# Affective and Bodily Involvement in Children's Tablet Play

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## ABSTRACT
The rapid development of tablet applications targeting pre-school children presents us with challenging questions concerning how this age group engages with the applications. We performed a study with a tablet game designed to teach pre-school children about emotions, studying their mode of engagement and their understanding of the game. The purpose of the study was to provide insights into what play activities are encouraged by tablet play. The study showed clearly that even though the interactivity of the game was very limited, the children understood the social and emotional aspects of the game content very well. We also found that the children would sometimes engage affectively and dramatically with the game content; we highlight in particular instances of bodily involvement with the game. We argue that tablet games offer design opportunities for children in this age range that may be less relevant for older children, by taking corporeal play around the tablet into account.

While none of the models for computer game-based learning and persuasion that have been proposed in literature constitutes a perfect fit to the behavior observed in our study, we find some resonance in the concept of procedural rhetorics in the way the players' interaction with the game serves to complete a rhetorical argument; in this case the storyline of the game. The children's dramatic involvement may potentially serve to strengthen such arguments.

## Keywords
Game-based learning, play, engagement, persuasive games, functional play, dramatic play, tablet computers.

## INTRODUCTION
Compared to traditional computers and laptops, the tablet computer is cheap and durable. This has lead to a rapid introduction of tablet computers with pre-school children, both at home, and in school settings such as pre-school and kindergarten. The applications targeting this age range are typically games or toys, but since the children in this age range do not buy their own applications they tend to serve a double function. They are made to at the same time entertain and teach; attracting interest from children but also parents and teachers. For example, the company Winci (http://www.vincigenius.com/) offers applications that are intended to teach, together with a full curriculum aiming at getting children 'school-ready'.

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While the idea of developing games and playful applications for learning is in no way new, the rapid development of applications targeting the pre-school age range presents us with challenging questions concerning how this age group engages with the applications, as well as how we can even begin to analyze and understand the effects of engaging with these games and toys. Literature presents us with multiple perspectives on how children and adults engage with games, but it remains unclear how these apply to pre-school children and the applications designed for this age group.

We performed a study with the goal of exploring how pre-school children engage with a tablet application. While the study did not aim to measure or assess what the children learned from playing the game, it showed that the children were able to explain and replay the emotional interactions depicted in the game, and also that they were intensely engaged with the emotional content of the game. We were also able to map the observations from the study on multiple frameworks for understanding play activity and game-based learning, offering a possible explanation for the way in which the children might have reached their thorough understanding of the emotional content of the game.

## BACKGROUND

### Theories for game-based learning

The concept of teaching through the use of games has been around since long before the computer game and has experienced at least two surges in popularity since videogames came into existence. The first surge was spurred by the concept of 'edutainment' in the nineties; programs that would teach a subject through engaging interaction. The commercial applications that were presented as edutainment have been criticized for 'sugar-covering' various menial training tasks such as spelling exercises with little insights into the learning opportunities offered by games in general and videogames in particular (Deterding et al 2011). Very similar critique has been raised against a second recent surge of interest spurred by the concept of 'gamification' the use of gamelike reward structures in non-game contexts (Deterding et al 2011).

In order to further our understanding of the learning potential in videogames, Gee (2003) turned to ordinary videogames to explore how and what they teach. Gee argues that games provide perceptional stimuli for situated action, facilitating situated learning (Gee 2003) in an environment that can be seen as a computerized simulation.

> "People are quite poor at understanding and remembering information they have received out of context or too long before they can make use of it." … "Good games never do this to players, but find ways to put information inside the worlds the players move through, and make clear the meaning of such information and how it applies to that world."

Gee also argues that the way that video games typically will introduce more challenging content in a gradual way constitutes a way to scaffold the learning process. In a similar vein, authors have emphasized how the free exploration offered by simulation-style games is well suited for supporting problem-based learning (Kiili and Ketamo 2007).

