We are what we tell

Designing narrative environments for children

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Introduction

"Who am I?" "What are the values I hold and cherish?" "Which is my place in the world?" Young people frequently ask these questions regarding identity and values. And they use different kinds of narratives to answer them: personal stories, popular tales, cultural myths. Computational systems can support young people to tell and listen to stories in order to learn about themselves and others. I coined the term *identity construction environments* to refer to technological tools specifically designed to allow children to learn about different aspects of the self through storytelling and computation. While their fundamental mission is to help young people construct a well-grounded sense of self by engaging in the exploration of personal and moral values, they also serve other educational goals. On the one hand, they support the cultivation of narrative intelligence by engaging in storytelling. On the other hand, they foster the development of computational intelligence by providing an opportunity to explore the power of design and programming.

In this chapter I will first present the concept of identity construction environments. Then I will describe three prototypes that I designed and tested with children and teenagers: the SAGE authoring environment, the web-based Kaleidostories and the 3D graphical multi-user environment Zora. I will briefly describe the technologies, the design principles and the use of each of these environments by young people in the real world. I will also share lessons learned with each one.

Identity construction environments

I coined the term *identity construction environments* to refer to technological tools purposefully designed to afford opportunities for exploring identity and engaging in reflection and discussion about personal and moral values. Given this definition, six design principles distinguish them from other technological tools for learning:

1. They are *purposefully* designed to help young people learn about their identity, particularly personal and moral values.
2. They are designed upon a theoretical model that understands identity as a complex and dynamic construction composed by conflicting values.
3. They afford opportunities for learners to engage in the design and creation of computational objects. These objects represent aspects of the self and can be created and programmed in a playful way.
4. They integrate the use of objects and narratives. For example, computational objects are described with narrative attributes and storytelling behaviors.
5. Their design is informed by the constructionist learning theory (Papert 1980), theories of identity formation (Erikson 1950) and Kohlberg's theory of moral development in a just community (Kohlberg 1982).
6. They support the creation and participation in a community. No sense of self develops in a social vacuum.

In the same spirit as other constructionist tools for learning, identity construction environments engage young people in a hands-on learning experience. They support the construction of knowledge by building personally meaningful artifacts that behave in the world. Identity construction environments are designed following the "construction kit" metaphor: an environment with a set of parts to be assembled and connected together. For example, structural or mechanical construction kits, such as LEGO, have parts from the world of engineering (e.g. bricks, gears, 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, 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 provide dynamic building blocks focusing on identity and per-

sonal and moral values. These building blocks represent different aspects of the self and can be arranged and put together in a playful way.

Learners can design and program these building blocks with storytelling attributes and behaviors, thus exploiting the power of narrative (Polkinghorne 1988). Narrative is a fundamental component of identity construction environments. It serves a descriptive function because it supports the finding of coherence between the diverse personal experiences, thus allowing the telling of a coherent life story (Linde 1993). It also serves a constructive function because it enables, through external dramatizations, to play out diverse aspects of the self in "what if" situations. Both the descriptive and constructive functions of narrative are important in the process of identity construction and are supported by identity construction environments.

SAGE: Storytelling agent generation environment

SAGE is an authoring environment for children to create their own wise storytellers to interact with by telling and listening to stories. Children can engage with SAGE in two modes: 1) by choosing a wise storyteller from a library of already existing characters and sharing with him or her what is going on in their lives. The sage storyteller "listens" and then offers a relevant tale in response, and 2) by designing their own sages and programming the conversational interaction between storyteller and potential users as well as creating the database of inspirational stories offered by the storyteller in response to user's problems (Bers & Cassell 1998).

The LISP-based SAGE architecture has three parts:

- **Computation module:** in charge of parsing the user's story to extract nouns and verbs, expanding these keywords through WordNet, a hierarchical semantic lexical reference system (Fellbaum 1998), and performing a match between the user's personal story and an inspirational story in the database. This module does not have any knowledge about story grammar; it only deals with augmented keywords in order to find the story that is most like the user's story — which deals with the same themes.
- **Authoring language:** serves to design the personality of 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. A graphical user interface allows children to create conversational flows in a way similar to that by which they engage in pretend role play games, by
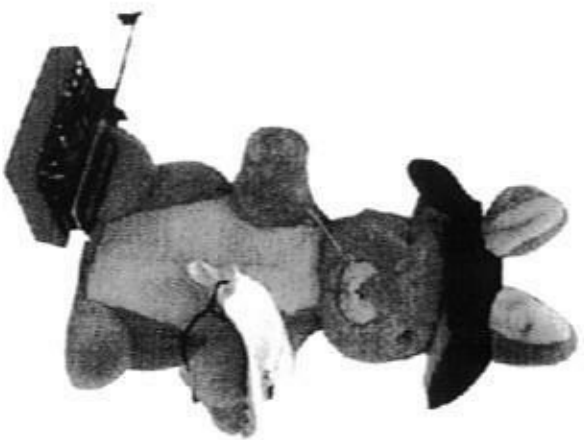
planning *who* will say *what*, and *when*, while arranging graphical objects. In the database of stories users can write or record the inspirational stories that will be offered by the sage. They can index them with personal and moral values that they consider good descriptors of the main story points.

