Games based learning for Exploring Cultural Conflict

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Abstract. In this paper we discuss the early stage design of MIXER, a technology enhance educational application focused at supporting children in learning about cultural conflict, achieved through the use of a game with an effective embodied AI agent. MIXER is being developed re-using existing technology applied to a different context and purpose with the aim of creating an educational and enjoyable experience for 9-11 year olds. This paper outlines MIXER's underpinning technology and theory. It presents early stage design and development, highlighting current research directions.

1 INTRODUCTION

Creating interesting and enjoyable role-play games for a serious purpose provides considerable challenges to developers. Role play games are notoriously expensive, with most successful games the result of large teams and considerable development time. Role play games typically include a cast of characters who need to act in a credible and believable way that engage the user and provide the essential information permitting the user to succeed in the game. Whilst games engines such as UNITY ensure that games mechanics, graphical display and essential functionality are relatively easy to incorporate, achieving complex and sophisticated cognitive and affective character behaviour typically requires significant development.

This paper outlines research being conducted as part of the European funded FP7 project, eCUTE (education in Cultural Understanding, Technology Enhanced). The aim of the project is to research and develop computer based innovative techniques to make users aware of cultural and group differences around them. Conventional role-play and game-based simulations such as Barnga! [29] are widely used with the aim of creating safe environments in which participants can be exposed to emotional states such as culture shock and those arising from intercultural conflict and then reflect on their own experience. In eCUTE, we aim to provide such game-based learning, with applications under development that are aimed at using role-play based intelligent software to engage user with affective synthetic characters which simulates cultural differences based on theories in Cultural and Social Psychology.

eCUTE focuses on culturally specific expressive emotional behaviour using autonomous synthetic characters that display behaviour representing a synthetic culture. The project draws upon theories in social psychology, emotion and in inter-cultural communication to create these characters. The characters will be virtual actors that embody models of culturally-specific behaviour; through various interactions with the game, children and young adults, differences in cultures experienced and explored.. Affective and narrative engagement of learners in these scenarios is seen as an important motivating mechanism for meeting the pedagogical goals of the system.

Within eCUTE, we are developing an application for 9-11 year olds focused at culture-related conflict. MIXER (ModeratIng Cross-Cultural Empathic Relationships) focuses on enabling the children to identify, explore and understand differences between cultures. It was developed with two main criteria:

- To ensure that users not only learn but that they also have enjoyment and fun as part of their interactive experience. To achieve this we needed to provide a scenario where we could highlight cultural conflict, but where the interaction engaged the children in a context that would be both interesting and fun for them.
- To re-use FearNot! [6] to provide the existing architecture, technology framework, look & feel, characters and environment, thus massively reducing required development.

This paper presents our early stage design and development activities aiming to meet this criteria. Section 2 provides an overview of the context, focusing on cultural conflict. Section 3 provides an overview of our technological context provided by FearNot! Section 4.1 outlines our use of Hide and Seek as a cultural conflict scenario, with section 4.3 detailing how we intend to incorporate cultural dimensions into the synthetic cultures. Section 5 discusses our approach and outlines current and future research directions. Finally, in section 6 we present brief conclusions.

2 MIXER's Purpose: Experiential Learning of Cultural Conflict

Europe has become the centre of global diversity, populated by a huge diversity of economic, political and social immigrants and migrants and annually visited by millions of tourists. In 21st century Europe, many cultural, ethnic and religious groups must live and work together. However, such integration is not always a smooth process and cultural differences can lead to social stresses and sometimes outright conflict. Providing an educational experience where such issues are explored is difficult in the traditional classroom environment. However, AI and games offer considerable potential for experiential and enjoyable experiences that could impact upon children's cultural understanding.

