Achieving Empathic Engagement Through Affective Interaction with Synthetic Characters

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Abstract. This paper considers affective interactions to achieve empathic engagement with synthetic characters in virtual learning environments, in order to support and induce the expression of empathy in children. The paper presents FearNot!, a school based virtual learning environment, populated by synthetic characters used for personal, social and health education, specifically bullying issues in schools. An empirical study of 345 children aged 8-11 years who interacted with FearNot! is outlined. The results identify that affective interactions resulting in the expression of empathy were increased when children had high levels of belief and interest in character conversations and if they believed that their interactions had an impact on the characters' behaviour.

1 Introduction

Affective interaction relates to, arises from, or influences feelings and emotion [18] and generates acts between user and computer that have a reciprocal effect on feelings and emotion. Evoking affect in users has been achieved through a range of approaches and for a variety of motives, including making systems simpler to use [22], affecting the user's physical and mental health [15], reducing stress levels [14] and improving the learning experience [20]. Research has highlighted the potential of affective interaction with synthetic characters in educational drama and story telling applications e.g. Ghostwriter [19], Virtual Puppet Theatre [1, 13]; and personal, social and health education [4, 7, 15].

Empathic engagement is the fostering of emotional involvement intending to create a coherent cognitive and emotional experience which results in empathic relations

between a user and a synthetic character. Empathising with characters permits a deeper exploration and understanding of sensitive social and personal issues [5]. Here, we are focusing on affective empathy, that is processes with an affective outcome of a shared affect of two persons [6], or "*An observer reacting emotionally because he perceives that another is experiencing or about to experience an emotion*" [21]. For the user to experience an empathic response to a character, the interaction must affect the user's emotions in one of two ways: by mediation via situation, where a situation is presented that encourages the user to recognise the emotion felt by the target, or by mediation via expression, where the target shows emotional expressions with which the user can identify [16].

The VICTEC (Virtual ICT with Empathic Characters) project [3] applied synthetic characters and emergent narrative to Personal and Health Social Education (PHSE) for children aged 8-12, in the UK, Portugal and Germany, through using 3D self-animating characters to create improvised dramas. The goal in VICTEC was to support affective interaction between the child and the synthetic characters resulting in empathic engagement for the user in a social and emotional learning situation. Our aim was to affect users and evoke empathy and empathic engagement in social and emotional learning for bullying and coping strategies, using mediation via both situation and expression.

In this paper we focus specifically on the evocation of affect and empathy through the child's engagement with the characters and perception of the characters engagement with the user. In section 2 we briefly outline FearNot! (Fun with Empathic Agents to Reach Novel Outcomes in Teaching), the virtual learning environment developed in VICTEC. In section 3 we discuss its use in an empirical study with 345 children. In section 4 we briefly outline our results. Section 5 presents a discussion of these results, followed by some brief conclusions.

2   FearNot!

FearNot! aimed to enable children to explore physical and relational bullying issues, and coping strategies, through affective interaction and empathic engagement with the synthetic characters who populated a virtual school. Interaction with FearNot! was achieved through 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.

A design decision was made to provide FearNot! characters with only crude facial expressions and limited gestures [3] and this was evaluated using a Classroom Discussion Forum [10]. We found that children in the 8-12 age group had relatively little to say about emotions, either their own or those of the characters. However, children clearly understood the characters' expressions having no problems in identifying the emotional state of the characters and found the appearance appropriate. The simple cartoonesque approach supported mediation by expression with children empathizing with the characters, feeling both sympathy and anger.

In a FearNot interaction the child user was asked to take responsibility for the victim, providing support and advice as they would to another child. This interaction enables the user to experience the character's emotions and problems in a distanced

way, while being at the same time engaged in and affected by what happens to the characters [3, 7, 15, 16] leading to empathic engagement.

