Increasing Children's Social Competence Through Games, an Exploratory Study

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ABSTRACT
We describe the design and evaluation of Playground Architect, a multi-player game designed to help shy children gain social confidence. The game is played by a small group of children around an interactive tabletop surface using a tangible user interface. The game was evaluated with 32 children (mean age 9.5). All players enjoyed the game. Shy children enjoyed being in charge and were quite talkative during play. Interviews with teachers show that some shy children behaved notably more outgoing. These results illustrate the potential of socially educational games.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *evaluation/methodology, user-centred design, prototyping*.

General Terms
Design, Human Factors

Keywords
Children, Social games, Social competence, Shyness.

1. INTRODUCTION
A lack of social competence in childhood is often seen as a reason for concern. Developmental theorists such as Piaget and Vygotsky regard a child's peer interactions as a principal learning context for social skills. Long-term empirical studies have shown the lifelong negative consequences of early social problems (e.g. [15]). Researchers have studied various methods of improving children's social development, most of which concern long-term interventions, not games (e.g. [1]). However, play provides an ideal context for practicing and developing social skills, and the view that a main function of play is to benefit children's development is currently widespread [16, p.4]. Recent research has shown that playing games can also be (a part of) effective social interventions [5].

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Social gaming studies often focus on triggering and studying the social interactions between players of a game (e.g. [8], [14]). Engaging in such social interactions helps practice one's social skills and can thereby improve social competence, but these earlier works remain unspecific regarding the specific social skills they help children practice. Most evaluations show that such games succeed in triggering social interactions between the children playing the game.

This research set out to create an appealing aid for children to develop a specific social skill, and provide evidence of achieving this. LeGoff [7] showed that letting children with a disorder in the autistic spectrum play together with LEGO™, as a part of behavioral therapy, is an effective way of increasing social competence. Piper et al. [10] designed a cooperative tabletop computer game to help adolescents with Asperger's Syndrome practice group work skills. In contrast to these studies, we do not restrict the target group to children diagnosed with social disorders.

2. GAME DESIGN
To gain insight in the current practice of dealing with socially incompetent children, six primary school teachers were interviewed. These semi-structured interviews revolved around different types of social incompetence, and typical problems for these children. Teachers mentioned numerous examples from their experience, but found it hard to group those examples into categories of social incompetence. To map this information to design, the findings from these interviews were distilled and synthesized into three vignettes about three different children lagging behind their peers regarding their social development. These short stories served as incentives in creative sessions that were held to generate novel game concepts for practicing social skills. Three game concepts were finally selected for prototyping and for concept evaluation with primary school teachers. Based on their comments, a single game concept called 'Playground Architect' was selected for further development.

The socio-educational focus of this game is helping shy children to speak up and to be more assertive. Shy children

Figure 1. The playing board with some objects on it. The numbered tiles trigger the instructions for the Architect.

Figure 2. A play session in progress. The board lights up to show that all objects have been placed correctly so far.

have both "high approach" and "high avoidance" tendencies: they want to interact with other individuals, but falter due to fear of social failure [1]. Miller and Coll [9] argue that it is important for shy children to have 'success opportunities' within the context of peers, and suggest that having such opportunities can lead to greater peer acceptance and social confidence. Playground Architect was designed to provide shy children with such social success opportunities.

2.1 The Playground Architect game concept

Physical design. Playground Architect consists of a large electronic game board and fifteen miniature playground objects such as slides, trees, and a playing castle. There are also two pawns, called the Architect's pawn and the Bulldozer pawn. It was chosen to implement the game using an interactive tabletop game board [13] that allows several children to stand around the board, and allows face-to-face interaction between players. The board's 8 x 8 surface tiles can light up in any color. Embedded electronics allow the board to detect and localize pawns and other objects placed on it.

Gameplay. One of the three to five players assumes the role of Architect. This role is specifically intended for a shy child. The Architect receives the Architect's pawn and a pair of headphones, and the Builders get all playground objects and the Bulldozer pawn. The Architect directs the Builders in creating a Playground.