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Exploring cultural conflict essentially relates to perceptions of group membership. Such membership bolsters self-importance and boosts self-esteem of individual members [3]. Thus, children (and adults) connect themselves to others through the evaluative implications of a set of common physical [27] or moral traits [4]. Children however, consistently rationalize differences and categorize individuals primarily based on physical characteristics (i.e.: skin or hair colour, body size, language etc.) [1, 19] above and beyond gender [27] and moral traits [21, 8]. Consequently, they use this attributional information to decide on potential friendship (see [27]). Whereas in-groupers are favoured and perceived "as different as snowflakes" [8] p.34, – similar but positively distinctive, out-groupers are often denigrated and stereotyped as being all much the same. While there is some debate as to the age at which in-group preference and out-group prejudice begin to decline as children develop better cognitive abilities (where they start examining the individual characteristics of members of out-group rather than stereotyping the members as a whole), in-group bias is prevalent throughout the primary school years - 7-12 years old [7, 31] and can increase during these years [24].

A child's experience is dominated by his or her affective-perceptual processes [1] that are associated to fear of the unknown and familiarity attachment. Thus to avoid uncertainties, a child most likely attaches him or herself to a similar group and usually considers out-group members as a threat [27, 23,], or to some extent, inferior [21, 20]. Although children's preference for similar group is determined primarily by physical attributes, several findings [21, 3, 4, 20] point that discrimination towards members of out-group is also based on status, consistent with the Social Identity Theory [28] – a widely accepted theory accounting to social prejudice in adults. Nesdale (2004) [21] asserts that children as young as 3 years start to develop awareness about which groups carry better image, and prefer memberships with groups that are regarded highly or considered superior.

The moral circle theory [4] makes a similar assertion. The theory posits that people identify themselves with a particular group that exhibits a set of moral traits of equal 'standard' (moral identity). Anyone who is outside this circle is viewed as inferior. In children (and adults), the tendency towards prejudice will increase as tension and conflict increases between ingroup-outgroup and will reach its peak when the "inferior" group threatens the social standing of the "superior" one [4, 21].

Insufficient information about those outside the group causes insecurity in children and threatens their social identity (group status). This evokes the need to restore a good self-image in order to maintain self-esteem [4], and an effective way to achieve this is by negatively evaluating the out-group members [25, 26].

Often, prejudice in children is seen as a mirror that reflects the society's attitudes and values [20, 21], regularly transmitted by the closest people who daily interact with them. However, there is a wealth of evidence that shows that correlations between children's prejudice and prevailing societal norms have been between low and nonexistence (see [2]). This shows that children do not just sponge up dominant ethnic attitudes by the community but also seek to understand and process their experiences through active participation in their interpersonal worlds, but this depends on whether they have acquired sufficient information to be able to engage in proper moral reasoning.

One way to do this is through extended contact [16, 32] – where an in-group member becomes an active participant in the activities of an out-group member, gets to understand the latter's values and rituals and consequently disconfirms the negative beliefs about the whole out-group. In other words, the out-group member is seen as a model whose positive exemplar is extended to the group as a whole. Studies by Wright and colleagues (see [32]) confirmed that an in-group member that has friendship with an out-group member leads to more tolerant and positive intergroup attitudes. A similar study was replicated by Liebkind and McAlister [16] in promoting tolerance between native and non-native Finnish children showed favourable attitude changes when a particular child from both groups are brought into contact with each other.

Hence, it is not necessary to completely dispel existing group boundaries or forcing them to reach a mutual compromise in order to engage children in intergroup play and friendship, but rather to keep it less salient while concurrently establishing ways to facilitate some sort of contact [13]. This is where an application such as MIXER plays a role - as a plausible platform in enhancing children's intergroup attitudes in an anxiety-free environment, by engaging children in new cultural experiences through active participation with out-group synthetic agent's representative(s) and facilitating the generalisation of the positive effects towards out-group peers as a whole. Among major advantages of such application include training children to combat negative preconceptions by looking at things through the perspective of out-group members (i.e. why certain things are done in certain ways) and making them experience the feelings of such children - which will subsequently enhance empathy skills. Additionally, social training of this sort may provide a better solution to the problem discussed as observing interactions among synthetic agents (or directly interacting with those agents) does not evoke anxiety in the user.

