zora easier (see figure 29). This realization happened as learners

started to try out different Zora features and test its technical limits. For example, they created huge objects and left them in inadequate virtual places, they learned how to distort the look of personal avatars and how to change the size of other people's personal homes. In contrast with other experiences of just-communities in education, the idea of creating laws emerged in a natural way, as a need of the community and not as a suggestion from an external agent, such as teacher or facilitator.

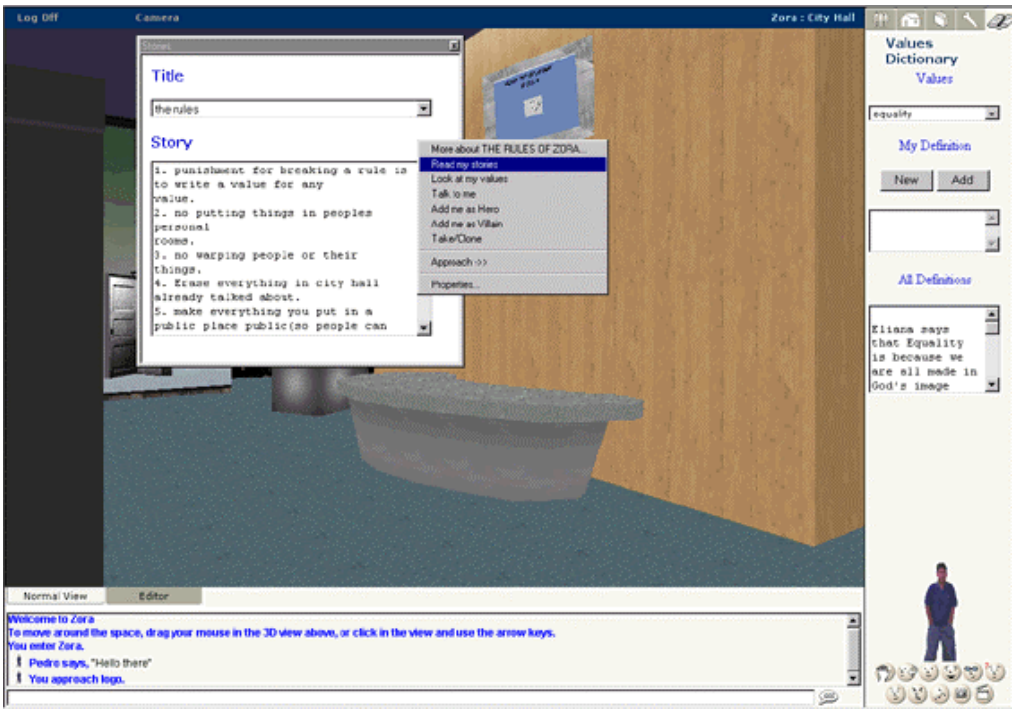

Figure 29 shows the virtual City Hall and the laws posted on the wall

In the first City hall's virtual meeting a mayor was elected and took charge of coordinating the writing of the rules of Zora. Participants placed cases that they thought needed to become laws. The mayor asked who was in favor of making them into laws. The students experimented with different on-line voting systems, such as *"press 1 if you*

agree" or *"stand on the left side of the room if you disagree",* but they had a very hard time organizing themselves so that everyone was heard and a consensus was reached. This was due, in part, to their lack of familiarity with on-line synchronous communication, and in part, to their inexperience in organizing themselves without top-down intervention.

After a long discussion with many disruptions, they agreed on some basic rules*: "no putting things in people's personal rooms", "no warping people or their things", "set the properties of the objects placed in public spaces so others can clone them", "people can make their own rules for their own rooms but it must be clear", " the junk room can never be too full", "fess up to what you do",* and *"there will be no jail"*.

During the following days children continued meeting in the City hall and reviewing the new cases placed there. For example, there was a heated discussion about the "punishment" case created by fifteen-year-old Chinese-American Nino, who said *"there should be physical punishment to rule breakers."* The following are some excerpts of the discussion:

Nino says: everybody read the new case

Janet says: I don't get it

Sybil says: physical punishment?

Elisa says: The punishment idea is absurd.

Janet says: well I think the physical punishment is ridiculous.

Elisa says: It's ridiculous. Why would we, in a peaceful city need this?

Sybil says: let's ignore that one

Nino says: it's the only thing that will work

KOSHO says: no it won't

Elise says: is not even real, want to start off with hitting or otherwise hurting people?

Janet says: if someone breaks a rule, they shouldn't be beaten like a piece of meat. That's ridiculous

Nino's punishment case wasn't accepted as a possible law by the rest of the community members. Some of the participants proposed community service as a form of punishment, while others advocated locking people up in a jail. They spent a long time, mostly face-to-face, discussing how the could technically implement a virtual jail which could be secure enough to prevent avatars from escaping. They considered the possibility of having a guard in charge, but no one wanted that role because, as Nino said during a tea break, *"it is too boring to always stay in the same place and go chasing people. You don't get to do your own thing"*. Finally consensus was reached and a law was created: *"Punishment for breaking a rule is to write a value in the dictionary*".

Another case that didn't make it into a law, proposed by twelve-year old Matrix, was about the creation of a stripping bar. This case originated as a result of one of the users finding in the Microsoft avatar's library a cartoon character, called Theo, which when clicked on the posing gesture would strip. Although there were no body parts exposed, the gesture of the character clearly conveyed the idea of stripping. The stripping issue kept being discussed all through the workshop, maybe due to the fact that the partipants were in their teens, an age in which talking about sex is particularly appealing. However, the stripping bar was never created and stripping eventually was outlawed. Zora

community members chose Theo as both a hero and villain. The value "stripping", was given the definition *"the freedom of pure and carefree expression"*. Following are some excerpts from the system log on striping:

Matrix says: only stripping in a bar!

Janet says: FORGET ABOUT THE STRIPPING MATRIX

Nino says: matrix, shut up, I can strip where ever I want, whenever I want, to whomever I want

Nino poses

Carla says: stop posing

Sybil says: quit that

Nino says: I made my point

Sybil says: can we be a little more serious? It's city hall...

Sybil says: indecent exposure should not be allowed

Nino says: freedom!!!!!!!

Janet says: who cares if someone poses. It's not that big of an issue. If u want to see someone nude, then just watch yourself take a shower or something.

Nino says: stripping is our natural birthright

Elise says: You mean because you were born naked?

Sybil says: it's stupid

Nino says: it is the symbol of absolute freedom

KOSHO says:no it isn't

Elise says:Then, by the same theory, it's your birthright to stay as mature as infants. I'm glad you're at least consistent.

Nino says: I LOVE STRIPPING

Sheila says: But it is our birthright to say we don't want to see you naked

On the one hand, the virtual City Hall provided a public forum for participatory democracy and decision-making about authentic dilemmas faced by the Zora community, such as the creation of laws, a jail or a stripping bar. On the other hand, it provided a safe space to voice opinions and discuss moral dilemmas faced by society at large. For example, during the second week of the workshop, Elisa, who built the virtual Jewish temple, placed in City Hall a case with a web link to a news article about a shooting in a Jewish Community Center in L.A that had happened the day before. She attached to it the value *"tolerance*" and defined it as " *I say that Tolerance is something that everybody needs in relation to other people or nobody would be able to get along with anyone else. We should tolerate everything peaceful and nothing hateful or hurtful."* A meeting was called to discuss the news.

Elisa says: It was very scary. I read the article and one of the things the man who committed this act said he wanted to remind people that all Jews should be killed. That sent serious shivers down my spine.
KOSHO says: Nazis. A leader tells them that others are the cause of all their problems.
Pablo says: some people are just looking for someone to blame.
Janet says: people are gonna feel the way they want to feel and no one can really change their minds
Pablo says: they are entitled to their opinions but it's their actions that need to be stopped
Elisa says: Janet, do you really think that? No one can change their minds? And if it's true that we can't change their minds, should we do something to limit their actions?
Pablo says: there isn't anything we can do.

Nino says: this guy should be dragged out and flayed alive

KOSHO says: you just can't fix a wrong with a wrong

Janet. says: yeah violence is never the answer

Nino says: if anybody deserves the death penalty, he does

Pablo says: but I think no one deserves the death penalty

Carla says: he should just have life in jail

Sheila says: He shouldn't be shot but helped, I really don't know how, but he just needs a way to get familiar with other cultures

Nino says: that's not going to help. Death penalty.

Pablo says: we don't have the authority to take a person's life. Death penalty is still not justified

Sheila says: I think by killing him we show that we have given up and the only way to solve things is to kill somebody, and I know that is not right

Matrix says: I read an editorial that said people should just be put in jail for life because, believe it or not, the death penalty cost more than letting him live for the rest of his life(30 yrs.)

Elisa says: answer my questions, should anyone who kills be killed? Or does intent matter? And if intent matters does it matter more or less than the result of the action?

Nino says: intent and result both matter

Elisa says: And once he is killed, assuming he is, what would be the repercussions of that? Would his family go after the government? Would he become a Neo-Nazi martyr?

Janet says: maybe there should be a boot camp for people like this

Pablo says: it wouldn't really work. The only prevention is at home. people need to be brought up knowing discrimination is wrong

Sheila says: I think we can't do that much for adults, but the kids in school I know we can do a lot, so I think we should try to concentrate on making sure they know that this stuff is wrong

Janet says: yeah we should try to prevent

Pablo says: the only place is at home

Elisa says: I'm thinking that if it doesn't exist in the home, school won't help, but only home won't be as good as home and school.

Pablo says: teachers don't have nearly enough influence as the parents

As a result of this conversation, Eric, one of the youngest and shyest children in the workshop, was very quiet "listening". He did not participate in the on-line conversation, but he made the "Everyone's temple", which he described as a space for *"all the cultures and religions to get along"*. Zora allows users to participate in the community not only by engaging in discussions and arguments, but also by contributing through the design of objects and new places within the virtual city. Other children who had already started a temple made a special effort to put in more objects and characters in order to teach others about its content. For example, fourteen-year-old Sheila further developed the Southern Baptist church by putting God as a hero, and the devil as a villain. She wrote stories to convey her point of view about them. Also, children who had not yet put any cultural objects in their rooms or temples, added flags to them. For example, Janet put a flag from her homeland of Nigeria, and Kosho put one from his mother's home, Iran, attaching the value "identity" to it and defining by saying that *" identity tells people who I am and what cultures I belong to."*

In Kohlberg's "just-community" approach, students and teachers also engage in conversations about dilemmas and controversial issues similar to the ones described above. However, members can make decisions about all aspects of the community life, except curriculum decisions. There are three difference with the Zora experience. First, as shown by the examples above, community members do not follow an already established curriculum specifying the activities they should engage in. They have the power to decide what kind of projects they would work on. Second, Zora makes it easy for learners to observe the connections between what is said in the on-line conversations (i.e. discussion about discrimination) and what is done in the virtual city (i.e. creating the "Everyone's temple"). An environment that offers the possibility of observing the relationship between *saying* and *doing* is powerful because in issues of identity and values, concrete actions matter as much as analytical thinking (Blasi,1983; 1984). In the real world, however, taking action would involve a long-term process and, because of the feedback loop, it would be hard for young children to be in complete control of an authentic experience. Third, in Kohlberg's work, the tools people have to build a just community are words and their derivates such as meetings, sharing stories, discussing dilemmas, etc. In Zora, as shown by Eric's "Everyone's Temple", people can also engage in making concrete things, such as virtual places, that can be used and inhabited.

