Virtual Forum Theater – a computer supported collaborative learning environment for underprivileged children

Alice C. Mello Cavallo

Tufts University

Arts, Science and Engineering (http://ase.tufts.edu/).

Departments of Computer Science, Child Development, Drama and Dance.

Halligan 246 161 College Ave, Medford MA, 02155 USA

Alice.Cavallo@tufts.edu

Abstract

This is an interdisciplinary research and a work in progress where I am trying to understand, investigate, document and critique how children's learning of expressive arts, engagement and self-confidence can be augmented or transformed by the use of an on-line Forum Theater environment. The potential of this computer-based educational tool is to provide an open constructionist learning environment, or microworld, in which the learner can safely explore and express his imagination, creativity, language, aesthetics, participatory design, written skills, conflict resolution, role-playing, decision-making, and coordinated teamwork. Virtual Forum Theater-VFT is a CSCL and MUVE environment target to be explored by children between ages ten and thirteen years old. It is being developed in Java, SMIL and incorporating some internet-based free-ware tools.

Introduction

In my research, I try to understand, investigate, document and criticize how children's learning of expressive arts, engagement and self-confidence can be augmented or transformed by the use of an on-line Forum Theater environment. The potential of this computer-based educational tool is to provide an open constructionist learning environment, or microworld, (Papert, 1990) in which the learner can safely explore and express his imagination, creativity, language, aesthetics, participatory design, written skills, conflict resolution, role-playing, decision-making, and coordinated teamwork.

Virtual Forum Theater is a digital drama or multimedia presentation of a dramatic play using digital means, including audio, images, and video. VFT's digital dramas are produced through the use of computer software and performed using browsers available on the Internet.

History of MUD, MOO, MUVE, CVE and CSCL

Multi-User Virtual Environment (MUVE) started as Multi-User Dungeon or Dimension (MUD) which was text-based adventure game. The first MUDs in 1967 were networked multi-player dungeons and dragons games where players tried to kill monsters and find magic treasure (Bruckman, 1999). Amy Bruckman (1999) developed one of the first educational MUD environments called *Moose Crossing* which provides an environment that encourages children to develop their own spaces composed of rich textual descriptions and compelling programmed interactions. As computer science advanced in their operational systems and programming languages MUD evolved into MUD Object Oriented (MOO), which categorizes *Moose Crossing*.

After more than ten years of its creation, and with the graphical advances in computer science, the MUDs and MOOs started to incorporate graphics and sounds losing the emphasis on text-based interaction. By that point there were a number of MUDs which were not related with dragons' games anymore, and the naming of the environments that included graphics, and sounds capabilities evolved into MUVEs. MUVE becomes more appealing than MUD or MOO as it exploits visual interfaces.

MUVEs support the formation of virtual communities and terms like Collaborative Virtual Environment (CVE) and Computer Supported Learning Environment (CSCL) are somewhat interrelated. CVE tries to incorporate all the existing multi-user virtual environments under one definition like an overarching theme. CVE is one that actively supports human-human communication in addition to human-machine communication and which uses a Virtual Environment (including textually based environments such as MUDs/MOOs) as the user interface. It is a computer-based, distributed, virtual space or set of places. In such places, people can meet and interact with others, with agents or with virtual objects. CVEs might vary in their representational richness from 3D graphical spaces, 2.5D and 2D environments, to text-based environments. Access to CVEs is not limited to desktop devices, but might well include mobile or wearable devices, public kiosks, etc (Churchill et al, 2001). Most of the multi-user virtual environment applications today incorporate computer graphics, sound simulation, and networks to simulate the experience of real-time interaction between multiple users in a shared three-dimensional virtual world.

