

Serious Games for Teaching Conflict Resolution: Modeling Conflict Dynamics

Yun-Gyung Cheong, Rilla Khaled, Christoffer Holmgård, Georgios N. Yannakakis

Abstract Serious games have already found use in several non-leisure contexts including simulation, training, health and education. In this study we present a serious game designed for the purpose of enhancing the ability of children between the ages of 9 – 12 to cope with conflict situations. Inspired by theoretical models of human conflict and experiential learning, we designed a game through which players experience and try to resolve conflict situations themselves in a virtual environment. In our multiplayer game, *Village Voices*, each child plays the role of a villager and is asked to complete a number of conflict quests that require social interaction and resource management; the game allows anything from very aggressive behaviours (stealing resources and spreading negative rumors) to collaborative play (trading resources). To model conflict intensity in *Village Voices* and evaluate its ability to elicit strong emotions and conflict, we ran a game user survey in Portugal from 32 children. Data collected include demographic information and conflict profile types, as well as in-game behavioral data and self-reported notions of conflict and affect during play. The analysis presented in this paper shows that there appear to be strong effects between gender, age, conflict resolution strategy type, cultural tendency, reported emotions and perception about the other players, and reported conflict intensity. Indeed, *Village Voices* serves as an excellent vehicle for teaching conflict resolution as it is able to elicit bounded conflict situations of varying intensities, and, importantly, enables us to further understand conflict dynamics amongst students of this age group and beyond.

Yun-Gyung Cheong
IT University of Copenhagen, Denmark, e-mail: yugc@itu.dk

Rilla Khaled
University of Malta, Malta, e-mail: rilla.khaled@um.edu.mt

Christoffer Holmgård
IT University of Copenhagen, Denmark, e-mail: holmgard@itu.dk

Georgios N. Yannakakis
University of Malta, Malta e-mail: georgios.yannakakis@um.edu.mt

1 Introduction

Conflict resolution skills are fundamental to navigating daily social life, but many of us acquire them only piecemeal and indirectly, over a lifetime of social interactions with others. In this chapter, we describe our game *Village Voices* [14], an adaptive serious game designed to support children in learning about conflict resolution, in the context of conflict situations that are likely to arise in a school setting. Relying on experiential learning as an underlying learning philosophy, and based on Bodine and Crawford's six-phase model of resolving conflict [2], *Village Voices* puts players in the role of interdependent villagers who need to work through the various conflicts that arise in the game world. To gradually earn conflict guru status, players must successfully complete various personalized quests, which require cooperation between players.

Our game does not represent the first instance of a game about conflict resolution. Existing games, for example, have placed players in the role of conflict mediators seeking to find a win-win solution to conflict and of mentors teaching conflict resolution skills [10, 20]. What is novel about our game is that it creates situations for players to experience conflicts first-hand, and relies on an accurate player model that drives the adjustment and selection of quests for each player. As such, it provides a personalized learning experience for its players, providing them with quests appropriate to their conflict resolution abilities.

In developing this form of personalized experience, it is necessary to capture how players react to conflict, identify detectors of conflict through the game and, thereby, understand the dynamics of conflict. An innovation of *Village Voices* is the data-driven approach for assessing children's perception about conflict through a game. We therefore start this chapter by detailing the path towards designing the game based on theories about conflict resolution and learning (which are discussed in Section 2). We then present a game user survey held in Portugal involving 32 students playing *Village Voices* in a classroom setting. We log behavioral data of the players and we ask them to report (a) the conflict intensity of the game every time a conflict situation occurs (e.g., trading, message posting, stealing), (b) the current affective state, and (c) relationship status of two players involved in the conflict situation. In addition to the self-reported and behavioral data which are logged during the game, we ask students and teachers to fill in questionnaires prior to the game experience that provide information about their age, cultural background, and conflict resolution style. The data is analyzed for identifying detectors of conflict intensity. It shows that gender, age, in-game behaviour, cultural tendency, and conflict management style all have a direct impact on perceived conflict in our game. In addition, the occurrences of detrimental actions in the game are associated with conflict escalation and positive actions tend to result in conflict deescalation. Finally, the children's social relationships with the other players and their emotional status within the game are key indicators of their perception about conflict.

2 Related Work

This section covers the central aspects of the presented study and reviews related work on serious games for conflict which involves framing conflict and learning about conflict resolution. The section ends with an outline on computational models of conflict.

2.1 *Serious Games for Conflict*

Serious games, games that feature non-entertainment objectives alongside entertainment ones [32], are increasingly being recognised as effective and powerful tools for facilitating learning and encouraging behaviour change. In the case of conflict resolution in particular, games are a promising vehicle for learning. At a basic level, games provide us with the ability to create bounded worlds and realities [12]. Conflict falls within the class of events that is not necessarily safe or consequence-free if enacted in non-simulated environments, thus the partly bounded nature of game worlds is a useful affordance for exploring, experiencing, and practicing conflict behaviours and resolution approaches. In addition, our focus is on the practice and internalisation of skills that are highly relevant to real world behaviour, and we note that the literature on games and role-play indicates that learning achieved within gaming contexts can be transferred to real world knowledge and behaviours [19, 21, 24]. Finally, games are a ubiquitous media form of our time, and are played widely within the target population we are hoping to reach with our work, namely, young people between the ages of 9 – 12. As such, games are highly promising as an intervention mechanism.

There are a number of existing serious games that deal with topics related to conflict. The *Global Conflicts* series developed by Serious Games Interactive concern games set in different locations around the world dealing with major conflicts for the purpose of challenging players' beliefs and ideas about conflict. In *Global Conflicts: Palestine*, for example, the player takes on the role of a journalist who is collecting information for a newspaper article, and must balance trust building with information collection [22]. *FearNOT!* is another example of a serious game about conflict, but specifically focuses on bullying. In this game, the player is an invisible friend of a virtual character who is a victim of bullying, and the player's task is to interact with the friend and advise him on how to cope with bullying-related problems [1]. *Choices and Voices* is a role-playing game in which players can experiment with peer pressure management and resistance strategies, decision making in moral dilemmas, and critical assessment of advice [20]. The interactive scenarios are integrated into a narrative, where players must make a range of decisions and consider different points of view. *Quandary* is a digital card-based game that presents ethical issues and conflicts involving non-player characters for the player to reason through from a mediator perspective, requiring critical thinking, perspective taking, and decision making [10].

Several design and research opportunities becomes apparent on examination of these games. Firstly, they are all single-player games, thus not requiring players to deal with other people in exploring and resolving conflicts. A multiplayer game, in theory, can lead to richer, meaningful, emotionally-charged, and memorable game experiences and social learning, especially if the players are familiar with one another [9]. Secondly, many of them put players in an advisory or mediator role. On the one hand, this relieves players of encountering the effects of conflict directly, and invites them to approach decision-making in a more objective manner. On the other hand, it does not place players in situations in which they genuinely experience conflict. Formulating and enacting conflict resolution behaviours when there are personal stakes involved is considerably more difficult than simply being knowledgeable of possible response behaviours. Finally, these games present conflicts that have been pre-established and set during the game design phase. There is no adaptation to a particular player's sense of conflict: what one player perceives as a situation of high conflict may not be perceived as such by a different player.