For all of the workshop participants, with the exception of two who attend parochial schools and one who goes to a particularly progressive private school, this was the first time they encountered an atmosphere where they could have conversations about controversial issues in an open way. In the final interview, Sheila said: *"The City hall was*

a place to freely voice your opinions and I had a lot to say because in my school we don't talk about this kind of current events and if we do it is only in separate clubs". Following is an extract from the log:

Elisa says: So, do your schools do anything to prevent or talk about racism and the like?
Sheila says: Not my school
Kosho says: we have a newspaper every month that discusses these issues.
Janet says: No. no one talks about it in my school
Nino says: in my school they just forbid it
Elisa says: They just forbid racism? Well that's an obvious thing to do. Do they talk about it though?
Pablo says: in my school usually they don't really care and it's just PC mombo jumbo…pc crap. They look too bad if they don't say anything. It's a private school and they need donations so people "pretend" to care
Janet says: it first came an issue when we heard about the Colorado shootings[15]. People don't discuss it because they don't want to make it a big deal.
Nino says: my school holds forums to talk about these issues
Pablo says: we hold forums too but these things don't come up, people just don't want to bring those things up.
Nino says: they believe that if they ignore them, it will go away.

[15] This refers to the fact that two students in the Columbine High School in Littleton, Colorado, shot twelve classmates and a teacher, injuring 23 others, on April 20, 1999.

As research by Erickson has shown, young people need spaces to talk about controversial issues and work through different explanations and points of views. There is an important body of research on computer supported spaces to foster discussion and reflection. Some of this work is aimed at supporting discussion about science (Songer, 1996; Scardamalia & Bereiter, 1994; Pea et al. 1994; Edelson, 1999), while other programs engage students in case-based moral reasoning about current ethical choices (Cavalier, 1996; 1998). However, none of this work explicitly looks at how to design networked technologies to support discussion and reflection about personal and moral values in relationship to identity the way that Zora does.

The discussions happening at City Hall offered an opportunity to develop ethical fluency by engaging in interactions with people who might have different opinions and who make explicit their values through their virtual creations. *"It was the first time I had this conversation [about the death penalty] with someone who thought in such a different way than I do. It was weird because I didn't know I felt so strongly against it, but because Nino felt so strongly in favor of it, it forced me to think really hard about what my real thoughts were."* Pablo stressed the fact that in a face-to-face conversation they probably wouldn't be able to discuss this with the same level of "seriousness". As soon as the different opinions became clear they would switch to a more playful tone in order to avoid confrontation. However, it is precisely the open confrontation, in a respectful way, which leads to developing better ways of thinking about controversial issues and understanding them from others' perspectives. At the same time, by engaging in dialogue

about their inner worlds, kids were able to learn about themselves and others and share common concerns.

Elise says: If your school Janet, started seriously working on race relations, it would embarrass you? That's interesting.
Janet says: yeah, exactly. I go to a predominantly white school. Eyes are focussed on me. One mentioning of black people, I feel people staring
Pablo says: same thing with me and Latino.
KOSHO says: it is hard when you are of a different race but if you stand up something good might come out of it
Pablo says: there are 500 people in my school and only 7 Latinos.
Janet says: only about 15 out of 435 are black in my school.
Elise says: You see, my school is all white, all Jewish, and we had an exchange program where we got together with some kids, mostly Hispanic and black, once a month to hang out and talk and find out things about each other.
Pablo says: I bring attention to the fact I'm Latino, if you're noticed so what? in no way does it handicap me
Janet says: I am proud of myself and I have succeeded so much. I am going to be the middle school president and I made lots of friends…yeah I feel the same way Pablo
Pablo says: I don't let people get away with race jokes.
Elise says: To tell you the truth, I had a few classic misconceptions that were a little prejudiced, that, of course I would never act on, but was ashamed of, that were all because of ignorance.
Janet says: I'm glad we are all being honest.

Elise says: I don't have racist parents or schools or anything. I just live in an upper middle class, Jewish, suburb and I didn't know anything about people other than educated Jews.
Pablo says: it happens
Elise says: I'm glad I'm here, eliminating my stereotypes that I'm sure just came from movies or TV. I think ignorance is a huge part of it
Janet says: Knowing things about other cultures and races is good for everyone and should be happening more often

According to most of the workshop participants, being on-line helped them to discuss delicate issues in a deep way and to open up. During the final interview Janet, a 14 year-old African American, reflected upon her experience: "*I go to a white school and when they talk about racism or stuff like that I am embarrassed and I feel all the eyes on me, but in City Hall it was easier because I could talk freely without feeling everyone starring at me."* It was hard, at first, to understand what Janet meant, particularly because her avatar displayed a picture of herself and she was physically sitting next to everyone else during the workshop. Why didn't she feel all the eyes staring at her? I believe there were three factors. First, Janet could type, instead of talk. This helped her distance herself from the ideas and express them without feeling observed by her peers. Second, the avatar, although it had her picture and name, served the function of an alter ego. Third, Janet knew that Zora was a space explicitly designed to talk openly about these issues and she felt free to express herself because everyone else was also doing it.

These kinds of conversations started on line and were later carried on off-line. Video analysis of face to face interactions showed how participants engaged in thoughtful

discussions about current controversial issues, such as censorship of a popular movie, during the tea breaks. I believe that having those conversations would have been much harder if children hadn't had the chance to have the on-line experience first. This allowed them to distance themselves from the ideas and get to know each other in a non ego-threatening environment. The participatory micro-community, by providing a safe virtual on-line environment, promoted face-to-face dialogue.

Values as aspects of identity: concrete and abstract explorations

How did learners explore the relationship between personal and moral values and identity while using Zora? What are Zora's design affordances that make this kind of learning possible? What is unique about Zora's approach to help children understand the relationship between values and identity? These are some of the issues I will address in this section.

The relationship between questions such as "who am I" and "what are the values I feel are important" is not always easy to address because it is frequently taken for granted or assumed. Therefore, two design decisions were made to help young people explore this relationship in a tangible and concrete way: First, in Zora learners can create objects that evoke aspects of the self. In the spirit of the object-oriented paradigm, they can define these objects with attributes. These attributes are narrative-based, meaning that they tell stories about the particular meaning that learners assign to the objects. Values are also attributes of these objects. And since the objects are meant to evoke aspects of the self, the values associated to them also convey what is most important for the individual. Therefore, when creating these values, learners are explicitly engaged in thinking about

the relationship between identity and personal or moral values. Second, this relationship becomes salient by the choices made at the Zora's interface level. It is very clear that every object is associated with a value attribute.

Zora's design afforded approaching values with a plurality of thinking and learning styles, as shown by the following experiences by Elisa and Sybil. For example, Elisa chose the value *"community"* and associated it with a picture of her school year book. Here is her definition: *"At the New Jewish High School I don't just have teachers and classmates, everyone is friends. I hang out in the office with the staff or in the lounge with my peers. Whenever anyone has a problem, there is someone to whom we can go for help. That is community."* Elisa's definition is grounded in the concrete object (the yearbook) that represents a personal experience that is an important aspect of Elisa's identity (belonging to the school community).

In contrast, Sybil created the value "*community"* as a stand-alone value in the values dictionary and defined it as: *"… a group of people in a certain place in which everyone cares for each other."* She did not associate it with any object in Zora. This definition of community is not anchored to any particular community, therefore its conceptualization is abstract and seeks to be universal. None of these two definitions is better than the other. The difference lies in the kind of thinking process that both Elisa and Sybil engaged in while creating them.

As shown by these two examples, Zora's design supports two very different ways to learn about personal and moral values. One, as shown by Sybil's definition of community, affords thinking about values as repositories of prescribed beliefs or normative universal principles. This is supported by the design feature of the collaborative values dictionary. This approach is typified by abstract definitions. In order to create a new value and its definition in the dictionary, learners think about values as universal principles, disassociating them from any specific context or object in the virtual world [16]. This abstract approach to values is not always conducive to thinking about the relationship between values and identity. However, it is the most common one found in educational interventions where the use of the Socratic method of discussion about moral dilemmas abound (Lipman, 1988). This abstract approach tends to engage children in thinking about values as a hierarchical pyramid in which the most important values are at the top and can be accessed by logical reasoning.

A different approach to values is represented by Eliza's definition of community. Instead of a universal definition, Elisa wrote about a very concrete case of community (her own school) and represented it with a very concrete object (the yearbook). This way of thinking about values is supported by Zora's design: objects are defined in terms of their behaviors and attributes, of which values are one. Therefore, when a child designs an object, she also has to think about the values that the object conveys and its relationship

[16] It is interesting to note that participants considered this abstract approach as a punishment. As shown earlier, writing a value in the dictionary was a way that the Zora community members chose to penalize bad behavior.

to her personal identity. During the final interview, when I asked fifteen year old Nino what he learned during the workshop he said: *"…how to see values in things… because usually when I see something I just see it, I really don't think about it…this opened my eyes. For example, before I didn't think that there was much value in my Dave Matthew's poster or a picture of me fishing… I didn't think about values at all. By attaching values to things you realize what your values are and you also make other people more likely to know you better. Right now when I see something, somehow I wonder what values it has, and what certain people think its values are."*

Most of the children who worked on Zora chose this concrete way of approaching values (i.e. grounding them and their definitions in objects), instead of the abstract approach (i.e. entering values and definitions directly into the values dictionary). Janet's comment in the post-interview is representative of most participants' opinions: *"When I write values for my objects I feel like I can express my feelings and it is a way to see what is going through my mind. I usually don't talk about values and don't think much about them. For example I wrote down something about love and I realized wow! I am really into this but I didn't know because I don't talk about it…so there was something new for me. When I wrote the values is when I learned a lot more about myself".*

Zora users create virtual autotopographies populated by many objects and their associated values. These values do not always form a coherent value system but a collection of diverse values that, because they are grounded in very different experiences, might be in conflict with each other. This *society of self* , represented by the autotopographies, can be

visualized as a dynamic network in which a diversity of values interact with each other and, according to the context, some values take a more predominant role and affect behavior. This view provides a different alternative to thinking about values as a hierarchical pyramid in which values are organized according to universal ethical principles.

This realization did not happen overnight but evolved over time, as children created more complex autotopographies. For example, During the workshop Nino first struggled very hard to understand what values are, in general, and why Zora's design "forced" him to specify values as attributes of objects. He said: *"At the beginning my mind would drop to a blank because I usually don't think about values or my values. But since I had to write down the values of objects that I put in my room, it forced me to think deep down inside to see what this actually means to me."* For him, as well as for most of the workshop participants, the process of thinking about values in concrete ways turned out to be a difficult learning experience, even harder than creating abstract definitions in the value dictionary. However, it was perceived to be a more enjoyable task, perhaps because it involved them personally. While treating values in an abstract way led to the repetition of commonly accepted definitions without much thinking about the complexity of their meaning, and was seen as a punishment, the concrete approach required children to think hard about the connection between the abstract principle and its personal meaning.

As shown in this section, the Zora identity construction environment supported the exploration of values in both an abstract and concrete way. The design and manipulation

of computational objects with values attributes provided a unique opportunity for the participants to think about the relationship between values and their identity. It also provided a different way, more in line with the idea of a *society of self*, to think about values.

Open questions

The learning stories in this chapter highlight some of the strengths and successes of how the Zora identity construction environment supported learning about identity and values by engaging young people in the design of a graphical virtual city and its social organization. But it is also useful to look at the problems and difficulties encountered. Some of the problems are technical in nature, and are reasonably easy to fix. For example, the programming language to create conversations for objects and characters was very difficult to learn and use, therefore none of the workshop participants was able to program an interesting interaction. In the experience at Boston's Children's Hospital described in the next section, this was fixed and some patients were able to create conversations for their characters. Other technical problems were not so easy to fix such as the need of high bandwidth or a very fast modem connection to avoid frequent computer crashes that disturb the engagement.