CSCL is a paradigm for learning technology built upon the research traditions of anthropology, sociology, linguistics, and communication science resulting in a different view of learning and instruction – a view that brings culture and other aspects of the social setting into the foreground as the central phenomena for study (Koschmann, 1996). According to Koschmann, the most important socially oriented sciences that influence this paradigm are: Socially Oriented Constructivist Viewpoints (Piaget, Doise &Mugny, 1984; Bauersfeld, 1995; Cobb, 1994; Ernest, 1995), Soviet Sociocultural Theories (Vygotsky, 1978; Forman & Cazden, 1985; Griffin & Cole, 1987; Newman, Griffin, & Cole, 1989), and Theories of Situated Cognition (Suchman,1987; Brown, Collins, & Duguid, 1989; Greeno, 1989; Lave & Wenger, 1991). CSCL informs and guide the design and development of educational MUVEs. Some research questions provided by the paradigm intend to direct the design of collaborative environments, for example how social factors do enter into the process of learning, or how technology is used in collaborative settings. CSCL's research focuses on participants' talk, the artifacts that support and are produced by a team of learners (participants) , and the participants' own accounts of their work.

Current state of the art: MUDs and MUVEs

The Internet has grown so much in the last 10 years that the act of searching the site google.com became a verb "to google". At google.com just by typing MUD one can find definitions as *Basic Information about MUDs and MUDding* (Smith, n.d.), or links like *Top Mud Sites* (n.d.), which provides the rank and description of MUD's games by categories like fantasy, futuristic, graphical, horror, medieval, multi-genre or *MUD*

Resource Collection (n.d.) among others. If one "googles" for "educational MUDs" one can find a variety of learning environments developed at various universities inside or outside of this country, for example *LinguaMOO* (n.d.) from University of Texas, Electronic Learning Communities (ELC, 2002) from Georgia Institute of Technology College of Computing, *AussieMoo* (2002) and *LearningCommunitiesMOO* (2001) from Charles Sturt University in Australia. There is even a *Lost Library of MOO* (n.d.) that keeps track of some old educational MOOs. It seems that both MUD and MOO are still being used but are not as popular anymore.

Searching the net for "Educational MUVE" also opens a long list of resources and links to existing MUVEs, for the example *Mr. C's MUVE Links* (n.d.) or the links to several academic works like Harvard Graduate School of Education (2000) and others. MUVEs are now incorporating 3D graphics, VR goggles and other tangible objects. MUVEs are entering the public schools to provide enhancement to some subjects like physics according to Chris Dede's research (Dede, C. et al, in press).

Lately MUVE is being transformed into massively multiplayer online (MMO), which is also a kind of role-playing game for thousands, where players assume a role in a fantasy world. Some good examples are *SIMS* (2003) and *Second Life*. *Second Life* favors world-building over wanton violence and can depict one of the latest development of MMO (Odelius, 2004). This environment allows people to create and inhabit a virtual world of their own design and has been developed by a group called Linden Lab (2003).

ActiveWorlds (AW) is another platform for developing MUVE or simply chatting in 3D (ActiveWorlds Inc., 1997). One example of an educational MUVE created using AW is Active Worlds Education Universe – AWEDU (IEA, 2003). Adobe Atmosphere (2004) is yet another vehicle to create 3D virtual reality (VR) environments. Both of these VR authoring tools represent new trends of MUVE and can tell the story of where MUVE is going.

In reality there are diverse kinds of educational MUVE being developed by universities and by software companies. Some follow the traditional method of teaching and tend to be product oriented and directive therefore leaving no room for exploration. Others are designed based on constructivist approaches and focus on the process rather than the product, therefore promising a better learning experience, for example *MUVEES* (HGSE,2003), *AquaMOOSE3D* (ELC, n.d.), *KidPad* (HCIL,n.d.), *Tapped In* (Schlager &Schank,1996) among others.

Situating Virtual Forum Theater

I designed a first version of Virtual Forum Theater (VFT) while at the Harvard Graduate School of Education (HGSE). This was created in the fall semester of 2000 and development continued until August 2001. That first version of VFT provided the ability to construct scenery, characters, props, and “frames” that replace “acts” in a traditional play. Written in Director, this version has no ability to allow online interactions among geographically separated children. To overcome this limitation, I am currently implementing a new version of *VFT* in Java.