2.2 *Framing conflict*

Our work concerns expressing conflicts through game experiences. As there is a wide variety of literature available about conflict, and assorted perspectives on how to manage it, we have looked to perspectives that can be relatively easily interpreted for game design structures. In keeping with Thomas's views, we understand conflict as a process that is initiated when two or more parties involved in an interaction perceive that one member shows or feels strong opposition to the interaction [28]. Notably, such an opposition can arise in relation to parties having different goals. For example, Deutsch states that "a conflict of interests occurs when the actions of one person attempting to reach his or her goals prevent, block, or interfere with the actions of another person attempting to reach his or her goals" [8]. Processes, characters, opposition, and goals all form a natural fit with game design.

Other broadly accepted characteristics of conflict have also assisted us in conceptualising and representing conflict from a game design context. At base, conflict is a social interaction between opposing sides with a specific temporal duration. Laursen and Hafen explain the typical components of conflict with language we normally associate with narrative texts: "There is a protagonist and an antagonist (conflict participants), a theme (conflict topic), a complication (initial opposition), rising action (conflict behaviours), climax or crisis (conflict resolution), and denouement (conflict outcome)" [16]. Such a conceptualisation of conflict readily maps to building blocks of game design, namely, characters, overall game objectives, obstacles that complicate achieving the objectives, game actions that supply players with means to achieve the objectives, and game outcomes.

The conflict literature reports how conflict can lead to both detrimental and beneficial consequences [8, 16, 13]. While detrimental consequences can include stress and other health problems, as well as emotional and behavioral difficulties, some

beneficial consequences can include enhanced autonomy and individualisation, and improved social, cognitive, and negotiation abilities [16]. It is these beneficial consequences that we set out to foster within the relatively controlled environment of a serious game played in a classroom context, in concert with post-play reflection.

Thomas suggests a taxonomy for conflict-handling modes specified in terms of two underlying dimensions: *cooperativeness* and *assertiveness* [28]. The former describes attempts to satisfy the concerns of others, while the latter describes attempts to satisfy one's own concerns. These dimensions can be combined to describe five modes of behaviour, which in the rest of this chapter we refer to as TKI style: *competition*, *collaboration*, *compromise*, *avoidance* and *accommodation*. The competition mode is used when one party places their interests before those of another party, and thus adhere to their own solution in solving the conflict. The collaboration mode is used when solutions that are optimal for both parties are adopted. The compromise mode is used when solutions that are acceptable for both parties are adopted. The avoidance mode is used when a party displays passive behaviour and shows no interest in conflict resolution. The accommodation mode is used when one party allows the other to control the situation. Thomas's typology suggests that in managing interpersonal conflicts, we need to consider our own goals and needs in relation to those of other parties involved, as well as how we wish to act towards other parties. We note that these conflict-handling modes also relate to conflict process and conflict outcomes.

A final point we raise with regards to our framing of conflict concerns whether conflict should be understood solely as situations in which all parties involved recognise the presence of a conflict (mutual conflicts) or whether it should also include situations in which only one party registers the presence of conflict (unilateral conflicts). Many authors define conflict in terms of an initial aggressive move from a first party, followed by an aggressive counter-move from a second party [23]. For the applied goal of developing a broadly effective intervention tool, we believe that it is also necessary to consider situations in which the aggression of both moves is not recognised by one or both parties. This can include, for example, situations in which the first party intends a move as playful but the second party interprets the move as hostile.

2.3 Learning about conflict resolution

Understanding the theoretical qualities of conflict can only go so far in terms of informing approaches on how to manage conflict resolution, or how to teach conflict management. Bodine and Crawford note that the way conflict resolution is typically approached in schools includes third party settlement of disputes, reactive responses after conflict has reached a critical point, and breaking of school rules as key focal points [2]. Additionally, our own informal studies reveal that many schools have no specific conflict education, and teachers have no guidance on how to approach conflict resolution in the classroom.

Bodine and Crawford identify the following six abilities as being critical in the constructive management of conflict. They are: *Orientation abilities*: holding appropriate values, beliefs, and attitudes (e.g. respect for others' opinions; the desire to resolve conflicts in a way that benefits both sides), *Perception abilities*: Understanding both parties' points of view on a particular conflict situation, *Emotion abilities*: Managing negative feelings such as anger, frustration, and fear, *Communication abilities*: Listening and speaking to other parties in such a way as to enable the effective exchange of facts and feelings, *Creative-thinking abilities*: Brainstorming a variety of options for resolving the conflict, and *Critical-thinking abilities*: Choosing effective, objective criteria for judging between options.

To facilitate young people in dealing with their conflicts more proactively and effectively, and based on the six aforementioned abilities, Bodine and Crawford have developed a six-phase problem-solving process. These are: *Setting the stage*: Assuring students that they will be listened to and not judged, and that all the parties are equally valued, *Gathering perspectives*: Collecting as many points of view as possible, *Identifying interests*: Using communication abilities to determine the underlying sources of conflict, and to focus on people's interests rather than positions, *Creating options*: Using creative-thinking abilities to come up with imaginative, mutual gain solutions to conflict-related problems, *Evaluating options*: Using critical-thinking abilities to apply objective criteria for determining the suitability of a conflict resolution option, and finally, *Generating agreement*: Coordinating integrated deployment between the two opposing parties, across all of the foundation abilities.

Importantly, Bodine and Crawford's process [2] puts young people in the position of resolving their own conflicts. To enable young people to build up the skills necessary to resolve conflicts, we therefore opted to design a multiplayer game for the classroom that would create conflict situations for players to experience from a first-person perspective. Such a game would provide a bounded, supervised opportunity for players to experiment with conflict behaviours and their consequences.

2.4 Computational Models of Conflict

While the literature extensively discusses variant theoretical models of conflict (some of which are mentioned earlier), it is rather sparse with regards to computational models of conflict. In our previous work [5] we proposed a computational model of conflict for serious games as a generic adaptive framework. The framework consists of five processes: *conflict creation*, *conflict detection*, *player modeling*, *conflict management*, and *conflict resolution*. Campos et al. [4] present a conflict process that focuses on conflict emergence and escalation from an emotional agent. The model accounts for an agent's decision-making process when latent conflicts (caused by interference of incompatible goals) exist. The model was implemented in the FAtiMA emotional agent architecture [3], which in turn was used as an architecture for Non-Player Characters (NPCs) appearing in the serious game *My Dream*

Theatre. In *My Dream Theatre*, the player is given the task of directing a play, which involves allocating roles to different game NPCs. Each NPC may respond to a conflict-triggering event differently, depending on its TKI style [28].

A number of attempts have been made to model the types of conflicts found in narrative. Swanson and Jhala [26] present a computational model of interpersonal and group conflict. Their model proposes *cause*, *diagnosis*, *intervention*, *expectation*, and *relationship* as contextual factors that may influence the dynamics of an ongoing conflict. Via Amazon’s Mechanical Turk, Swanson and Jhala also collected a corpus of narratives recounting real conflict experiences, for the purpose of learning about the relationships and interactions between the contexts and conflict dynamics from the data [25]. From the initial analysis of the corpus, they identified six core dimensions which can categorise the parties in a dispute: *active*, *aggressive*, *interest*, *yielder*, *solver*, and *involvement*.