Other problems did not have technical fixes and instead require re-thinking or re-designing the nature of the learning experience. For example, since the Zora micro-community was very small, it was relatively easy for learners to reach consensus and engage in a participatory democracy. What will happen when scaling up? What mechanisms need to be put in place, when learners engage in a full-size virtual

community and not only in a micro-community? What syllabus, if any, should facilitators follow when scaling up? What kind of assessment methods should be used to evaluate the learning experience when scaling up? The CSCL (Computer Supported Colaborative Learning) community has been struggling with these issues for a long time and research in this area should be very useful when responding to these questions in future projects.

In this experience all the participants met face to face at least twice, and most of them were physically present when logged in. When difficult issues of socio-dynamics arose on-line, it was common for children to go off-line to resolve them. What is the right balance between on-line and off -line activities? What kinds of issues require face-to-face interaction? Did the learners continue the conversations about controversial issues that were initiated on-line once they were face-to-face? If this research were going to be done in a longitudinal way, the next step would be to see how these conversations engage children in taking action not only in the virtual world but also in their real communities at home, school, etc.

When the focus of the experience switches from a child-centered model of learning, such as the one described in this paper, to one where an adult has a more predominant role, new questions need to be answered. Should the adult indoctrinate learners about personal and moral values as the "bag of virtues" approach proposes (Bennett, 1993; Chazan, 1985)? Or should he or she be a neutral facilitator who does not interfere or reference personal or external values, but helps young people clarify their own values and engage in the valuation process such as "Values Clarification" proposes (Raths, Harmin &

Simon, 1978)? For example, should the facilitator seed the Zora virtual city with particularly controversial cases to foster debate? Should the teacher be an advocate of moral content and moral behavior or only a process facilitator? What kind of knowledge and skills should he or she have? As I observed the kinds of creations and interactions that happened in Zora, I believe that facilitators might benefit from having counseling skills and expertise in ethics, since their role goes beyond being a moderator. Another question to investigate would be how and whether a facilitator, with special training and background knowledge about psychology and ethics, would help children to engage in more sophisticated discussions.

As with other design-based and project-based educational initiatives, the Zora experience raises significant logistical challenges, and makes special demands on the available technological infrastructure. Is 3D really needed or is it possible to implement a 2D version of Zora requiring less computational resources? As said earlier, 3D mainly served engagement and immersion purposes. It was not used to address a content matter that can be better understood and learned in 3D, such as physics, where the possibility of seeing a process in three dimensions adds to the comprehension of the concept (Dede et al, 1999). For the content of identity and values, 2D pictures would have been sufficient. However, it is not clear if it would have been enough to engage children in a self-motivated way for long periods of time. Most of the workshop participants said that they really liked the 3D aspects of Zora because of the navigational challenges it poses as well as the aesthetical resemblance to popular video games. Further research needs to be done to answer the question about the benefits of 3D for ICE's.

This work is just a first step, and many questions are still unanswered: will the young people that participated in this experience carry out their explorations of identity and values to the other aspects of their lives? In other words, will the learning transfer to other contexts? How does the experience compare to face-to-face workshops? These questions are very hard to answer, and a very different methodological approach may be required to answer them.

Case 2: pediatric patients using Zora at the hospital

This case study describes the experience of pediatric patients with end-stage renal disease (ESRD) at Boston's Children's Hospital using the Zora identity construction environment. The dialysis unit has a constant population of young patients with ESRD who need dialysis three times a week for approximately four hours per session. Hemodialysis is only sufficient to ameliorate or prevent some, but not all, of the complications of renal failure. Studies have found evidence of psychological resiliency, but also of significant constraints and burdens on patients (Brem et al, 1988). The treatment usually significantly disrupts the social, emotional and academic experiences of young people (Brownbridge et al 1994).

Patients with ESRD facing hemodialysis are an ideal population to benefit from the use of identity construction environments such as Zora. They are struggling with issues of personal identity and are in need of interventions that support expression of emotions, working on relationships, being involved in meaningful activities, and seeking support from others with similar experiences (Shapiro, 1996).

Patients already form a community with a shared medical condition and treatment that makes them and their lifestyles different from these of other young people their age. However, two factors hinder the formation of a community in which social support networks and patient interaction can fully develop. First, patients are on different dialysis schedules. Therefore they do not always know each other and/or have the chance to interact. Second, although some patients spend many hours together in the same room, they cannot communicate with each other in a private way while in treatment. The dialysis process ties them to unmovable beds that are too far apart physically to allow adequate social conversations.

The study

This study grew out of a collaboration with the Departments of Psychiatry and Nephrology at Boston's Children's Hospital. The five-month pilot study reported in this chapter was conducted in the dialysis unit there. Participants ranging from seven to eighteen years old were identified by the social worker and child-life specialist of the unit based on their personal interests. No computer expertise was required. From the total of twelve patients initially recruited, five children discontinued their participation after one demonstration session for varied reasons: changes in their medical condition, lack of interest in computers and feeling tired and sleepy during dialysis.

Each of the seven patients who did participate in the study used Zora an average of six sessions that lasted in average an hour each. In some cases children engaged with Zora for as much as 3 hours and others for only 15 minutes at a time, depending on patient's

attention span, medical treatment required and general well-being. Patients had access to a networked computer at their bedside (see figure 30). Since there were only three computers, a maximum of three children were able to connect to Zora at the same time.

Figure 30: the Zora computer and the dialysis machine

A key component of the success of the project was to obtain the chief nephrologist's approval and support as well as the participation of the unit's social worker, child life specialist and nurses. The child life specialist and three nurses took an active role in participating in diverse aspects of the Zora project.

Research questions

The questions this case study looked to address were:

- Studying feasibility and safety of using Zora in a hospital setting (i.e. Is Zora an application that is safe and satisfying for children with ESRD on hemodialysis?)
- Observing how patients use Zora to explore personal identity (i.e. How do patients in dialysis use Zora? Is there a connection between using Zora and self-understanding of illness?)

- Facilitating mutual patient support and interaction (i.e. Does Zora have any impact on patient's and staff perceptions of social support?)
- Providing design guidelines for the use of identity construction environments in hospitals (i.e. How can they best help children and families cope with the stresses of having a serious illness?)

Methodology of Work

The Zora system was only accessible to the patients and staff in the dialysis unit, physicians in the Department of Psychiatry and the team at the MIT Media Laboratory. This team was composed of myself, an MIT pre-medical undergraduate who only collaborated in the later phases of the projects, and two high-school students interested in medicine. Computers in the unit had been installed with the Zora environment, graphical software and an Internet filtering system. They were mounted on tables suitable for bedside use in the hospital. A digital camera was also provided. Appropriate human studies permission was obtained. In addition, according to hospital regulations, an agreement to respect a code of conduct in using Zora was signed by the patients and parents (see appendix)[17].

[17] I had my reservations about having patients sign this code prior to using Zora. Part of the experience was to observe how patients would develop their own code of conduct over time, as teenagers did in the summer workshop. However, in order to legally protect the hospital in case of lawsuits, this wasn't possible.

The work in the unit had three different phases, followed by a "service" stage in which the computers were left at the hospital as a service for the community even though research had been completed (see figure 31).

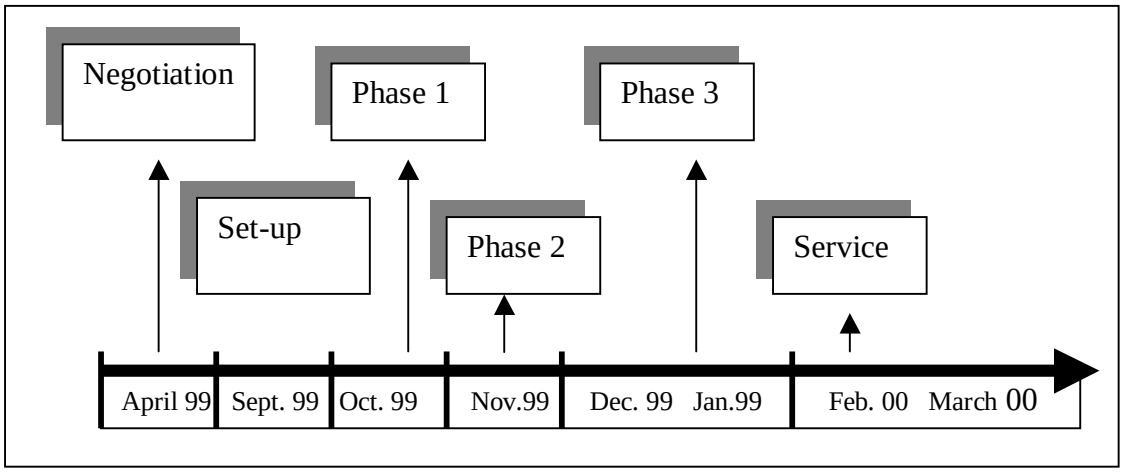

Figure 31: time frame of project

Phase 1: building interest around the Zora project. This phase was critical, as dialysis patients were found to have lower motivational levels to use Zora than the healthy children described earlier. During this phase, which lasted a month, I went to the Unit to meet all the patients and staff and to introduce them to Zora, without asking them to commit to participate in the study. I also participated in different activities organized on the Unit in order to become more familiar with the dialysis environment.

Phase 2: hands-on work with Zora. I and members of the MIT team, composed by two high school students and a pre-med student, went to the unit four times a week. We rolled the computers to the patient's bedsides and worked on a one-to-one basis. We also trained the child-life specialist on how to use Zora so that she could integrate its use into

her repertoire of activities. While undergoing dialysis, patients logged onto the Zora application and used it for as long as they wanted, as long as it did not interfere with medical procedures. The goal of this phase, which also lasted one month, was to teach the Zora environment to the patients so they could learn to express themselves through their creations. Within this phase, a field trip to the Media Lab for patients and staff was organized.

Phase 3: working remotely. Once patients became familiar with the technology, they were able to use Zora by themselves. They could roll the computers to their bedside by themselves before the beginning of the treatment or ask hospital staff for help. We agreed on certain days when we would be logged on remotely. At this point in the project, nurses became very involved and asked if they could be trained to learn Zora.

The work with Zora did not follow any specific syllabus. The idea was to engage patients to use Zora in any way they wanted to, whenever they wanted to, accommodating to their medical, mental and physical needs. Since no commitment was requested for the patients, part of the research regarding feasibility involved the study of the usage patterns of the population.

Methodology of evaluation

The evaluation methodology was similar to the one described in the previous case study. I did observations of on-line and face-to-face interaction, and analysis of the system logs that recorded, with date and time, everything participants said or did on-line. In terms of qualitative methodology, the log of the on-line interaction was analyzed for recurrent

themes, ideas, or patterns. In terms of quantitative analysis, logs were parsed to assess the number of objects, characters and virtual spaces created as well as the number of on-line interactions that occurred during the study.

Semi-structured personal interviews were conducted with both patients and staff. Analysis of the interviews had both a quantitative and a qualitative aspect. Measures of satisfaction and safety were analyzed by calculating mean scores and standard deviations and transcripts were coded to identify recurrent themes. Volunteer participants were videotaped talking about their general impressions and their evaluation about their participation in the project. These videotapes were also analyzed following a qualitative methodology.

Learning stories

During the pilot experience, participants designed a total of 16 virtual places (10% of total creations). The hospital staff created 3, such as the Nurse's Room and the Temple of Feeling Better, *"a place to tell each other ways to cope with hard things "* (see figure 32). The MIT staff created 3 spaces such as the Restaurant. Patients designed personal homes and common spaces such as the Music Room and the Renal Rap, *"a virtual space for dialysis patients to get together do fun things".*

Figure 32: The Temple of Feeling Better

Participants made a total of 94 objects (59%) ranging from pictures of the hospital staff, favorite cartoon characters and video games. Overall, participants created 14 characters that they called heroes (9%), most of which were cartoons characters. The values dictionary of the virtual city had 13 values with their definitions (8%), such as "friendship", *"doing something positive to help myself or someone else"* and "respect" with the definition *"people should be aware of what they do to other people's things."*

During the experience participants created 5 cases (3% of total). As mentioned earlier, cases are special types of objects representing events or circumstances to be discussed and agreed upon. They require community members to take action to resolve them. Some dealt with setting up the social organization of the virtual city, such as *"someone changed the appearance of my door and I don't understand why. I would like to suggest as a rule that there is no tampering with other people's stuff"*, while others were about personal medical problems.