During the interaction with FearNot!, the child user viewed one physical bullying scenario and one relational scenario. Each child initially provided their personal information (name, gender and age) and a unique personal code. After the introduction of the characters, school and situation, children viewed the first bullying episode, followed by the victimised character seeking rescue in the school library, where it started to communicate with the user. Within the initiated dialogue the user selected an advice from a list of coping strategies (shown as a drop down menu). The user also explained his/her selection and what he/she thinks will happen after having implemented the selected strategy, by typing it in (see figure 1).
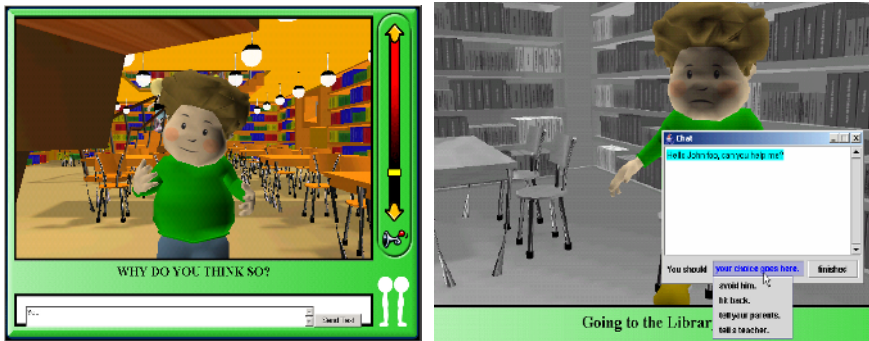

Fig. 1. Interaction with victim

The next episode then began. The content of the final episode depended 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 this case the user had selected a successful strategy, i.e. "telling someone"; or Martina (the bystander) might offer Frances (the victim) help. However, if the user selected an unsuccessful strategy, i.e. "run away", the victim rejected the help in the final episode. At the end of the scenario, a universal educational message was displayed pointing out that "telling someone" is always a good choice.

3   Investigating Affect and Empathy in FearNot!

To investigate the children's empathic engagement and affective reactions to the synthetic characters in FearNot!, we performed a large scale study with a scripted version of the FearNot! prototype [3, 9]. This large scale evaluation event called "Virtually Friends" was held at the University of Hertfordshire, UK, in June 2004.

345 children participated in the event. 172 male (49.9%) and 173 female (50.1%). The sample age range was 8 to 11, mean age of 9.95 (SD: 0.50). The sample comprised of children from a wide range of local primary schools.

3.1 Method

Two classes from different schools participated each day in the study. All children individually interacted with FearNot! on standard PCs.

FearNot! began with a physical bullying scenario comprised of three episodes and children had the role of an advisor to help provide the victim character with coping strategies to try and stop the bullying behaviour. After the physical scenario, children had the opportunity to interact with the relational scenario showing the drama of bullying among four girls.

After the interaction children completed the Character Evaluation Questionnaire (CEQ). This was designed in order to evaluate children's perceptions and views of the characters in FearNot, see table 1. This questionnaire is based on the Trailer Questionnaire [23] that has been used extensively with a non-interactive FearNot! prototype as is reported in [12]. Questions relating to choosing characters were answered by selecting character names (posters of the characters were displayed with both a graphic and the name as an aide memoire). Children's views were predominantly measured according to a 5 point Likert scale.

Table 1. Content of the Character Evaluation Questionnaire

Aspect	Nature of Questions
Character preference	Character liked most and least, most like to be friends with Prime character - who child would choose to be
Character Attributes	Realism and smoothness of movement Clothes appreciation and similarity to own Age
Character conversations	Content believability, interest and similarity to own conversations
Impact	Victims acceptance of advice and how much child had helped
Bullying Storyline	Storyline believability and length
Similarity	Character that looks and behaves most and least like you
Empathy towards characters	Feeling sorry for characters and if yes which character Feeling angry towards the characters and if yes which character Ideomotoric empathy based on expected behaviour

4 Results

Character Conversations
Substantial significant differences were found between feeling sorry for the characters and whether the children found what the characters spoke about believable (t (306) = 4.10, p < .001). Those children who expressed feeling sorry for the characters in the drama rated the character conversations as being more believable than those children that did not feel sorry for any of the characters (sorry for characters: $\underline{M}$ conversation

believability = 2.08 vs. did not feel sorry for characters: M conversation believability = 2.70). Significant differences emerged between feeling anger towards characters in the drama and character conversation believability (t (293) = 2.27, p = .02), (anger towards characters: M conversation believability = 2.13 vs. did not feel anger towards characters: M conversation believability = 2.45).

Significant differences were also revealed between children's ratings of interest in the character conversations, and feeling sorry and angry towards characters in the dramas (sorry for characters t (307) = 4.62, p < .001), (anger towards characters t (294) = 3.47, p = .001). Children who expressed feeling sorry for the characters in the drama rated the character conversation as significantly more interesting compared to those children who did not feel empathy towards any of the characters (sorry for characters: M conversation interest = 2.35, did not feel sorry for characters: M conversation interest = 3.09). This same pattern of findings was found for anger towards characters, where children who expressed anger towards characters rated the character conversation interest as significantly higher compared to those children who did not express anger (anger towards characters: M conversation interest = 2.33, did not feel anger towards characters: M conversation interest = 2.85).