Gee's conceptualization of games as simulations has received some critique. Based on the theory of ecological psychology (Gibson 1986), Linderoth and Bennerstedt (2007) propose an alternative model for the learning effect in games, the ecological model of gameplay. This model is suited in particular for analyzing what may be learned from

learning to play a game. Linderoth and Bennerstedt argue that games offer a space of affordances that can be actively explored through two kinds of actions: *exploratory* actions, that are done in order to figure out what can be done, and *performatory* actions that affect the state of affairs. The activity of learning to play a game is oriented towards understanding these internal structures of the game. If the purpose of the game is to teach by simulating something that exists outside the game, this connection becomes gradually weaker as the learner is oriented towards understanding the game's internal structure. The meaning of play is 'trivialized' to be about the game itself.

> "To become a skilled player is, therefore, a process where the gamer develops a more and more fine-tuned understanding and in one sense is more and more distanced from seeing the screen as a depiction of something else." (Linderoth and Bennerstedt 2007)

This 'trivialization' effect has been documented in studies with children (Linderoth 2004) as well as expert players (Reeves et al 2009, Bennerstedt 2013). Bennerstedt (2013) further problematizes the concept of transfer, arguing that the trivialization effects makes it less likely that competences created by playing a game can be applied in contexts *outside* of the game.

## Involvement in computer game play

While there is convincing support for the ecological view on how we learn to play games, it does not capture the full complexity of how players engage themselves with computer games. Bogost (2008) introduces the concept of procedural rhetoric, looking at how the procedural aspects of a game can interplay with its theme and narrative. Rather than looking at games as simulations, Bogost argues that they form a persuasive, rhetorical argument. As rhetorical arguments, games do not necessarily simulate real-world phenomena, but neither do they just teach something about their own internal structure. Games present us with persuasive arguments for ideas, and by playing the games we actively enact these ideas. While this is a potentially very powerful persuasive structure, we still face an issue with transfer; understanding to what extent a player will assume or challenge that – or even reflect upon if - the idea holds true outside the game fiction.

Through an interview study with children who regularly played computer games, Ermi and Märyä (2005) were able to distinguish between three forms of 'immersion' with computer games: challenge-based, sensory-based, and imaginative. The latter has also been discussed as narrative immersion (Quin et al 2009). Of these, it is really only challenge-based immersion that corresponds to the ecological perspective that Linderoth and Bennerstedt analyze. The concept of immersion is in itself problematic, however, and Calleja (2007) suggests to instead investigating what he calls involvement, placing focus on how players choose to engage with the game while immersion largely is seen as an effect of play. Calleja proposes six different aspects of involvement in computer games that he names tactical, performative, affective, shared/social, narrative, and spatial involvement. Of these, the concepts of tactical and performative involvement roughly correspond to the division between exploratory and performative actions from the ecological gameplay model. We can expect players to be motivated by different modes of involvement at different times and shift between them (Calleja 2007). It is not unreasonable to expect that there also is some interplay between them, creating interpretations, meanings and effects that are not covered by a purely ecological perspective.

## Pre-school children and play

The concepts and theories on computer game play discussed above have primarily been developed from studies of older children and adult players. Hence, we know less about the ways in which pre-school children engage with and interpret computer game play. However, there exist extensive research on the development of children's play, originating in Piaget's theories of play as instrumental in cognitive development (Piaget 1962) and Parten's models of social play development (Parten 1932).

A comprehensive model was developed by Rubin et al. (1976) and has influenced later work in the area. Based on studies of free play they developed an integrated classification for social and world-explorative play that has been very influential in development studies. Concerning cognitive aspects on play, which are the most relevant when discussing learning outcomes related to the game content rather than to the gaming situation, they distinguish between functional, constructive, dramatic and rule-bound game play.

An important contribution by Rubin et al. was that in contrast to the previous strict division of these forms of play into development stages, they saw that the various forms of play would co-exist with older children. For example, functional play is not just something that toddlers do and grow out of, but is also prevalent among children in the age range of three to six. Hypothetically, a tablet application could very well support all of the cognitive forms of play. The tablet is also a more interesting option than a regular computer for social play, as it is more easily shared between children.