Participants posted on the bulletin boards 17 messages (11 % of total creations) such as *"I really liked what you guys have done with the renal rap room"*. They engaged in interactions with each other more on an asynchronous way than on a real-time way. This is not surprising since not all the participants were in the same dialysis shift and not all of them felt healthy enough to use Zora at the same time.

Is it possible, and safe, to use Zora in a hospital setting?

In order to assess the feasibility and safety of using Zora in a hospital, in the middle of dialysis treatment, participants were asked to rate the application using a 7-point Likert scale anchored at one end by "1=not at all" and at the other end by "7=a great deal". Descriptive statistics were calculated for each of these rating scales. Participants were also asked several open-ended questions.

Feasibility

Overall, the seven patients reported that they were very satisfied with Zora (mean = 5.3; standard deviation =1.31) and that they enjoyed very much participating in the experience (mean = 5.71; standard deviation =1.60*)* (see figure 33). *"It was really nice to have something fun to do at the hospital that could keep my mind off dialysis and that it was not schoolwork, but entertaining"*, said a fifteen year old patient.

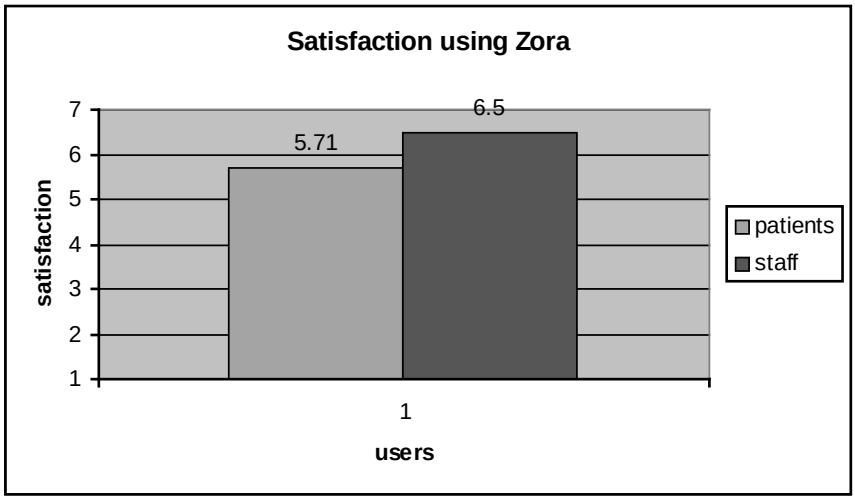

Figure 33: satisfaction of using Zora

When designing the pilot study there were some doubts about how patients, who are usually unmotivated and who sleep during most part of their treatment, would engage with Zora and if they would even use it at all. The pilot experience shows that Zora was not only feasible to use with patients undergoing dialysis treatment, but that it was also an enjoyable and positive experience.

Hospital staff also reported that they very much liked participating in the experience (mean = 6.5; standard deviation =0.58). For example, the child life specialist noted that being involved with the project helped her learn about the infinite potential of computer applications designed with a structure that might support different forms of therapy. Nurses did not see Zora as interfering with their medical routine. On the contrary, they enjoyed seeing their patients using Zora. One of the nurses said: *"I liked it a lot because I noticed that kids could say things in the computer that they might not say face to face and*

this has a lot of potential. It is a wonderful program for kids who are restricted and limited to the outside world."

Nurses also enjoyed being involved with different logistical tasks, such as helping the patients move the computers around and connect to the Internet. At a personal level, the hospital staff enjoyed the fact that Zora helped them learn new computer skills. They regretted that they could not devote more time to participate in the experience and that they didn't have a dedicated computer.

Safety

Overall, the seven patients reported that Zora was safe (mean = 5.93; standard deviation =1.84) and that participating in the experience was not hurtful (mean = 1.43; standard deviation =1.13). When asked about the safety of using Zora, 17 years old Larry *replied "It might be unsafe if you put certain things in your room that younger kids shouldn't see. But that's the whole point with having the [virtual] city hall, where we set the rules and laws for Zora. I don't think it's not safe for kids.*" When designing the pilot study, safety was a big concern on the part of the hospital Committee on Human Subjects. They were mostly concerned about the multi-user and open-ended nature of Zora and the fact that it runs on the Internet where children could easily find inappropriate material. Larry's response shows the importance of having in Zora a space for community participation and democratic decision-making. In his perspective it was the patients' responsibility to make Zora a safe space, and not only a matter of obeying a code of behavior imposed by

outsiders[18]. Hospital staff also reported that using Zora was safe (mean = 5.63; standard deviation =1.49) and they all agreed that participating in the experience was not hurtful at all (mean = 1; standard deviation =0) (see figure 34).

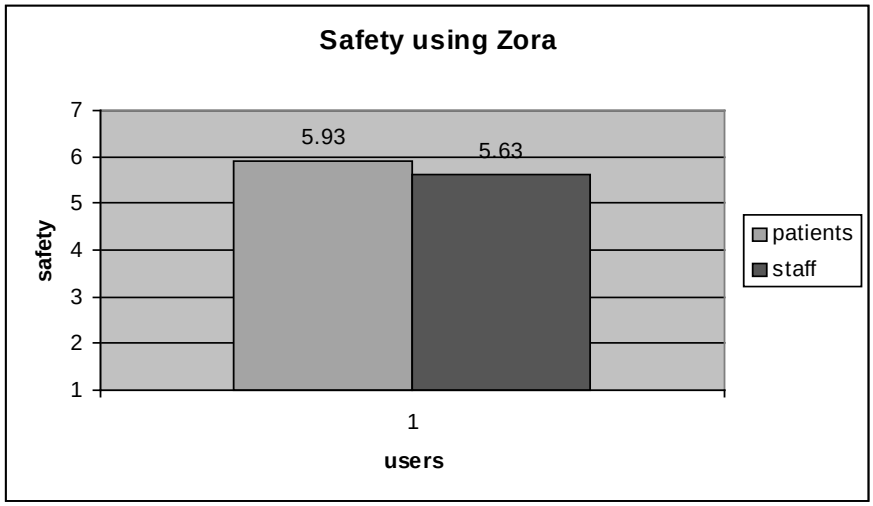

Figure 34: perceived safety of using Zora

One of the nurses said: *"Zora was a safe place and a safe way for patients to get their feelings out. It was an appropriate way to discuss their feelings. Rather than going out an punching a wall they had an opportunity to discuss things and to learn and to ask anything in Zora."* The child life specialist agreed with this but pointed out the importance of supervising what kids were doing and saying, in case intervention from an adult was needed. In the five months that the program was running, there was no need of intervention. However, the community of users was small and they all belonged to the same institution.

[18] It is interesting to note that none of the patients refer to the code of conduct they signed before engaging in the experience as having had any impact in making Zora a safer space.

Exploration of personal identity: escaping the harshness of the dialysis experience

While designing the pilot study one of the hypothesis was that patients would use Zora to explore their illness as a key component of their identity. We imagined that children would build virtual rooms populated by kidneys, dialysis machines and nurses. However, this did not happen. On the contrary, all of the patients consciously avoided any mention of dialysis in their virtual rooms. As a fifteen year old said: *"I am already on dialysis and I don't want to put things in my [virtual] room that remind me of dialysis; I don't want to go to other rooms that have that kind of stuff either."* It is not surprising that, when asking children if participating in Zora helped them gain perspective about their illness, most of them replied that it did not (mean 2.43; standard deviation =2.30) and they were happy about that.

Children used Zora as a way to escape from the harshness of the dialysis experience, not to think about it. Patients escaped in two different ways. First, they used their avatars to "move around" the Zora virtual city, while being "tied down" to a bed and hooked up to the hemodialysis machine. Patients decided where to go and visit in the virtual city and were able to make decisions regarding how long to stay in the different places. This sense of autonomy and control was one way of escaping the frustrations of dialysis where there is no possibility of moving around at all, or of making many choices.

Second, patients escaped the harshness of dialysis by using their rooms to represent aspects of their identity that are usually underplayed during treatment, but are important

to them nevertheless. In general, while undergoing hemodialysis, patients spend their time sleeping or watching TV. Their identity is represented by "passive" activities. However, when outside the hospital, like most people of their age, they participate in active endeavors, such as working, going to school or going out with friends. Their image of themselves is not the same inside and outside the hospital. Zora provided a way to bring back the self-image of patients as active agents. It offered a different venue of how to use their extensive time in dialysis in a creative and fun way by engaging in the creation of a personally meaningful project. According to the patient's personality, they enjoyed most the challenge of learning new computer skills and programming their interactive characters to engage in conversations, using their creativity to write stories, make drawing and design their virtual rooms, or interacting with others using the chat system.

For example, Larry, a very bright seventeen-year old boy who was in and out of school at different times of his life, created a cartoon character called Goodie, and described it as his personal clone. Larry did not have previous experience with computers, except for playing video games. However, he was able to write a program for his clone to greet visitors to his personal home. The following is a short extract of the log of an interaction between, Larry's clone and a visitor:

Goodie says: "Hi dude, I am Goodie and who are you?"
Ana shrugs.
Ana says: "I am Ana"
Goodie says:"Welcome to my home, Ana. Do you like it?"

Ana says: “yes, it is very nice. Who are you?

Goodie says: ”Good, Ana, I am happy that you like it. Larry made it. Do you like the colors?”

Ana says: “No. How come that you can talk?”

Goodie says:”Bye.”

Larry took some time to understand how to create a branching structure for his program and worked very hard on imagining potential answers that people would give to his clone. For each potential answer, Larry created a response. However, as shown in the interaction log above, Goodie was not a very robust clone, and crashed very often. Particularly when people talked to him with other words than the ones envisioned by Larry. However, Larry was very proud of himself. He was able to do some programming on the computer and not only play video games. He dreamed that, now that he understood how it works, in the future he could create his own video games. Although Larry still has a long way to go before being able to create complex programs, he already went through the most difficult part. He changed his self-image and was able to see himself as a powerful person with a bright future and not just as a passive patient

Larry’s experience was shared by other kids like fourteen year old Laila. When asked what she learned using Zora, Laila said: *"I learned new things about computers, like how to work with pictures and design my room, but I guess that I also learned about myself because I realized the things that I really care about and what my interests are and how to talk to others about that. In my room in Zora I could put computers and other things I like."* Laila refers to the fact that she created a virtual place called "Washu’s Lab" with

objects such as a chemistry lab and a computer, that reflect her interest in science (see figure 35). This virtual space did not resemble a traditional lab. It was an open space that looked more like a forest than a close laboratory. Laila was a very bright child who showed genuine interest in technology and science and said that when she is older she would like to be a scientist. Through her alter ego Washu, she started to explore this aspect of herself while undergoing dialysis.

Figure 35: Washu's lab

Since undergoing dialysis was a common factor for all of the participants, most of them did not feel the need to make it explicit in their rooms, except for Eddie, who became very engaged with Zora regardless of his developmental problems. He wrote the following story in his virtual home (see figure 36). *"On Mondays I practice basketball with a team after school. We play games against other teams. I'm lying in bed right now. It's not fun. I have to get dialysis. This is my first year of dialysis. I like the people here. The nurses are my favorite people here. I come three days a week: Tuesday, Thursday,*

and Saturdays. I like coming in on Saturdays because I don't have to do any schoolwork then. While I'm in dialysis I like to take naps, play video games, give everyone here a hard time, and watch TV. I have to miss school on Tuesdays and Thursdays. I would rather be in school because I want to graduate from school. I'm in the 12th grade. When I'm done with school I'm going to work. I want to work on cars."