Only the Architect can access a set of narrative instructions that describe the client's wishes, by placing the Architect's pawn on certain tiles (see **Figure 1**). These instructions are audio files that are played back through the Architect's headphones, e.g., "I would like the half-pipe to be built at the south-west" and "The castle should be as far away from the toilets as possible". One instruction requires the Architect to make a decision: "In the middle should be either a sand pit or a pond, that's for you to decide". The Architects are able to hear the other players while wearing the headphones, and they are free to (temporarily) take the headphones off.

The Architect must communicate building instructions to the Builders, who are expected to place the objects correctly on the 6x8 building area of the board. However, tiles first need to be prepared using the Bulldozer pawn. All tiles start out being green and 'unbulldozed'. When the Bulldozer is placed upon a tile, the tile becomes black after a delay of one second, which means that it is prepared for building.

Builders can also call upon the Architect to inspect their work. If the Architect's pawn is placed in the building area, the tiles underneath all correctly-placed objects will automatically light up (see Figure 2). These 'halos' take about a second to appear, adding to the excitement and preventing rapid trial-and-error strategies. Once all required objects are placed correctly, the group has succeeded and the game is over.

2.2 Game Design Rationale

The Architect role is essential to the team's success, yet it is rather straightforward to perform. The Architect's three leader-like tasks – giving instructions to the builders, making a high-level decision, and approving work – are made easy by the board's automatic indication of correctly-placed objects and the audio instructions that only the Architect can hear. Thus, shy children are given the experience of successfully completing a group task with their peers, which may support an increase of social confidence.

3. EVALUATION

3.1 Participants

The prototype of Playground Architect was evaluated at two primary schools. One class from each school participated after consent had been obtained from the children's parents. In total, 40 children (age mean 9.5 SD 0.64, 18 girls and 22 boys) played the game.

We considered that grouping the shyest children with the most dominating ones might interfere with the game's effectiveness. To assess children's shyness and dominance levels the Shyness and Dominance subscales of the Temperament in Middle Childhood Questionnaire (TMCQ) [12] parent-report form were used. The short shyness subscale was extended with three items from the Children's Behavior Questionnaire (CBQ) [11], taking care that all items were appropriate for 9- and 10-year-olds and within a teacher's typical knowledge of a child. The

resulting questionnaire consists of 16 Likert scale items. Dominance items included "likes to be in charge" and "is first to speak up in a group". Shyness items were "is shy with new people" and "is comfortable asking other children to play" (reversed). The questionnaire was then translated to Dutch. Teachers used the questionnaire to rate every child, resulting in a 1–5 shyness and dominance rating per child.

In each class, the 4 children with the highest dominance score were grouped together and their data was excluded from the analysis. The results concern the 32 remaining participants (mean age 9.5, SD 0.66, 15 girls and 17 boys). These were divided into eight groups of four classmates, with one of the shyest children in each group. This shyest child was always given the role of Architect.

3.2 Method

Each group of children played the game once. We evaluated the game using (1) Self-reported happiness and interviews, to assess the game's fun and difficulty; (2) Sociometric data, to detect changes in the shy children's peer acceptance; (3) Speech rate, as shier children tend to speak less frequently [3]; (4) Teacher reflections on changes in the children's behavior during the game.

Both before and after the game, groups were separated and children were individually asked to mark how happy they felt on an 'emotional thermometer', a scale on paper that children filled in to indicate their current happiness. Sociometric data were obtained before and after play. Each child was asked to indicate 3 classmates they would like to play the game with, as well as 3 they would rather not play with. They were provided with two alphabetized lists of all their classmates (not just the ones participating in the experiment). After the game, all players were briefly interviewed in pairs. They were asked what they thought about the game, what they thought about their role, what they would like to change in the game, and whether they would like to play again and in what role.

Some weeks after the evaluation sessions, the video recordings of the playing children were shown to their teachers. They were asked whether the behavior displayed by each group was consistent with their knowledge of the children, and what might have caused any unexpected behavior. Each child's behavior was individually discussed.

3.3 Analysis

Happiness and interviews. The children's self-reported happiness was quantified by measuring how full their 'happiness thermometer' was, resulting in a 0-100 rating. Participants felt significantly happier after playing (before playing, mean 84.7; after playing, mean 95.7; within-subjects 2-tailed T-test, $p < .01$). There was no significant difference in happiness between Architects and Builders. In the interviews, all children said they had enjoyed the game and all wanted to play it again.