Play theory presents us with a useful tool for analyzing the play activities with children. If we can identify the mode of play that a child engages in, this may tell us something about what kind of learning that is enabled in the interaction. Functional play, for example, is according to Piaget significant of exploring the world – which in the case of a tablet game would be the world within the game. Consequently, instances of functional play would indicate that the primary mental model might be game-internal, as advocated by the proponents of an ecological model of gameplay (Linderoth and Bennerstedt 2007). Dramatic play, by contrast, presents children with opportunities to express emotions and enact various roles and scenarios, and plays a role in understanding cultural norms, social behavior and social roles (Frost et al 2001).

| Classification of involvement | Ecological gameplay model of activity | Cognitive classification of play |
|---|---|---|
| Tactical | Explorative action | Functional play |
| Performative | Performative action | Rule-bound play |
| Affective | - | Rule-bound play, Dramatic play |
| Shared/social | - | Rule-bound play |
| Narrative | | Dramatic play |
| Spatial | - | - |
| - | - | Constructive play |

**Table 1:** A comparison of classification models

## Comparison of the Models of Play Involvement

This article primarily relies on the classical taxonomy from Rubin et al (1976) in its classification of play engagement, updated through the more recent models to be adapted for computerized play. Above, we have discussed three different classification models for understanding play engagement; the ecological model of gameplay activity, Calleja's model of involvement, and the classical development psychology classification of play. All of them aim to describe observable modes of play engagement, but they differ in what instances of play they aim to cover, and for this reason do not fully map to each other. In particular, they are more similar in their analysis of individual engagement, than of social engagement.

A rough comparison concerning individual engagement is shown in table 1. We can se that the ecological model of gameplay, which focuses on the modes of interaction that a game as a system of rules and goals affords, does not include narrative and creative involvement. With a keen eye to the simulation capabilities of computer games Calleja introduces the concept of spatial involvement, related to the cognitive ability to understand virtual space. This effect has very little to do with the fact that players are playing a *game* rather than just participating in any simulation, and none of the other models considers it to be a significant aspect in play. Furthermore, just as the ecological model of play, Calleja's model of involvement prioritize the play opportunities generated within a designed system and does not discuss creative play.

The remaining factors are more closely related to each other. Mapping cognitive theory onto the ecological gameplay model, performative play seems to require some understanding of rules and is as such related to rule-based gaming, whereas explorative play is more similar to how Piaget describes functional play. Building on Parten (1932), Rubin et al. (1976) carefully deconstruct what Calleja simply classifies as 'social play'; this is however left out of figure 1 as it is limited to the cognitive part of the full model

from Rubin et al. It should be noted that according to Rubin et al, 'rule-bound play' occurs almost solely in more complex forms of social play, as the concept presupposes some level of social agreement around the rules. Dramatic play, finally, is not included in the ecological gameplay model while an embryonic version of it is included in Calleja's taxonomy. Full-fledged examples of dramatic play are unlikely to occur with single-player computer games, but the form of engagement that Calleja classifies as narrative involvement constitutes a simple form of dramatic play. Finally, affective involvement can also be dramatic play; however in computer games affective involvement is more commonly an effect of high effort in overcoming the game challenges (frustration) and as such more closely related to rule-bound play.

## STUDY

We performed a study with the goal of exploring how pre-school children engage with a tablet game. The goal of the study was not to study what or how much, exactly, they learned from playing the specific game, but to get insight into how the game was played. Based on models of game-based learning, this can provide insights into how the game may contribute to learning.

The studied game, Peppy Pals, is described below. While there exist a plethora of games that potentially could have been used in the study, the choice of Peppy Pals was not arbitrary. Peppy Pals was designed with pre-school children as its main target audience, and it is also a learning game: it is intended to foster emotional intelligence. The game's special focus on emotions (and what the developers call 'emotional intelligence') was also relevant, as it calls for using the narrative capabilities of videogames in the design in a way that would have been less relevant in, say, an instrumental spelling or counting game. We also put as a requirement on the study to a complete and professionally designed game that had been trialed with children during its development; this to avoid running into issues related to unfinished design or implementation.