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 moves its ears, shakes its body and blinks its eyes to indicate attentiveness. These body movements can also be programmed by the children (see Figure 1).

Figure 1. The interactive stuffed storyteller assistant.

Becoming sage by designing a 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 Abraham, 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, Abraham.

USER: I kept on 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: Well, your situation reminds me of a story. Remember that there is power on 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 later studies we conducted research with fourth and fifth graders who built 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. Children created storytellers as projections of fears, feelings, interests, and role models.

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, we explored how SAGE could be used for therapeutic purposes with chronically ill children who are particularly in need of telling the stories of their lives. A pilot study was conducted in the Cardiology Unit of the Children's Hospital in Boston (Bers et al. 1998). Young cardiac patients used the SAGE environment to tell personal stories and created interactive characters, such as Mrs. Needle or Mr. Tape, as a way of coping with cardiac illness, hospitalizations, and invasive medical procedures.

Lessons learned

The research done with SAGE showed that children in very different situations used this identity construction environment to explore aspects of their inner lives through the creation of stories and storytellers. While expressing their feelings by telling personal stories and listening to inspirational stories, children learned about themselves. While designing conversational interactions in which other people could participate, they also learned about others. SAGEs design engaged young people in learning about identity, as well as developing narrative and computational intelligence. However, it did not support further explorations of how a community shares narratives, nor how identity is constructed in a social context. Neither were kids engaged in exploring values through concrete actions. They only used them to label and categorize stories. Since all of these elements are important to develop a well-grounded sense of self, I decided to design a second generation of identity construction environments.

Kaleidostories: A web-based narrative experience

Kaleidostories is a web-based identity construction environment that focuses on the use of narrative to explore role models and values in the context of an on-line community. Every participant in the community is represented by a geometrical figure in the kaleidoscope displayed in the right top corner of the screen. The figure's color and shape changes according to how many role models and values are shared between the logged user and the other participants. The kaleidoscope allows visualizing community patterns of shared role models and values (see Figure 2). Kaleidostories runs in an NT Java-based Web-server and it is implemented in Java. Data entered by the children is stored and recovered from a database using Java servlets. The patterns visualized on the kaleidoscope are generated at run-time by queries to the database (Bers 1998).

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 asks them to write stories involving 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 the values that I admire about him or her?" The
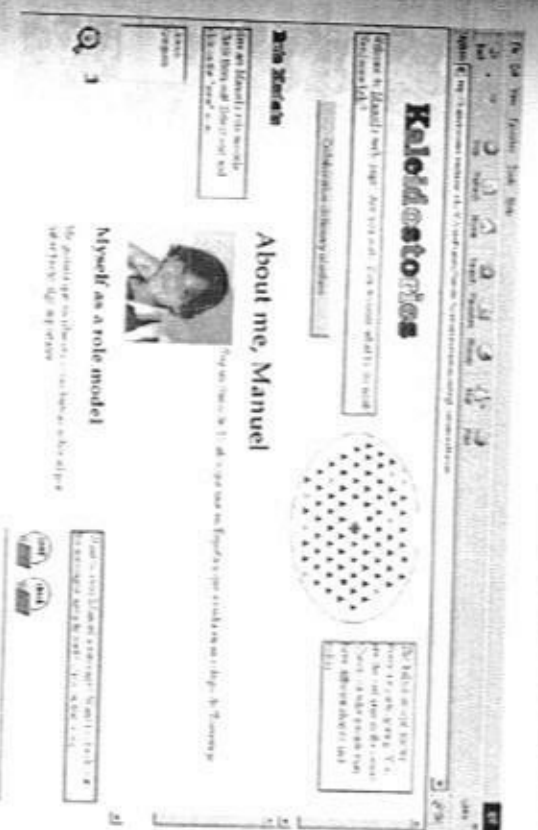
system also invites users to link role models' stories with particular values (such as friendship and justice) and to define those values in a collaborative values dictionary. This dictionary has all the values that the Kaleidostories community holds as a group, as well as the personal definitions that each individual creates to ground those abstract concepts to concrete situations. At any point, children can look at the kaleidoscope, browse the creations of other participants and engage in a-synchronous communication.