VFT is based upon the work of Augusto Boal, a Brazilian theatre director, author, activist, teacher, and politician (who also began as an engineer). Boal developed the Theatre of the Oppressed (TO) (Boal, 1983) based upon Freire's Pedagogy of the Oppressed (Freire, 1972). Just as Freire exploited local concerns to help participants develop literacy and to become critical questioners of, and conscious actors upon their environment, Boal (1983) used participatory theatre to develop a similar awareness through modeling real-world situations and role-playing potential solutions.

Forum Theater is a TO technique where the spectator can stop the play when conflict arises and when he or she disagrees with the course of action proposed by the actors. The spectator might go on stage and re-enact the piece or explain to the actor what should be done; TO is pedagogical in the sense that actors and audience learn together. Spectators are encouraged to become "spect-actors": active participants rehearsing strategies for change (Boal, 1992).

Virtual Forum Theatre maintains these characteristics while adding the ability to interact over distances, to efficiently try out many different scenarios, and to provide channels for discussion about alternative courses of action, characters, and topics. In *VFT*, learners construct their own plays, including short scenarios or vignettes. *VFT* provides a wide variety of tools for the learners/participants to write, record, edit, animate, portray emotive stances, costumes, and nuance for characters, create the visual scenery, and so on.

VFT is being designed and implemented based on the constructionist framework of Papert (1980) and CSCL. Even though *VFT* does not make use of avatars, it is a MUVE because it makes use of computer graphics features and it is a multi-user application. It is a CVE as the learners are collaboratively constructing a digital drama through interactions over the internet. *VFT* uses continuous media which include all kinds of time-dependent media, such as audio/video streams, animation, and speech. The design criterion is not a question of spatial layout, but of sequencing and timing as well as turn-taking in a conversation. They determine the dramaturgy of an application (Ulrike, 2000**).**

VFT incorporates some WWW free software tools and blend them with our own Java implementation of GUI interfaces in order to create a new paradigm of participatory and collaborative user interfaces applied to learning of expressive arts. The performance of the digital drama involves an animation of graphics images, synchronized with sound and caption. The performance can be interrupted at any moment and the sequence of the animation can be edited and rearranged providing a collaboration of theater design. This blend of WWW free software and java implemented interfaces will provide a unique tool directed at facilitating learning and introducing an effective and empowering use of WWW for the children.

Virtual Forum Theater will allow role-playing and trials of solutions to children in conflicted and oppressive communities, because it is a safe environment in which to play out different responses. Children will interact with peers on the WWW in order to help validate or invalidate their proposed solution. I will study the extent to which this online validation works in aiding children on the process of expressing themselves. They will be

collaboratively trying out scenarios and rehearsing possible realities of their life. The findings of this study will benefit directly the fields of cognitive science and learning, helping to improve the quality of education world wide.

Emotions are an essential part of dramatic productions and the challenge of providing effective ways to convey emotions through a web browser is being carefully investigated. As a first level of complexity, I propose to blend voices and dramatic faces as a simple way to express emotion. Children will be able to twin dramatic faces (Figure1) in order to create expressions and add voices to their faces. The characters can be represented by chosen faces. A set of pre-defined theater emotions masks (icons) will also be provided. One mask at a time would be displayed on the top right corner of the face, or character for the period of time equivalent to the required emotion. Children can choose not to execute the change in action, but to propose the change to the group who is creating the play. In this case, they can use the virtual forum chat room.

The pyramid in Figure 2 represents the structure and components of VFT. At the top I introduce the simplest method to create a digital play by creating dramatic faces who will deliver their lines through the audio files resembling a radio theater, except with visual emotion clues. The audio interface has been developed in Java and the audio clip is being saved on a server. The video recording and editing tool will also be developed in Java and added in a second phase of the project. The first animation prototype is ready and it consists of a drag and drop GUI interface where the child can drag each image into a frame, followed by a sound file (character's line) and a text if desired (Figure 3). Once

the sequence of the frames and sounds are added to the story board, the child will define the time in between frames and a Synchronized Multimedia Integration Language - SMIL file will be created. At the bottom of the pyramid one will find all the incorporated free-ware tools like Real One Player that will play the SMIL file (Figure 4); WebDwarf, a drawing tool which generates Scalable Vector Graphics - SVG image files; possibly a video editing tool and a chat room. The main technologies used in this project are Java, SMIL and SVG and this combination makes VFT a breaking ground research. The use of SMIL and SVG also extend the current existing MUVEs and CVEs.