### Peppy Pals

Peppy Pals is a video game designed to function as a tool to teach children about emotions. The game was developed by the Swedish company eQuidz[1] together with the game development studio Talawa Games and is the brainchild of the CEO Rosie Linder. While the ultimate goal is expressed as reducing bullying, the game does not explicitly discuss bullying but instead focuses on social emotions and emphatic thinking. The game targets children aged three to six; in our studies we found that the age range four to five more accurately describes the age range when children are attracted and intrigued by the game. The game has received positive critique and was one of five winners of the Swedish ’reach for change’ award in 2014.

The game introduces four animal characters, each with its own personalities, who reappear in a set of interactive play scenarios. While there exist several types of scenarios, the study focused on the five scenarios that constitute playable stories where the animals interact with each other. These are short animated stories where the animals appear in some situation where they need to solve a problem together. They progress as the child clicks or holds a finger on an animal or an object in the scenario. Apart from the four story scenarios, the game also contain two color-book coloring tasks, and two

[1] http://eqidz.com/

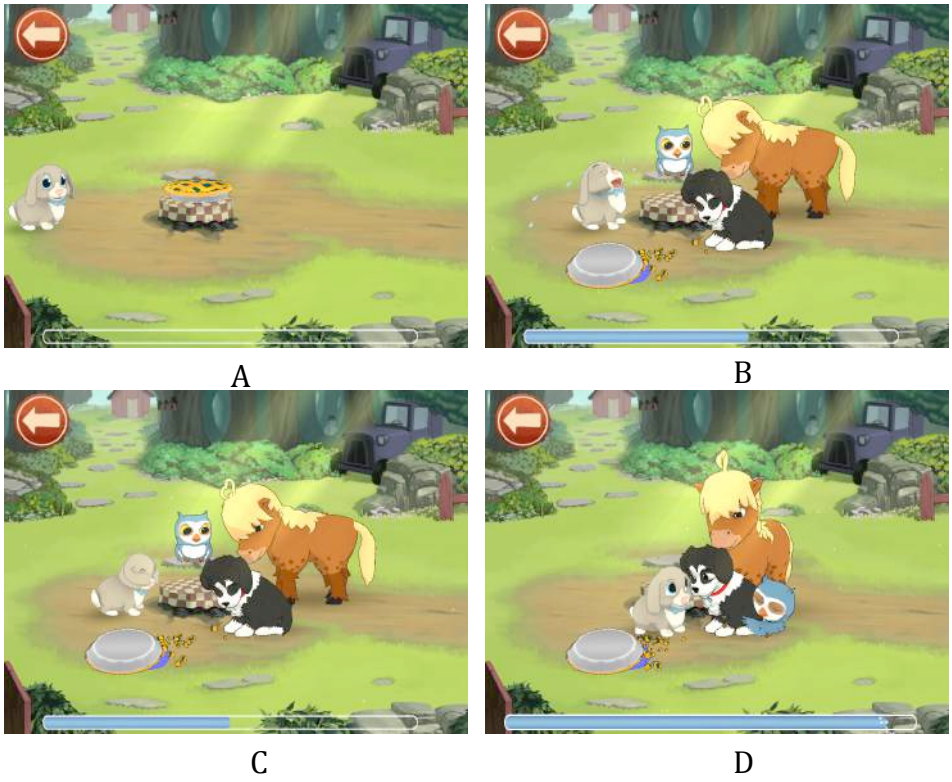


**Figure 1:** Example scenario: The dog topples the pie.

emotional reaction scenarios where two of the animals react emotionally to the player offering them different objects (such as a spider, a whoopee cushion, or an apple).

Figure 1 depicts one of the story-oriented tasks in the game. In this scenario, the four animals enter the scene one by one, apparently to share a pie. When the dog enters the scene, she accidentally topples the pie that becomes ruined. All of the animals react emotionally to this; we see the rabbit crying in screen shot B and covering her eyes with the ears in C. The owl is initially angry at the dog (screenshot B). The dog is ashamed (as can be seen in B and C). The horse recognizes this and moves over to comfort the dog (screenshot C), and eventually all of the animals move over to comfort the dog (screenshot D). The scenario progresses when the child clicks on 'the right' animal, the one that will move next. Most of the time only one of the animals is clickable, and the interaction provides subtle hints as to which one (by slight illumination and a 'beep' sound for incorrect clicks). The big red button to the top left allows the child to abort the scenario at any time. The progress bar at the bottom of the screen shows how far the scenario has progressed (this was typically not understood by the children in our study).

