

# Narrative Construction Kits:

## “Who am I? Who are you? What are we?”

Marina Umaschi Bers

MIT Media Laboratory  
20 Ames St. E15-320A  
Cambridge, MA 02139  
marinau@media.mit.edu

### Abstract

This paper proposes narrative construction kits as powerful tools to help children and teenagers explore identity and values as dynamic complex constructions. The metaphor of a construction kit suggests that users can combine building blocks (e.g. aspects of the self), program them with storytelling behaviors and try them out in interactions with others. By integrating storytelling and computation these kits also support the development of knowledge about narrative and programming. Three examples of narrative construction kits designed and tested by the author with children and teenagers are described: SAGE, the web-based Kaleidostories and the 3D graphical multi-user environment Zora. Differences and similarities, design principles and lessons learned are presented.

### Introduction

Narrative construction kits are computational environments that allow children to put together different elements of their lives through story telling. The construction kit metaphor refers to an environment with a set of parts to be assembled, arranged and connected together. For example, traditional construction kits such as LEGO or Meccano have parts from the world of engineering (e.g. bricks, gears, pulleys, etc.). Through the exercise of assembling them, 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, etc.). For example, computational construction kits such as Lego-Logo support explorations of powerful engineering, robotics, computational and mathematical ideas. Construction kits support the construction of internal knowledge by building a personally meaningful external artifact that behaves in the world (Papert, 1980).

In the same spirit, narrative construction kits include collections from both the world of computation and the world of narrative. On the one hand, narrative construction kits engage people in cultivating narrative intelligence by providing an opportunity to explore the narrative genre and the construction of meaning and interpretation within a context. On the other hand, narrative construction kits engage people in developing computational intelligence by providing an opportunity to explore the power of design and programming.

My work on narrative construction kits aims at helping people develop a type of intelligence or knowledge that asks and responds to questions such as who am I? What are the values I hold and cherish? What are my roots? Which is my place in the world? Where am I going?. Some might call this set of questions and answers knowledge about the inner world. Howard Gardner calls it personal intelligence (Gardner, 1983). According to Gardner this type of intelligence involves two forms of knowledge that are intimately intermingled: intrapersonal, which involves looking inward and a sense of self-knowledge and self-awareness, and interpersonal, which looks outward at the other individuals and the community

As I will show later in this paper, narrative construction kits are very powerful tools to help people develop and experiment with personal intelligence in its two forms. The metaphor of a construction kit suggests that users can combine building blocks (e.g. aspects of the self), program them with storytelling behaviors and try them out in interactions with others.

Narrative construction kits allow people to explore their identity as a complex and dynamic construction composed by diverse and conflicting aspects (Erikson, 1950). Narrative has a major role in achieving cohesiveness and coherence between these multiple aspects of the self. Narrative serves a double-edged descriptive and constructive function with respect to identity. Descriptive function, because it supports the finding of coherence between the diverse personal experiences, thus allowing a

coherent life story (Linde, 1993). Constructive function because it enables, through external dramatizations, to play out diverse aspects in “what if” situations. Both the descriptive and constructive functions are important to understand the role of narrative in the process of identity construction.

In this paper I will present three different examples of narrative construction kits for young people that I have designed and tested over the last four years: SAGE, Kaleidostories and Zora. First I will briefly describe each of the environments, both from a conceptual and a technical design perspective. Then I will present results of empirical studies conducted with diverse populations of children and teenagers using them, and I will summarize lessons learned with each one of them. Finally I will present conclusions.

### 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 design wise interactive storytellers and engage with them 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. This work was done for my master's thesis under direction of Prof. Justine Cassell (Bers & Cassell, 1998).

Children can engage with SAGE in two modes: 1) by choosing from a library of already existing characters a wise storyteller to share what is going on in their lives. The sage storyteller “listens” and then offers a relevant comforting tale in response, and 2) by designing their own sages and types of story telling interactions for themselves and other children to interact with.