3 MIXER technology: ReUsing FearNot!

In eCUTE the pragmatic decision to base MIXER on FearNot! (Fun with Empathic Agents Reaching Novel Outcomes in Teaching) will significantly reduce development time. Re-using this architecture enables development effort to focus on the extension of FearNot! to incorporate cultural factors.

FearNot! is a school-based Virtual Learning Environment (VLE) consisting of synthetic characters representing the various actors in a scenario related to bullying issues. FearNot! uses emergent narrative to create episodes with those characters. The goal of FearNot! is to enable children to explore bullying issues, and coping strategies, by interacting with characters to which they become affectively engaged. User empathy is triggered by the different properties of the characters such as their appearance, behaviours and emotions.

3.1 What does FearNot! look like?

FearNot! engages children's interest by letting the children role-play as an advisor (invisible friend) to the bullying victim. The episodes introduce different characters and then show some bullying incidences and then the user interacts with the victim

character and advises the character what he/she should do to cope with the bullying situation. And then the story then emerges from there. The following screenshots show the interface for FearNot! application.

Figure 1: Bullying Episode

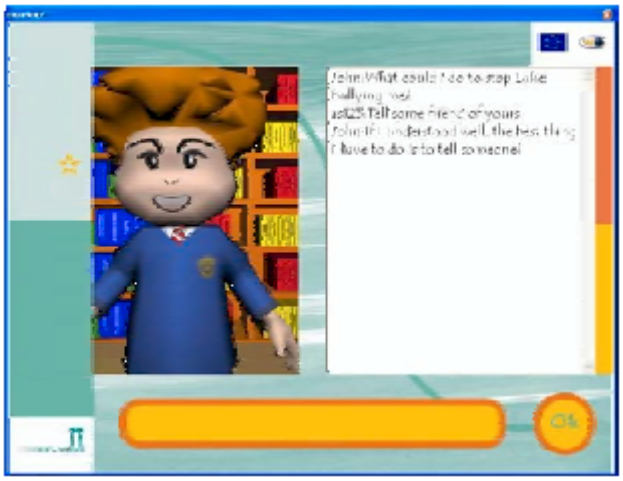

Figure 2: User Interaction with Victim.

3.2 FearNot! Architecture

Autonomous agents running with FATiMA architecture work as the character minds to generate affective behaviour for the characters as the story goes on [6]. Although FearNot! is driven by emergent narrative it is very important to keep the learning goals in context and the story to run towards these goals. A story facilitator [5] in the architecture keeps check on the emergence and guides the story and interaction. The following diagram shows the FearNot! architecture:

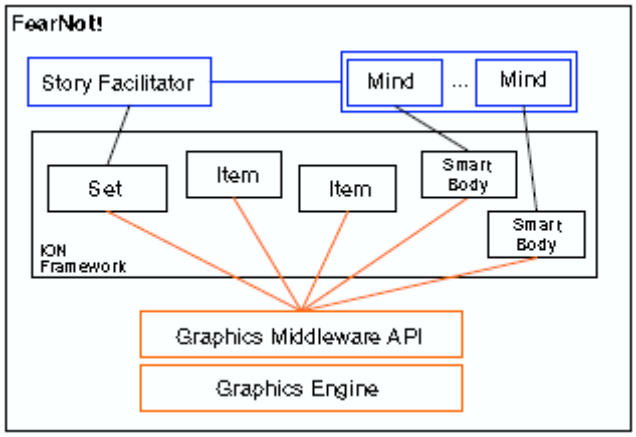

Figure 3 – FearNot! Architecture

The layered architecture that FearNot! uses consists of three layers: The application layer, the world model and the Graphics layer. Application layer combines the user-interface, world model with the FATiMA architecture which is the architecture for the Affective characters in FAtiMA [11] where the character minds are running and also initiates the story facilitator. [5]. The world model consists of the ION framework which includes symbolic representations of entities in the application, The ION framework [30] is used create abstraction between to communicate between two entities. And finally the last layer consists of graphics engine and the graphical objects.