Ware et al. [31] present an AI-plan based computational model of narrative that operationalizes conflict. In their Conflict Partial order Causal Link (CPOCL) model, a conflict can be understood as a series of steps that threaten or obstruct part of another plan, i.e. negate causal links that have been established for another plan. CPOCL is based on the perspective that “conflict occurs when a character forms a plan that is thwarted by another event in the story, or would have been thwarted if the event had succeeded”. Ware et al. further define seven dimensions that characterize conflict: *participants*, *reason*, *duration*, *balance*, *directness*, *stakes*, and *resolution*. The first three dimensions (i.e. participants, reason, and duration) are used to detect if conflict exists, while the remaining dimensions are used to generate stories that embed different kinds of conflicts. Their experimental studies validated the notion that the *participants*, *reason*, and *duration* metrics could detect conflict as well as the average human subject. The *balance*, *directness*, and *resolution* metrics were also found to be in agreement with what human subjects judged. On the other hand, there was disagreement between CPOCL and subjects on evaluating the degree of *stake*. The nature of conflict in [31] differs from our work in that their understanding of conflict concerns a narrative phenomenon which can potentially involve multiple participants and a structured story, while the conflict dealt with in this particular study refers to emotion experienced by an individual participant.

While the aforementioned studies take a theoretical stance on conflict modeling or approach conflict indirectly, in this paper we introduce a data-driven approach to conflict model construction which allows subjects to *experience* conflict and report it. For that purpose we collected data from children playing the *Village Voices* game, asking them to fill-in demographics and conflict style questionnaires and recording their behavioral patterns in the game. We further asked them to report the conflict intensity of each game quest during play. We then used linear mappings to approximate the underlying function between in-game behaviour, user profile (e.g. conflict style) and conflict intensity.



Fig. 1 A screen shot from *Village Voices* where the player of the Blacksmith role is given the quest to gather three metals.

3 Game Design

Village Voices is a four-player open world game that takes place in a fictional village set in pre-industrialisation times. It is designed to be played in a classroom setting by players who know one another, under teacher supervision. On the surface, the game is about survival and prosperity in the village. On closer inspection, however, the game is about friendship and reputation management in the village, and mastery of conflict resolution.

Each game world contains four player-controlled character roles: the blacksmith, the innkeeper, the alchemist, and the carpenter (see Figure 1). When the game begins, each player is assigned a particular character to play. This character role is retained for the entire duration of the player's experience with *Village Voices*. As part of daily life in the village, players are required to undertake various actions related to maintenance of their characters' livelihoods, and to complete quests related to their responsibilities within the village. For example, the alchemist must tend to his crop of magic mushrooms, keep an eye on his own health, and may be in the process of collecting and processing items to build a wall to keep wolves out of the village. At the same time, all of the characters are interdependent, thus situations inevitably arise that trigger conflicts or exacerbate existing ones. For example, in order to complete the barrier wall, the alchemist may need to obtain an item from the innkeeper, who he is not on good terms with due to a previous theft incident involving the innkeeper helping herself to the alchemist's mushrooms. While players may initially be faced with simple quests involving no trades or only one trade



Fig. 2 The trading interface in Village Voices

with other characters (trading interface shown in Figure 2), more difficult quests involve trades with all three of the other characters (see Table 1). Given that players have the ability to perform actions that can lead to conflict – including theft, property damage, spreading rumours, and not sharing collective resources such as food, completing multi-player quests rapidly becomes a difficult proposition in the absence of negotiation.

Many digital learning games adopt an explicitly didactic approach to conveying domain knowledge. But how one resolves conflict in a constructive manner is contextually-defined; it makes little sense to teach “correct responses”. In addition, an individual’s life experiences will play into their interpretations of acceptable or desirable modes of conduct. What becomes important, then, is to explore possible responses and what they may entail in specific situations and social contexts, and to make sense of them on one’s own terms. As such, in terms of pedagogical approaches, *Village Voices* draws from social constructivism and experiential learning theory [15]. Instead of explicitly instructing players how to resolve particular conflicts, the game creates situations in which players are pushed into conflicts with one another. Players therefore experience conflict from a first-person perspective, and must use the affordances of the game to enact conflict management strategies.

Crucial for learning experiences of this kind is access to learning facilitation. While any individual play session is designed to last around 15 minutes in itself, it is followed by a 10 – 15 minute reflective debrief featuring the other players and a learning instructor, thus a complete game experience takes around 30 minutes.

During the debrief, players are able to address the issues raised during the play session, relate game experiences back to life experiences, reason through and advise one another on alternative resolution strategies, and collectively negotiate rules to guide future play sessions. Game sessions are intended to take place once or twice a week, over a time period spanning approximately six weeks. It is important that the game is played over a number of weeks, as opposed to in a block of back-to-back sessions, as this gives players the opportunity to reflect on how their play behaviours evolve over time. Furthermore, it enables players to identify parallels between conflict episodes experienced in daily life, and the problem solving strategies employed in-game.

In terms of underlying conflict resolution philosophy, *Village Voices* draws on Bodine and Crawford's previously discussed six-phase model of resolving conflict [2]. It creates situations in which players develop their *perceptual skills*, that is, they learn to see an issue from different perspectives, as the game triggers conflicts of different types and intensities based on player relationships and conflict experiences within the game, and requires players to present conflict solutions for one another. The game encourages awareness of *emotional skills*, namely, recognising the distortion role that strong emotions play during conflict, as it requires players to regularly update their feelings towards other characters. The game makes player develop their *communication skills*, by requiring them to express their perspectives, feelings, and strategies for conflict to other players and also to the learning facilitator. The game invites practice of *creative-thinking skills*, as there are no "correct" ways to resolve specific conflicts triggered within the game world, and players must piece together their own potential conflict resolution strategies given the resources and networks they have within the game. Finally, the game invites players to hone their *critical thinking skills*, in judging between options. Conflicts are only deemed constructively resolved once both parties feel sufficiently at ease with the conflict outcome, thus an appropriate conflict resolution approach is very much contingent on context, requiring application of critical thinking.

As *Village Voices* is premised around creating conflict situations, it is therefore centrally important that individual players indeed perceive game situations as actual conflicts, as without this they would lack meaningful grounds to draw on during the debrief phase. But perception of conflict can vary radically from one individual to another. Part of the design challenge therefore became to ensure that each player experienced conflict, in spite of their different conflict perception thresholds. The literature on conflict proposes that it typically takes the form illustrated in Figure 3.

