FearNot's Appearance: Reflecting children's expectations and perspectives

Lynne Hall[1], Marco Vala[5], Marc Hall[1], Marc Webster[1], Sarah Woods[2], Adrian Gordon[3] and Ruth Aylett[4]

[1] School of Computing and Technology, University of Sunderland, Sunderland, SR6 0DD, UK
lynne.hall, marc.hall, marc.webster}@sunderland.ac.uk
[2] Psychology Department, University of Hertfordshire, Hatfield, Herts, AL10 9AB, UK
s.n.woods@herts.ac.uk
[3] Mimosa Wireless Ltd., 63 Galen House, Low Friar Street, Newcastle, NE15UE, UK
adriangordon@mimosa-wireless.co.uk
[4] Mathematics and Computer Science, Heriot-Watt University, Edinburgh, EH14 4AS, UK
ruth@macs.hw.ac.uk
[5] INESC-ID, TagusPark, Av. Prof. Dr. Cavaco Silva, 2780-990 Porto Salvo, Portugal
marco.vala@tagus.ist.utl.pt

Abstract. This paper discusses FearNot, a virtual learning environment populated by synthetic characters aimed at the 8-12 year old age group for the exploration of bullying and coping strategies. Currently, FearNot is being redesigned from a lab-based prototype into a classroom tool. In this paper we focus on informing the design of the characters and of the virtual learning environment through our interpretation of qualitative data gathered about interaction with FearNot by 345 children. The paper focuses on qualitative data collected using the Classroom Discussion Forum technique and discusses its implications for the redesign of the media used for FearNot. The interpretation of the data identifies that the use of fairly naïve synthetic characters for achieving empathic engagement appears to be an appropriate approach. Results do indicate a focus for redesign, with a clear need for improved transitions for animations; identification and repair of inconsistent graphical elements; and for a greater cast of characters and range of sets to achieve optimal engagement levels.

1   Introduction

A wide range of virtual environments populated by synthetic characters have been developed for children. The most common examples of these are in the home, where many games involve interaction both with synthetic characters and other users in the form of avatars, such as The Sims and World of Warcraft. There has been increasing use of synthetic characters for educational purposes [10], particularly for educational drama and story telling applications [13] and Personal, Health and Social Education [9].

Where children are the intended users of the application, research clearly shows the need to incorporate their views, expectations and perspectives within the design process. Although this is important for all applications involving child users, where the interaction approach requires the child to interact with synthetic characters within the virtual world this is crucial. If the appearance of the world and the behaviours of the objects and characters within it are not appropriate, then it is highly likely that the child will reject it. Even when the technical aspects of such an experience are perfect; *inconsistency*, lack of realism, or poor design of the behavioral aspects of the virtual elements could cause breaks in conviction [8]. Such rejection is not uncommon with children having unprecedented choice of competitive traditional and technology oriented products.

Wages et al (2004) point out that more than 99% of the information taken in everyday reality is non-essential in the sense that it is not used to create a person's internal representation of the world [14]. In addition, where children are the end-users, the developers may not be able to predict where this 1% of essential information lies, without in-depth user involvement. Children's feedback can identify those characteristics of a VLE that are immediately noticed by the users as inconsistent, inadequate or wrong. This would help identify what aspects need improvement and what aspects are best left relatively untouched. For example, there may be aspects that, although unrealistic, might not have been noticed as such or may derive a pedagogical benefit from being this way.

There are many issues and factors to ensure that a virtual learning environment populated by synthetic characters will provide a valuable, engaging and enjoyable experience for the child. A significant factor impacting upon this experience relates to the design of the graphics, the animation of objects and characters, and the character interactions with the child and additionally the design of AI responses.

In this paper we discuss our approach to FearNot (Fun with Empathic Agents to Achieve Novel Outcomes in Teaching). This application was initially developed within the VICTEC (Virtual ICT with Empathic Characters) project. FearNot provides a school-based Virtual Learning Environment populated by synthetic characters representing the various characters in a number of bullying scenarios using 3D self-animating characters to create improvised dramas [1]. Currently, FearNot is undergoing an extensive redesign in the European Framework 6 project eCIRCUS.

