

e – Motional Learning in Primary Schools: FearNot! An Anti-bullying Intervention Based on Virtual Role-play with Intelligent Synthetic Characters

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Abstract: Addressing the problems of bullying in schools, this paper presents a novel and highly innovative pedagogical approach, building on the immersive power of virtual role-play. Educational role-play is widely accepted as a powerful instrument to change attitudes and behaviour, but faces some difficulties and disadvantages when applied to sensitive social issues in the classroom. This paper shows how the FearNot! software application, developed within the scope of the EU-funded projects VICTEC (Virtual ICT with Empathic Characters) and eCIRCUS (Education through Characters with emotional-Intelligence and Role-playing Capabilities that Understand Social interaction) uses virtual role-play and autonomous agents to provide children aged eight to eleven years of age with the opportunity to visit a virtual school environment populated by 3D animated synthetic characters that engage in bullying episodes.

The characters' actions and the storyline are created as improvised dramas by use of emergent narrative, resulting in unscripted and highly believable interaction experiences for the learner. While the students are spectators to the bullying episodes that unfold among the FearNot! characters, the victimised character starts a conversation with the student in between the episodes, describing their experiences with bullying and how they feel as a result to it, and asking the student for advice. The aim of this approach and particularly of this interaction sequence in between the virtual bullying episodes is to sensitise primary school students to the potential problems that victims of persistent aggressive behaviour are facing: By triggering an empathic relationship between learners and characters, learners understand and vicariously feel into the plight of the victimised character. Empirical evidence from bullying research implies that bullies are regularly reinforced by bystanders that witness the bullying and turn their attention to it, but do not actively intervene to end it (Craig & Pepler 1996; Lean 1998; Salmivalli 1999; Hawkins et al. 2001). Hence, this intervention strategy targets these bystanders to stand up to the bully and help the victim, due to their heightened awareness and sensitivity to the grave consequences victims face.

Preliminary evaluation results indicate that the children were willing to immerse themselves in the virtual drama and that they empathically engage with the characters, attributing a range of emotions to the characters depending on the events that happen within the respective scenario. An ongoing long-term intervention in school in the UK and Germany covers several interactions with the software over a ten week period of time.

Keywords: virtual environment, social and emotional learning, synthetic characters, bullying.

1. Introduction

Improvisational drama and role-taking exercises have been shown to enhance students' personal and social development (Wright 2006). As a pedagogical means that is social and emotional in nature, role-play is seen as enhancing the ability to take over someone else's perspective including thoughts, feelings and behaviour, and thus ultimately enhancing the ability to empathise.

By stepping outside one's usual role and adopting others' perspectives, ways of thinking, feeling and acting (empathic process) students gain a better understanding of the experiences of others (empathic outcome). While empathy can happen purely on the basis of observing the other and the situational context (e.g. while empathising with a real person in a social encounter) or of imagining their internal state (e.g. while

empathising with a fictional character in a book), it is facilitated by actively adopting the perspective of the other by taking over his/her role. Role-play can therefore be seen as a method to facilitate empathy in social interactions (Davis 1996).

Empathy is defined as comprising two aspects, one being affective in nature and focusing on the process of feeling something due to the perceived feelings/thoughts of a target person, and the other being cognitive and focusing on understanding feelings and thoughts of a target person. These processes produce affective (parallel affect, reactive affect) as well as non-affective (perceptual accuracy, attribution styles, behavioural tendencies) outcomes (see also Davis, 1996), all related to an observer's internal simulation of a target person's internal states.