The LISP-based SAGE architecture has three modules:

- 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 (Miller et al., 1993), and performing a match between the user's personal story and a comforting 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: used by children to design their own 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. In the conversational structure design window children model the conversational flow between user and storyteller (or the storyteller's intermediary, the toy assistant) by selecting and arranging graphical building blocks of three different types from a palette —turn-taking states, communicative actions, and parts of conversation. The graphical user interface allows children to create conversational flows in the same way that they engage in pretend role play games, by planning *who* is going to say *what*, and *when*, while arranging objects in the conversational structure window. In the database of stories users can write or record the comforting stories that will be offered by the sage. Children annotate the stories with story values, nouns and verbs that they consider good descriptors of the main story points.

- **Interface:** this module is the layer through which a user communicates with the system. SAGE embeds the sage storyteller's assistant in a programmable interactive toy —a soft interface— that carries on the conversation with the user (see figure 1).



Figure 1: The interactive stuffed storyteller assistant

The stuffed animal is capable of some of the types of nonverbal behaviors that humans use to indicate engagement: the stuffed animal moves its ears, shakes its body and blinks its eyes to indicate attentiveness. In design mode, children can program the toy's communicative behaviors by specifying an action that the toy would perform at each turn in the conversation. Since the technology is not yet available to create a stand-alone interactive toy (the main obstacle being the lack of adequate speech recognition systems for children's speech), we integrated the desktop computer with the interactive toy. Output is multimodal (motor behaviors, sound and text) and input is typed text only.

In SAGE, a strong sense of context and a shared assumption about the socio-cultural role of the storyteller allows the user 1) to believe in the abilities of the system, despite minimal natural language understanding, and 2) to find coherence between his or her personal stories and the comforting stories retrieved by the system. This is

achieved by enabling children to design storytellers with strong stereotypical characteristics and well-defined domains that set up certain behavioral expectations.

### **Empirical studies**

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.

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. These projections allowed the presentation of the self to themselves as well as to others.

Using SAGE they were able to design and model abstract structures needed and used in both programming and story telling. 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 notions of communication while observing computational and communicational breakdowns through 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 and design recommendations for narrative construction kits to be used in hospital environments were produced (Bers et al, 1998). Young cardiac patients ranging from age 7 to 16 used the SAGE environment to tell personal stories and create 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 extensive 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 exercised their intrapersonal knowledge by looking inward and expressing their feelings. They also used basic forms of

interpersonal knowledge by designing interactions in which other people could participate. This invited them 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, the design of SAGE did not support further explorations of interpersonal intelligence, such as the integration of the sense of self with the social world of others and the community. SAGE's goal was to help people learn more about themselves. The knowledge about others was just a means of gaining further understanding of one's own identity.

Since neither form of knowledge can develop without the other, I decided to explore the design of a narrative construction kit that would engage young people in both learning about themselves and learning about others in a community context. Understanding of the social world involves paying special attention to issues that have to do with personal, social, cultural, moral and spiritual values. The challenge was to design a computational environment that would allow people to use narrative to explore different aspects of their identity, particularly their values and their role models.

### **Kaleidostories: an on-line narrative construction kit**

Kaleidostories is a web-based narrative construction kit to support construction of coherence between the fragmented models of identification\_\_ people real or imaginary, live or dead, who have a positive influence \_\_ and values that populate our identity (Bers, 1998). The name Kaleidostories reflects the metaphor of both diversity and unity that kaleidoscopes convey.

Every child participating in the Kaleidostories community is represented by a geometrical figure in the kaleidoscope. Its 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).



Figure 2: The Kaleidostories website

The system guides the user in the creation of a personal on-line portrait with narratives about the present \_\_ who am I? \_\_ and narratives about the future \_\_Who or how do I want to become? It also guides users in the creation of role models. Children can choose their role models from a list, as well as create their own and add them to the already existing library. The system invites them to write stories that involve 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 from him or her?" The system also invites users to link role model's stories with particular values and to define those values in the 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 adds.