Sharing stories across the world

I conducted two on-line pilot studies with Kaleidostories. First, I did 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. Second, I conducted 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.

During both studies 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

Figure 2. The Kaleidostories website.

most of her students spoke very well but were not very comfortable writing. In Spain the teacher decided to focus on the values dictionary and did 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 requested 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. 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 resulted, in both studies, 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"*. While reading the diverse definitions kids engaged in discussions about the different meanings that a same value might have for different people.

Kaleidostories provided a framework that encouraged reading and writing as fundamental tools for communicating with others. It helped bilingual kids to find a meaningful activity through which to express themselves in writing to an engaged audience of peers. Juan's story is a good example. Juan is a 17-year-old recent immigrant who did not yet speak English and who had severe problems writing in Spanish. He was a tough kid with 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. 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 others, kids across the world he started to care, for the first time, about his spelling. 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 converted into an expert user of the computer. Juan's development of narrative and computational intelligence helped him become a more confident learner and gain self-esteem. Juan's case shows how Kaleidostories fostered a social context that helped a teen change his sense of identity.

Lessons learned

Kaleidostories allowed young people to explore aspects of themselves such as role models and values through sharing stories. At the same time it provided a forum to share differences and similarities with others living in different parts of the world but sharing a language. As an identity construction environment it combined the power of computation to visualize community patterns and the power of narrative to express feelings and thoughts. However, Kaleidostories lacked the capability to include direct communication through real-time chat. It also lacked the flexibility to express a more complex sense of self. 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 enable those values to be put to test through behaviors in the on-line community.

In order to facilitate the passage from moral knowledge to moral action, Kaleidostories' design was not enough. Although there was a sense of community, represented by the patterns of the kaleidoscope, the tools for self-organization and forums for discussion were missing. This is essential to form a responsible and just community (Kohlberg 1982) in which values are developed not only as narratives but also through action. Kaleidostories did not exploit the full potential of computation, as it did of storytelling. It limited computation to networking and visualization. On a different note, Kaleidostories was not fun enough to engage children to use it on their own for a long period of time. But 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 keep students on track. The experiences with SAGE and Kaleidostories served me in designing a third generation of identity construction environment.

Zora: A narrative-based virtual world

Zora is a 3D graphical multi-user environment that provides the tools for young users to create a virtual city. As with the other identity construction environments mentioned before, Zora's design supports the exploration of identity and values through storytelling and programming. The name Zora was inspired by one of the cities that Italo Calvino describes in his book "Invisible"
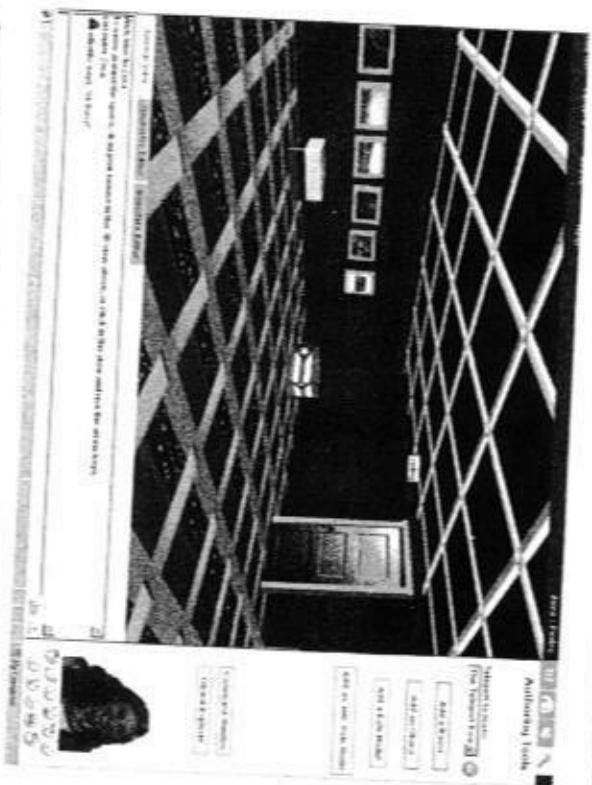
"Cities": "*This city is like a honeycomb in whose cells each of us can place the thing we want to remember... So the world's most wise people are those who know Zora.*" (Calvino 1972).