Village Voices attempts to create this experience curve for each individual player, by selecting quests that appropriately escalate or de-escalate the conflict they are currently experiencing. An example of quests that are given sequentially to the character *innkeeper* is shown in Table 1. The quests were designed so that a player's perception of conflict rises as the quests advance. We hypothesized that the degree of intensity of conflict that players feel escalates as the number of trading partners increases, and the number of resources required grows. As such, in *Quest 1*, the simplest quest, the player is asked to collect her own resources only. In *Quest 2*, the player is required to obtain items from one other player, while in *Quest 4*

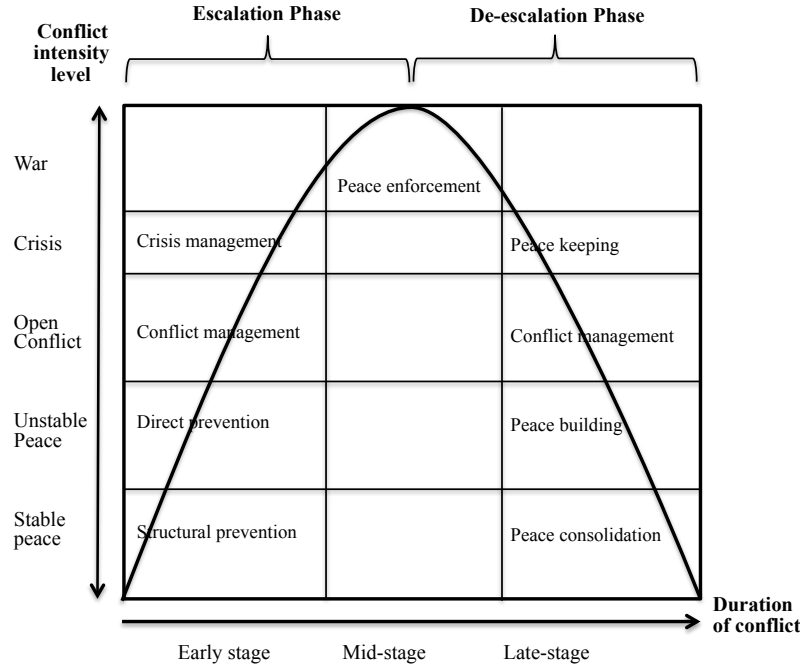


Fig. 3 A conflict cycle proposed by Swanstrom and Weissmann (reproduced from [27]).

the player must obtain items from all three of the other players. Put differently, we expected that players would be more likely to experience greater conflict when pursuing *Quest 4* than when pursuing *Quest 2*.

To test our assumptions regarding quest design and in order to model the conflict escalation and deescalation process, we collect the following three metrics from players: experienced conflict intensity, emotional state, and current feelings towards other players following major game events (e.g. completion of quests, trading success and failure, stealing, message posting, and spreading rumours).

Although the game can continue indefinitely, the game has a number of badges that players can collect. These badges both serve the purpose of introducing to players to the possibilities of the game world, while also articulating play goals for them to work towards, some of which concern game progress, others of which concern conflict learning progress. Examples of badges include “Rude surprise”, which is earned by a player when another player leaves a bad comment about her, “Change of heart”, which is earned when a player registers a significant change of feelings about another player, “There’s No “I” in Team”, which is earned after successfully completing a trade with three players during a single quest, and “Wise Words to Live By”, for giving helpful advice to other players during the reflective debrief conversation.

Table 1 Quest Structure and Narrative Texts for Inkeeper

Quest Number	Title	Description
Q1	FARMING	You are an Innkeeper. And Innkeepers can gather Grain. Try to gather 3 Grain. Find a cornfield and click on it. The Grain will then appear in your pack. Gather 3 grain.
Q2	THE SCARECROW	Oh no! There are birds all over the cornfields. And they eat the grain. They MUST be stopped. You should build a scarecrow to keep them away. Get 3 metal (trade with Blacksmith). Make 1 food (gather 5 grain and click on the oven).
Q3	BIGGEST BREAD - EVER	The mayor of the village has asked you to make the BIGGEST bread EVER. This is a big challenge, but if you get some grain and a magical potion, maybe you will be able to do it? Gather 4 grain. Get 1 potion (trade with Alchemist).
Q4	SPIRITS OF THE CLOUD	The spirits of the cloud need to be paid. They keep the sky clear so the sun can shine and make the grain grow. If they stop it will turn dark and the grain will stop growing. Gather this for the spirits: 2 metal (trade with Blacksmith), 2 mushrooms (trade with Alchemist), 5 wood (trade with Carpenter), and 2 foods.
Q5	THE PRESENT	One of your friends has a birthday and you want to make a very special present. A kite you can sit on while it is flying! Great magic is needed for this, so get 1 potion (trade with Alchemist), 1 tool (trade with Blacksmith), 1 furniture (trade with Carpenter), and 1 food.

4 Experimental Protocol and Data Collection

In order to test the game’s ability to induce the escalation and deescalation of conflict, as well as reflective learning of conflict resolution strategies, we conducted a game user study. The user study also served the purpose of collecting data for training the computational user models enabling the game’s scenario adaptation.

The study was run at a Portuguese school with 32 (20 male) children between the ages of 10 – 12 who played 21 game sessions in total. The maximum duration of each play session was 15 minutes. All sessions consisted of groups of four players who were classmates. All groups consisted of children of the same gender. Choosing classmates with prior relations meant that the actions and evaluations in the game plausibly would be influenced by these relations. However, since this would be the natural use case for the game in a school setting, we consider this advantageous, rather than detrimental, to the user study.

Every participant played multiple game sessions (2 – 4). In total, we collected 2126 reports about conflict intensity, emotions, and judgment about the other players across the 21 game sessions. In order to establish a baseline for assessing the short term impact of interacting with the game, the students were asked to report

Table 2 Categories and types of data collected during the game (online) and just before (offline).

	Category	Data type
OFFLINE	Demographic data	age, gender, years in Portugal
	Cultural tendency	individualist index, collectivist index
	Aggression tendency	victimization index, aggression index
	TKI conflict resolution style	accommodation, competition, compromise, collaboration, avoidance
ONLINE	In-game actions	trading accept and reject
		rumor and positive message posting
		stealing
	Self-reported	conflict intensity (11-point Likert scale) affective state (angry, sad, happy, neutral) social relationship with others (5-point Likert scale)

their emotions and judgments about the other players at the very start of the session. These ratings were updated whenever key events occurred in the game environment. Events included rumoring, message posting, trading, and stealing actions. The conflict intensity in the beginning of the game was assumed to be 0 as no in-game actions have happened yet. Subsequently, the conflict intensity was updated whenever any student reported his or her own rating about conflict, on the completion of a quest, and at the end of the game.

Additional data gathered from the participants included their demographic background data, a psychological profile, self-reported conflict resolution strategies, and behavioral data from the game session. The demographic data consisted of information about participant age, gender, and whether they had been residents of Portugal for a minimum of 5 years. This information was collected from the participants' school teachers.

Profile information consisted of a number of psychometric measures obtained from the following questionnaires (see Table 2): The Aggression/Victimization Scale [7, 18], an adapted version of the Thomas-Kilman Conflict Mode Instrument [29] modified to facilitate comprehension by children, and a questionnaire assessing individualist/collectivist orientation [30]. The children completed the questionnaires before interacting with the game (offline).

Children's self-reports were collected through the in-game interface during gameplay (see online data types in Table 2 and the reporting schemes/interfaces in Figure 4). The reports include ratings (0 – 10) of experienced levels of conflict, ratings of conflict with other individual players (a variant of a 5-point self-assessment manikin), as well as indications of the player's immediate emotion (four affective states to pick from: angry, sad, neutral, happy). In-game behavioral data was logged automatically including all core game actions (i.e. trading, spreading rumours, message posting, and stealing).

Finally, sessions were video recorded in order to ensure supporting qualitative material for the subsequent interpretation of the game data, as necessary.