At any point, children can look at the kaleidoscope and browse the creations of other participants as well as send messages to each other. Kaleidostories was designed so children can participate 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 relevant links to other web sites. The stories written by the children must reflect the characteristics (values) that they most admire from their role models.
- **Grounding:** the system has a library of abstract universal values (such as friendship, justice, responsibility, etc.). Children have to 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 patterns.
- **Communication:** children can contact each other and engage in a-synchronous communication about both the process and the products within the Kaleidostories experience.

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 run-time by queries to the database.

### Empirical studies

I conducted a four month on-line pilot 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 Torre Vieja, Spain and a youth group from a Jewish Sunday school in Buenos Aires, Argentina. The total number of participants was 49: 45 kids between 10 and 17 years old, 3 teachers (one per site), and myself as a researcher.

Although all the sites were participating in the same Kaleidostories experience, every local teacher decided to use it in a very different way and with different goals. For example, the teacher in Cambridge integrated the tool into her "Spanish Literature and issues of adolescence" class focusing on writing stories about role models in Spanish, a language which most of her class spoke very well but was 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 on values. The experience in Argentina was very different. There wasn't a real teacher coordinating the activity and the kids would use the tool from their home as pleased.

A total of 13 role models were chosen from the pre-existing library and 33 were created by the kids: 8 family members, 8 singers, 7 classmates, 5 scientists, 5 actors, 3 historical characters, 2 writers, 2 athletes, 1 teacher, 1 cartoon character and 1 representation of the self (a boy created his fictional double as a role model). Most of the kids had problems distinguishing between the role model's biographical information and the stories that were personally meaningful.

In the post-interviews, most of the participants expressed that they enjoyed most the experience of communicating with others with similar ideas but from very different countries. Kaleidostories provided a framework that encouraged reading and writing as fundamental tools for communicating with other participants. Therefore, as stated by the Cambridge teacher and shown through her student's productions, it helped bilingual kids to find a meaningful activity through which to express themselves in writing to an engaged audience of peers.

For 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 was a tough kid who 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 kids across the world he started to care, for the first time, about his spelling because it was a barrier to being understood. He asked the teacher and his classmates to correct his writing. Reading and writing had become for Juan an authentic meaningful experience. Juan's case shows how technology helped a teen change his sense of self and become a more confident learner. His identity was affected not directly by the technology but as a result of the social context that Kaleidostories fostered.

Friendship, study and responsibility were the most popular values with 25, 19 and 14 definitions respectively. For analysis, I grouped the values definitions into three categories: **1. Basic**, which included circular definitions of the type "*Friendship is to have friends*" and definitions that show their personal detachment as "*They say that you have to be sincere, respect people and never tell lies*" or "*To study means to learn the lessons to pass the exams*"; **2. Average**, with functional definitions of the type "*Friendship is simple: two people meet and they become friends*" or "*To study is for kids, because if they don't study they will never know anything*" and definitions involving feelings such as "*For me friendship is a feeling of sincerity, honesty and love towards a person*"; **3. Complex**, which included analytical definitions like "*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*" or "*To study is not only to accumulate knowledge but to develop intelligence. It helps you resolve life problems by yourself, now and in the future*".

The complexity of the definitions was not related to the age of the kids neither to their homelands. These categories show the diversity of ways of children's thinking about values when engaged in sharing their ideas about abstract concepts with others. It is still open for research to determine if the classification of kid's values definitions actually correlates with the quality and depth of self-knowledge and self awareness that kids expressed through their personal portraits and their role model's stories.

### Lessons learned

Kaleidostories allowed kids to explore aspects of themselves such as role models and values. At the same time it provided a forum to share differences and similarities between kids that live in different parts of the world but who share a language. As a narrative construction kit it combined the power of computation to

visualize 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 afford to put to test those values through actual behaviors.

In order to facilitate the passage from moral knowledge to moral action, from identity expression to identity exploration, 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 formal 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 served the function of a mirror but did not allow to step in and act, as Alice did in "Through the looking glass", and actually live the experience. This 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 children to use it on their own for a long a period of time. Whereas 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.

### Zora: a narrative-based virtual world

Zora is a 3D graphical multi-user environment for pre-teens and teens, a period characterized by the struggle towards forming a coherent identity. As with the other narrative construction kits 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 things we want to remember...So the world's most wise people are those who know Zora.*" (Calvino, 1972).