One focus of the eCIRCUS project is to use the empathic process to get students to empathise with bullying victims. To achieve this goal, the virtual role-play approach provides a secure "as-if" framework for exploring experiences of self and other and ultimately to alter the students' behaviour and attitudes in order to better match the challenges of social encounters in their day-to-day school environment. In attempting to help children with aggressive behaviour problems as well as socially insecure children, role-play has been successfully applied in school and therapeutical settings (Jupp & Griffiths 1990; Hungerige & Borg-Laufs 2001; Wright 2006), focusing on the *holistic* experience of another person: Even though behaviour is usually in the centre of role-play interventions, cognitions are also challenged by role-play as a side-effect of behavioural change and through reflection processes subsequent to the role-play (Hungerige & Borg-Laufs 2001). Another advantage of using role-play as an educational tool is that it allows for the learner to imaginatively leave the artificial classroom or therapeutic setting and act "as if" in real life situations ("prehearsal", Kanfer 1979), but without exposing themselves to immediate feedback from real world interaction partners. Rather, the school or therapy setting offers a secure environment for the testing of new behavioural strategies that are immediately followed by professional feedback provided by educators, facilitators or therapists informing the role-player about the appropriateness of their actions. By acting out new roles, new schemas representing attitudes and actions develop within the role-player (Kelly 1955) and are differentially reinforced through immediate feedback in an encouraging and positive atmosphere. Ultimately role-play leads to more understanding of others' experiences and also – occasionally – to a change of their own ways of thinking, feeling, and acting.

In social contexts, role-play helps at detecting and interpreting social stimuli and offers immediate reinforcement for appropriate social strategies, influencing the subjective evaluation of a student regarding his or her social skills and their social self-efficacy.

A crucial precondition for role-play to work as an educational tool is immersion: the learner is to stop thinking of themselves as students in a classroom, and take over their assigned identity for the duration of the role-play (see chapter 3.1 and 3.2).

However, some problems arise when applying role-play to school contexts: First, if immersion is to be achieved, role-play is a rather time-consuming and staff-intensive pedagogical tool which often clashes with the curriculum-driven reality in the classroom. Second, it involves groups of students that are involved in real-life social situations which might cause problems of stigmatisation, oppression and retaliation if role-play is applied to social conflict situations; in cases where there are latent or overt social conflicts between students in a class and educational staff is applying role-play techniques to address the problem, victimised students are less able to address their problems and anxieties publicly in front of the whole class, even more so if their perpetrators are present as well.

The approach presented in this paper suggests avoiding the negative implications of role-play as an educational tool by transferring it to a virtual environment, equipped with synthetic characters and providing the individual student with the possibility to engage in role-play in this virtual school setting. The approach is seen as particularly suitable for tackling sensitive social issues in the classroom, e.g. bullying.

2. Bullying

According to Olweus (1999), bullying can be described as follows: "A student is being bullied or victimised when he or she is exposed, repeatedly and over time, to negative actions on the part of one or more other students" (p. 9); it usually involves an imbalance in power between the bully (or bullies) and the victim that can be either real or perceived. Bullying can manifest itself in different behaviours: it can be direct verbal (blackmailing, shouting, calling names, etc.) or physical (hitting, kicking, punching, stealing, etc.) behaviour,

but also indirect behaviour targeted at the manipulation of social relations, e.g. spreading rumours or the deliberate ending of friendships (Björkqvist 1994; Wolke et al. 2000).

Bullying is an international problem. While aggressive behaviour is quite common in primary school, bullying in its combination of power abuse and long-term exertion is experienced by 10-15% (Pepler & Craig 2000) in an extent that makes them require support and intervention; while bullying is identified in various countries as a major problem among students (Norway, Sweden, Germany, Australia, Canada, UK, Japan, US, etc.), the figures vary to some extent due to differences in assessment methods and bullying definitions applied. Bullying is associated with concomitant phenomena for bullies and victims that range from delinquency, social exclusion and academic problems for bullies and anxiety, depression, somatisation problems, social exclusion, academic problems (concentration, refusal to go to school, eventually school dropout) for victims.