No significant differences were uncovered between children's ratings of conversation similarity with characters in the drama and expression of feeling sorry or angry towards the characters in the drama.

Character Impact and Empathy
Independent samples t-tests were calculated to determine whether the level of impact children felt their help had on the characters' actions in the virtual learning environment was associated with the amount of empathy expressed towards the characters in the virtual dramas. Overall, a trend was revealed for children feeling sorry for the victim characters in the dramas and whether they felt that the victim characters John and Frances followed their coping strategy advice on how to stop the bullying behaviour (t (316) = 1.83, p = .07) (felt sorry for characters M = 2.18 vs. did not feel sorry for characters M = 2.43). A trend was also found between whether children felt sorry for the victim characters and whether the child felt that they had actually helped John or Frances with the bullying situation (t (307) = 1.62, p = .1) (felt sorry for characters M = 2.19 vs. did not feel sorry for characters M = 2.44).

When these analyses were calculated for boys and girls separately no significant differences emerged with the exception of one finding for the girls. Girls were significantly more likely to express feeling sorry for the victim characters if they believed that their advice had actually helped John and Frances (t (155) = 2.23, p = .03) (felt sorry for characters M = 2.10 vs. did not feel sorry for characters M = 2.71).

5   Discussion

In this paper we have considered the evocation of affect and empathy focusing on engagement with the characters. Gender, perceived similarity to character and character preference all have an impact on empathic engagement and results are reported elsewhere ([9, 17]). Here, we are focusing on the mediation of the situation, considering the child's engagement with the character's conversation and the child's perception of their impact on character's actions.

Supporting earlier findings [23], empathic engagement does not appear to be strongly related to character appearance. Thus, although children were critical of the graphics, animation, lack of voices and character movement in FearNot! [10] this did not appear to impact on levels of affect, engagement and believability. This suggests that children are mediating via situation rather than via expression. The situation is expressed most clearly through the conversation of the characters.

The character conversations and FearNot! scenarios were developed using a drama production methodology by a team of experienced researchers in bullying, teachers, and drama staff. These scenarios were extensively tested to ensure that they had believable and interesting storylines [11], provided key educational messages [8] and that characters had appropriate language and behaviour [2]. Our results highlight that this approach has produced interesting and believable characters that affect and engage most children.

We found that those children who expressed feeling sorry for and angry about the characters in the drama rated the character conversations as being more believable and interesting than those children that did not feel sorry for any of the characters. Affect can clearly be evoked with child users through the use of mediation via situation, evidenced by the users feeling sorrow or anger towards the characters in the situations presented in the drama, and their interest in the conversations between characters. The higher rating of belief and interest in character conversation shows a greater level of engagement with the scenario and the characters leading to increased affect and empathy.

The study presented here used a high fidelity prototype of FearNot that provided a scripted rather than an emergent narrative. In this version, the structure of FearNot! gave little possibility for the child to really influence what happened, with only two possible final episodes. However, a significant number of children believed that their interaction had impacted on the character's behaviour. Further, results indicated that levels of affect and empathic engagement are higher if children felt that their interactions were having an impact on the characters' behaviour.

Children expressed more empathy towards the characters in the drama if they felt that the characters had followed their coping strategy advice, and if they felt like they had actually helped the victim characters. This was particularly significant for girls who were more likely to express feeling sorry for the victim characters if they believed that their advice had actually helped. These results indicate that empathic engagement and the affect of that engagement are increased if the child believes that their presence and interventions has had an impact on the characters.

In the current version of FearNot, the child's impact on the characters is supported using an emergent narrative approach, in which action is driven by the characters themselves. This approach has been used as a natural solution to making the victim responsive to the advice the child gives. This responsiveness is constrained through the need for FearNot to attain pedagogical outcomes, and current work focuses on the extent to which the necessarily somewhat unpredictable outcomes of episodes are in conflict with social and emotional pedagogical objectives. Current work focuses on ensuring that both pedagogical effectiveness and character responsiveness are achieved by FearNot!

6   Conclusions

This paper has considered the use of affective interaction to support and induce the expression of empathy with children. The synthetic characters in FearNot! involved children in empathic engagement, with engagement in believable and interesting situations creating affect, leading to an empathic response. From our results, we can conclude that affect and empathic engagement can be increased if the child believes that their interactions are having an impact on the character's activities.

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