In the virtual Zora users are graphically represented by an avatar and can navigate around the virtual city. Zora is divided into personal homes, community centers and temples, shared public spaces that hold objects, role models and anti role models representing cultural and spiritual traditions as well as personal interests (Bers, 1999).

Children can populate the city by creating spaces, objects and characters. 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 and draw pictures. But in Zora, the programming aspect is limited to storytelling behaviors. Children can visit each other's homes and can communicate through their avatars via text or gestures. Avatars can gather in the City Hall to decide the laws of the virtual city as well as to discuss cases related to self-government and current controversial news. Since identity and values do not develop in a vacuum but in constant relationship with others, it is very important to have a space devoted to organizing the life of the community.

A multi-user virtual environment provides the right technological infrastructure for facilitating this type of activities. Zora is implemented using Microsoft's Virtual Worlds research platform, a software development kit for the design of distributed multi-user 3D graphical environments.

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 on-line. Narrative construction kits are specifically designed to serve this purpose and to help users integrate and reflect upon the different aspects of the self.

In Zora people are encouraged to tell stories and to program storytelling interactions. Like in the psychological novel, the engine of action is placed in the richness of the characters rather than in the plot. Although the term narrative construction kit might imply multi-path interactive narratives, in Zora there is no plot. The plot constantly evolves according to the places that a user's avatar visits in the world, the people and objects encountered and the resulting interactions. The richer the encountered characters are, in terms of storytelling and conversational behaviors programmed by the children, the richer the experience.

In Zora narrative serves both as a communicative and a cognitive function. Storytelling allows people to communicate with each other or with their created

characters and, at the same time, it is fundamentally responsible for organizing the diverse and contradictory aspects of identity. To put together those stories and aspects in a coherent way requires a construction process that leads to deeper learning about identity. Constructing, in this metaphor, refers to both constructing an artifact as a "second self" (Turkle, 1984) and constructing meaning to give coherence to fragmented stories, objects and values.

### **Empirical studies**

During August 1999 I conducted a three-week pilot study with eleven kids between 11 and 15 years old. Eight of them 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. The population was very diverse: Five girls and six boys, two African-American, two Asian American, one Latino, one Iranian and five White-American. Six of the kids were inner city kids going to private schools with the help of a foundation. An older child, a senior in high school who had previous experience with Zora, helped to coordinate the activity and served as a mentor. All participants had e-mail and were subscribed to the workshop mailing list. Parents were also subscribed to a parent's mailing list and were invited, the last day of the workshop, to an open house to see their kid's work.

The methodology used for the study is based on an ethnographic approach. I used observation of on-line and face-to-face children's interaction, analysis of system logs that recorded, with date and time, everything they said or did on-line, videotaping and extended personal interviews. The data collected was very rich and voluminous and it is still under analysis.

Diverse kids used the system in different ways, according to their needs to express and explore identity issues. For example, thirteen-year-old Pablo put special emphasis on designing a home with meaningful wallpaper colors with matching ceiling and floor. He hung portraits of his dearest family members and pets. He took pictures of a chain that he wears everyday, and placed it in his virtual house with a story of how important was that present from his grandmother. He also put the flags of Colombia and Puerto Rico, the homeland of his parents. Pablo worked very hard on making the space look as much alike to his room at home and was very eloquent about the importance of making a personally meaningful place (see figure 3).



Figure 3: Pablo's virtual home in Zora

By contrast, 11 year old Kathy did not make a personal home but a Video Game Room where she wrote stories and put pictures of all her favorite video games. She also defined values for each of the video games. When another boy tried to add some Nintendo games to her room, she explained to him that those games were not welcomed there and that he should make a separate room for them. And so he did: he created the Nintendo temple. Zora had a variety of temples: a Salsa and Merengue room, a Britany Spears temple, a Dinosaurs Hall, a Sports Arena, a Jewish temple, a Southern Baptist Church, a Music Temple, a New England Revolution temple, a French Chateau and a Junk Shop, *"to drop all the objects that people are not happy with but do not want to delete"*.