Figure 36 shows Eddie's virtual home

As mentioned above, most of the other patients did not refer to their medical condition or treatment in their virtual creations. Instead they chose to represent other aspects of their identity. For example, Sharon created an Elvis Presley room with animations of the singer performing on the walls and Rina created a horse haven, with stories and pictures of her horse at home. In future studies it might be worth looking at what happens if patients create a Zora virtual city together with others who do not share medical problems

that require treatment. Will they want to highlight the fact that dialysis is part of their identity? Or will they prefer to ignore it? Another question is what would happen if participants were using Zora at home instead of at the hospital. By being removed from the machines, would they use the opportunity to reflect about their experiences?

Facilitating mutual patient support and interaction

In order to facilitate mutual patient support and interaction, Zora provided both synchronous and asynchronous ways of communicating and sharing experiences. Patients talked with each other in real-time through their avatars and they also posted messages and wrote stories for their objects and characters.

Patients reported that using Zora helped them make friends or get support from others on dialysis in a somewhat moderate way (mean = 3.86; standard deviation =2.41). At the same time, they reported that it greatly helped them to feel more part of a group on dialysis (mean = 4.43; standard deviation =1.62). *"I think that I always was part of the dialysis group but using Zora helped me to get to know the people better because I could talk with them and see their interests, what they like and do not like by going to their virtual homes"*, said a 13 years old patient. Hospital staff perceived that using Zora helped patients a lot to make friends (mean = 4.50; standard deviation =1) and a little less in making them feel part of a group (mean = 3.75; standard deviation =0.5) (see figure 37).

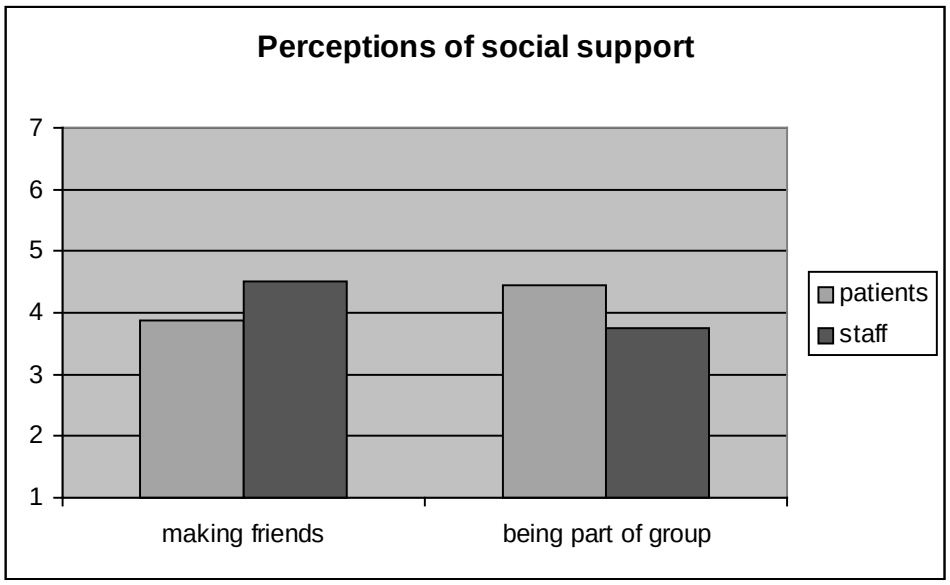

Figure 37: Patients and staff's perceptions of support

Synchronous communication: a private way to talk in a public space

The dialysis room is a public noisy space where patients are physically together for long periods of time. However, since their beds are far apart from each other, they cannot communicate with each other in a private way. Although the dialysis patients have all the characteristics to form a community, they lack the means to converse while undergoing treatment (see figure 38). Most of the patients particularly liked the fact that Zora provided a good way to communicate with each other in a private way, while undergoing the public event of dialysis. "*I really liked that I could use Zora to talk to other kids who were at a distance. Otherwise I would have to yell across the room. But using Zora was great because others could not eavesdrop on my conversation and I felt more comfortable discussing things. I particularly liked to talk with others about our favorite nurses, without being heard"*, said a 13 years old patient.

Figure 38: The busy dialysis unit

On-line conversations were not about dialysis per se, but about favorite video games, movies and activities done during the weekend. Again, patients used Zora to escape the harshness of their situation by talking about fun things. Most of the conversations were task-oriented such as helping each other to resolve technical problems and use some of the Zora features. Thus, the participants were able to learn and collaborate with each other. In the process, they changed their traditional role of passive patients to active agents. This was even more dramatic when patients helped nurses to learn the Zora software.

Asynchronous communication: a space to voice opinions

Patients used Zora to post messages in each other message boards and to write stories for their objects and characters. This asynchronous way of communicating their feelings was, as one of the nurses noted, *"a way to help patients that weren't on the same shift together to get an understanding of the other patients when visiting their rooms"*.

Asynchronous communication facilitated the creation of a social network by providing a space for patients to voice their opinions, without the burdens of face-to-face and real-time conversation. For example, 17 year old Larry put a case in the "Temple of Feeling Better" in which he complained about the increase of his time on the dialysis machine: *"I believe that my time on dialysis is too long. Most of the patients are on for only three and half-hours. Maybe you can pull some string and get it cut back. Thank you. Please reply in caza's room. Leave a message on the bulletin board"*. He attached the value "pity" to the case but did not define it. At first Larry made his case very small and hid it behind other objects in the virtual temple. Only a very skilled Zora user could find it.

Meanwhile, the child life specialist noted that Larry was very upset and couldn't talk about what was bothering him. When we pointed out to her the case that he created in the virtual temple, she used it as a jumping board to engage in a conversation with Larry. Shortly after, Larry made his case big and put it in the center of the temple, thus recognizing the legitimacy of his feelings. Later, Larry engaged with Dr. Joe, a psychiatrist involved in the experience, and some of the nurses in an exchange by leaving messages in each other's rooms, and expressed that he was very happy to be able to voice his opinions and be heard. Below are some of the messages left in Larry's bulletin board that engaged him in a different type of dialogue than the one that he normally had with hospital staff.

From Dr. Joe: Caza, Thank you for the beautiful rotating pyramid that you left in the Temple of Feeling Better. It made me think about how important time is to all of us. At

least for me how I spend my time makes a big difference in how I feel also thank you for letting me know that you are spending a lot of time on dialysis. More time than any of us wants you to. I wish there was something I could do to make it shorter. I don't have any strings to pull that could actually shorten the time, but I wonder if you could tell me how do you spend the time that you are there. Are there things that make the time go by slower or faster? I would like to understand about this better…

From a nurse: … if you don't like your time on dialysis than let's work on your transplant. Many people, in adults units, are four hours; remember you are probably the biggest person in the unit, so you'll have more time and…

From a nurse: I wish we could shorten your time. I know you would like to change. Maybe we can try 4.5 hours.

Open Questions

One of the study's goals was to identify, not only the positive aspects of Zora, but also its problems. This is important to the design of future interventions tailored to the particular needs of this complex real-world setting.

- **Need of a broader community.** In each dialysis session only three patients were able to connect to Zora at the same time. This was due, on the one hand, to the lack of computers, and on the other, to the lack of motivated participants in the

required age range, and the difficulties of having a broad patient population feeling well-enough to work at the same time. Therefore the Zora community that logged in on real-time was very small. *"It is kind of lonely in there [Zora] because when you get on, there are not many people with you and it is hard to talk with others"*, said a 15 years-old girl. Other patients pointed out that they felt embarrassed to talk with children they see everyday about their feelings about dialysis. They rather talk anonymously. In the future it might be important to increase the number of Zora participants, such as involving other dialysis units. Another possibility would be to extend the experience to a large community by including renal transplant and/or at home dialysis patients.

- **Need of more intervention.** Another goal was to observe how patients would use Zora on their own and how they would create their own participatory community. However, this patient population requires a lot of direct intervention and guidelines in order to be engaged and motivated in any activity for long periods of time. As the child life specialist noted *"after a point in time the kids get bored with anything, they want bigger and better to keep them entertained, and a lot of them just want to sleep… they don't want to do anything because they are not feeling good."* In future experiences it would be helpful to designate a project coordinator that would propose a tailored syllabus The creation of a syllabus is a big challenge because, due to their medical treatment, not all the patients can engage in the same type of activities at the same time.
- **Education about or escape from dialysis.** All of the patients agreed that they did not want to encounter in the Zora virtual city any content related to dialysis. They

wanted Zora to be a space to escape from dialysis. However, all hospital staff had exactly the opposite opinion. They thought that Zora would be an excellent medium to teach kids about dialysis and to engage them in thinking about the process. For example, one of the social workers suggested the creation of a restaurant because food is a big issue for kids undergoing dialysis. The MIT staff set up the virtual space and asked patients to create the menus. Much to our surprise, none of the created menus took into consideration the particular dietary restrictions of this patient population. Following is an excerpt of a conversation that happened in the virtual restaurant:

Vitor says 'Weshu, do you have any idea about what should we have in the menu?'

Weshu says 'shrugs'

Vitor says 'What drinks do you think we should have in the menu?'

Weshu says 'coffee, tea, ice water, etc....'

Vitor 'Which ones do you like best? '

Weshu says 'I like tea with cream and suger'

Vitor says 'I've never tried that, what about desserts'

Weshu says 'ice cream and there is a Chinese dessert that all the nurses love'

Vitor says 'What kind of food do you like?'

Weshu says 'I like Chinese food and Italian foods…noodles and fried rice spaghetti and meat balls''

Marina says 'I wonder if there should be a special menu for people on dialysis...what do you think?'

Weshu says 'I guess that is helpful to people but I don't like to be reminded that I need different food'

Patients are very clear and consistent about not wanting to use Zora to talk and think about dialysis. However, hospital staff is also very clear in seeing a lot of potential in creating a space dedicated to learning and teaching about the dialysis process. How can both perspectives be reconciled? One way is to create spaces that go beyond displaying information produced by professionals. Patients need to take an active role in their creation. For example, they could be the ones who, working together with the professionals, design the virtual rooms to teach visitors about dialysis. For this to succeed it is important that the activity be authentic, namely real visitors should be invited to walk around these rooms and engage in conversations with the patients. For example, visitors can be kids recently diagnosed with ESRD, medical staff, parents of patients, elementary and high school students interested in medicine.

- **Gaining perspective about dialysis**. Patients reported that using Zora did not help them gain perspective or understanding about their illness (mean = 1.86; standard deviation =1.21). At the psychological level, children did not use Zora to talk about dialysis, but as an escape from it. At the physiological level, Zora did not help patients explore what happens in their bodies while undergoing dialysis. However, Zora can support both types of interventions in future experiences. On the one hand, a mental health professional can coordinate virtual meetings in the same style as therapeutic communities do. On the other hand, the Zora environment can support the collection and display of physiological data provided by the dialysis machines and other medical charts. This data indicates progress in the treatment as well as the level of compliance between visits. If patients were

> encouraged to not only look at this data but also to manipulate it in a friendly, creative and educational way they could also explore "what if" possibilities regarding their own health care. And it would allow researchers to investigate a possible correlation between engagement with Zora and successful medical compliance.

More and more hospitals are acquiring the means to connect to the Internet. However, connectivity by itself is not enough. We should ask ourselves how we could use the potential of the computer and the Internet to support therapeutic work already going on in medical facilities. Identity construction environments, such as Zora, open up new possibilities for mental health care. As shown in this chapter, this is both feasible and safe in the context of a hospital setting such as a dialysis unit. Introducing a fun, self-exploratory and community-building computer activity had several positive benefits. Patients used their extensive time in dialysis in a creative way by expressing themselves and exploring aspects of their identity that are usually underplayed during treatment. They were able to interact with others in a similar situation in a private way and, at the same time, voice their opinions about their medical treatment.