VFT's related work

My work builds upon the research from a CSCL environment, Amy Bruckman's *Moose Crossing* and a MUVE – Marina Bers's *Zora*. *Moose Crossing* (1998) provides an environment that encourages children to develop their own spaces composed of rich textual descriptions and compelling programmed interactions. *Zora* (2001) provides an environment where children can create interactive graphical and textual expressions of their sense of their own identities and values.

In Bruckman's work children create their own rooms filled with objects and characters in a virtual space. It allows users to take fictional roles and pretend they are someone else. Children describe via text the nature of the space, the characters, and the interaction. They write small programs to guide the interaction. Because the children are both hosts of their own space and explorers of the overall space, they can interact with and view the descriptions of their colleagues. In this way they contextualize examples of what was possible, and can improve the depth and beauty of description and interaction of their

own construction. They have to write to participate, and they can improve their writing through good examples, practice, and interaction. Another result of Bruckman's (1998) research is that online communities can provide a supportive context that makes new kinds of learning experiences possible and that the learning facilitated by Moose Crossing is strongly tied with the on-line collective peer support.

In Bers's environment children also create their own rooms in a virtual community. The thrust of Bers's work is to explore new domains, concepts of identity and values through the types of objects and descriptions children would choose to use to define themselves to others. She combines children's creation of both visual and textual representations, and facilitates interaction in a shared, on-line social space. Children have to think about how they could best represent their concepts of themselves, their identities, and their values. They then observe and interact with each other's spaces, to better understand themselves and their peers. Bers (1999) concludes that it is extremely important to investigate the role of technology in the development of the self, its personal and moral values, and not only in the learning of the sciences.

The work of both Bruckman and Bers contributes significantly to exploring how on-line collaborative environments (CVE) can provide a better understanding of learning, particularly in fields not necessarily associated with computers and programming (literacy in the case of Bruckman and ethics, values, and identity in the case of Bers). The development of a better understanding and practice of social cooperation in a mediated environment is also key in their work: the participants need to propose, discuss, and

decide collectively on how to legislate and regulate the activities within the environments.

Some work has been done on this field of digital dramatic plays like *Teatrix* that explores drama as a form of collaborative make believe for children. Children create storyboards of existing fairy tales. They have a certain control over existing characters who are intelligent agents, but the environment, the creation and the problem solving capabilities of the tool are limited. It confines the learners to a very specific domain (Machado et al, 2000), and does not allow or emphasize Internet interactions.

Another example of a digital drama is *Carmen's Bright IDEAS* (Marsella et al, 2000) an interactive pedagogical drama where the learners influence how the drama unfolds by controlling the intentions of one or more characters who are avatars. This educational software is stand-alone and single user, but it is relevant to VFT because it explores the influence of drama as an educational tool. It has important considerations related to character believability and the importance of emotions, but it fails on the constructionist approach as it imposes too much control over the learner experience. The didactic used by their authors takes as a premise that they have some goals to achieve in their teaching. Therefore, they have to control the environment to make sure the user will learn the lesson they have planned.

SceneMaker (Gebhard et al, 2003) also emphasizes the importance of believability in virtual theater. It explores the use of multiple characters to convey social aspects such as interpersonal relationships between emotional characters and introduces small talks

between characters which then become yet another performance or “meta-theater”. This performance between groups of avatars binds the attention of passers-by, and gives the agents the authenticity of real human actors, conveying the impression that they are permanently alive. Using *SceneMaker* one can create CrossTalk that is an interactive installation with animated presentation agents working with plan-based dialogue generation and a number of pre-scripted scenes to be used for advertisement.

Some examples of CSCL related to storytelling and collaborative work among children are environments like *KidPad* (Hourcade et al, 2002), *StoryRooms* (Montemayor et al , 2001), and *PETS* (Druin, 2000) developed at The University of Maryland in partnership with some others academic institutions. These learning environments share the constructionist approach and open-ended philosophy that are the basic premises of VFT and they are also designed for children and with children.