3.3 FAtiMA (FearNot Affective Mind Architecture)

FAtiMA is used to build the affective agents in FearNot!. FAtiMA presents two main layers for the appraisal and coping processes. Emotional Reactions and reactive behaviours are formulated in the reactive layer, while the goal-oriented behaviour is the outcome of the deliberative layer. It's also composed by two main memory components: the Knowledge Base that stores semantic knowledge such as properties about the world and relations. The autobiographic memory stores episodic information concerning previous events and the personal experience. Figure 4 shows the major components of FAtiMA architecture.

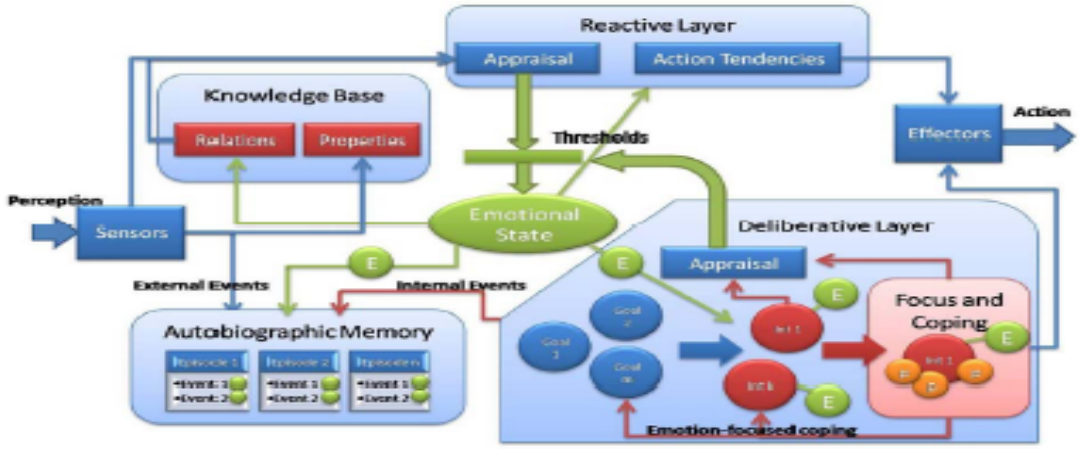

Figure 4: FAtiMA's architecture.

After perception of an event in the world appraisal is done at the reactive layer which results in possible generation of a set of emotions (emotional concepts in FAtiMA are based on the OCC model [22]) memories are updated simultaneously memories are updated with the change in the world values and the events are stored in to the autobiographic memory of the agent. The perceived event is then used to initiate the goal activation process. After a goal is selected the reactive and deliberative layers use the information stored in the memory which also includes emotional information to decide what action to take next. Then the effectors are used to send the selected action to the world.

3.4 Maximizing the Use of existing software

We know from previous projects that the FearNot! approach is plausible and can be quite useful with children of the target age [12]. The development of MIXER aimed to develop scenarios and interactions that made the maximum use of the existing FearNot! software architecture and also identified ways it provides to enhance the ability of FearNot!

4 MIXER's DESIGN

With MIXER, we had a number of significant constraints. Firstly, that whilst we were looking for a cultural conflict situation, however, that cultural conflict was not to be based on race, religion or politics rather it was to be based on a synthetic culture. We wanted our scenarios to be realistic, yet we wanted our cultures to be synthetic (mainly not being translatable to any one ethnic group)

Secondly, as we were using FearNot! we had to follow an episodic structure where the role of the user would be that of an invisible friend or advisor. And finally, we really wanted our users to have a fun interaction, something that sometimes seems to be forgotten in the development of serious games.