Interventions up to date concentrate on individuals, the class and the whole school. Many of them include programs for the educational staff and parents, curriculum material addressing the problem of bullying, strategies to make sure that students are monitored and a general plan or school policy to agree on standards in case bullying occurs. Meta-analyses on the effectiveness of bullying interventions (e.g. Smith, Pepler & Rigby 2004) have reported an average reduction in bullying after interventions of 15% at most, underlining the notion that new and innovative approaches are needed. One problem of existing intervention strategies is that the roles of the students' involved are not differentially acknowledged and tackled. According to Salmivalli et al. (1999) students involved in bullying can be assigned to a participant role, e.g. not only bullies or victims, but also assistants to or reinforcers for the bully, bystanders who provide their attention and thus have reinforcing power, too, and defenders to the victim. Only very few students are real outsiders, and hence not involved at all in the bullying incident. With the software FearNot! application we aim at getting those involved who are either outsiders or bystanders, and try to raise the awareness of the bullying problem and eventually encourage them to become pro-active when faced with bullying and take the side of the victim (Schäfer 1998; Batson 1991; Eisenberg & Miller 1987).

3. FearNot!

The EU funded project eCIRCUS (Education through Characters with emotional Intelligence and Role-playing Capabilities that Understand Social interaction) aims at applying educational role-play to bullying problems among primary school students featuring autonomous agents as social interaction partners. The software depicts bullying episodes between virtual characters in a virtual school, with the learner – who is interacting with the software individually – acting as a spectator during these bullying episodes. After each episode, the victimised character addresses the learner asking for help and advice regarding what he/she could do to end the bullying. The student engages in a conversation with the victimised character, acting as advisor and friend by suggesting coping strategies. In order to be of help, the learner is to think and feel into the situation of the victimised characters, understanding the plight of victims and eventually feeling their misery and desperation. Thus, while the learner is not directly part of the virtual role-play that is happening within the bullying episodes, he/she takes over the role of an off-stage “invisible friend” to the victimised character and can execute (limited) power over the storyline as the advice given to the victimised character affects its mental state (personality, emotional state, goals etc.) and thus ultimately the victimised character's actions in the next episode. However, since the characters act according to their personality, emotional state, and goals in a given situation, the student's input during the interaction sequence is only one determinant of the behaviour of the victimised character in the episodes to come. Hence, by being an active part of the story through counselling the victim, the student can affectively engage with what happens but at the same time benefits from the “as-if” mode of the virtual drama, being not involved themselves but being able to distance themselves when needed (Hall et al. 2005). Figure 1 shows a screenshot of the German version of FearNot! software depicting a bullying episode between Lukas (the bully) and Johannes (the victim).



Figure 1: FearNot! screenshot (German version).

As outlined above, role-play can be a powerful instrument to change attitudes and behaviour among children, if the precondition of immersion is met: students have to believe in the characters as really experiencing bullying, and they have to accept them as similar to themselves in how they experience it. Hence the effectiveness of the approach is directly linked to software development issues such as character design, narrative structure, and modelling of characters' minds. In the following section, these issues are addressed.

3.1 Character design

3.1.1 *Autonomy*

Autonomous characters perceive information from the virtual environment and other characters, as well as from the interaction with the learner. They can also react flexibly to perceived changes in that environment and interact with other characters as well as with the learner. That does not necessarily mean that the character does not make mistakes in perceiving the environment or the actions of other characters or the learner; humans also make mistakes when they perceive their environment, even more so in complex social contexts. However, the character's reactions to its perception should make sense for the learner who interacts with the character. In order to be able to react to perceived information in a way that allows for a believable and meaningful narrative to develop, characters need to incorporate an agent architecture that allows for selecting an action from an action repertoire (including language-based actions) according to a set of rules; furthermore, characters need to be capable to plan a sequence of actions in order to reach a long-term goal (Aylett 2006).