VFT versus on-line role-playing games

Most of the existing commercial role-playing games on the Internet have an existing plot where the drama takes place. The user can create a character that suits the environment and the story-line. There is not much room for deviation or to create a completely new drama. They are not in an environment of free expression, but of adult pretend play; a place where one can escape the stress of daily life, imagine and pretend that one is living in a medieval time or a paradisiacal island. In that situation one can dress up and give a set of behaviors to an avatar and pretend to live that life through the created character. Since this is a make-believe situation there is not much space to work on daily issues or oppressions. Quite the contrary, one wants to forget the real life problems. Examples of

such environments are *Asheron's Call* (Turbine, 2004), *Shukuen: The Abduction* (Infinite Realities, 2003), *StarCluster Guide to Cluster Religions* (2004), etc. *VFT* on the other hand has the goal to act out real life problems in a safe environment in order to rehearse and find solutions to them. *VFT* is likewise FT a "rehearsal for change" (Boal, 1992).

Mike Scaife and Yvonne Rogers (2001) argue that one of the key properties of virtual environments is their ability to captivate; they suggest that immersion in 3D environments is highly motivating, inducing users to spend more time on a given activity. VFT has a different focus. There is no desire to immerse the learner in a 3D environment because it might shift their attention from reality to a pretend world, therefore decreasing their capability of reflection upon the story presented.

Most of the MUVEs described so far are based on AI techniques that control either plot generation or real-time character behavior. They usually appear as real-time 3D animations or virtual environments populated by autonomous synthetic actors performing according to a baseline plot, with which the user can interact. VFT does not use avatars like all the MUVEs because my objective is to have an open-ended tool where the children will design and create their own characters. The children will not be controlling or interacting with agents. They will be interacting with each other through their creations. It is a distinct concept and idea of the existing MUVEs. There is no intention in using three dimensional characters or anything that tries to be as close as possible to the human being. I believe that creating computer images too close to reality might make the learner forget that he is in charge and might facilitate catharsis by allowing identification

and empathy with the virtual characters. I want the learner to be aware that the virtual dramatic play is a representation of reality and not reality in itself.

Discussion

I will apply VFT with underprivileged children and study the impact of the tool on their learning and cognition process and on their interaction with their immediate community. This research itself will encourage discovery in the expressive arts. Once the children master the process of collaboratively creating their digital drama, they will also have learned some negotiation skills, which might be different from social negotiations, since some of them will not be interacting in the same physical space. The aspects of social psychology are also being researched in light of the anonymous characteristics of Internet interactions.

In terms of technology, *VFT* is breaking ground by using the very recent technology of SMIL file, and SVG image files. It allows children to put together a digital drama that does not require a high end of computer resources, or a fast internet connection as it will be dealing mainly with XML files. Therefore VFT will have no cost for the user making it possible to be used by disadvantaged children.

By developing VFT in Java and incorporating free-ware drawing tools like WebDwarf, players like Real One or Flash, it will provide an engaging multimedia learning tool for the learning of dramatic arts and conflict resolution. Children will feel ownership of a play created solely by them.

VFT could also be used in school settings in order to support most of the items from the Massachusetts Arts Curriculum Frameworks under Theater as well as directly related to items at Technology Competencies and the Arts (MA Dept. of Education, 1999, pp. 57-66, 144 & 145).

Conclusion

Disadvantaged children usually do not have the opportunity to communicate or express themselves freely in many settings, which typically impacts the full development of their argumentation skills and problem solving. They might become shy and apathetic. Virtual Forum Theater can give them one vehicle with which to improve their expressive fluency. In most places, the underprivileged population has access to community technological centers in their neighborhoods. VFT aims to establish an electronic environment of free expression that exploits and builds upon the anonymous characteristics of Internet interactions. Children physically located in widely separated areas can share their experiences with others in similar situations. They can safely elaborate their struggles, pursue points of view and formulate solutions to the same kind of problems that their peers experience in another part of the town, state or country in which they live. At the same time, they can become more acquainted with the technology that might be essential for their future professional life.