4.1 Why Hide & Seek?

Our initial design ideas with MIXER focused on an episodic soap opera style format (much as FearNot! had been), where conflict between groups would be provided through a storyline about an in and out group. Trying to determine who those groups should be and why there should be cultural conflict provided us with somewhat earnest scenarios. It was readily apparent that such serious content would be of little interest to the intended users. The fact that we were meant to be providing games based learning did suggest that somehow there should be some element of fun in the application.

Our user needed to be more than a commentator about a situation within which they had little buy-in and possibly wouldn't really understand. Rather they had to be able to envision themselves in the situation of the characters. Returning to the basic fact that we were meant to be creating a game we decided to explore the games that children play and examined their potential to provide an opportunity to explore cultural conflict.

There are a few games that are played in almost every culture by the majority of children. One of the most typical of such games is Hide and Seek, played everywhere by both genders. The rules for Hide and Seek are not dependant on race, nationality or politics, rather they are handed down and modified based on children's experience and agreement in the game space. Children are often aware that others (even in the next street) may have different rules for Hide and Seek.

Typically where rules are not the same, conflict will occur, with cultural expectations (e.g. the rules of hide and seek) not being adhered to. Whilst older children will generally define rules before starting to play, late primary children will generally only discover the difference in rules when conflict occurs, often with game abandonment and shouts of "its not fair" and "I don't want to play any more."

4.2 The Scenario

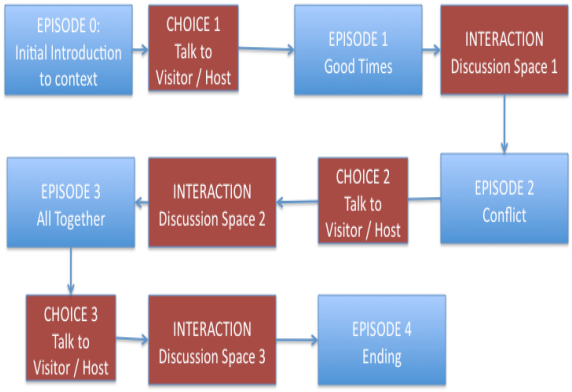

Figure 5: Mixer General Episodic Outline

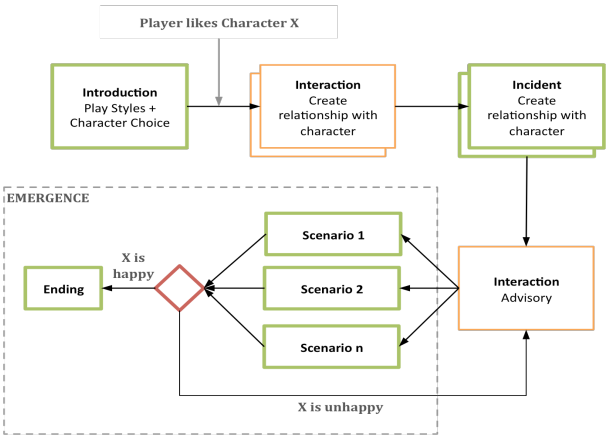

Figure 6: Intergrating Emergence in MIXER

As figure 5 outlines, MIXER is composed of 5 episodes where the user decides who to interact with and has 3 interaction points where the user talks to their selected character. In Episode 0 (figure 7), the user is introduced to the context with simple back story being presented, that 2 schools are attending an activity week. One of these schools is the host school and the other are visitors. At this point (Choice 1) the user can decide which school they want to watch further. The aim of the first episode and interaction is for the user to start to make friends with character in a positive, non-conflict oriented way, so that user is focused towards being an everyday friend rather than shoulder to cry on.

In the next episode (figure 8) the user sees a game of Hide and Seek where only 1 child is from the school not selected by the user. The rules of the Hide and Seek will not match and the user will watch conflict as the children fail to agree how to play the game, followed by its abandonment. Again at the end of this scene the user can select who they talk to and then discusses what has happened. The user will be asked to suggest what the agent can do to help deal with the conflict that involves cognitive, emotion and behavioural elements (figure 9). This part is zoomed out in figure 6, where the user's suggestion or advice combined with the agent's decision will influence the emergence of the events.