As should be clear from this description, the interactivity offered by the story-oriented scenarios is rather low, to the level that their 'gameness' can be questioned due to the minimal element of challenge or meaningful choice. Neither is there any built-in support for social play, as the tablet only reacts to single clicks and progresses through the scenario one step at a time. In the terms of cognitive play modes, the interaction model of Peppy Pals primarily supports *functional play through exploration* – basically clicking around to figure out what will happen.

## Study setup and methodology

The study consisted of an initial and explorative pre-study and a controlled main study. During the pre-study, the game was made freely available to children for a full week, in two homes as well as in two pre-schools. At the end of the week, the homes and the pre-schools were re-visited and some of the participating children were asked to demonstrate the game to the experiment leader. These demonstrations were done with groups of two children. The pre-study was not filmed or recorded, but the experiment leader took extensive notes.

The main study was limited to the story scenarios in the game, as these contained the most complex emotional content. It was carried out in a two-phase setup. Two children were first asked to use the tablet to play two or three of the story-based scenarios (some scenarios were omitted to avoid tiring the children). The pair play setup was used in order inspire discussion and dialogue between the children, and in order to make them more comfortable with the experiment situation (including being filmed). The experiment leader controlled who held the tablet, and shifted the tablet between the two participants between scenarios. While playing, both were supported by an experiment leader to 'think aloud' and explain what they were doing or what was happening in the scenario. After concluding this session, the children were thanked, but just as they were about to leave they were called back to receive a reward for participating. After receiving their reward, they were asked to re-play the scenario using stuffed animals. Both the play activity and the recollection sessions were filmed. This method of letting the children almost leave only to be called back, served to separate the recollection study from the play study. It was inspired by similar studies with children participants (Samuelsson et al 2011).

In total, seventeen children participated in the pre-study and we recorded eight sessions with two children each during the main study. All participating children were in the age range of four to six.

The filmed material was analyzed in a two-step process. First, the films were scanned in order to identify significant sequences of interactions. The selection criteria for what was considered a 'significant instance' was that there was some indication of how the children were thinking about the game, indicated by dialogue or other visible behavior. This means that sessions when they were just silently clicking were omitted from analysis.

The selected film clips were transcribed using a slightly simplified form of interaction analysis for screen-based play, following Linderoth (2004). These transcriptions were complete in the sense that all visible interactions with the tablet or the toys, as well as all utterances and physical interactions between the children and between the children and the experiment leader were transcribed. However, details concerning overlaps and pauses in verbal dialogue were left out of the transcription.

## OBSERVATIONS

Below, we focus on the observations that concern the children's mode of involvement with, and understanding of, the narrative content of the game. The study also uncovered details about the interface design that were very specific to the game studied. These are left out of the discussion.

### Functional play

From the filmed main study, it is clear that the main form of involvement with the game is in the form of functional play. It remains however to understand if this is interpreted as "playing a game" by the children. As already discussed, the story scenarios are only to a limited extent 'games', as there is very little choice or challenge involved.

When the children were probed about how the game should be played, they were able to identify a game challenge: to 'make the animals move'. For example, when asked about when it was time to interact with the game a child answered, “when no one moves”, and another one described the success criteria as “when it moves then it is right”.

While playing, children clicked around rather randomly to find out how to make such moves happen. Analyzing this from the perspective from ecological gameplay and its distinction between exploratory and performatory actions, this is best interpreted as a performatory challenge. It is clear to the children what to accomplish (make the animals move), but they need to figure out how to achieve this. The result is a somewhat random exploration by clicking around in the interface, a game mechanic that is related to the 'rules' of the game (as implemented), but has nothing to do with the storyline or the emotional content of the game.

This was confirmed by our interviews, as none of the children described the game challenge in terms of the content of the story. Nobody would for example explain the goal of a scenario as 'one of the animals should comfort the dog', or 'I need to help the horse cross the stream'. This observation is consistent with the ecological model of gameplay, which would indicate that the children should be unlikely to learn about emotions from playing the game.