A learner-centred approach is taken to elicit children's reactions to interactions with FearNot [3] and here, we focus on our approach to gaining children's views and perspectives on the graphical, visual and interactive issues related to their use of FearNot, and their impact on our redesign. Section 2 briefly outlines FearNot. In section 3 our approach to designing media for FearNot is discussed. In section 4 we discuss our approach to qualitative data collection, Classroom Discussion Forums (CDF). A large scale evaluation of FearNot with primary school children is presented in section 5. In section 6 we present the main results and their implications for the redesign of FearNot are discussed in section 7. Finally, potential future steps are outlined.

2   FearNot

FearNot (see figure 1) depicts bullying incidents in the form of an episodic virtual drama. The child user views the bullying incidents that take place between autonomous agents in a virtual school and acts from the perspective of the 'invisible friend' of the victimised character or (initially) impartial 3rd person in between episodes, providing help and advice. Each episode is framed by an introduction segment at the start of the episode, and a reflective interactive segment at the end.

FearNot aims to enable children to explore physical and relational bullying issues, and coping strategies, through empathic interaction with the synthetic characters who populate the virtual school. This is achieved through providing scenarios in which the main purpose of the communication was to engage in social interaction as opposed to accomplishing a task as efficiently as possible.

Fig. 1. Screenshots from FearNot

A preliminary version of FearNot with scripted rather than emergent scenarios was developed for evaluation purposes. Although this scripted version did not feature autonomous agents, emergent narrative or a language system, it permitted a high-fidelity mock-up that enabled user testing and evaluation. Whilst characters behaved in a similar manner as they would in the final FearNot, their behaviour was pre-scripted and not a result of the character's autonomous reactions to each other or the user.

3   Designing FearNot's Media

Our goal in eCIRCUS is to create synthetic characters that by their appearance, behaviours and features allow the user to build an empathic relationship with them. Our domain with FearNot is of bullying and our pedagogical goal is to enhance children's ability to empathise with the protagonists in the bullying scenario. The aim is to provide children with the strategies that will enable them to help identify and defuse a potential or actual bullying situation.

For the child to have the potential to develop empathic relationship with the characters, they must believe in the characters and their experiences, or rather the child must be prepared to suspend disbelief. The dramas within FearNot were written by

experienced scriptwriters and extensively evaluated with children and teachers prior to their virtual representation, including extensive evaluation of mid-tech prototypes in the form of electronic storyboards. These evaluations highlighted that the stories and characters were believable and that the script was appropriate and highly understandable.

Taking a believable script and using it to create a believable virtual world poses considerable difficulties. Not least, that there are two paradoxes associated with attaining believable virtual environments [14]. Firstly, that decreasing the discrepancy between the real and the virtual causes the user to become more analytical of smaller discrepancies. Secondly, that the realism of different aspects of the virtual world are interdependent, so making one aspect of the virtual world more realistic can highlight the non-realism of a different aspect of the virtual world. Thus, aiming to increase the realism of the virtual environment may degrade the user's sum conviction therein.

This is particularly pertinent for the design of characters. Whilst it is relatively simple to create near-realistic graphical environments and objects, creating near-realistic characters offers considerable problems. Further, the "uncanny valley" has highlighted that if a character is too realistic, but not quite humanistic, this can result in discomfort. Continuing work with Embodied Conversational Agents highlights the ongoing difficulty of creating realistic animations of emotion. If the characters themselves are relatively limited in terms of actions and behaviours, then the world itself must also reflect that limitation.

Fig. 2 Screenshots of the virtual environment provided in FearNot

The virtual world of FearNot, see figure 2 has a cartoon style which is fairly simplistic and fun. Not only were children most in favour of cartoon characters [3], but additionally this offers a technical safety net in that highly naturalistic behaviour is not expected in cartoons making the element of jerkiness natural to experimental software less of an issue for children. Furthermore, the cartoon metaphor already provides design decisions that most cartoon-viewing children accept naturally. The design of the virtual world and characters were developed in collaboration with a media company that had created highly successful on-line resources for children. The design was derived from characters and environments that had been used successfully with children in the 8-12 age group. The characters and the environment were successfully evaluated with children at an early stage of the development.