3.1.2 *Expressivity*

Bullying, as outlined in chapter 2, is a social problem among students that implies a wide variety of risks to the victims' both long- and short-term social adaptation as well as emotional well-being. If the software aims at believably depicting the problem of bullying in schools, virtual characters enacting these bullying episodes need to be emotional by definition; this relates both to their behaviour that needs to be selected according to an emotional model that specifies emotional influence on action selection, and also to their expression of their emotional states. The latter is important if the learner is to understand the internal states of victims to bullying behaviour (cognitive empathy) and also if the learner is to be affected by the emotions that they perceive in the victim (affective empathy). The emotional expressivity of character actions is reflected in gestures and mimic, and in the tone of voice of the character.



Figure 2: Interaction with the victimised character (English Version).

3.2 Narrative structure / emergent narrative

The aim of the software FearNot! is to engage learners emotionally with the situation of victims to bullying in schools. How can this emotional engagement be fostered apart from how the characters look and behave? As has been outlined above, the learner has a certain control over the events by interacting with the victimised character and thus influencing – to a certain degree – its decisions in the bullying episodes to come. However, this influence can only be partial, since the characters act autonomously in creating the story. This highly flexible real-time storytelling approach that has previously been termed “emergent narrative” (Aylett 1999) results in a highly believable experience for the learner. In contrast to a script-based approach, the learner is provided with a complex and engaging virtual space inhabited with intelligent agents that accept or do not accept his/her suggestions, just like in real life. On the one hand, the autonomy of the characters and their role is creating a believable and realistic story about bullying; on the other hand, handing over control solely to autonomous characters and their interactions with one another and the learner poses some risk: how can one prevent the characters and their autonomously unfolding behaviour to oppose or hinder the educational goals, that is how can one ensure, even though the control of what happens next in the story lies with the characters and their decisions made in real-time, a believable, meaningful and appropriate (in the sense of the educational goal) learning experience for the learner?

3.3 Modelling agent minds

As outlined in section 3.2, the FearNot! characters need to meet some basic challenges in order for the software to fulfil the educational goal. First of all, all relevant objects, events, and other agents that exist in the virtual environment must be perceived and appraised regarding their significance for the emotional state of the character. Our realisation of the appraisal mechanism is based on the emotion model proposed by Ortony, Clore and Collins (1988), and can be described as “a subjective evaluation of a given stimulus according to the character’s goals, standards and beliefs” (Aylett et al. 2005). Characters build an internal goal hierarchy and appraise the goals’ importance in relation to available objects, actions of the other characters and consequences of events. The result of the appraisal process determines the emotional state of the character. The appraisals are influenced by former experiences of the organism and result in emotions that can refer to the outcomes of events, the agency of other agents or the attributes of objects. For each of these appraisals the appraisal criterion is different: objects are appraised regarding their appealingness, agents regarding the praiseworthiness of their actions, and the outcomes (or consequences) of events are appraised regarding their desirability.

Ortony et al. (1988) posit that different appraisals lead to qualitatively different types of emotions (see figure 3).

The emotional state of a character also depends on a variety of pre-set personality characteristics that are reflected in emotional thresholds and decay rates, emotional reaction rules, action tendencies and goals that are all authored in FearNot! Through authoring significant parts of the agents’ intelligence, their behaviour can be influenced in order to represent the desired overall learning experience. The resulting emotional states can either directly trigger action tendencies, or indirectly influence action selection through problem-focused or emotion-focused coping (Lazarus 1991), with the most intense emotional state triggering the current intention.

4. FearNot! evaluation

The pedagogical aim of the FearNot! software application is to raise awareness and sensitise students for the problem of bullying in school, and eventually to reduce victimisation by getting more bystanders and outsiders involved in helping the victims. While there are already some preliminary results regarding the believability of FearNot! characters and learner reactions to them from earlier evaluation efforts using an earlier version of FearNot! (chapter 4.1), extensive evaluation activities are currently taking place in primary schools both in the UK and in Germany (chapter 4.2).