For the user study, the following protocol was followed: Background data was collected several days before the actual user study, in order to allow the children



Fig. 4 Three interfaces to collect data on the player's affective state. The topmost interface requires the player to specify the level of conflict intensity s/he currently feels on a 0-10 Likert scale. The middle interface requires the player to select one of four available affective states (angry, sad, neutral, happy) to describe his/her current emotional state. The interface at the bottom asks the player to report his/her current relationship with a particular player on a 5-point self-assessment manikin represented by emoticons (i.e. highly positive, somewhat positive, neutral, somewhat negative, highly negative).

to focus on the game during the gameplay sessions. The questionnaires were administered in the classroom with a regular teacher of the children's, assisted by an experimenter.

On the day of the user study, once the children entered the classroom, a common presentation of the purpose of the study and an introduction to the game was given in Portuguese. Two experimenters played through a shortened session of the game, demonstrating the interface and the object of the game, completing quests. All features of interaction were demonstrated in order to ensure the children knew all forms of interaction with and through the game. This included demonstrating quest management, resource collection, trading, and stealing. Children were allowed and encouraged to ask questions during this demonstration session.

Following the introduction, the children were divided into groups by the experimenters with the help of their regular teacher. Each session was conducted in a round table arrangement with the children seated facing each other in order to facilitate easy communication during gameplay. For the same reason, the game was played on laptop computers allowing the children to simultaneously perceive each other as well as the game. To ensure minimum technical complications, the experimenters facilitated the start of game for all groups. In the case of technological failure for one player, an experimenter would restart the session if the game had recently begun, but would allow the session to finish if the game was almost over, before including the child again. The decision of whether to restart or let the session play out was made on a case by case basis in order to ensure that all children felt included throughout the study. During sessions, the experimenters interacted with the children to handle questions about the game's interface, functionality, and rules, but otherwise attempted to have minimal influence on in-game proceedings, avoiding giving the children any advice on which actions to take during gameplay. In the case that children asked experimenters to intervene or arbitrate in any conflict, the experimenters would communicate that it was the childrens' decision to make. Apart from fulfilling this observational and supportive role, experimenters were instructed to only intervene in the actual gameplay and mediate in the case that a conflict escalated to an unacceptable level, for ethical reasons. This did not prove necessary during the user study. At the end of the session, all children were collectively thanked for their participation.

5 Conflict Rating Analysis

This section outlines the key findings of our analysis of the data. In particular, we begin by describing our data processing process. Next, we present the result of analysing the conflict ratings with respect to gameplay time and quest played (section 5.2), and age and gender (section 5.3). We then proceed to examining the relationship between conflict ratings and the TKI style of children (section 5.4) and the impact of children's cultural tendencies on their conflict ratings (section 5.5),

and we conclude by investigating the effects of in-game actions to conflict ratings (section 5.6).

5.1 Data Preprocessing

As mentioned in the previous section, the students' profiles/TKI styles and reports were separately collected. Since we were investigating the relationships between conflict ratings and the student's demographic data, each report was annotated with the reporting student's age, gender, TKI style, and cultural tendency. The TKI conflict resolution strategies and collectivist/individualist orientation values were computed from the student's responses to the questionnaire distributed before gameplay.

Due to a technical error in the logging system, the timestamps in the logs collected during the first two days of the experiment were not available. As a result, of the 2126 reports collected, 1523 reports lacked timestamp information, while only the reports collected only the last day contained timestamps. As such, the number of reports with timestamp information was reduced to 603. Worth noting is that these 603 reports all came from male students, which accounts for 50.9% of the male population involved in our dataset.

5.2 Gameplay Time and Quest Played

Figure 5 shows the mean values of the 603 ratings (i.e., the reports containing time information when the rating was recorded) including a 95% of error bar for each minute of gameplay. The conflict levels that are reported during, for example, the first minute of gameplay are averaged and shown at the 0 minute on the x axis.

Next, we examined whether there is a relationship between the conflict ratings and the quests given to the students. Figure 6 shows the average of conflict ratings submitted by students per quest, across all of the 2126 reports, as timestamps are not necessary in this analysis. As the graph shows, students reported higher conflict levels as the quest number increased with exception of *Quest 2* which produced the highest conflict level.

Analysis & Discussion: Averaging the conflict ratings across the minutes of gameplay generates a graph which consists of 3 bell-shaped curves. Although individual variances exist, the width of a bell curve generally corresponds to the duration of a single quest. This finding is consistent with the principles of Swanson and Weissmann [27], suggesting that a conflict experience is expected to reveal a bell shape in terms of conflict intensity (see Figure 3). Furthermore, an analysis on the relationship between the reported conflict ratings and quests reveals that children felt greater conflict as they received more difficult missions. Increased conflict intensity in children is in agreement with the principle of our quest design; that is, higher conflict is induced as the quests advance. It is notable that conflict intensity

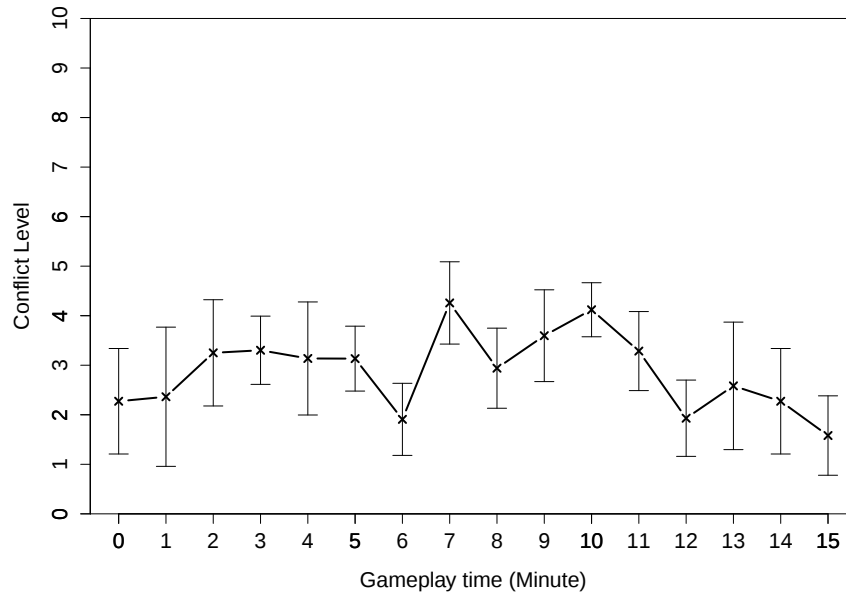


Fig. 5 The means of conflict ratings by minute with 95% standard error bars (number of reports = 603). The x axis denotes the time of gameplay by minute and the y axis denotes the average of conflict ratings which are measured on a scale from 0 – 10.

peaks at *Quest 2*, even though *Quest 2* should have theoretically been one of the easier quests amongst the five quests. Given that *Quest 2* is the first quest to introduce trading between two players (see the quest description in Table 1), we hypothesise that the high level of conflict was perceived as a result of the introduction of trading, rather than the inherent difficulty of *Quest 2*.

5.3 Student Profile (Age and Gender)

A correlation analysis was carried out to test if the student's profile (i.e. age and gender) had an impact on her evaluation about a conflict situation. While all the reports contained valid gender information (number of reports = 2126), some reports lacked age information. For the analysis of the relationship between age and conflict ratings, these reports were eliminated, which resulted in 2043 valid reports in total.

