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Learning Without Knowing

A study of playfulness in educational games

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September, 2014

Abstract

The use of tablet computers have increased significantly in numerous parts of society during recent years, and the educational sector is no exception. Use of games in educational situations has intrigued scholars of different disciplines, presenting both favouring and opposing opinions. Whilst the educational effectiveness of the game media is discussed, research done in the area of cognitive development, psychology and pedagogy argue for the importance of play and the positive effects it entails on education and learning.

This thesis investigates to what extent playfulness has been incorporated into the educational game-genre for children on Google Play by studying four games from the genre along with a fifth game from the entertainment section for comparison. Based on selected literature discussing play, education and games eleven attributes were assembled to dissect the games and to measure their playfulness and educational effectiveness.

The study proved that educational games for children seldom possess playful elements. The analysed games possessed very few of the attributes from the study and tended to focus on educational values rather than offering a playful approach to learning, resembling the traditional educational school system. The lack of playfulness and effective guidance in the games and the absence of knowledge of modern, active and tested educational theories to base the game design on lead the educational game genre to produce educationally ineffective games, which in turn effects the educational game market as whole.

Keywords : game design, educational games for children, playfulness, educational games in Sweden

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1. Introduction

Ever since Apple launched their first tablet in 2010, being the first tablet to achieve significant success among customers with 19 million units sold globally within its first year, the tablet market has grown incredibly. According to Pew Research Centre 42 % of American adults owned tablets as of January 2014 while in Sweden the national public television broadcaster, Sveriges Television, reported on the 8th of October, 2012, that every fourth urban commune in Sweden use computer tablets in preschool. Scholars of philosophy as well as psychology and game design have been intrigued by the subject of learning through games, although the media has much cultural luggage.

Simultaneously researchers argue for the importance of play, and its effect on motivation, creativity, imagination and on increasing effectiveness of learning. However, playfulness likewise has not successfully been included in Swedish school curriculum and its importance is still debated. As its importance is stressed in research this thesis investigates if and, if so, how it has been absorbed by the chosen genre.

This thesis investigates playfulness and effective learning in the educational tablet game-genre on Google Play in Sweden today.

2. Background

This section addresses, firstly, the debate concerning video games and violence, to inform the reader and declare the theoretical aspects that has influenced this thesis to discuss learning with computer tablet games. Secondly, due to the Swedish aspect of the study it discusses current educational theories concerning play and its status in Sweden.

2.1 Video games and learning

As media consumption increases in large parts of the world as well as usage in younger ages many are concerned with effects it may have on the future generations, as time that used to be spent on studying now is spent on games and social media. With different views on culture it becomes a struggle between the generations. (Drotner 1990, quoted by Lindqvist 2002) In the 1990-ies most daycare centres in Sweden forbid mass media toys and TV consumption as well as games were questioned (Lindqvist 2002).

The educational attempts at using computer games in school has had to deal with the cultural luggage that may follow, that may have a both positive and negative effect on the effectiveness of the method (Egenfeldt-Nielsen 2009). Instead, many schools today seem to fall back on using the 'skill-and-drill'-approach for teaching, using repetition to teach instead of what many find to be the most interesting theories of learning in cognitive science, as well as learning in good games. Video games often act as a creative safe space for children, allowing them to learn without the otherwise constant social pressure that may exist in traditional learning environments. If a game contains good principles of learning, as well as a solid game design that keeps the child interested, the game has more chance of teaching by simply engaging the child in a playful and inviting way compared to lessons in school that may fail to do so (Gee, 2003). Some argue that as the world becomes more globalized and education more accessible, the standardized skill-and-drill taught knowledge will not be enough to stand out or to make a difference. The future generations will have to be able to see opportunities where others see problems, discuss and develop new ideas and methods, iterate and come to new solutions. They will have to learn to *innovate*, both for their own benefit as well as the world. Video games can not only engage children to learn, without social pressure and on their own terms, but they can also help the player think in innovative ways (Shaffer 2006; Gee, 2003).

With the engaging environment a good video game may provide, they are a good media for learning as many researchers argue that there is a casual relationship between subject's engagement and motivation and their learning (Girard, Ecalle & Magnant 2012). Though, creating games with educational purposes without using the approach of skill and drill or obvious educational elements is not an easy thing – making the player learn, without noticing. Making the player, and keeping the player, immersed is a key point.

Even though many argues for video games in educational areas, the controversies concerning video games and their effect on players' attitude and behaviour still progresses. 'The ages-old

debate', IGN journalist Dustin J. Seibert calls it as he reports on another study from Singapore in March 2014. The study indicates that children playing a certain kind of games are more likely to demonstrate violent tendencies, and that parental involvement did not make any difference. The results of a recently revealed decade-long study conducted in the U.K. contradicted the results from the Singaporean study.