Sociometrics. When comparing pre- and post-play sociometric data, we looked at promotions and demotions. A promotion denotes either being added to a 'want to play with' list or being removed from a 'do not want to play with' list, a demotion the reverse. Note that a change in a child's list always constitutes a promotion for one child and a demotion for another. 23 out of 32 children changed something in their like/dislike-lists. 19 of the total 48 changes concerned a play group member (2 demotions, 17 promotions), significantly more than one would expect from random changes (Pearson's χ^2 test, $p < .01$). 6 of those 17 were promotions of the group's Architect. This is higher than 25% so Architects received relatively more promotions than Builders, though not significantly so.

Speech analysis. All players' utterances were transcribed and each player's speech rate in words per minute was calculated. Because Architects were required to communicate building instructions to the other players as part of the game, these utterances were excluded from the calculations. The resulting speech rates, grouped by shyness, are illustrated in Figure 3. The least shy Builders speak significantly more than the shyest Builders (2-tailed Student's T-test, $p < .05$), but there is no difference between Builders and Architects.

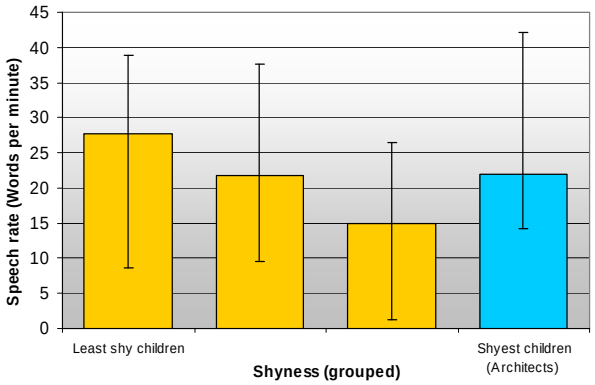

Figure 3. Shyness vs. Speech rate. Each column represents 25% of all (32) children, ranked by shyness. The first three columns are builders; the fourth one represents the architects.

Teacher comments. Teachers thought the shyest child of each group (the Architect) behaved in an expectable manner in 6 out of 8 cases. In 3 of these cases the Architect was rather withdrawn or silent, in the other 3 cases the Architect was more outgoing, but the teachers did not find this surprising, attributing this for example to the presence of friends in the group. In the 2 remaining cases, there was some notable improvement in the shy child's behavior. In these cases, teachers stated that the Architect was "alert and active, also with others", and "he started as just a messenger, but then started to actively participate and think with the group".

4. RESULTS AND DISCUSSION

From the interviews, happiness ratings and our own observations we conclude that the children had fun playing the game. Some groups went through the game fast and without help, while others needed hints on the most difficult instructions. Only once did a player explicitly blame another for bad results ("you're just a bad Architect"). The noticeable change in the group's sociometric data, even after only a single round of play, can be interpreted as evidence that the game

increases peer acceptance (at least temporarily). This is especially important for shy children, as anxious-solitary behavior and peer exclusion often occur together and reinforce each other [4] and reducing peer rejection reduces both internalizing and externalizing problems [6].

Children's reactions in the interviews indicated that the game makes shy children more assertive and that they enjoy leadership. 6 out of the 8 Architects reported that it was "nice to give instructions", that they "liked being the boss" or "enjoyed telling the others what to do". The increased assertiveness is also reflected in the speech analysis, which showed that the shy children talked as much as their not-shy peers, even when excluding their direct building instructions (see Figure 3). Additionally, teachers were positively surprised by the shy children's behavior in two out of eight cases, and were never negatively surprised. Since each group only played the game once, we interpret this as a positive result: just a single round of play was enough to obtain an improvement in some cases.

More confidence in these results can be obtained through a comparative evaluation against an equivalent game without the socially educational component. A limitation of our game design is that it relied heavily on the Architect's language skills for understanding the instructions. We observed that verbally weak children had considerable difficulties understanding building instructions. Reducing dependency upon language skills could enable more children to benefit from this game.

5. CONCLUSIONS

We have described the design and evaluation of a tabletop interactive game to aid in children's social development. Its evaluation makes a strong case that this game can help shy children become more assertive and more accepted by their peers. Our results also suggest that the general concept of socially educational games is a promising one. Longer-term evaluations are needed to establish whether the anticipated developmental benefits of this type of games materialize outside the game context.

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