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Figures

Figure 1: Java Dramatic Faces

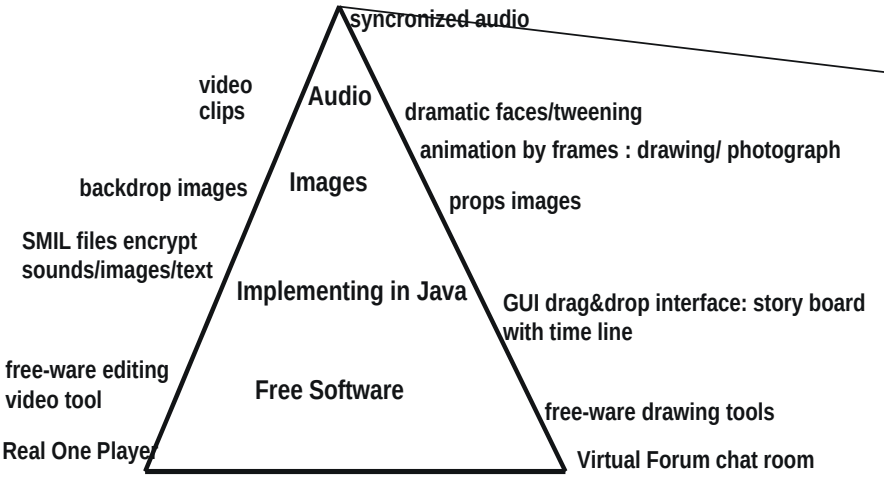

Figure 2: VFT's design structure

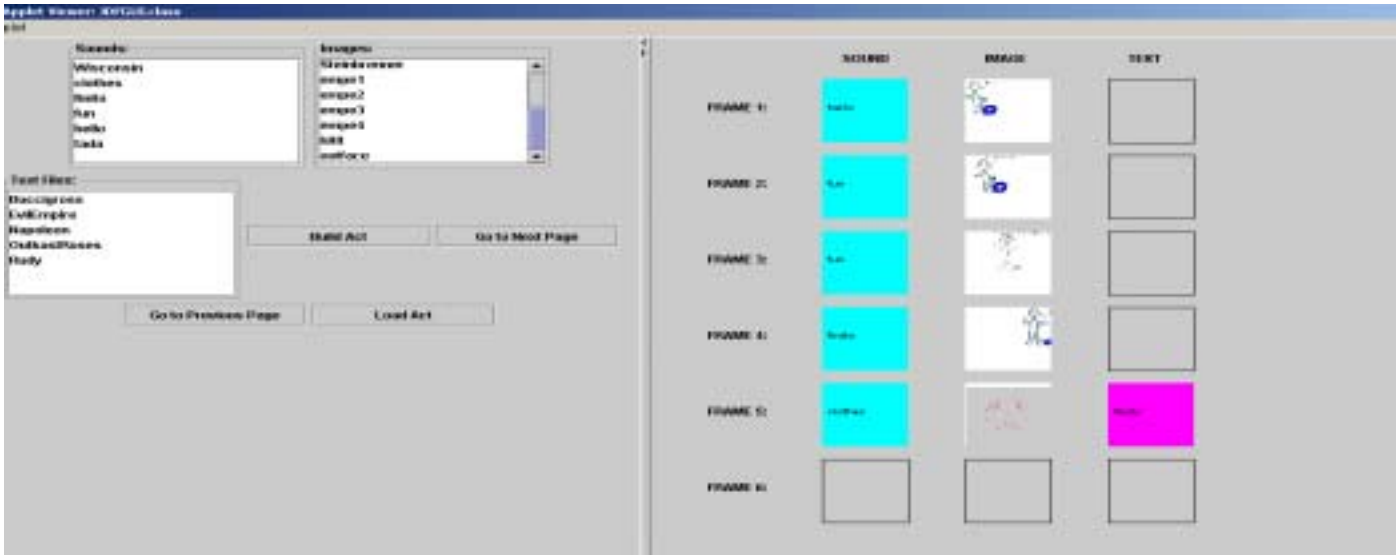

Figure 3: Java GUI storyboard interface

Figure 4: Real One playing SMIL