The flexibility of Zora allowed each of these kids to express themselves in their own particular way. Kids brought pictures from home, downloaded them from the Web, drew their own pictures and scanned them in or used a digital camera. Some kids wrote as much as three stories per object and added many values and definitions to the dictionary while others wrote none. Kids created heroes or villains in their rooms or temples and some choose the same person as both a hero and a villain and explained in which context she was one or the other. Most of the kids said that it was harder to create a hero or villain than to create an object or a picture frame because you had to think about the qualities of the person and decide your feelings about him or her.

During the second day of the workshop kids discovered that they needed to create laws to make living in Zora easier. In the first City Hall virtual meeting a boy was elected as the City mayor and took charge of writing the rules of Zora on a virtual wall of the City Hall. Kids 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 had a very hard time adjusting to the on-line chat as well as organizing themselves and having a productive meeting where everyone was heard and consensus was reached. However, once they agreed on nine basic rules, such as "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 use them if they like", "fess up to what you do", and "there will be no jail", they carefully respected them. Although much of the conversation was about punishments for breaking the rules, during the whole three weeks they did not find necessary to apply any of the punishments.

As time went by kids started to drop "cases" they wanted to talk about in the City Hall, so that others could see them and call a meeting. Most of the cases were about things left in the wrong places, unwanted gifts that people wanted to delete from their rooms or invitations to add stuff to some of the temples. However, during the second week a different case was dropped. The girl that made the Jewish temple placed in the city hall a link to the shooting to the Jewish Community Center in L.A that had happened the day before. A meeting was called to discuss the news. It lasted an hour and a half and all the eleven kids participated, for the first time, in a very organized way. The conversation started by clarifying the facts and checking the web site that the girl had attached to the case (to which she also added the value tolerance). The conversation evolved in the following way: 1) how stupid the racists and nazis are, 2) discussing how it wasn't just stupidity but hate crime, 3) talking about punishment and death penalty, 4) the role of education and family as a prevention mechanism, 5) the lack of talk about these issues in a meaningful way at school, 5) opening up and sharing very personal experiences, 6) discussing the role of ignorance about other cultures or religions, 7) deciding to build more temples to the Zora city so people learn about each other.

The quality of the conversation evolved and the ideas became more mature as time went by, with almost none interventions from my part. For example, most of the kids started by saying that there was no hope to prevent hate crimes and that death penalty was the only solution. Later they were able to think of ways to help prevent these crimes and to have a serious debate about death penalty. The girl who initially dropped the case in the City Hall, as well as the other kids, felt that Zora was an appropriate environment to discuss these issues despite the fact that nobody told them so. It was also very interesting to see how, by the end of the discussion, one of the African American girls said that she sometimes felt embarrassed in her private school because she was the only black person. The Latino boy expressed how he also felt the same way but he was proud to be different and he would make sure that everyone knew where he came from. The discussion became very personal and involved other participants with similar feelings and experiences.

During the open house kids shared with their parents their projects and exchanged phone numbers with each other.

They asked to continue using Zora during the school year either at home, if they had the required computers, or at the Lab. After the workshop ended, I can still see in the log that kids connect to Zora often.

### 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. The programming aspect is not fully implemented yet, so it is not clear if kids would use it in similar ways as they did with SAGE or in very different ways. 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. The first pilot experience with Zora was very successful and I am looking forward to fully analyze the data and to conduct future studies with other populations.

### Conclusion

As shown through the three computational environments presented above, SAGE, Kaleidostories and Zora, narrative construction kits are very powerful tools to help young people develop both intrapersonal and interpersonal knowledge. Narrative, in both its descriptive and constructive functions supports the construction of coherence between different values and aspects of identity. Computation allows the user to become a designer of a context (a city, in the case of Zora or a wise storyteller, in the case of SAGE) in which to engage in storytelling interactions, "what if" situations and real-time communication. The most successful narrative construction kits are fun and flexible for children to engage with for long periods of time, encouraging them to put together different fragments of both personal and social identity.

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