Having a computer based application that promotes increased coping and resiliency in the face of medical illness has great potential to provide accessibility to an intervention that previously has only been available to those living geographically close to a major pediatric medical center. In the same spirit as therapeutic communities, identity

construction environments such as Zora provide the opportunity for patients and staff to participate in social support networks.

Discussion: comparing both case studies

This section compares both case studies described earlier. Identity Construction Environments such as Zora are designed upon a constructionist philosophy of learning and provide tools for users to become designers of their own meaningful projects. Therefore the experiences of both populations, the resulting virtual cities and the kinds of interactions children had are completely different. The fact that such diverse populations were able to use Zora to serve their own needs, shows the flexibility and the potential of identity construction environments. What teens in the summer workshop and patients and hospital staff have created with Zora strongly reflects who they are. Below I present some similarities and differences between both case studies in terms of:

- **Work methodology:** Both experiences were based on a child-centered approach in which adults had no role in terms of coordinating virtual meetings or organizing the social life of the micro-community. This approach worked well in the summer workshop and not as well in the hospital study. Patients needed more guidance and active involvement of an adult. In both experiences, peer mentors helped participants become familiar with Zora and engage in different activities. In the summer workshop the mentor quickly became one of the participants, and her role as mentor rotated amongst the group of children who had mastered the technical aspects of Zora. In contrast, the peer mentor approach did not work well in the hospital experience. The mentors were the same age as most of the patients. However, the patients did not accept them, nor included them as part of the

community. This was due to two reasons. First, it is possible that the personality and style of the mentors clashed with those of the patients. Second and more importantly, the mentors did not share the same medical condition. They were seen as outsiders and were not welcomed into the community.

- **Exploration of identity**: Patients in the hospital study used Zora to escape the harshness of their situation by creating a fantasy world. Their illness is not who they are, it is only one aspect of their identity. They chose to use Zora to represent other aspects of their identity, in which they have more agency and control, and which are usually underplayed during the dialysis treatment at the hospital, where they lie in bed and have things done to them. Participants in the summer workshop used Zora to explore aspects of themselves in a deeper way, such as what it means to be Latino in Pablo's case, and Jewish, in Elisa's case. They revealed to others and to themselves a notion of self, more complex than the one they had before. In terms of group identity, patients used Zora to create community spaces about their shared medical condition and to be in touch with who they are as a group. The participants in the summer workshop created community centers that let their imaginations roam free, and yet they explored issues of social organization and self-regulation.
- **Exploration of values**: While the participants in the summer workshop created 37 values (9% of total creations) and 95 definitions, hospital patients created 13 values (8% of total creations) with only 16 definitions. The two populations used Zora in different ways, according to their needs and to what interested them most. For summer workshop participants struggling with issues of multi-cultural

understanding and discrimination, thinking about values was an important aspect of the experience. Whereas, for patients at the hospital this wasn't their most immediate need. They wanted instead to escape their medical condition and treatment by exploring a fantasy world. It is also important to mention that patients were not in full control of the values their Zora city had, since they had to agree about a shared code of conduct imposed by the hospital, before participating in the study. I believe that this made it difficult for patients to have a sense of ownership about their values dictionary.

- **Quantity of creations:** Although the summer experience was shorter than the five-month pilot study at the hospital, participants created an overwhelmingly greater number of virtual places, objects, heroes, villains, values and cases (430 during the summer workshop vs. 159 in the hospital experience). This is due to different reasons, but mainly due to the difference in both attitudes and general well being of both populations. While the summer participants worked hard to be accepted by the workshop by writing an application, the children at the hospital were immediately recruited just by showing an interest. Hence the level of commitment of both groups was different because of the initial demands and enthusiasm of the experience was also different. On the other hand, young patients used Zora while undergoing a medical treatment that makes them tired and sleepy. Therefore just the fact that they were able to use Zora is impressive, since this patient population is usually seen as unmotivated and apathetic.
- **Public community spaces**: Whereas in the summer workshop children created the City Hall and the Junk Shop, in the hospital study they created the Renal Rap

and the Temple of Feeling Better. The choice of community spaces reveals the particular needs of both populations and the specific issues they were most concerned with.

- **Personal homes:** In the summer experience most of the personal homes show, through pictures and objects and their associated stories, the personality of the owners. Most of these virtual homes display favorite pictures of friends, family members and pets as well as pictures of personal objects with sentimental value such as jewelry and clothes. Navigating through these homes one gets the sense of who the owners are in real life (and not only in the virtual city). One can learn about the children's cultural and religious background, their family life and their personal interests. Participants made an effort to bring to the virtual world cherished artifacts from their real lives. In contrast, in the hospital experience, virtual homes were about fantasy and imagination. Almost no personal pictures or objects from patient's real lives were brought to the virtual city. There is no way to know who the owner of the house is or where he or she comes from. Navigating through these virtual homes, one only learns about the patient's interests in cartoon characters, favorite singers and musicians and video games. The stories associated with these objects are not introspective, but descriptive. There is no explicit connection between why certain objects were chosen and the particular meaning that the patients assign to them.
- **Avatars**: In the summer workshop almost all the participants chose to have an avatar displaying their own picture. This was not the case for hospital patients who always imported cartoon characters from the library. How one chooses to

physically represent him or herself may be an indicator of how happy or uncomfortable one is with ones own body image. When I asked the patients why they did not want to use their pictures they unanimously said that they did not like them. Teenagers, in general, are sometimes uncomfortable with their self-image. But if in addition they have scars from insertions of fistulas and their bodies show signs of their illness, such as deformities, their self-consciousness increases. During the summer experience, one of the participants was unhappy with the way she looked. She thought she was overweight and wasn't happy with her picture. Therefore she chose a standard cartoon character. However, after learning Photoshop, she discovered that she could modify her image to make it look trim, just the way she wanted to be. She did the trick and was very happy showing off her new envisioned body to others. At first I wondered why hospital patients did not choose the same path of playing with the way they looked. When I asked them they said they were not interested and that they would rather use a cartoon character. I could not get a sense of why they did not want to use their real pictures or improved versions of them. My hypothesis, which needs to be looked into more in future studies, is that it was very painful for them to "look at themselves" and consciously modify parts of their bodies that they are unhappy with. The weight problem of the summer workshop participant could be resolved in real life if she chose to diet (and she was very outspoken about that possibility) She could become an agent in complete control of her situation. It was only a matter of willpower. However, this was not the case for the hospital patients. Many of their physical marks were not so easy to fix. And they did not feel

comfortable even mentioning them. Therefore, why change it in the virtual world if it can't be changed in real life? Another way to think about this is that since patients chose to have personal homes with no traces of their identity, besides their interests, their avatars were chosen accordingly. A cartoon character in a virtual home populated by more cartoon characters forms a coherent system in which fantasy is the protagonist.

The following table summarizes some of the differences between both experiences:

Domain	Summer workshop	Dialysis Unit
Work methodology	Child-centered Success of peer mentors	Psychotherapeutic Failure of peer mentors
Identity as a society of self	Real life identity	Fantasy
Ethical fluency	Concrete + abstract values Thinking-doing-behaving	Conflict with hospital culture
Participatory community	Argumentation, inquiry Self-organization	Voice opinions Support network
Narrative fluency	Personal stories + information	Fantasy

Chapter VII- Revisiting the powerful ideas and areas of fluency

In this chapter I revisit the powerful idea of *society of self* and the different areas of fluency evoked by the Zora identity construction environment. In order to show how children developed them, I use examples from the case studies presented earlier

The society of self

Zora engaged learners in understanding their identity as a complex evolving construction. Zora's structure afforded the participants the opportunity to see their virtual autotopographies (personal homes and temples) as constructs representing their identity. These spaces are not monolithic, but composed of different aspects of the self, represented by the objects populating them. As learners developed different ways of understanding their identity, they incorporated new objects and characters into their autotopographies and even created virtual temples as aututopographical extensions, as Pablo's story shows. At first, Pablo's home was populated by all sorts of objects that he considered representative of who he is. Over time, he included new objects conveying his Latino origin and started to further explore this aspect of his identity. As he engaged in on-line conversations sharing his feelings with others about being a minority, he created an extended autotopograhical space, the Salsa and Merengue temple.

As the children grappled with the powerful idea of *society of self*, they explored personal and moral values as aspects of identity. This happened in the following way. First, they created objects representing aspects of the self. Then they assigned personal and moral values to these objects. Therefore, values were not conceived as abstract concepts, but as

explicitly linked to the objects, therefore to their identity. This concrete way of thinking about values and their relationship to identity, is rarely explored in cognitive approaches to moral education that place the emphasis on reasoning about values. However, it is a powerful idea present in disciplines that look at the values systems of individuals, such as psychology and anthropology. Thinking about the self as a system is in line with current theories of mind and certain psychoanalytic schools, such as object-relations. If a purely child-centered approach had not been taken for this project, the mentor would have made these connections in an explicit way. The Zora system is seeded with the tools that would afford a skillful teacher, knowledgeable about these new trends of thought, to successfully lead her students to think about these issues in deeper ways.

Technological fluency

Zora gave learners the opportunity to develop technological fluency, or the ability to use technology in an effortless and skillful way, by providing a rich set of tools for them to become designers and programmers of their own computational projects. For example, they learned to design a three-dimensional virtual space and to calculate vertical, horizontal and depth axes to locate their objects. They used complex graphic tools and computer-related equipment such as digital cameras and scanners. They also learned how to program and debug simple interactions for their objects by using a conversational programming language based on the turn-taking metaphor.

Learners became empowered by becoming technologically fluent. As the experience evolved, they were able to approach new software and equipment without a top-down instruction. They played with the materials and were able to transfer previous knowledge

to new situations. For example, in the summer workshop, children learned how to manipulate their avatars and rooms, to shrink and enlarge them, even beyond what the tools allowed them to do. They became comfortable enough with the technology to push its limits in a creative and responsible way. During the hospital experience, to become technologically fluent helped the young patients gain a different kind of self-image. They saw themselves as powerful learners in active control of their computers, if not of their bodies. Also, as some of them said, they used their time on dialysis to develop some of the skills and knowledge that they did not acquire at school, either because they had to miss many classes due to the medical treatment or because they had already dropped out of school altogether.

Young people were able to use computational ideas to think about themselves and the world around them in new ways. For example, Nino said that he learned "*how to see values in things… by attaching values to things you realize what your values are and you also make other people more likely to know you better. Right now when I see something, somehow I wonder what values it has, and what certain people think its values are*." This way of thinking about values as properties or attributes of objects and people is in line with the object-oriented computational paradigm. It opens up the possibility to approach these abstract issues in a very concrete way.

Ethical fluency

When engaging with Identity Construction Environments learners developed ethical fluency by engaging in role taking about present and future situations, cultivating a sense of responsibility about their actions, developing their creative thinking, experimenting

with “what if” situations, and assuming a point of view and a set of values without dangerous consequences.

Zora afforded two different ways for learners to tackle these ethical issues. First, they engaged in on-line conversations (both in synchronous and a-synchronous modes) and discussion of cases. Some cases were about life in their own virtual city, such as how to punish members who broke a law, and others about society at large, such as the death penalty and how to prevent hate crimes and discrimination. However, due to the child-centered approach that I took for both studies, the participants did not explore in a thorough way what it means to think in the ethics discipline, nor did they utilize the conceptual tools of philosophical reasoning (Lipman, 1988)[19].