There are essentially two types of animation in FearNot, the movement associated with geometry and the facial animations. FearNot used a set of animations represent-

ing individual actions and states associated with the characters geometry. One approach taken to provide the appearance of emotion in FearNot was through the use of a number of images, representing fixed expressional states, which were changed to suggest facial motion. This approach was successfully evaluated in small-scale evaluation with children using a mid-tech prototype [6]. However, this evaluation involved children watching the researcher interacting with a trailer version of FearNot for only 2 minutes. Here, we report on a large scale evaluation of a 20 minute individual interaction with FearNot.

Knowing that separately and even in a mid-tech form that the script, cast and set are believable, understandable and appear to appeal to the user group still does not necessarily result in a successful product. It is the whole interactive experience that determines acceptance and positive effect. We have to know what specific aspects of the aesthetics of the software and the animations of the characters should be improved in order give the user the right cues for believability, ensure comprehensibility and promote empathic engagement. The only way to be really certain about these aspects is to ask the children.

4   Classroom Discussion Forums

Classroom Discussion Forums (CDFs) [6] assist children in verbalising opinions about novel, innovative software, such as FearNot. CDFs allow children to participate and to inform the design process. CDFs form a significant method within the classroom-based curriculum-focused learner-centred approach to be developed for eCIRCUS. Their use helps to ensure that FearNot is created from a child-centred perspective, rather than relying on adult aspirations and goals.

With our over-arching aim of producing methods and techniques to permit in-classroom design and evaluation, our intention in the development of CDFs was to create a method that worked effectively in a classroom context. Thus, CDFs differ significantly from other approaches through the incorporation of classroom culture and organization into a data collection method.

Following the format preferred by teachers, CDFs follow the normal classroom approach of "Table Time" (small group discussion) followed by "Circle Time" or "on the carpet" (whole class discussion). Classroom culture strongly impacts on the discussion activity, requiring it to be structured with clear goals and steps. Thus although, CDFs clearly have some similarities with focus groups, where they differ most strongly is in their staccato pace, something that strongly reflects the classroom situation.

Rather than a facilitated discussion, a CDF involves a question and answer session, involving many small, related questions from the researchers and rapidly raised hands and responses from the children. Even when a child responds to another child, our fieldwork has identified that rather than a free-flowing discussion, children in this age group typically turn-take via the researcher who nominates whoever has a raised hand to respond.

CDFs have been extensively used in the VICTEC project with a range of different prototypes, including mid-tech such as electronic storyboards and trailers [3]. For

instance, small-scale pilot evaluations were carried out with approximately 90 primary school children from schools in Hertfordshire and Worsley, using a scripted trailer of FearNot!

After children had finished interacting with the scripted trailer, they participated in a CDF session in groups of between 8-10 children for a period of 15-20 minutes. These initial evaluation sessions were invaluable as they provided important information about necessary improvements required for the FearNot! software before a large scale evaluation event was carried out. For example, it was clear from the CDF sessions that overall children wanted FearNot! to contain spoken language that they could hear through the use of earphones, as opposed to having to read the story content off a screen. Reading from the screen was difficult from some children with dyslexia or below average reading abilities. Furthermore, it was difficult to find the right speed to present the storyline text due to such wide variations in children's reading speed.

Other important outcomes from these preliminary CDF evaluations revealed that although the children found some of the graphics amusing, simplistic and unreal, this did not adversely affect the level of storyline believability, engagement and empathy with the characters, and overall enjoyment with FearNot! A further crucial observation was that children were extremely positive towards the idea of being able to interact with an educational piece of software in a private and safe environment, where the fear of being ridiculed by peers is eradicated. Children expressed that this enabled them to explore different issues surrounding the sensitive subject of bullying behaviour that they might not feel comfortable doing in a classroom circle time session.

Here the results from CDFs with 345 children at the 'Virtually Friends' FearNot evaluation event are discussed.

5   Method

The evaluation of the Scripted FearNot was achieved through a large scale study, further discussed in [5]. This large scale evaluation event called "Virtually Friends" was held at the University of Hertfordshire, UK, in June 2004, and involved 345 children aged 9-11 years. Two classes from different schools participated each day in the evaluation event. These full day events involved a number of sessions including interactions with robots, virtual learning environments and storyboarding software in addition to FearNot.