After the shooting at Sandy Hook Elementary School in December 2012, U.S. president Barack Obama proposed that 10 million US dollars in Congressional funding should go to research concerning the relationship between new media and gun violence, including video games. "Congress should fund research on the effects on violent video games have on young minds,[...] we don't benefit from ignorance. We don't benefit from not knowing the science" (Barack Obama as quoted in Rose, 2014).

In November 2013 the *Sandy Hook report* was released, not stating anywhere that video games were responsible for the shooting, rather the result of mental health issues and their effect on social life.

Many scientific studies indicate that video games increase aggression in young people as well as many proves that they do not. The matter is by no means a simple matter, still the general thought on games does not seems to have been too stigmatized by the ongoing discussion, or perhaps they have simply improved as many scientist have started to argue for its sake (Gee 2003, Shaffer 2008, Lindqvist 2002, Egenfeldt-Nielsen 2009). The ESA report from 2013 shows that 52% of participating parents say that video games are a positive part of their child's life, while 72 % believe that gameplay provides mental stimulation or education. Though, it also shows that 86% of parents do in some way control what their kids play and 93% pay attention to the content of their children's games. Even if the debate is still active, many seem to feel that games do have some educational or stimulation value for their children. If parents were sure that the video games their children play help them learn about to the subjects they study in school they would probably be more supportive of the media, but it still stands that the cultural expectations on computer games among children, parents and teachers may impact the effectiveness of the educational game (Griffiths 2012, Egenfeldt-Nielsen 2009).

The effectiveness of educational games in comparison to learning has been reported very inconsistently with different tones through out the years, but play has become unquestionably important for learning (Randel, et al. 1992; Smith 1986 as quoted in Egenfeldt-Nielsen 2009). According to Gunilla Lindqvist (2002) computers should be seen as a way to make school more enjoyable. Something new and radical is required to help cultural flexibility (Ziehe 1992). Groundwork for such pedagogy can already be found in children's play (Lindqvist 2002 p.64). This thesis investigates the presence of play and effective learning in educational games for children of age six.

2.2 Play in Swedish schools

The influences regarding play in the Swedish educational system have been many. Friedrich Fröbel greatly affected the Swedish schools during the late 1700th and early 1800th century with his pedagogical theories of play, as the natural way for children to express themselves (Lindqvist 2002).

As time passed the educational system became less and less focused on play, and during the 1930-ies barely any discussions or books were destined for the subject of children's play. During the 80-ies the focus lay on structure and order, and due to reduction in expenditures of the public sector the child welfare fell out of focus. During the 90-ies the thoughts of teamwork and structure lingered, together with new thoughts of play.

”Children's play often occur when children are in the process of learning or come to an understanding of something – when they need to adhere something they have just learned.” From the Swedish pedagogic program for pre-school, 1987 quoted in Lindqvist 2002, p.42.

Even though these thoughts have been discussed, since then there has been a very ambivalent attitude towards children's play, and play has had a very unclear role in pre-school. In 1996 the college of education in Stockholm held a conference together with the National Agency for Education and the Health and Human Service Department concerning the role of play in school, but no real effect on the educational system followed (Lindqvist 2002).

Even though play has been greatly discussed since and its importance stressed, and efforts have been made to implement play more into the school and pre-school curriculum it has not succeeded. In one of Birgitta Knutsdotter Olofsson's (1991) reports she asks ”Why do children not play at daycare?” and she concludes, that even if the daycare personal did stress the importance of play, they did not participate in the play that took place in daycare, and thus they did not encourage or stimulate it. Even though many teachers in daycares and pre-schools claim to be interested in the playfulness, they strive more towards the work-related activities – a discrepancy exists in what they believe and what they do - they still take a therapeutical approach to teaching.

A distance between the children and the teacher is created, as the adults stand for rules and norms and seldom participate in the children's play (Bae, 1985; Henckel, 1990 as quoted by Lindqvist, 2002).”Indeed, few 'serious' teachers would want a playful class. As such, lessons arising from play are not often desirable in the traditional educational curricula.” (Reiber 1996a, as quoted in Egenfeldt-Nielsen, 2009, p.79).

Gunilla Lindqvist points out the importance of solidarity between the child and the adults in play – a bridge between generations is needed, to put oneself in the children's place (Lindqvist 2002, p.19).

Birgitta Qvarsell (1987a, b) has held conversations with children of age 6 to 13 for many years with topics like free time, culture and school. These conversations proved strongly that children separate child-culture with school-culture, and that children believe that play and

school are not compatible. School is considered important, but boring, and connected to learning. Play, on the other hand, is considered important but not something to learn from.

What they learn in school seem partly fragmented, whilst they have a great ability to remember all rules of a game such as *Dragons and Demons*. Playing can help children process and practice their skills, and should not only be a part of their leisure time (Qvarsell, 1987b).

Even if the children state that play is not important for learning, they do identify motivation as one of the major factors in learning, and motivation towards learning is one of the most important aspects of play (Rieber 1996, as quoted in Egenfeldt-Nielsen 2009).