The analysis shows a statistically significant difference between genders as determined by one-way ANOVA ($F(1,2124) = 229.46$, $p = 0.00$) (see Table 3). On average, female students were shown to report higher conflict ratings than male students (see Table 4). Moreover, we observe a significant difference between age

groups as determined by one-way ANOVA ($F(2,2040) = 115.01, p = 0.00$) (see Table 5). A post-hoc Tukey test showed that the conflict ratings reported by 11 year old students were significantly lower than those reported by students in the other two age groups at $p = .000$, as can be seen from Table 6.

Analysis & Discussion: Gender has been found to be a crucial factor affecting perception and experience of conflict. In particular, girls reported significantly higher conflict ratings than did boys. Statical analysis also revealed that children of 11 years reported significantly lower ratings than children from the other two groups (10 years and 12 years old). However, no clear pattern was found to explain the relationship between perception of conflict and age.

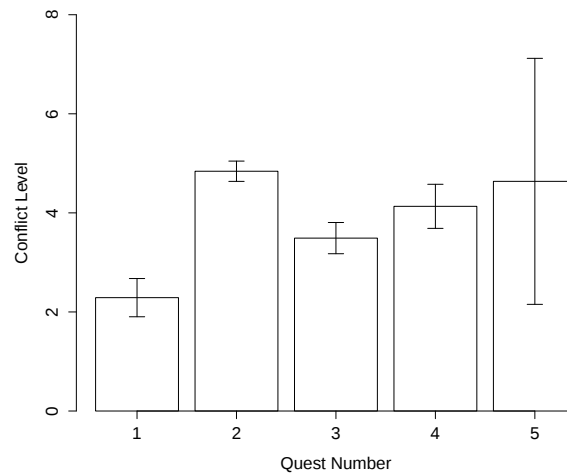


Fig. 6 Average conflict rating values over time (95% standard error bars are included) from all the students (number of reports = 2126). The X axis denotes the quest number and the Y axis denotes the average reported conflict rating across subjects.

Table 3 One-way ANOVA analysis on the conflict ratings by student's gender.

Source	Df	SS	MS	F	Sig.
Gender	1	2734.33	2734.33	229.46	0.0000
Residuals	2124	25310.20	11.92		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Table 4 The mean value and standard deviation of conflict ratings reported by each gender group

Gender	N	Mean	SD
Female	941	5.50	3.77
Male	1185	3.22	3.18
Total	2126	4.23	3.63

Table 5 One-way ANOVA analysis on the conflict ratings by student's age.

Source	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>
Age	2	2649.46	1324.73	115.01	0.0000
Residuals	2040	23496.85	11.52		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

Table 6 The mean value and standard deviation of conflict ratings for each age group.

Age	N	Mean	SD
10	801	5.28	3.55
11	967	2.89	3.53
12	275	4.76	2.22
Total	2043	4.08	3.58

5.4 TKI style

We investigated whether the student's TKI style was related to their perception of conflict (reported via conflict ratings). We consider that the TKI category that has the maximum value is being the dominant one. We eliminated data instances in which more than one TKI style is dominant for each student resulting in 1049 data samples. For example, we would disregard a data sample if the accommodation and the collaboration indexes for a student are the highest among the five and both equal to e.g. 10.

As shown in Table 7, the majority of the TKI styles found in the conflict ratings fell under the the accommodation style (70.2% of the total report with a single dominant TKI style). The number of subjects in the competition and the compromise groups were marginal; and avoidance did not appear as a dominant style. Applying one-way ANOVA on the groups we find significant differences in conflict ratings among TKI style groups ($F(3,1045) = 10.7$, $p = 0.000$) (see Table 8). Since the conflict ratings do not necessarily follow a normal distribution, we ran the Kruskal-Wallis test which also showed that TKI style has a significant impact on the conflict ratings ($H(3) = 40.0453$, $p\text{-value} = 1.042e-08$). Moreover, a post-hoc Tukey test showed that the conflict ratings reported by the students in the accommodation group differed from those reported by the students in the competition group and those in the collaboration group significantly at $p < .01$.

The conflict ratings reported by the students in the compromise group were not significantly different from the other three groups, although some differences are shown (see Figure 7).

Analysis & Discussion: The statistical analysis presented here shows that a student's self-evaluation of her conflict management style has an impact on her conflict ratings. It appears that the TKI style is linked to the student's judgment about a conflict situation in terms of intensity. The students in the accommodation and compromise groups tended to give higher ratings; and the students in the competition group tended to give lower ratings. However, it is noted that there might be

a discrepancy between the self-reported TKI style and the student's real TKI style, since the majority of the students' responses to TKI questionnaire were evaluated as either accommodative or collaborative categories (91.3% of all the valid reports).

5.5 Cultural Tendency

We also examined whether the student's collectivism/individualism orientation was related to their perception of conflict (reported via conflict ratings). We considered the orientation with a higher value as being the dominant one. This resulted in us eliminating the ratings associated with students for whom collectivist and individ-

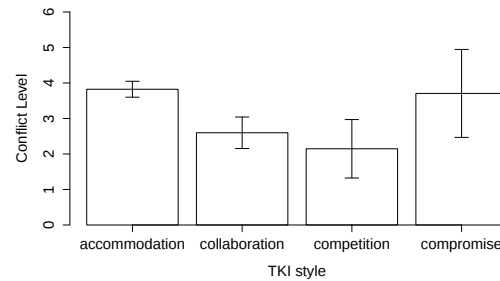


Fig. 7 The means of conflict ratings by the student's dominant TKI style (number of reports = 1049).

Table 7 Means and SD of Conflict Ratings for TKI conflict style (Avoidant style is omitted because it did not appear as a dominant style).

TKI style	N (percentage)	Mean	SD
accommodation	736 (70.2%)	3.82	3.1
collaboration	221 (21.1%)	2.60	3.37
competition	41 (3.9%)	2.15	2.69
compromise	51 (4.9%)	3.71	4.51
Total	1049	3.49	3.27

Table 8 The result of One-way ANOVA analysis on the conflict ratings by TKI style.

Source	Df	SS	MS	F	Sig.
Between	3	334	111.43	10.7	0.0000***
Within	1045	10881.91	10.41		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.'

ualist index values were equal. This resulted in 1461 reports being available for analysis.

Table 9 reveals that the majority of the students were oriented towards the individualism orientation, and made up 87.2% of the total reports available. As shown in Figure 8, there is a clear difference in conflict ratings between the two groups, with students in the individualism group tending to give higher ratings than those in the collectivism group. The two groups' average reports are significantly different ($t = 11.94$, $df = 298.974$, $p = 0.000$).

Analysis & Discussion: The statistical analysis indicates that a student's self-evaluation of her collectivist/individualist orientation has a significant impact on her conflict ratings. The students in the individualist group appeared to rate conflict situations significantly higher than the students in the collectivist group. It also appears that the students who were individualist tended to be more sensitive to conflict situations, therefore giving them higher ratings.