Children completed several questionnaires before their interaction with FearNot to assess empathy, bullying behaviour and emotion recognition [12]. Each child then individually interacted with FearNot on standard PCs for approximately 30 minutes. After the interaction with FearNot children completed a theory of mind questionnaire [4] and a Character Evaluation Questionnaire [5].

The majority of the assessment instruments used in the Virtually Friends event were highly structured and collected quantitative scaled data. Recognising the need to also collect qualitative data relating to user reactions, perspectives and views of FearNot, we concluded each day with a Classroom Discussion Forum.

5.1 Interaction with FearNot

In the scripted version of FearNot, the child user views one direct physical bullying scenario and one relational scenario. Physical bullying includes acts such as hitting, kicking, punching, and taking others' belongings and relational bullying is the purposeful damage and manipulation of peer relationships and feelings of social exclusion.

Fig. 3 Interaction with victim

After the introduction of the characters, school and situation, users view the first bullying episode, followed by the victimised character seeking rescue in the school library, where it starts to communicate with the user. Within the initiated dialogue the user selects an advice from a list of coping strategies (shown as a drop down menu). The user also explains his/her selection and what he/she thinks will happen after having implemented the selected strategy, by typing it in (see figure 3).

The next episode then starts. The content of the final episode depends to some extent on the choices made by the user concerning the coping strategies: Paul, the bystander in the physical bullying scenario, might act as a defender for John (the victim), in case the user has selected a successful strategy, i.e. "telling someone"; or Martina (the bystander) might offer Frances (the victim) help. If the user has selected an unsuccessful strategy, i.e. "run away", the victim rejects the help in the final episode. However, even if the advice is appropriate the victim does not always follow this and may pursue a strategy counter to that suggested by the user. At the end of the scenario, a universal educational message is displayed pointing out that "telling someone" is always a good choice. This universal message had to be incorporated as all teachers had strong preferences for children to finish the interaction with a positive feedback message.

5.2 Classroom Discussion Forums at Virtually Friends

The CDFs allowed children to discuss the Virtually Friends event, with general discussion and a number of topics specifically about FearNot. The CDFs took place at the end of the day, with groups of approximately 10 children, led by a trained re-

searcher, and lasted around 10-15 minutes. In addition to questions about FearNot children were also asked about their other experiences during Virtually Friends. In relation to FearNot, the main topics discussed were the children's views and perspectives of the best and worst aspects of FearNot; what, if anything, they had learned from using FearNot and had this changed their perspective of bullying; and was FearNot easy to use, interesting and would they use it again. Typically many groups mentioned the same points, and a number of relevant quotes from a range of the CDFs are included in the results.

6 Results and Interpretation

The results reported here focus primarily on aspects of FearNot that are relevant for the graphical redesign of the interaction. The results along with a range of quotes from the participating children are summarised in the following sections.

6.1 What children felt that they learned from interactions with FearNot and changes in perspective of bullying

In all of the CDFs children highlighted that their interaction with FearNot had changed their perspective of bullying: "*I hadn't realised how bad it was for the victim*" or extended their knowledge / awareness of coping strategies and reasons for being bullied "*…don't know why they picked on her, there didn't seem to be a good reason. The other girls should have helped her*"

Where children were less effusive about the increase in knowledge this was typically due to their already having studied coping strategies in some depth and already having reasonable levels of knowledge. Typically, boys were more likely than girls to identify that they had increased their awareness and knowledge "*I would probably try to do something like ask him to join in,*" whilst girls frequently expressed already existing knowledge "*the only way to deal with them is to make friends.*"

6.2 Communication and interaction with the characters

Many children highlighted that communication with the victim "*When they ask you questions and you answer them*" and "*being able to provide advice,*" were the best aspects of FearNot. Children enjoyed the interaction with the characters *"It really involved us"* viewing this as one of the most positive aspects of FearNot. Not all children had such positive interactive experiences, particularly in those cases where the character did not act upon the children's advice: "*he didn't do what I said, if he had it would have stopped and I told him the same thing more than once.*"

Even though the children liked "*telling John and Frances what to do,*" most children did not like the interactive menu that enabled them to select their response "*I wanted to tell her to do something that wasn't there and it wouldn't let me,*" and "*It would be more fun to make up your own answer.*" Other children were blunter: "*It*

looked really old fashioned" and "*using that menu thing made it hard to concentrate on John's problems.*"