### The children's understanding of the emotional content of the game

The analysis of the game as functional and rule-based play is not consistent with how the children understood the emotional content of the game, and could re-play the storyline in great detail. Already in the pre-study, it became clear that the participating children were quite proficient in recognizing and retelling the emotions that the animals exhibited. While demonstrating the game for the experiment leader, the children would talk about the scenarios using emotion-related explanations. The children could say things such as “the dog was a little afraid, then the owl”. Furthermore, the children would bring up the social interactions between animals, with explanations such as

“The owl became angry because the horse ate the food belonging to the owl“, and “The dog helped the owl”

To add, these were always the 'right' explanations, as intended by the game designers.

**Figure 2:** Re-playing the scenario: The rabbit is sad and covers its eyes.

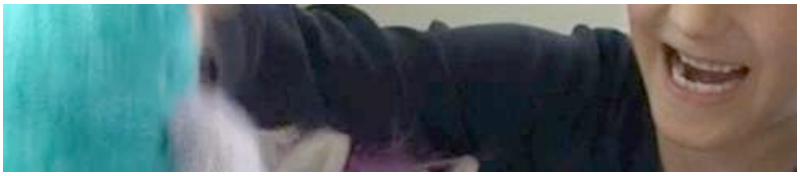

**Figure 3:** Re-playing the scenario: The owl is flying (lifted from the table) and angry (illustrated by making a face)

In the main study, the replay scenarios confirmed these observations from the pre-study. When called back to re-play the in-game scenarios with stuffed animals, the children would do so almost flawlessly and emphasize the emotional interplay between the animals. Consider the example shown in Figure 2, where two children from two different sessions replay the pie scenario. Both children manipulate the toy animal to cover its eyes with its ears. The movement is used to express sadness, and it is copied right out of the game where the animal is animated to do exactly this. On other occasions, we observed the children using their own body in replaying the scenario, as seen in figure 3, where a boy makes a facial expression to illustrate that the owl is angry.

## Affective and Narrative Involvement

The play sessions from the main study provide some insights into how this understanding was achieved. While playing the game, we observed several instances of what would be classified as affective or narrative involvement according to Calleja (2007). For example, several children would laugh out loud when the pie was toppled, and also make sympathetic sounds when an animal needed comforting.

Even more interesting were the instances of corporeal dramatic play that we could observe while the children played with the tablet. These were instances when the child would mirror what was happening at the tablet with their own body and mimics. A clear example occurred in the 'slide' scenario, a narrative scenario where two different animals (first the dog alone, then the owl with support from the dog) needed to calm down in order to dare travel down a slide. In order to help the dog calm down, the child had to hold a finger over the animal to make it slowly breathe in and out a couple of times (see figure 4). It would then be brave enough to slide down the slide. While playing this scenario, several children would start to actively synchronize their breathing with the dog.

**Figure 3:** The slide scenario. Touching the dog with a finger will cause it to breathe slowly, in and out, until the blue bar fills up.

It is possible to further deconstruct this is by dividing the children's responses into *forward-directed* and *retrospective* comments: looking at how they discuss what to do and what just happened.

In general, the children were not very good at talking about their forward-directed intentions or plans. Their practical engagement was primarily situational: typically they would just click around until the effect was achieved, and then show the result to the experiment leader. However, when helping each other they would sometimes express what to do next. This was always presented as an instrumental instruction (where to click, what to do) and is probably best interpreted as functional play according to the cognitive model of play (Rubin et al 1974), as a performative challenge according to the ecological model of gameplay (Linderoth and Bennerstedt 2007), or in Calleja's terminology as tactical involvement (Calleja 2007). However, when talking about *what just happened*, the children would be much more verbal, and most of the time also volunteer details about the emotional content of the game.