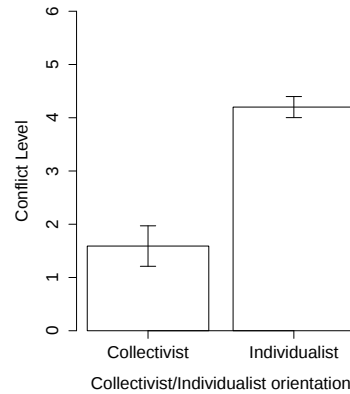


Fig. 8 The means of conflict ratings by the student's dominant Collectivism/Individualism orientation (number of reports = 1461).

Table 9 Means and SD of Conflict Ratings for Collectivist and Individualist style.

Orientation	N (percentage)	Mean	SD
collectivist	188 (12.87%)	1.59	2.66
individualist	1273 (87.13%)	4.20	3.60
Total	1461	3.86	3.60

Table 10 Game Features where t denotes the time that the log is recorded

Feature Type	Symbol	Description
Reported Features	C	Conflict rating reported by the player at t
	S	The sum of all the player's reports about social relationships with the other players (where higher number denotes disliking)
	E_H	The number of players who report being happy at t
	E_S	The number of players who report being sad at t
	E_N	The number of players who report being neutral at t
	E_A	The number of players who report being angry at t
In-game Actions	G_D	The number of trade rejections featuring the player up to t
	G_R	The number of incidents concerning spreading or receiving rumors featuring the player up to t
	G_M	The number of positive messages posted or received featuring the player up to t
	G_S	The number of thefts (stealing or being stolen from) featuring the player up to t
	G_T	The number of successful trades featuring the player up to t

5.6 In-game actions

We examined potential effects between reported conflict ratings and in-game behaviour, reported emotions, and social networks updates. Table 10 presents the features recorded and extracted for investigation in our study.

While C represents a single student's report only, the social judgment about the other players (S) and emotion factors (E_H , E_S , E_N , and E_A) represent collective states at the moment. S is the sum of all the player's social judgments about the others participating in the game. Therefore, the range of S is between 0 (when all the players reports are highly positive) and 16 (when all the players reports are highly negative). The emotion factors define the number of the players who reported being in the particular emotion. For instance, if three players report that they are happy and the fourth one reports that she is angry, E_H is 3 and E_A is 1 and the rest emotion factors (E_N , E_S) are 0.

In addition to the features shown in the table, two complementary factors were computed from the recorded in-game actions and used in the analysis: the detrimental factor (D) and the beneficial factor (B). The detrimental factor is the summation of the counts of the harmful actions that the player was involved in either as the giver or receiver (Equation 1). The harmful actions in this study include rejecting a trade, spreading a rumour, and theft.

$$D = G_D + G_R + G_S \quad (1)$$

The beneficial factor (B) is the sum of the counts of the positive actions that the student was involved in, such as posting a positive message, accepting a trade, or being involved in altruistic gifting, either as giver or receiver (Equation 2).

Table 11 The result of Pearson’s r analysis between reported conflict intensity, children’s reported features and in-game actions (number of reports: 2126).

S	D	B	E_A	E_H	E_N	E_S
Social	Detrimental	Beneficial	Angry	Happy	Neutral	Sad
0.44***	0.23***	-0.15***	0.15***	0.08***	-0.10***	0.02

Significance notation: 0 ‘***’

$$B = G_M + G_T \quad (2)$$

The correlation analysis between conflict ratings, in-game actions, and other reported features reveals some noteworthy effects. As is evident from Table 11, in-game harmful actions (D) beneficial actions (B) were, respectively, positively and negatively correlated to conflict ratings. Self-reported anger (E_A) and happiness (E_H) were positively correlated whereas neutral feelings (E_N) were negatively correlated with conflict ratings. In particular, the positive association between happiness and conflict escalation is noteworthy. Since the emotion factor is the summation of all the players’ reports, we speculate that the happy emotion reported during conflict escalation may represent the view of the player who is the giver of the action rather than the view of the action’s receiver. Imagine that a high degree of conflict arises as a result of a theft. While the victim of the theft may report an angry affective state (i.e., $E_A = 1$), the other student (i.e., the thief) may report happiness (i.e., $E_H = 1$). In this case, the conflict escalation is associated with both of the angry and happy emotions. The children’s judgments (S) about other players in the game were also found to be significantly (and positively) correlated with conflict ratings. There was no significant relationship between the self-reported emotion of being sad and conflict ratings.

Analysis & Discussion: Strong correlations between conflict ratings and in-game actions and self-reported responses were found. Not surprisingly, negative in-game actions tended to escalate conflict and positive in-game actions tended to de-escalate conflict. The student’s own judgment about the other three players and self-reported emotions were found to be direct indicators of conflict; negative judgments about other players were correlated with conflict escalation. Likewise, the angry affective state was also positively correlated with conflict escalation. Surprisingly the happy affective state was also found to be positively correlated with conflict escalation. This might have been linked to the student’s role as a giver or receiver of the detrimental action.

6 Discussion and Conclusions

In this paper, we present a multiplayer serious game *Village Voices*, which was designed to support children between the ages of 9 – 12 in learning about conflict resolution. *Village Voices* is informed by Bodine and Crawford’s conflict resolution problem-solving process [2], and thus focuses on equipping young people with skills to address conflicts proactively and without the need for mediators, and to be reflective about conflict experiences. As our intention in *Village Voices* was to create situations of conflict for each player even though players would potentially have different perceptions of conflict from each other regarding the same game event, we set out to model conflict intensity in players during play. As such, we introduced a method for capturing conflict and conflict dynamics within a group of players via the use of serious games.

We then used the game and its available conflict quests to collect data from 32 children in Portugal each playing a number of quests in a 4-player setup in a school setting. The data consisted of demographic information, conflict resolution strategy profile information, cultural tendency, in-game behavioral data, self-reports on conflict and affect during the game. A number of features were extracted from the data and analysed in this paper. We revealed effects between conflict management style, gender, cultural tendency, and conflict intensity reports. In particular, significant effects were found among different TKI conflict resolution styles, collectivist/individualist orientation, and gender. The students in the accommodation and compromise groups gave higher ratings than the students in the competition group. Girls tend to report higher conflict ratings than boys. The students who are oriented towards individualist also tend to give higher conflict ratings while the students oriented towards collectivist tend to give lower ratings. Finally, strong correlations were found between in-game actions and conflict ratings; in particular, the self-reported emotions and social relationships indicated the degree of conflict that the students felt.

The study presented in this article is constrained by a number of limitations. First, the curved pattern of conflict experience reflects only the responses collected from the male students. A subsequent study is required to test whether a similar pattern can be clearly found from girls’ reports. Second, a student’s TKI style was judged by his own responses to a TKI questionnaire and not by an expert’s (e.g. teacher’s responses), thus, our findings on TKI style and conflict ratings might be undermined by this limitation. Third, the duration of each game session was limited to 15 minutes, which can sometimes be too short for meaningful conflicts to occur, or for conflicts to occur between players with particular conflict management styles. We therefore plan longer game sessions as an immediate future study to examine the impact of gameplay time in reported conflict. Finally, while self-reports in rating format offer a potentially useful psychometrics tool for children of our age group the study presented here treats ratings as values for a regression problem. We argue that doing so only provides an initial (and limited) perspective on the conflict phenomenon as ratings should be naturally treated as ordinal values. Several studies have already showed the clear benefits of rank-based questionnaires

over rating-based questionnaires [33, 17] which suggest the transformation of ratings into ordinal scales and the further processing of them via rank-based statistics or non-linear preference learning models.