6.3   Story realism and believability

Many girls commented on the storyline and identified that the relational scenario was more realistic than the physical bullying scenario. Children reported on the story realism represented through the character's actions, finding the "*bullying behaviour really like what happens at school.*" However, in general children did not find that the characters exhibited physically realistic behaviours or rather, or they found specific aspects of the characters appearance and actions unbelievable: "*3D stuff looks really good, but the characters don't move right.*"

6.4   Graphics and Animations

A number of children commented on the graphics in a positive way saying that there were "*cool looking streets*" and that the graphics were "*funny and made you smile.*" However, when children highlighted that they approved of the graphics, this was often with a qualifying statement identifying graphical issues that need addressing: "*Graphics were good except for some weird faces when they cry.*" Boys were particularly keen on the football episode "*even though the way the ball moved was wrong,*" identifying the need to increase the realism of the ball's movement to improve believability. Girls identified that they would want more variety with "*a whole class of kids not just a couple*" and "*more places, like where we go… swings or something like that.*" No one noted that the scenarios were adult free or suggested that adults should be included within the scenarios.

Several groups commented on the clothes of the characters: "*The girls looked wrong, the skirts didn't move*" and "*the clothes need patterns and stuff or they don't look real.*" The criticisms of characters were typically related to their appearance, but this related to factors such as hair styles and clothes.

In general, children were of the opinion that the animations were poor and this was often seen as being one of the weakest aspects of FearNot. The facial expressions of the characters were criticized in several groups: "*faces need to be made more real.*" The movement was criticized in all groups "*he kept waving his hands about,*" "*he looked like he'd killed him*" "*she jerked about, no one moves like that*" and "*it jumped about except for the ball, that went straight.*"

6.5   Sound

Many children commented on the lack of sound: "*The worst thing about FearNot was that it didn't have enough sound. It was annoying having to read the text and would have been much better with sound all the way through.*" Most children suggested that sound should be added and that this would improve FearNot: "*There needs to be*

sound all the way through rather than having to read from the screen as this made it not very believable."

6.6   User Experience

Children found FearNot interesting and useful, "*because you get to meet the virtual people and you learn about bullying and how to react in situations in the playground.*" Most children identified that they would definitely prefer to use the software compared to a classroom session such as circle time "*to find out stuff and discuss things to do with bullying problems.*" Children could see the benefits of using FearNot for exploring bullying and coping strategies: "*I liked the fact that it was just me trying stuff out, you could try different things and then see what happened to the bullying.*"

Children were asked what they had enjoyed most and least in general at the Virtually Friends event. However, the interaction with FearNot rarely appeared in either of these categories, typically losing out to the robots (best bit of the day) and the filling in of questionnaires (worst bit of the day). So, even though our evaluation of FearNot was positive it still was not the most interesting of the opportunities on offer.

7   Design Implications for FearNot

This study focused on a scripted version of FearNot which was used to evaluate children's reactions to empathic engagement with synthetic characters. Some of the design implications resulting from this study have already significantly impacted upon FearNot and are discussed in the context of the emergent version of FearNot already developed. A number of other design implications are still under consideration as we prepare FearNot for the classroom within the European Framework 6 eCIRCUS project.

CDFs clearly indicate that children believe that they are increasing their knowledge of exploring bullying and coping strategies and that FearNot is achieving at least to some degree its pedagogical objectives. Most of the children appeared to have changed their perspective of bullying to some degree, many expressing that the interaction had increased their understanding of the victim. Most of the children clearly empathized with the victim, feeling sorry for them and wishing to assist them in improving the situation. This supports the approach that we have taken with FearNot, highlighting that this virtual learning environment provides an interactive experience that helps children learn about bullying and strategies to cope with it.

Children clearly enjoyed interacting directly with the victim to provide advice. Although the character's behaviour was not actually tailored to the children's responses, where the character did appear to followed the child's advice, this tended to make the child more empathic towards the character. This result has also been supported by quantitative analysis [5]. This was reflected in the design of emergent FearNot and is being further extended, with particular attention given to ensuring that the characters typically appear to act on the advice of the child, or at least explain why they will not.