Second, they acted-out their solutions in a "tangible" way by becoming inhabitants and designers of their virtual city. For example, after a discussion about discrimination and racism in the City Hall, the shy Eric built the Everyone's temple, *"a space for all the cultures and religions to get along"*. Eric did not engage in debate about the nature of discrimination, as others like Pablo or Janet did. Instead, he created what he envisioned

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[19] Zora is seeded with tools that could afford a skillful teacher, trained in Lipman’s philosophical inquiry method, to help her students develop a higher level of ethical fluency. For example, the teacher could propose particularly conflicting cases and then moderate the students’ debates about them.

could be an acceptable solution to the problem, at least in Zora. Doing things in a creative way to resolve problems is a key aspect of ethical fluency.

Identity construction environments integrate argumentation and discussion about ethical issues with taking action. For example, the children in the summer experience engaged in a heated debate about punishment and alternatives to the jails and death penalty. But their learning experience went beyond offering different points of views and exchanging opinions. They built a virtual jail and tested its effectiveness without real consequences. After experimenting with different methods of punishment they realized that, at least in their virtual community, what worked best was to have people serve their time doing community service. This, in turn, opened up discussion about the feasibility of this solution for society at large and the problems of black and white solutions.

Narrative fluency

Zora engaged young people in telling both personal and informational stories. Since the objects created in the virtual city represent aspects of the self, the associated stories are fragments of a major narrative, namely an individual's life history. Narrative fluency refers not only to the ability of becoming better storytellers or mastering the narrative genre but also to the cognitive process of realizing that storytelling has a major role in the process of identity formation. For example, when Sheila said that she was able to learn more about others by reading their stories, and then re-wrote and revised her own stories so the other participants could get to know her a little better, she was developing narrative fluency. Her writing became better, and she felt more comfortable doing it. But

more important, she engaged in self-reflection while telling aspects of herself through her stories.

Chapter VIII- Conclusion

In democratic and pluralistic societies like the United States the issues of identity and values have largely been ceded to conservatives. But this monopoly has diminished the debate about moral and character education. There are three major advantages to tackling this complex challenge now, rather than at other times of our history.

First, we have not yet "schoolified" values and identity. The school mindset that has formed our current views on education, such as the compartmentalization of the curriculum and age segregation, has not spread yet to the moral/identity domain. Therefore we still have flexibility to debate and decide what content, powerful ideas, pedagogy, tools and assessment methods can be used. The second advantage in facing the challenge of values and identity in education now is the widespread pedagogical spirit of "learning by doing". This opens the possibility for constructionist methodologies that, by definition, avoid instruction and indoctrination. And third, is the impact of new technologies on education. What computers were in the 80's to influencing new ways of thinking and learning about mathematics and science, today they can be to values and identity. However, computers by themselves can't produce changes. The philosophy behind the software matters more, as does the context of its usage.

The research described in this thesis shows the potential of identity construction environments to foster self-awareness, personal cultivation and multicultural understanding. It also shows that, when integrated into the current practice of mental health professionals, it can serve to complement psychotherapeutic interventions. The

hope is to provide a new way of facing these issues in light of new technologies, as well as to invite designers of technology to join the effort and produce more innovative tools.

Design principles for identity construction environments

How should someone approach the design of identity construction environments? I intentionally use the vague word "someone" to show that this section is aimed at providing guidelines to orient people with and without prior experience in designing technological tools. My hope is that this thesis will inspire researchers and practitioners, both in the areas of education and mental health care, to become designers of their own tools.

The following table summarizes the learning afforded (in terms of knowledge and skills about identity, values, technology and narrative) by the different identity construction environments presented in this thesis (see figure 39). The hope is that this table can serve as a basis to identify learning goals and assessment methods for the design of a curriculum that integrates the use of new technologies with learning about identity, and personal and moral values.

In terms of learning about	**SAGE**	**Con-science**	**Kaleidostories**	**Zora**
identity				
Designing representations of self	Yes	No	Yes	Yes
Understanding identity as construction	No	No	Yes	Yes
Exploring identity in a social context	No	Yes	Yes	Yes
values				

Understanding values as abstractions	Yes	Yes	Yes	Yes
Enacting values through actions in the community	No	Yes	No	Yes
Recognizing values as aspects of identity	No	No	Yes	Yes
technology				
Expressing with different computer applications (graphics, sounds, etc.)	Yes	Yes	Yes	Yes
Designing their own projects	Yes	Yes	Yes	Yes
Using the Internet	No	No	Yes	Yes
Learning how to program	Yes	Yes	No	Yes
narrative				
Reading and writing stories	Yes	No	Yes	Yes
Communicating through text	Yes	No	Yes	Yes

Figure 39 describes differences in the learning afforded by the ICE prototypes

The ten commandments

Identity Construction Environments should:

1. Provide a safe space, or microworld, in which learners can design and program personally meaningful projects that highlight and make accessible concepts and ways of thinking about identity and values.
2. Support users to engage in self-reflection and introspection.

3. Provide tools with which users can create a complex representation of the self, highlighting its multiplicity of aspects and its change over time.
4. Provide flexibility to express and explore powerful ideas about identity and values in different ways (e.g. writing a story, drawing a picture, programming a character, conversing with others, etc.)
5. Provide opportunities for learners to engage in narrative expression, particularly in telling stories about the self.
6. Engage and motivate users for long periods of time in a natural and self-initiated way.
7. Make use of networked technologies to create a community to put to test new concepts and ways of thinking and behaving.
8. Support the passage from knowledge to action. Namely, provide opportunities for learners to express their identity and values, as well as to explore them in depth through behaviors.
9. Be designed following a participatory method in which potential users become partners in the different stages of the design process.
10. Be designed upon conceptual foundations originating from theories of identity and moral development, as well as specific theories relevant to the particular content matter and target population.

Guidelines for activities supported by identity construction environments

One of the dangers of the notion of identity construction environments is that it invites people to fall dangerously into the technocentric fallacy of giving undue centrality to the computer in the learning experience (Papert, 1990). Although in this thesis I show that the computer is the ideal medium for crafting identity construction environments, I do not

claim that these environments always accomplish their goal of helping young people explore notions of identity, in particular personal and moral values. In order to achieve a successful learning experience, there is a delicate balance between the use of ICE and the design of activities, within these environments, to create a social and learning context that leverages their potential.

Once the environment is designed, how should people go about using it in concrete educational and therapeutic interventions? The following guidelines are aimed at helping practitioners to use identity construction environments in a successful way. As mentioned earlier, the technology by itself can't produce changes. The way in which it is used matters a lot. Following is a list of questions the educator or practitioner needs to ask him or herself before using identity construction environments:

- **What kinds of activities can be done within identity construction environments?** Some of these activities can be planned ahead in the syllabus, such as regular meetings in the virtual City Hall, in the case of Zora. Others can spontaneously emerge as the work progresses and new learning needs are identified. For example, the activity of offering virtual gifts to each other. This was not planned in the syllabus, nor does Zora have a type of object called "gifts". The goal was to help children get out of their virtual homes, navigate the city and put themselves in the shoes of others to decide what presents would be most likely to be appreciated.
- **What are the goals of the activities?** Identity Construction Environments can support the implementation of many different activities. Therefore, in order to choose among them, it is important to be very explicit about their goals. Do they have a

specific learning goal, and therefore should they focus on particular content matter or skills? Is their goal to help learners become familiar with the system? Is their goal to create a friendly atmosphere and set up the kind of social interaction that would support collaborative learning? There are as many questions as there are goals that the practitioner has in mind. Although ICE provide a structure that naturally leads young people to think about issues of identity and values, it needs to be complemented by the specific goals of the practitioner.

- **What is the role of the coordinator or facilitator?** In most of the experiences described in this thesis I used a child-centered work methodology. Therefore the coordinator was mostly absent and only served to orient participants in terms of technical difficulties or followed a syllabus aimed at helping them learn the Zora design features. However, in both educational and therapeutic interventions, coordinators might want to take an active role and become more involved with respect to teaching a particular content or making sure that certain issues are discussed.
- **Who is the learner?** When dealing with issues of identity and values, it is beneficial to think about the learners (or the patients) as a family and not as isolated individuals. There are many ways to involve a family. At one end of the spectrum, one can work with both parents and children, as the example with Con-science shows. At the other end, one can include parents in a very limited way. For example, in the Zora experience during the summer workshop, parents were subscribed to a mailing list and were invited to an open house. When thinking about how to involve the family, the practitioner can decide what best suits the needs of each project and population.

- **What is the work methodology?** There are many ways of using the same identity construction environment in different forms. For example, it could be used in an intense way over a relatively short period of time. This is especially good when there are limited technological resources that are available for a certain period of time, as in the summer workshop experience. Or it could be used over a long period of time in not such an intense way, as in the experience at the hospital. It is also very important to make a decision about how learners will first become familiar with the tool? Will they participate in focus groups in which the ICE will be introduced to them or will they be given a lot of time to explore it on their own? Again, the answer to those questions depends upon the specific needs of each project and population.
- **What are the evaluation methods?** Evaluating a learning process about identity and values is not an easy task. Both what children say (their analytical thinking) as well as what they do (their behavior) need to be taken into consideration in order to see how their learning evolves over long periods of time. When deciding how to evaluate the experience, the practitioner needs to be very clear about the learning goals. It might also be interesting to think of students as partners in the process of designing the evaluation. If they are partners in the design of the ICE, why not in the design of its evaluation as well? This could be as simple as telling them that the systems logs will be saved for later evaluation, or as more complex as asking them to design a questionnaire or to interview each other in an open-ended way.
- **What is the underlying value system of the practitioners?** Since this work particularly addresses issues of personal and moral values, before engaging students in the use of identity construction environments, the practitioner needs to be clear

about his or her own values. It is therefore recommended that the practitioner participates in a similar experience to the one that the learners will have. This can happen either before working with the students or at the same time, in the spirit of peer mentorship. It all depends on the kind of experience the practitioner hopes the learners will have and the role he or she wishes to play. Whatever decision is made, the practitioner needs to inform the learners of where she or he stands on ethical issues that may arise.

- **How to react when "off-limits" ideas and actions are introduced?** One of the goals of identity construction environments is to encourage learners to explore "what if" situations and to engage in their own projects. It is very likely that they will try a few of what I call the "off-limits" ideas and actions. For example, in my work during the summer experience, one of the students wanted to create a stripping bar and was hoping to browse the Internet to find porno pictures for the virtual walls. At this point, I decided to intervene[20]. Even in a child-centered learning environment, such as Zora, the practitioner needs to make a decision before hand about how and when to intervene. This is easy if, as mentioned before, he or she is clear about his or her own values. While working with identity construction environments, if the work is succeeding, many controversial issues will come up. The practitioner needs to be ready to intervene without eliminating the debate, and acknowledging that certain situations do not have easy solutions.

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[20] My intervention consisted of reminding the children that their parents were invited to come and visit the virtual city that they had built. At the sight of having their parents visiting the strip bar, the participants decided on their own to drop the idea.

Contributions of this thesis

This thesis responds to the two research questions presented in the introduction: What kind of learning environment will afford opportunities for children to naturally engage in learning about issues of identity, in particular including their personal and moral values, in a constructionist hands-on way? And how can technologies be used to support this learning process?

In this thesis I named these environments *identity construction environments*. I described them as technological tools purposefully designed with the goal of helping young people understand identity as a complex construction composed by different elements, including personal and moral values. I presented three preliminary prototypes, SAGE Kaleidostories and Con-science and, based on the lessons learned with each one, I designed Zora. This multi-user virtual environment embodies the design principles that I consider fundamental to engage young people in this kind of learning. I described the idea of *society of self* that became salient when engaging with identity construction environments and the technological, ethical and narrative fluency developed in the process.