The children were also able to pass fluently between modes of engagement including instrumental instructions (to the other player), silent clicking, and narrative explanations. We illustrate this by a slightly longer excerpt from the interaction analysis in table 2. Here, two children are playing together under supervision of the experiment leader. The experiment leader's questions are marked with Q, and the two children as Ch.1 and Ch.2. Both children have previously played the scenario. In this excerpt, Ch.1 initially has the tablet and is instructed to play through the scenario. In the beginning of the excerpt, the two children are unsure about how to proceed, until Ch.2 remembers how to make it proceed and takes over the tablet from Ch.1. Ch.2 plays silently for a while, prompting the experiment leader to ask about what is going on. The child pauses, and describes the current emotion for the owl both verbally ("he dares not") and physically, by covering her eyes with her hands. Her lack of hesitation shows that while she was playing the game silently, she was still involved with the story content.

| Utterance | On screen | Behavior |
|---|---|---|
| Q: What is going on here? | The dog is at the top of the slide | |
| Ch.1: Go! | The dog does not move | Ch.2 Clicking |
| Ch.2: But drag it drag it, until it becomes completely full! | | Ch.1 physically interrupts Ch.2  |
| Ch.1: And then comes the owl | Progress bar fills up | Ch.2 takes over the tablet |
| Ch.1: Mm he tries to slide down | The dog slides down, the scenario starts over with the owl | Ch. 2 still has the tablet, continues to play by clicking. |
| Q: How does the owl look? | | |
| Ch.2: He dares not! | |  |

**Table 1:** An example of fluency in passing between instrumental situated play and emotion-directed explanations.

Although this was less common, we could also observe a few instances of more full-fledged dramatic play (Rubin et al 1976). An example of this is when a child suddenly comes to understand why an owl was angry, in a scenario where a horse just had eaten an apple. After exclaiming 'Ah! It's his apple!' the child turns (physically) towards the owl and scolds it directly:

"No, it is not your apple!"

While affective and dramatic involvement with the narrative was much less common than the 'tacit clicking' that we primarily interpret as functional play, most children exhibited some instances of affective or corporeal involvement with the game narrative.

## ANALYSIS

### An interactive storybook and clickable movie?

Due to the low level of interactivity offered by the game, one way to interpret Peppy Pals would as a storybook with hard-to-turn pages. The search for what to do next can be seen as a way to slow down the interaction, to enable the children to engage more deeply with the story and its emotional content. The slow interactivity in the game is one possible explanation why the children exhibited physical involvement. It is hard to envision how reading a book could have motivated e.g. the slow breathing that we observed in the slide scenario. The animation is another potential factor; it is for example possible that the same behavior could have been inspired by watching a movie.

Some of the design choices made by the design team indicate that Peppy Pals was deliberately designed as a film or storybook. From interviews with the developers, we know that one possible path towards making the story scenarios less linear was discussed but abandoned during the development of the game. This was the option of offering multiple endings to the scenarios, where some would be less 'happy'. The developers decided against this as the 'less happy' endings would be interpreted as punishing the children for doing the wrong choice, rather than creating interesting opportunities for exploration.

The slow interaction model was also partly deliberate. For example, several clicks are often needed in order to make the animals move, and while waiting, the animals will turn to look at the player to illustrate that they are waiting for him/her to do something. However, when talking to the developing company it became clear that the gameplay was slower than they liked, and that they plan to speed up the interaction in future versions of the game.

### Procedural rhetorics as a model for learning effects

As discussed above, both the dominating mode of engagement with the game (clicking around) and the forward-directed intentions that the players express indicate that the way the children learn to play the game is consistent with the ecological model of gameplay. However, analyzing the game from this perspective alone does not provide sufficient explanation for the level of understanding of the emotional content that the children exhibit. Rather, we argue that it is the instances of narrative involvement and dramatic play that provide clues towards how the children make sense of the narrative content in the game.

Neither does Peppy Pals seem to be a good fit to Gee's concept of game-based learning as based on simulation. Peppy Pals offers no simulation that the children can explore. The 'clicking around' is functional and serves as a performative challenge, directed towards 'making the animals move'. In a similar manner, the instances of narrative involvement and role taking that we observed were not simulations but direct involvement with the narrative of the game. Bluntly put, the procedural complexity in Peppy Pals is too low to fit with this perspective on game-based learning.