Although this is not realistic, in that frequently children being bullied agree to strategies proposed by others, but will not actually enact them, it appears to be an important aspect in the child's development of an empathic relationship with the character.

Children indicated that they would prefer to interact with free text [7]. Language actions had already been used to allow the agent action-selection system to select language as well as physical actions, and a shallow template-based system is used to turn these into utterances. The child user is treated as just another agent, with the additional requirement to infer the language action they are using rather than be told via the internal event system.

Of course this approach is potentially fragile, but tests so far suggest it is nevertheless adequate in this case. This is because the interaction with the victim is short and directed, with the conversational initiative kept on the victim side, the child users are slow typers who do not imput complex language, and there are only a limited number (seven) of possible coping responses that can be suggested., rather than being constrained to a menu. This change has already been implemented into the current version of FearNot, with children now able to enter free text. Current work focuses on improving and extending this language system to ensure that a wide range of inputs can be understood.

Due to constraints on time and resource, FearNot includes very little sound, with some speech at the beginning of one scenario and background music. The amount of foreknowledge the children possessed regarding real-time 3D multimedia lead to some surprisingly technical and sophisticated analysis of the experience and in turn suggestions on improving the same.

Supporting the earlier evaluations, children found the story realistic and believable, and in general, the look of FearNot was viewed positively. Children did identify that they would expect a far wider range of settings, characters and stories if FearNot was to be used in the classroom. Although there were a number of issues related to the graphics and animations these were largely resolved in the development of a fully emergent version of FearNot and now the focus is content development to support this emergence.

The facial textures used in FearNot provide a very basic level of graphic realism compared with what the children are likely to be familiar with. Some children did identify that they found the facial expressions unrealistic, which could lead to the implication of a need to improve the visual quality of the environment and characters. However, as noted by Cheng & Cairns (2005) the user's expectations of a game world's behavioural characteristics are based on the characteristics of the game itself [2]. This means that, for example, they might expect a character that looks cartoon-like to behave in a way that is different than a character that looks more realistic. Users seem less critical of characters (and indeed environments) that are not overly realistic. This leads to the problem that increasing the graphical realism of the characters could result in higher expectations that cannot be fulfilled by other aspects of FearNot. This was one of the major reasons that we decided to use textures for facial expressions and not a complex facial model. However, current experimentation identifies that we may need to increase and enhance the transitions between textures.

Although the animations used in FearNot were adequate, many children identified that the graphical poverty of the animations reduced the realism for them, identifying that this is a key issue for the redesign of FearNot. Wages et al (2004) suggest that that increasing realism causes an increase in the user's critical analysis of the game and that realism of different components of the game are interdependent, meaning that in order to cultivate believability the designer must choose carefully what aspects of realism to improve. Although scripted FearNot does not offer a way to transition smoothly from one animation to another (for either type of animation), a significant issue for many children, this issue had been resolved for the emergent version. Through using an underlying state machine to define stances, pre-conditions and neutral positions we have been able to ensure smooth transitions between all pairs of animations.

In scripted FearNot each animated character is under the control of an agent 'mind' (an autonomous intelligent agent whose behaviour is determined by a set of goals and a set of personality traits, such as a propensity for bully or victim behaviours, for example). The behaviours of each of these agents during a learning episode cannot be predetermined (unlike in the earlier pre-scripted prototype). Any of the range of possible actions permissible for the characters could possibly be followed by any other possible action.

Thus, an extensive library of animations is needed to represent the range of possible actions permissible by the characters. Many of these animations also needed to represent similar actions performed in differing moods (for example an angry walk, a sad walk etc.). The sheer number of these animations creates a problem when trying to transition from the end of one animation to the beginning of another. In the prototype reported here, this problem was not solved. In emergent FearNot the use of a state machine with neutral positioning has largely resolved this issue, although refinements continue, particularly focusing on increasing flexibility.