In Episode 3, both schools play together, it may be that more conflict ensues or perhaps the agent that the child has talked to will ensure that rules are clear early on to avoid misunderstanding. The agent could explore different suggestions at different times as trial and error in order to see which one works best, until he is finally happy (figure 6). As the architecture will permit MIXER to exhibit emergent behaviour the focus of this episode is not predictable. In the final episode a positive message will be given to the child by their selected character, either that they will continue to try to improve the situation or that the situation is now resolved.

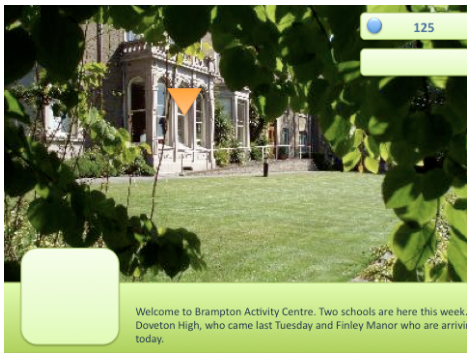

Figure 7: Episode 0

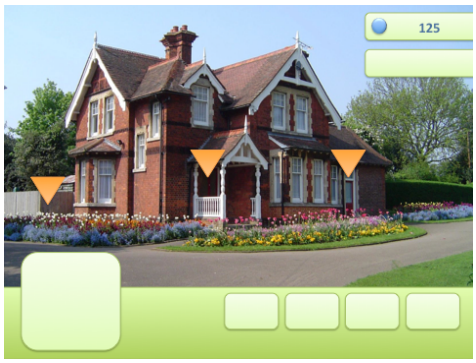

Figure 8: Possible hiding places

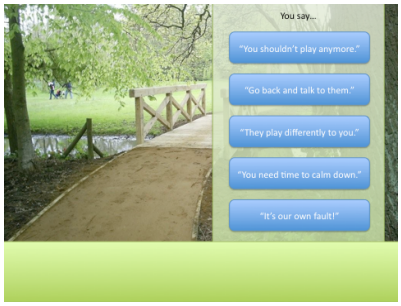

Figure 9: Discussion point with user

4.3 Synthetic Cultures: Dimensions of Hide and Seek

Synthetic cultures are simplified notion of real-world cultures, inspired by human cultural dimensions, but reflect the behavioural tendencies related to a specific extreme of a particular dimension [18]. For instance, an event may reflect the extreme side the individual/collectivistic dimension, instead of introducing elements of all the dimensions, as in real cultures. Our approach to synthetic culture is based on that of Hofstede [14, 15], who provides a 5-dimensional model. Using this as a framework has enabled us to highlight the extremes 3 of the 5 dimensions within the context of Hide & Seek. Table 1 identifies these dimensions and figure 10 an initial indication of how they could be represented in MIXER.

Dimension	**One Cultural Extreme**	**Other Cultural Extreme**
Identity	Indivualist	Collectivist
Hierarchy	High power distance	Low power distance
Gender	Masculine	Feminine
Truth	Uncertainty Avoidance	Uncertainty tolerant
Virtue	Long term orientations (Shotor)	Short term orientation (Lotor)

Table 1: taken from [15]

Hide and Seek has a myriad of potential rules, for example, as figure 9 reveals, when the rule "has been caught" is applied, what happens next? In some games, being caught means that the game is finished and the hider returns to base. Or it can mean that the hider joins the seeker and assists them in finding hiders. In other instances, "has been caught" means that the user is "frozen" and can no longer move. In some variants, frozen remains the state until the game ends, whilst in other approaches, hiders can be unfrozen by other hiders when the seeker moves on to another location.
These differences in rules can be mapped onto Hofstede's dimensions. For example, a more feminine culture is one in which the user can be saved (e.g. unfrozen by a fellow hider), whilst in a masculine culture, the more extreme position would be that once caught the games ends for the player. In an uncertainty tolerant culture, seekers might risk being caught, if they were aware that they could be re-engaged in the game. Although these mappings are relatively simplistic, they do allow a game as well known and easy to understand as Hide and Seek to provide synthetic cultures that can represent levels of extremism on Hofstede's dimensions.