4.1 Preliminary results from prototype evaluation (Hall et al. 2005)

Preliminary results from evaluations of various prototypes of the software indicate that children empathise with the victimised character and that characters seem to be believable (Hall et al. 2005). Results also suggested that the perceived believability of the conversation with the character is associated with feelings towards the character: children who felt sorry for the characters rated the conversation as more believable and interesting than children who did not feel sorry, whereas children who felt anger towards the characters rated the conversation as less believable and interesting than children who did not feel angry. Even though the early prototypes' graphics, animations, voices, and character movements clearly needed further development, which was acknowledged by the children's critical statements, learners engaged affectively with the characters and their problems, indicating that the social situation (conversation with the victimised character) prompts believability and interest in the fate of the character rather than expressive behaviour alone.

4.2 Current evaluation activities

In order to investigate whether the software really is able to change victimisation within classrooms when applied over a longer period of time, an evaluation study employing a quasi-experimental design with control groups, pre- and post-tests as well as follow-up tests has started in October 2007 (the evaluation scheme for the study is outlined in table 1). Apart from victimisation, the acceptance of and the contentment with the software is going to be evaluated as well as the students' knowledge about bullying, coping strategies and their empathic reaction towards the FearNot! characters. These variables will be measured using questionnaire methods that are applied at three points of time during a 9 weeks period of time in order to investigate long-term effects of the software interaction.

Table 1: Planned evaluation scheme for evaluating FearNot! in schools (UK / Germany)

Planned evaluation scheme for evaluating FearNot! in schools (UK / Germany)		
Week	Control group (delayed intervention)	Experimental group (immediate intervention)
1	Pre-test (including awareness session)	Pre-test (including awareness session)
2-4	Normal classes	FearNot!
5	Post-test	Post-test
9	Follow-up	Follow-up
10-12	FearNot!	Normal classes

The evaluation study, conducted both in the UK and Germany, employ a randomised controlled design including random allocation of schools to the intervention and waiting control (i.e. delayed intervention) group. Overall, approximately 500 children in Germany and 500 children in the UK, all aged eight to eleven years, are included in the study. The total sample is divided into two groups, one that interacts with FearNot! in between the pre- and the post-test sessions (week 5) and another that serves as a control group with normal classes continuing between pre- and post-test measurement, and a delayed intervention with FearNot! after the follow-up measurement to provide them with the same treatment as the first group. The pre-test session provides some basic information on bullying at the beginning that serves to raise awareness for the bullying problem and thus to provide a common ground for all students involved from where to start the evaluation study.

5. Conclusion

This paper introduces the pedagogical software FearNot! aimed at enhancing knowledge about and sensitivity to the problem of bullying among primary school children. By empathic processes experienced for the virtual victim of bullying episodes depicted by the software application and by means of affective interaction with the victimised character, the individual student empathises with this character and thus explores physical and relational bullying behaviour from the perspective of the victim, while staying in a safe and secure environment at the same time. The main challenge here is to reconcile the immersiveness and

realism of virtual environments as learning spaces with the necessary limitations to ensure the desired learning outcome for the students. The realisation of emergent narrative driven by autonomous characters poses a risk to differentially reinforcing reactions in the learner that are in line with the educational goal; the aim of creating a believable and realistic learning environment therefore needs to be balanced with the risk of reinforcing “unwanted” behaviour, e.g. that the software is used to learn how to bully more effectively.

A carefully planned evaluation study of FearNot! in the classroom, investigating the effects of repeated interactions with the software addresses this issue, among others. While this evaluation study is organised according to sound evaluation standards, it faces a problem that lies in the pre-selection of schools that provide the minimum technical standard to participate in the evaluation study: primary schools – especially in Germany – currently do not have a state funded budget that guarantees supplies of technical equipment to be integrated into everyday teaching or to be used in special projects, resulting in only those schools taking part in the evaluation that put extra effort in their technical equipment. The generalisation of the evaluation results to all primary schools in general might therefore be restricted.

Preliminary evaluation efforts however suggest that the virtual role-play approach is suitable for the target group of primary school students, offering a technologically challenging and immersive new approach for tackling sensitive social issues in the classroom.

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