Interactively transitioning between geometric animation data is possible but transitioning between images (i.e. image morphing) is very problematic with a better solution being one that allows the game engine to interactively merge animations together. This would allow a kind of cross-fade from one animation to another. This system would still require some rules be put in place to stop animations from being put together that shouldn't, As noted in [11] "if a character animation transitions from one pose to the next, bringing all parts of the body into the pose at the same time and in a linear fashion as commonly happens in physical and kinematic control solutions, the result will not only have a very robotic appearance"… but can give rise to unnaturally interpenetrating geometry. For example if animation A ends with the character's hand in front of the character and animation B begins with the character's hands behind the characters, the resulting transition AB could cause the characters hands to intersect it's own body. These rules would probably manifest themselves as a flowchart in which each node represents an animation and each connection represents a permissible transition.

8   Conclusions and Next Steps

FearNot is now undergoing redesign and development, prior to its use as a classroom tool in a longitudinal classroom study of over 1800 children in the UK and Germany, beginning in January 2007. This redesign is based on the results of the evaluations and in this paper results from Classroom Discussion Forums with 345 children were summarised and interpreted, identifying a number of key issues that require further design and development. In general, children approved of the graphical style and we are currently focusing on those elements that children have identified as being unrealistic or inconsistent with the other aspects of interaction with FearNot. We are also extending the world of FearNot with a greater cast of characters and settings to offer more variety within a longer classroom-based interaction. Current work focuses on achieving a believable emergent narrative with more and better content.

References

[1]   Aylett, R. S., Paiva, A., Woods, S., Hall, L., and Zoll, C., "Expressive Characters in Anti-Bullying Education," in *Animating Expressive Characters for Social Interaction*, L. Canamero and R. Aylett, Eds.: John Benjamins, 2005.

[2]   Cheng, K. and Cairns, P. A., "Behaviour, realism and Immersion in games," presented at ACM Conf. on Human Factors in Computing Systems, CHI 2005, 2005.

[3]   Hall, L., Woods, S., and Aylett, R., "FearNot! Involving children in the design of a Virtual Learning Environment," *Artificial Intelligence & Education*, in print.

[4]   Hall, L., Woods, S., Aylett, R., and Paiva, A., "Using Theory of Mind methods to investigate empathic engagement with synthetic characters," *International Journal of Virtual Humanoids*, in print.

[5]   Hall, L., Woods, S., Aylett, R., Paiva, A., and Newall, L., "Achieving empathic engagement through affective interaction with synthetic characters," presented at 1st International Conference on Affective Computing & Intelligent Interaction (ACII 05), Beijing, China, 2005.

[6]   Hall, L., Woods, S., and Dautenhahn, K., "FearNot! Designing in the Classroom," presented at British HCI, Leeds, UK, 2004.

[7]   Louchart, S., Romano, D., and Aylett, R., "Speaking and acting -Interacting language and action for an expressive character," presented at Workshops on Intelligent Computing, MICAI 2004, 2004.

[8]   MacIntyre, B., Bolter, J. D., and Gandy, M., "Presence and the Aura of Meaningful Places," presented at 7th Annual International Workshop on Presence (PRESENCE 2004), Valencia, Spain, 2004.

[9]   Marsella, S., Johnson, W. L., and LaBore, C., "Interactive Pedagogical Drama for Health Interventions," presented at 11th International Conference on Artificial Intelligence in Education, Sydney, Australia, 2003.

[10]   McFarlane, A., Sparrowhawk, A., and Heald, Y., "Report on the Educational use of Games," Available at http://www.teem.org.uk/publications 2005.

[11]   Neff, M. and Fiume, E., "Aesthetic Edits for Character Animation," presented at ACM SIGGRAPH/Eurographics Symposium on Computer Animation, 2003.

[12]   Nowicki, S. and Duke, M. P., "Individual differences in nonverbal communication of effect: The diagnostic analysis of nonverbal accuracy scale," *Journal of Nonverbal Behavior*, vol. 18, pp. 9-35, 1994.

[13]   Robertson, J. and Oberlander, J., "Ghostwriter: Educational Drama and Presence in a Virtual Environment," *Journal of Computer Mediated Communication*, vol. 8, 2002.

[14]   Wages, R., Grunvogel, S. M., and Grutzmacher, B., "How Realistic is Realism? Considerations on the Aesthetics of Computer Games," presented at ICEC 2004, 3rd international conference on Entertainment Computing, Eindhoven, The Netherlands, 2004.