Users are graphically represented by avatars and can communicate via text or gestures. They can navigate around the 3D virtual city, converse with others in real-time and construct the city's private and public spaces: personal homes, community centers and temples. Temples are shared public spaces representing cultural traditions or interests. Users can populate these virtual spaces with computational objects and interactive characters representing role models and anti role models, which can be programmed to engage in storytelling interactions with other users (see Figure 3). Both personal homes and temples become autotopographies or spatial representations of identity composed by artifacts symbolizing intangible aspects of the self (Gonzalez 1995).

Zora is an object-oriented environment, meaning that users can make new objects by cloning existing ones and inheriting its attributes. Users can create the following attributes for their objects: (1) presentation attributes, *graphical appearance* and *motion*; (2) administration attributes, *ownership*, which determines who owns the object and therefore can edit it, and *permissions*, which set if the object can be cloned; and (3) narrative-based attributes, *textual description, stories, values* and *conversations.* Zora is implemented using

Figure 3.   A personal home designed by a thirteen-year-old.

Microsoft's Virtual Worlds research platform, a software development kit for building distributed multi-user environments (Virtual Worlds Group).

There is a growing amount of work on virtual worlds (Turkle 1995). However, while most of the research looks at how community develops as such, Zora looks at how personal identity develops in the context of a community. The research is aimed at helping young people understand and affect the ways in which identity and values are constructed in the real world, as well as online. In the same spirit as other constructionist virtual communities such as the text-based MOOSE Crossing (Bruckman 1994) and the 2D Pet Park (De Bonte 1996), kids can program behaviors for their own creations. But in Zora, programming is limited to storytelling behaviors. For example, they can describe the underlying turn-taking rules between user and character as well as define the stories to be told in response to certain input. Like in the psychological novel, the engine of action is placed in the richness of the created characters and the resulting interactions rather than in the plot. As in Kaleidostories, users can create a collaborative values dictionary. But in Zora not only can they define its values but also put them to test through their actions in the community.

Kids designing their own virtual cities

I conducted two pilot studies in which young people used Zora: an intensive summer camp 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, 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 study focused on feasibility and safety of using the Zora virtual environment with young patients facing hemodialysis in a hospital setting. This includes the analysis of Zora's impact on children's understanding of their illness, and its potential to facilitate mutual patient support and interaction (Bers et al. 2001).

In both studies, participants built and inhabited a virtual city with personal homes and public spaces. For example, the summer camp participants built the Salsa and Merengue temple and the French Chateaux, while the dialysis patients built the Temple of Feeling Better and the Renal Rap room (see Figure 4).
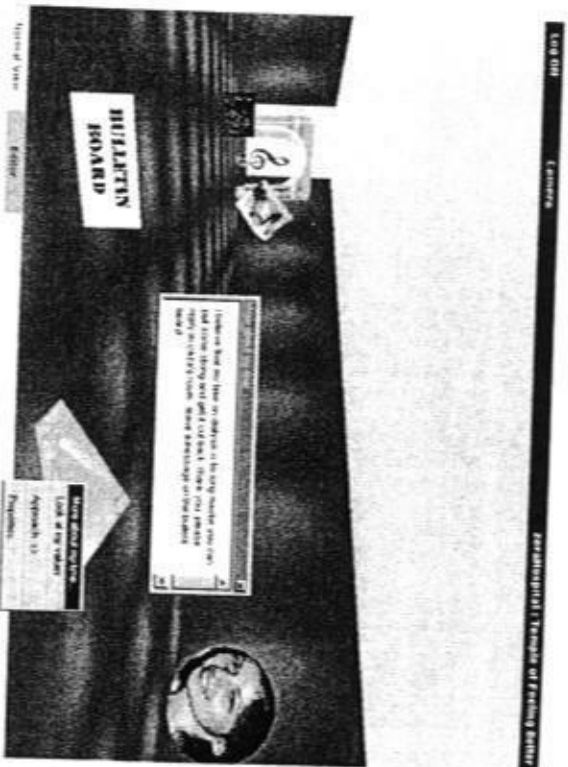
Zora engaged young people in the design of spaces and dynamic artifacts representing aspects of their complex selves. Kids used the Zora environment to explore personal identity and values in a community self-organized by democratic principles. For example, they held weekly meetings in the virtual City Hall and experimented with different on-line voting systems. As time went by they realized the need of laws to organize the social life of the virtual community. They agreed on basic laws such as "no putting things in people's personal rooms", "set the properties of the objects placed in public spaces so others can use them if they like", "fess up to what you do", and "there will be no jail".