In this thesis I showed how two different populations of young people in need of addressing issues of identity used Zora to design a graphical virtual city and its social organization. Children and teenagers created virtual autotopographies, spatial representations of identity composed of collections of objects and characters representing aspects of themselves. The participants in the summer workshop especially explored the

personal and moral values that these objects and characters carry, and engaged in a learning process that highlights the relationship between identity and values. Young patients at Children's Hospital focused on using Zora to escape the harshness of the dialysis experience by immersing in a fantasy world. In using Zora they were also able to see themselves in new ways, as active learners in control of virtual situations and not as passive patients.

Both populations created a participatory micro-community, essential to exploring issues of identity and values by providing a social context in which to identity and differentiate themselves from others. While in the summer workshop, children focused on creating the laws of their virtual city and discussing controversial cases that gave rise to heated discussions about ethical and moral issues, in the hospital experience, young patients and staff created a social support network to facilitate new kinds of interactions.

The work presented in this thesis contributes on three different levels that reinforce and enrich each other: theoretical, design and empirical. At the theoretical level, I proposed a constructionist framework to think about identity, and personal and moral values, as a construction process that can be supported by technological environments. At the design level, I offered design principles for implementing identity construction environments, as well as a design history involving different prototypes. At the empirical level I worked with young people who used these environments, and I presented two case studies of children using Zora.

The research presented in this thesis is outside the confines of both traditional education and psychotherapy but can complement both of these practices by providing new tools such as identity construction environments, and new ways of thinking about identity and values, such as the idea of *society of self*. I have used Zora outside the academic environment and can see that it has had a positive effect on many children. I can therefore see that its future use can positively affect many people's lives, especially those with particular needs: children struggling to grow up in a confusing world with contradictory values, teenagers going through a developmental stage characterized by the quest for identity, senior citizens re-thinking their mission in life; developing countries where democratic education is needed to sustain long-term economic changes; and developed countries with an alarming increase of mental health related problems as well as rising rates of violence by children.

It is my hope that my research will encourage designers of technology, educators, mental health professionals and all people interested in self-awareness to think about the role of technology with respect to identity formation. I initiated this thesis with a preface about how the Sabbath served for me as an inspiration for designing identity construction environments. I would like to conclude with an appeal to people to find their own metaphors and inspirations to construct their own "palace in time" -spaces and times, with or without technology, reserved for introspection, self-reflection and community building.

Chapter VIII- Future work

The research presented in this thesis shows first steps in the direction of designing and studying computational environments specifically created to explore issues of identity and personal and moral values. However, more work is needed in the area. Next, I group the future work into three clusters according to the main contributions: theoretical, design and empirical dimensions.

Theoretical dimension

- **Developing a research methodology and assessment methods**: In order to make this approach to learning about identity and values scalable and sustainable, there is a need for new methods and evaluation systems.
- **Creating a curriculum of powerful ideas about identity and values**: This might help practitioners and educators exploit the full potential of identity construction environments. As shown with other constructionist tools for learning, such as Logo, it usually happens that over time the powerful ideas behind the software get forgotten and the software is used in a very shallow way.
- **Advancing a refined *society of self* theoretical framework**: In this thesis I showed how the society of mind theory inspired my notion of a society of self. However, in order to continue this path of thought, more research is needed. For example, it would be very interesting to see how different values become active in certain situations, as opposed to others, and to provide a simulation toolkit that would allow young children to play with these ideas. The question of how certain values emerge in certain situations needs further research.

Design dimension

- **Creating a new generation of toys for play therapy:** One of the natural extensions of my work would be to apply what I learned about identity construction environments to the design of a new generation of computationally-augmented toys that might support the practice of play therapists.
- **Designing tools for the family**: Identity Construction Environments have the potential to provide spaces for the family to explore issues of identity and values together. However, they need to be designed in such a way that they allow each member to contribute his or her piece, and at the same time, to collaborate in a shared activity. This is not a simple task and presents an interesting challenge, both from a design and a conceptual perspective.
- **Introducing the body**: Identity Construction Environments do not need to be limited to the computer sitting on a desktop. New forms of interactive experiences should be created in order to engage people in the use of their bodies, through music and performance, to explore issues of identity and values. Today most of the modern science museums and amusements parks, such as Epcot, allow people to have participatory immersive experiences augmented by computers . However, except for few isolated installations in museums such as La Villete (Paris), the Diaspora Museum (Tel Aviv) , and temporary showcases at the Museum of our National Heritage in Lexington, Massachusetts, there is a lack of a permanent spaces in which people can have the experience of involving their bodies in a place devoted to exploring identity and values as a kinetic and emotional experience and not only as an intellectual one.

Empirical dimension

- **Implementing a virtual therapeutic community:** In the same tradition as therapeutic communities that functioned in the 60's, it is possible to use Zora to implement a therapeutic community between people living virtually among others who share a similar condition and mental health care professionals. This virtual therapeutic community might have many advantages over the face-to-face communities such as allowing people to continue living at home, supporting experimentation with different ways of being and "what if" possibilities, and reducing economic costs of these types of interventions. However, when implementing future therapeutic communities, it might be useful to think about creating identity construction environments that allow people to see each other in real-time. This is particularly important for psychotherapists that take into consideration not only what patients say but also their body language, gestures and facial expressions.
- **Longitudinal studies**: Since the results from learning about our identity and personal and moral values can only be seen in a complete way many years after the experience took place, it would be very interesting to do longitudinal studies that follow one individual over a long period of time.
- **Conducting learning experiences that include teachers and mentors:** In both case studies presented in this thesis I took a child-centered approach to how Zora would be used. This means, that since I wanted to see how the Zora system would be used by participants, and how by being seeded with certain key elements it would afford a particular kind of learning, I did not included an active role for

teachers or mentors. Although this approach allowed me to see some of the successes of Zora's design that allowed children to grapple with certain powerful ideas, it also showed me its limitations. Users did not go beyond exploring the surface of these ideas and missed the opportunity to make connections with other domains of knowledge. In future experiences I would like to see how Zora's potential for learning could be augmented by being used in a context that gives a more predominant role to the teacher, psychiatrist or facilitator.

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Appendix

I. Application form to participate in the Zora summer workshop

Are your children between 11 and 14 years old? Do they like computers and telling stories? Do you wonder how can they use the Internet in a fun and creative way? Do you want them to have a new learning experience?

They might be interested in participating in the **"Building a Virtual City"** free summer workshop during the month of August. They will be creating a virtual city with different houses and populating them with virtual objects and interactive characters. Participants will be represented by a graphical virtual person (avatar). They can visit each other's virtual homes, have online conversations and create characters that can interact with visitors by telling stories. They will be learning about computers as well as exploring issues about youth identity. During the workshop we will be using a prototype of new technology (a 3-dimensional multi-user networked environment called Zora).

We are looking for kids from diverse cultural and religious backgrounds in the age range 11-14 who have access to e-mail and who enjoy telling stories. No previous computer experience is required. Enrollment is limited to eight participants.

The summer workshop is part of a pilot research project at the MIT Media Laboratory and will be held at the MIT Museum, in Cambridge, during the first three weeks of the

month of August. It will run Tuesdays, Wednesdays and Thursdays from 2 to 5pm. (Tuesdays 3,10 and 17; Wednesdays 4, 11 and 18 and Thursdays 5, 12 and 19). At the end of the workshop we will have an open house for family and friends to visit the virtual city that we created.

If you would like your children to participate, please ask them to complete the application below. If you have further inquiries about the research project, do not hesitate to contact me, Marina Bers, at (617) 253-0379 or by e-mail at marinau@media.mit.edu

Send the completed application to Marina Bers by e-mail (marinau@media.mit.edu) or by mail at:

Marina Bers

MIT Media Laboratory

E15-320A –20 Ames St.

Cambridge, MA 02139

Participants will be selected on a first-come first-served basis, keeping a balance between boys and girls, and striving for cultural and religious diversity. Participants should be able to commit to come to all of nine sessions of the summer workshop and to contribute to online discussions through e-mail during the workshop's duration. Parents will be requested to sign a consent form to authorize children's participation in the research project (consent form will be mailed later).

----------cut here----------

1.- What is your name? How old are you?

3.- Where are you from?

4.- What is your family's cultural background?

5.- Do you belong to a religious community? If yes, describe what you do there and how often do you go.

6.- Do you use computers? If so, what do you do with them?

7.- Do you have access to your own e-mail account? If so, where? How often do you use it? What do you use it for?

8.- Write a short paragraph about yourself.

9.- Why would you like to participate in the "Building a Virtual City" summer workshop?

10.- How did you hear about this summer workshop?

11.- Are you available to come to the workshop the first three weeks of August (Tuesdays 3,10 and 17 ; Wednesdays 4, 11 and 18 and Thursdays 5, 12 and 19) from 2 to 5pm?

12.- How can we contact you?

II. Code of conduct to participate in the hospital study

I agree to follow this **code of conduct** while I am using the Zora computer system:

- Don't ever use your last name or enter your address or phone number. This is important in order to keep your privacy and security.

- Use responsible and appropriate behavior. Don't use bad words in your stories or insult and offend others. Keep in mind that some of the participants will be children as young as 11 years old. If you don't like what someone does or says, please contact the adult in charge. If you are not sure if something will offend someone, first ask to your self: Would I like it if someone did this to me? Everything that is typed into the computer or displayed in the system will be monitored to make sure that all participants are using responsible and appropriate behavior.

- Ask questions if there are things that you do not understand.

- If you think that there are new rules that need to be added to this list, please send them to us.

- Keep in mind that we won't use a product or commercial software. It is a prototype system built for research purposes. Therefore it might have bugs or technical problems. Please report them to us so we can try to fix them.

_____

DATE SIGNATURE OF PATIENT/PARTICIPANT

_____

DATE SIGNATURE OF PARENT/GUARDIAN

_____

DATE WITNESS TO SIGNATURE

III. Hospital questionnaire

This is a research project into the use of Zora which is a computer program for children. The purpose of this interview is to gain a better understanding of your experience with your use of Zora. I will ask you some questions about Zora. It will be useful for us to know in what ways Zora is helpful, unhelpful, and ways it could be improved. We are interested in both positive and negative impressions. There are no right or wrong answers to these questions; we are interested in your reactions and ideas about Zora. Also I want to remind you that all your answers are confidential, and that this interview will be assigned a project number—your name will not appear on any of this material.

We will probably meet for about 10-15 minutes. Do you have any questions before we continue?

Evaluation and Satisfaction

1. What did you like most about taking part in this project?

2. What aspects of Zora have you found most helpful.

3. Were there aspects of the Zora that were not helpful?

4. Do you have suggestions for how to improve Zora—make it more meaningful or helpful to kids?

5. Do you have suggestions on how to improve the design of the program ----make it easier to use, easier to read, etc.

6. Please try to answer the following questions:

Overall, did you feel that Zora was hurtful at all?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

Overall, do you think that Zora is safe for kids?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

Overall, do you think that Zora is fun (or enjoyable)?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

Overall, how satisfied are you with Zora?

1	2	3	4	5	6	7
Not at all			Moderately			Extremely

Why?

Impact on illness

Using Zora affects kids in many different ways. Please rate the extent to which Zora affected you in the following areas.

1. Did using Zora help you to gain perspective or understanding about your own illness?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

2. Did using Zora help you feel less “alone” in dealing with your illness?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

5. Did using Zora help you understand better your own experiences with dialysis?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

6. Did using Zora help you understand better what other kid on dialysis go through?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

7. Did using Zora help you make friends or get support from other kids on dialysis?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

8. Did the using Zora help you feel more a part of a “group” on dialysis?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

9. Do you think Zora could help kids without renal disease understand what it is like to have renal disease and be on dialysis?

1	2	3	4	5	6	7
Not at all			Moderately			A great deal

Why?

10. Is there something else you would like to say that I haven't asked you?