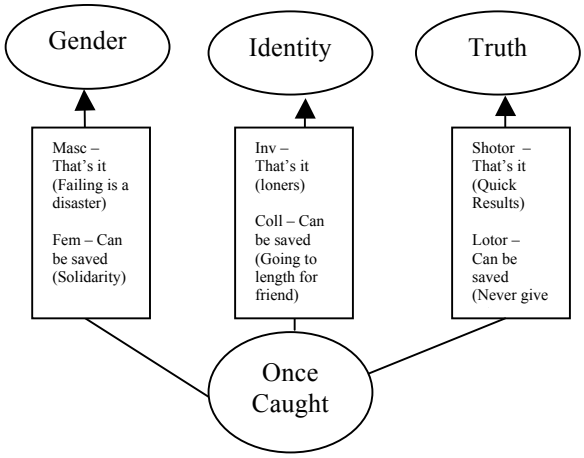

Figure 10: A rule mapped to cultural identities

4.4 Possible changes to existing Architecture

The prototype being worked on serves multiple purposes, initially it will serve as an experiment to implement and evaluate the new social framework with the existing architecture. This evaluation will act as a requirement analysis tool for possible changes required to the existing architecture. It is this implementation that will help us understand whether we need to change any particular components or concepts within the FAtiMA and ION framework.
Although, possible changes to the architecture will be clearer after the prototype has been testing, there are certain concepts we envisage in future implementations. One concept is 'Theory of Mind', since these scenarios may require a character to influence the goals and actions of others. 'Theory of the Mind' would allow the agent to perceive the possible responses or reactions of other agents.

Another possible change would enable certain characters in the environment to form a group dependent upon certain parameters, which serve to maintain relationships and hierarchy inside the group providing greater uniformity.

Other adaptations we are currently working are the replacement of the graphics environment OGRE with Unity 3D, considerably reducing the authoring effort by using Unity's easier interface and asset management. We also aim to make the implementations platform independent through the use of Unity. This will allow us to implement the game through a web browsers or, if required, on mobile phones. The intention here is a reduction in the Authoring time.

This approach appears to be viable and works, but as with any other innovative technology it requires iterative approach with this prototype being used to point the required modifications which will improve not only the working of FearNot! architecture but also the scope of social concepts that will be applied with in it.

4.5 Next Steps: Evaluating the Early Stage Mixer

Currently, we are engaged in two separate activities. Firstly, we are involved in user testing ensuring that the scenario is appropriate, understandable and enjoyable. This very early stage user involvement will use a low tech solution, where children and teachers are asked to comment on a version of MIXER provided through storyboarding software (on the screen, but largely passive).

Secondly, we are authoring the identified episodes and interaction points in a mid-tech prototype of MIXER. This mid-tech prototype will use aspects of the FearNot! technology and will have the FearNot! look and feel, with characters, sets and animations developed to provide the appropriate backdrop to the interaction. Although MIXER will use emergent narrative, we will take a scripted approach with this mid-tech prototype as this enables us to quickly evaluate it with users.

The user-centric approach taken in eCUTE requires that these scenarios and ideas are evaluated with the intended user group. This evaluation not only needs to explore children's reactions to MIXER itself, but additionally needs to identify if children can recognize cultural dimensions. The approach we will take to the early stage design evaluation of MIXER will be based on the use of certain techniques used as a line of enquiry that match the recommendations for pedagogy and practice of UK government in the area of 'Engagement Activities' [9].

One of the broad principles of 'Engagement Activities' is based upon are 'Directed activities related to text' (DARTs) developed by Lunzer and Gardner in the 1970s and 1980s [17]. In this text not only relates to the written word, but also diagrammatic representations or pictures.