By providing a social context for the development of self-government, Zora engaged young people in the creation of a participatory community in which values were discussed and put to test through behaviors. As time went by kids started to drop "cases" they wanted to talk about in the City Hall. 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. During the summer camp experience most of the cases dealt with setting up the social organization of the virtual city. Examples of those cases are "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". Other cases were to discuss and raise awareness about

Figure 4. The temple of feeling better.

controversial topics such as death penalty and current hate crimes reported in the news. During the experience at the hospital, cases raised awareness and discussion about particular situations regarding individual treatments and served patients as a way to voice their opinions and engage in informal interactions with doctors. For example, a seventeen-year-old boy left the following case in The Temple of Feeling Better: "I believe that my time on dialysis is too long. Maybe you can pull some string and get it cut back. Thank you. Please reply in aza's room. Leave a message on the bulletin board". As a result, the patient engaged in a long on-line conversation with one of the doctors participating in the study.

During both pilot studies, kids engaged in five types of processes that supported learning about identity and values: creation, introspection, communication, participation, and perspective taking.

- Creation: Kids designed personal homes and temples, virtual autotopographies in which collections of symbolically meaningful objects and characters are displayed. The creation of these spaces supported the development of new insights about identity and values. Kids also created a participatory micro-community, a safe space where powerful conversations and self-government took place.

- Introspection: Throughout the experience with Zora, kids engaged in thinking about what types of places, objects, characters and stories best represent themselves as individuals and as a community. In this sense, Zora served one of the functions that has been attributed to the idea of the Sabbath: a time for reflection and self-examination (Heschel 1951).

- Communication: In Zora communication is both synchronous (learners converse with each other through their avatars in real-time) and asynchronous (learners post messages, read and write stories stored in their artifacts and engage in conversations with already programmed objects.) By communicating with each other kids not only expressed their sense of self and values, but also learned how to exchange opinions and debate.

- Participation: A sense of self doesn't develop in a vacuum but in constant interaction with others in a community. Zora engaged kids in self-organization and decision-making by supporting the creation of a participatory micro-community. Values became not only matters of narrative and introspection but also matters of behavior and taking action.

- Perspective-taking: Seeing the world as others do, understanding their motivations and actions, is a fundamental mechanism for exploring issues of identity and values. In Zora this type of experience was facilitated by kids

visiting each other's virtual homes and temples and, in SAGE's spirit, by engaging them in programming conversational interactions between their characters and other users.

Lessons learned

Zora's design was a result of my previous experience with both SAGE and Kaleidostories. In the same spirit as SAGE, in Zora children can program storytelling interactions for their characters to engage in conversations with the visitors. However, the natural language parsing is simpler and WordNet is not used to augment keywords. In Zora, as well as in Kaleidostories, narrative is the principal medium to form a community. Children can tell stories as well as contribute to the collaborative values dictionary. However, communication is both a-synchronous and synchronous. Real-time chat facilitates exchanging points of view in discussions.

The three-dimensionality and the navigation around the city have certain similarities with popular video games. The kids do not see Zora as educational software but as a captivating game. Kids had lots of fun with it, which is important to keep them engaged, and at the same time were able to explore aspects of their identity and values as well as discuss issues relevant to the Zora community and society at large.

Conclusion

As shown through the three identity construction environments presented above, SAGE, Kaleidostories and Zora, the integration of narrative with computation is a powerful tool to help young people explore identity and values. Narrative supports the construction of a sense of self by finding coherence between different aspects and experiences. It can also serve a healing function by allowing people to reflect back on their experiences and tell and re-tell their story (White & Epston 1980). Computation allows users to become designers of a context in which to engage in storytelling interactions, "what if" situations and real-time communication.

The research described in this chapter shows the potential of computational tools, particularly identity construction environments, for educational and therapeutic interventions that seek to foster self-awareness, personal cultivation and multicultural understanding. It also provides a new way of conceiving moral and civic education in the light of new technologies. There is a

big potential in the integration of computation and narrative in the design of tools for learning about the inner world. This chapter hopes to provide some examples of how this can be done.

Acknowledgments

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PART II

Story Generation