Obtained results show that the game can successfully elicit conflict situations and that reported conflict ratings appear to follow a conflict escalation and conflict deescalation phase. While this is already an indication for the game's capacity in teaching conflict resolution, extensive studies across different countries within school settings will be required to further validate the ability of the game to transfer these skills to the real (non-digital) world. Such studies are currently running and preliminary results already suggest that both the game and its personalization mechanisms (user modeling and scenario adaptation) [11, 6] offer an alternative, yet very powerful, approach to social skill learning.

Acknowledgements This research was partially supported by the FP7 ICT project SIREN (project no: 258453). The authors would like to thank Joanna Campos and Carlos Martinho at INESC-ID for organizing the user study in Portugal. We also thank all the students who participated in this study.

References

- [1] Aylett R, Vala M, Sequeira P, Paiva A (2007) Fearnot! - an emergent narrative approach to virtual dramas for anti-bullying education. In: International Conference on Virtual Storytelling, Saint Malo, France
- [2] Bodine R, Crawford D (1998) The Handbook of Conflict Resolution Education: A Guide to Building Quality Programs in Schools. Jossey-Bass Inc. Publishers
- [3] Campos H, Campos J, Martinho C, Paiva A (2012) Virtual agents in conflict. In: Nakano Y, Neff M, Paiva A, Walker M (eds) Intelligent Virtual Agents, Lecture Notes in Computer Science, vol 7502, Springer Berlin Heidelberg, pp 105–111
- [4] Campos J, Martinho C, Paiva A (2013) Conflict inside out: A theoretical approach to conflict from an agent point of view. In: Proceedings of the 2013 International Conference on Autonomous Agents and Multi-agent Systems, International Foundation for Autonomous Agents and Multiagent Systems, Richland, SC, AAMAS '13, pp 761–768
- [5] Cheong YG, Khaled R, Grappiolo C, Campos J, Martinho C, Ingram GPD, Paiva A, Yannakakis G (2011) A computational approach towards conflict resolution for serious games. In: Proceedings of the 6th International Conference on Foundations of Digital Games, ACM, New York, NY, USA, FDG '11, pp 15–22
- [6] Cheong YG, Grappiolo C, Holmgrid C, Berger F, Khaled R, Yannakakis GN (2013) Towards validating game scenarios for teaching conflict resolution. In:

- Games for Learning workshop at FDG (Foundations of Digital Games), Chania, Crete, Greece
- [7] Dahlberg LL, for Injury Prevention NC, (US) C, for Disease Control C, (US) P (2005) Measuring violence-related attitudes, behaviors, and influences among youths [electronic resource] : a compendium of assessment tools / compiled and edited by Linda L. Dahlberg ... [et al.], 2nd edn. Division of Violence Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention Atlanta, Ga
 - [8] Deutsch M (2006) Introduction. In: Deutsch M, Coleman PT, Marcus EC (eds) The handbook of conflict resolution: theory and practice, 2nd edn, Jossey-Bass, San Francisco, CA, pp 1–22
 - [9] Egenfeldt-Nielsen S (2007) Third generation educational use of computer games. *Journal of Educational Multimedia and Hypermedia* 16(3):263–281
 - [10] FableVision (2012) Quandary. <http://www.quandarygame.org/>
 - [11] Grappiolo C, Cheong YG, Togelius J, Khaled R, Yannakakis GN (2011) Towards player adaptivity in a serious game for conflict resolution. In: VS - Games 2011 Natural Interaction and Player Satisfaction in Games Workshop, Athens, Greece
 - [12] Huizinga J (1955) *Homo Ludens: A Study of the Play-Element In Culture*. Beacon Press, Boston, MA
 - [13] Johnson DW, Johnson RT (1996) Conflict resolution and peer mediation programs in elementary and secondary schools: A review of the research. *Review of Educational Research* 66(4):459–506
 - [14] Khaled R, Yannakakis GN (2013) Village voices: An adaptive game for conflict resolution. In: *Proceedings of the 8th International Conference on Foundations of Digital Games*, pp 425–426
 - [15] Kolb D (1984) *Experiential learning: experience as the source of learning and development*. Prentice-Hall
 - [16] Laursen B, Hafen CA (2010) Future directions in the study of close relationships: Conflict is bad (except when it's not). *Social Development* 19:858–872
 - [17] Metallinou A, Narayanan S (2013) Annotation and Processing of Continuous Emotional Attributes: Challenges and Opportunities. In: *Workshop on Emotion Representation, Analysis and Synthesis in Continuous Time and Space (EmoSPACE)*
 - [18] Orpinas P, Frankowski R (2001) The aggression scale: a self report measure of aggressive behavior for young adolescents. In: *Journal of Early Adolescence*, vol 21, pp 51–68
 - [19] Pedersen P (1995) Simulations: A safe place to take risks in discussing cultural differences. *Simulation and Gaming* 26(2):201–206
 - [20] PlayGen (2010) Choices and voices. <http://playgen.com/choices-and-voices/>
 - [21] Raybourn EM (1997) Computer game design: New directions for intercultural simulation game designers. *Developments in Business Simulation and Experiential Exercises* 24
 - [22] Serious Games Interactive (2007) *Global conflicts: Palestine*
 - [23] Shantz CU (1987) Conflicts between children. *Child Development* 58:283–305

- [24] Simkins DW, Steinkuehler C (2008) Critical Ethical Reasoning and Role-Play. *Games and Culture* 3(3-4):333–355
- [25] Swanson R, Jhala A (2012) A crowd-sourced collection of narratives for studying conflict. In: *Proceedings of the 2nd Computational Models of Narrative Workshop at LREC*
- [26] Swanson R, Jhala A (2012) Rich computational model of conflict for virtual characters. In: *Proceedings of the 12th international conference on Intelligent Virtual Agents, Springer-Verlag, Berlin, Heidelberg, IVA'12*, pp 502–504
- [27] Swannstrom N, Weissmann M (2005) Conflict, Conflict Prevention and Conflict Management and Beyond: A Conceptual Exploration. *POLICY PAPER*
- [28] Thomas KW (1992) Conflict and conflict management: Reflections and update. *Journal of Organizational Behavior* 13(3):265–274
- [29] Thomas KW, Kilmann RH (1974) Thomas-kilmann conflict mode instrument
- [30] Triandis HC (1995) *Individualism & collectivism*. Boulder, CO: Westview Press
- [31] Ware S, Young R, Harrison B, Roberts D (2013) A computational model of plan-based narrative conflict at the fabula level. In: *IEEE Transactions on Computational Intelligence and AI in Games*
- [32] Winn B (2008) The design, play, and experience framework. In: *Handbook of Research on Effective Electronic Gaming in Education*, IGI Global Publication, Hershey, Philadelphia, pp 1010 – 1024
- [33] Yannakakis GN, Hallam J (2011) Rating vs. preference: A comparative study of self-reporting. In: *Affective Computing and Intelligent Interaction*, Springer, vol 6974, pp 437–446