Surprisingly enough, it is the software-centric view of procedural rhetorics that comes the closest to providing an interpretation framework for the children's behavior. Bogost frames procedural rhetorics as the way the procedural behavior of a game, as manifest through its interactive options, serve to construct an incomplete rhetorical argument. Through referring to the Aristotelian concept of enthymeme, Bogost sees the required player actions as *completing* the games' argument. By actively participating in progressing the game story (by clicking on the right animal), the children contribute to the construction of the game's persuasive argument. The interpretation of Peppy Pals as a persuasive game is consistent with the way the children's forward-directed instructions are instrumental whereas their retrospective explanations of the game are narrative and emphatic. While playing the children are focused on progressing the state and completing the argument; but their interactive involvement with the story content still enables them to grasp its content. Furthermore, for children of this age range the involvement is not limited to the required interaction with the game but includes corporeal engagement, such as when the children simultaneously hold their finger on the dog and breathe with it. While this involvement is not required to complete the procedural argument, it should still serve to augment it and make it stronger.

Finally, corporeal involvement influences our affective state (Höök 2009). It is likely that the children's corporeal involvement with the game contributed to the children's emphatic experience, and that they to some extent shared their emotions.

## DESIGNING TABLET GAMES FOR PRE-SCHOOL CHILDREN

Judging by Peppy Pals, we can conclude that tablet games for small children need not necessarily offer extensive interactivity or complex gameplay. In the pre-study we saw that even when we let the children use the game over a full week, many children played the story scenarios several times over despite their simplicity. They were still extensively engaged with the game when demonstrating it to the experiment leader at the end of this week. The low level of interactivity presented by the story scenarios did not hamper the children's engagement or their willingness to re-play the game.

Two aspects of the Peppy Pals design seem to be particularly effective in creating affective involvement and encouraging dramatic play. One is the slow pace of interaction and the seemingly nonsensical 'random click' interaction model. The second is the animations, and the way that they exaggerate and stereotype the facial expressions and body language of the characters. While we cannot say which was most influential, the combination of slow interactivity and emphasis on emotional expressions inspired the children to mimic the behavior of the on-screen animals. As discussed above, corporeal involvement is likely to contribute to the rhetorical strength of the game.

While corporeal involvement also has been observed with adult computer game players [20], it comes more readily to children in the pre-school age range. Children in the target age range for Peppy Pals are experts at dramatic play, and it is interesting to see that this manifests even while playing a simple tablet game. Hence, complementing a learning game with physical tools for dramatic play, such as dress-up clothes or plush animals (which we used in the re-play sessions), could extend and enrich the learning experience outside the game.

An interesting option is to use the tablet itself as a tool for dramatic play. An excellent example is the tea party application developed by Toca Boca. In this application, the tablet is used as a virtual table that can be virtually set with a teapot, dishes and cups,

cookies and cakes. The tablet is placed face up on the floor or a table, allowing a set of players (or a single player playing with dolls as the guests) to gather around the tablet and engage in corporeal dramatic play. Apart from being an excellent example of a dramatic play tool, the Toca Boca game also encourages physical play in the way it assumes that children gather around the tablet in order to play together.

## CONCLUSIONS

Our study shows that pre-school players are able to involve affectively and dramatically even with a very simple tablet game. Their involvement is not restricted to functional play but includes dramatic play and corporeal engagement, in a fluent and multi-faceted manner that is likely to support learning.

None of the models for computer game-based learning and persuasion that have been proposed in literature constitutes a perfect fit to the behavior observed in our study. We argue that in order to understand the children's involvement with the game one must take into account also their behavior *around* the game, including their affective and narrative involvement as visible in mimics and role-play behavior. Of the various models explored in this article, the behavior with the studied game most readily maps towards the concept of procedural rhetorics, in the way the players' interaction with the game serves to complete a rhetorical argument through their engagement with the game. From this perspective, the children's dramatic involvement can be seen as further strengthening the persuasive argument.

The multi-faceted model of involvement and fluency in moving between modes of involvement that pre-school children exhibit, open a range of design opportunities that may be less obvious for older players. We stress in particular the opportunities for physical and corporeal play around, or associated with, tablet games.

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