These engagement actives, such as the 'Odd one out' develops thinking skills as they describe reasoning for the difference along with similarity; but are also fun as they allow the child to think allowed and exchange ideas without the fear of being wrong [9, 10]. Activities that have been developed, based upon the principle of 'Engagement Activities' have been developed by teaching professionals and educational consultants, and are starting to become a common part of a teachers repertoire, with it being possible to map them to research tools found in Interaction Design or Evaluation with children.

With MIXER, we will use a range of engagement techniques, including card sorting, the use of a 'Thinking Box' (where children enter up to 9 words related to a specific question), discussion groups and "living questionnaires" where children take many paces forward or back depending upon their view, or a continuum in which pupils negotiate their position along a line of pupil or place them self at a given point in a line. Making the evaluation add value rather than a burden on stakeholders and user, which is a key aim of eCUTE.

5 DISCUSSION

This paper has outlined the early stage development of MIXER, with MIXER currently just about to be evaluated with the intended user group. Our aims with this evaluation are two-fold, firstly to ensure that the user experience is fun, but still enhances learning about cultures. Secondly, to identify essential extensions to the underlying architecture and the digital assets (e.g. sets, character animations) to allow us to appropriately display the dimensions and to ensure characters behave in an expected manner.

Early and informal discussions with children and teachers suggest that Hide and Seek is a good scenario choice: inclusive, popular and easy to understand. Currently, we are focusing on how we can incorporate the cultural dimensions into Hide and Seek in such a way as to make them visible but not intrusive or inappropriate. We are also focusing on how we can evaluate the users' awareness of these dimensions in a manner appropriate for 9-11 year olds. As detailed we intend to use engagement techniques and we are engaged in crafting this approach basing this on best practice information disseminated by the UK Department of Education and verifying with teacher input.

MIXER has been both enhanced and constrained by the project decision to re-use FearNot! to provide the existing architecture, technology framework, look & feel, characters and environment. Reusing the existing components of the FearNot! architecture will save huge amount of effort and time that goes into developing such complex AI systems. Autonomous agents are the most important part of this scenario and FAtiMA architecture provides a very powerful and workable solution for designing authored or autonomous agents

The existing FearNot! Architecture has the ability of combining pedagogically motivated emergent narrative produced using both autonomous agents and user input. The designed scenario has the potential to enhance the emergent narrative output by giving the user the option of choosing agents or group to be friends with and advise.

The overall architecture in FearNot! is connected and communicates with different components using ION integration framework which brings together the different ends of the software: the graphical appearance of the environment and agents, and the user input together to be used both by the graphics engine and the FAtiMA based agents. Although sets, props and animations have to be created and incorporated this is a relatively simple task with the content separated from the architecture thus readily permitting the incorporation of new content.

We have also changed the user interaction for MIXER. In FearNot! interaction was limited to free text entered as the user interacting as the invisible friend with a child character (this child was the victim in a bullying scenario). In MIXER we are aiming to give the user more choice. Thus children will be able to decide which group do they want to interact with, whose side of the story do they want to hear, etc. These choices not only extend the interaction and perspective of the user, but are also useful information for the development team, particularly the psychologists and cultural theorists. In this scenario since the interaction will be choice based, it makes it easier for both the user and the system to operate and communicate. It helps us in avoiding the complex lexical analysers and glossary of inputs words and then constructing meaningful events for the agents to understand and also, it's very time consuming and difficult for most children in this age group to type text in.

6 CONCLUSIONS

This paper has outlined the early stage development of MIXER, a game-based learning application that will provide users with the opportunity to engage with characters in synthetic cultures. Hide and Seek provides an ideal game with which to provide synthetic cultures, providing a context where cultural difference is not based on race, religion or politics, but rather on the application of the rules of a well known game. MIXER has been developed using existing technology thus rapidly speeding up the development process. A low tech prototype of MIXER is just about to be evaluated with 9-11 year olds. A mid tech prototype is currently being authored and will be tested in early March 2011.

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