Play and own initiative are the key features that describe child culture, while subjects, skills and constraints are those of school culture. Qvarsell states that school must be focused on creating purpose-filled activities, and that the thought of play as "only play" may prove hurtful for education along with the view of learning as an hierarchical process and mechanical demonstrations (Qvarsell 1987a, Lindqvist 2002, p.59).

Lindqvist (2002) believes that the educational practices in pre-school has been, and is, very reliant on developmental psychological theories with no cultural or social context. She also believes that because of the romanticised view on play following in Freidrich Fröbel's footsteps the thought of free play has been able to exist simultaneously to a more development-focused, adult-led, functional view, but never in harmony with it. Events in pre-school has either been based on the children's freedom (play), or through external guidance from an adult. The pedagogical role of the adult is undetermined in Swedish pre-schools - they can either be a threat to, or a leader of play. This kind of dualism in pedagogical theories is according to Lindqvist an obstacle for further progress of the field as they do not ask the question of the child's relationship with its surroundings, a question necessary for developing a pedagogical process.

For Lindqvist the adult role is very clear; play is a condition for education and adults should be present in children's play and affect their social evolution, and the relationship between adult and child is very important.

2.3 Methodological considerations

This section describes the theoretical ideas that later helped define the attributes chosen for the study. Starting out with defining the meaning of play, continuing to the aspects needed for effective learning and concluded in the educational possibilities of games.

2.3.1 Definition of play

Play is, and has been for a long time, a well discussed are. Presently playfulness is not very often thought of as something connected with "valuable" learning, especially not by those who exercise it the most – children (Lindqvist, 2002). Though, playing per say is something

that is found in all parts of society and culture, as Johan Huizinga states in his book *Homo Ludens* – “Man the Player” (Huizinga, 1955).

As play is very undefinable, it also means it is a very versatile phenomenon - in 1994 the Webster dictionary had 74 different definitions of play (Lindqvist, 2002). Some of them were;

- To take part of rule based games and play.
- To pretend to be someone you are not.
- To rejoice in current activity.
- To move with enthusiasm, uncommitted and in freedom.
- To spend time on something nice.
- do something sportsly that is not taken seriously.

Others that have tried to define play has mentioned the following; play is an elaboration, it requires inner motives, it is independent and demands a coherent narrative. It is about transformation, increasing motivation, delight and enjoyment. Play is pleasurable, rule-governed, voluntary, active, meaningful and episodic (Docket and Fleer 2002; Csikszentmihalyi 1988; Cohen 1993 as quoted by Egenfelt-Nielsen 2009). Play is a dynamic encounter between rules, a child's inner thoughts and wishes and the exterior world.

In play, as rule-following actions, a initialization of consciousness for the social grammar is born. This creation of an imaginative situation also enhances and teaches abstract thinking (Vygotsky 1978 as cited in Lindqvist 2002). According to Docket and Fleer (2002) play is culturally conditioned, and depends on the culture and values, and that it is an attitude of mind – any activity can be play to someone.

The difference between play and learning is that play abides less specific rules and a more voluntary nature (Egenfeldt-Nielsen 2009).

2.3.2 Aspects of Learning

Kenneth Ginsburg, professor of paediatrics, is one of many professors that state that play contributes to both the physical, social, and emotional well-being of a child and is essential part of the child's development. Play also tends to improve independence which is in turn enhances creativity – it can keep the challenging nature of an event whilst removing fear (Wilson and Spears 2003 as quoted in Egenfeldt-Nielsen 2009; Ginsburg 2007).

Lev Vygotsky was another strong influence on the Swedish educational system, especially on the point of play. Play is about wish-fulfilment – in a child's play unrealistic wishes can be realised according to Vygotsky. In their play the children start to stand up against the adult world, creating new understanding of their own actions, also towards others. Therefore,

according to Vygotsky, play is the most significant source for a child's development of thought, will and emotion (Lindqvist 2002 p70).

“(In play) the child is always above its middle-age, above its daily behaviour; in play it is as if the child is one head higher than itself. “ Vygotsky 1981, p.169, as quoted in Lindqvist 2002, p.70

A child's imaginative capability is only as rich as it's surroundings, and vice versa. Creativity and imagination is the creative process that allows the human to create something new – which constantly occurs in play. (Vygotsky as mentioned in Lindqvist 2002)

Vygotsky had a creative pedagogical approach, which states that the mind is dynamic and changing, and constantly mirrors the surrounding social and cultural environment. Play is a dramatisation of reality, a reproduction which mirrors the relationship between reality and fiction (Lindqvist 2002). Play can be used as an outlet of children's daily experiences and their thoughts and feelings about it. Play becomes a mediator for the child's inner thoughts, and a negative of daily life, just like the arts, according to Vygotsky. Play is the most important way of developing a child's consciousness about the world (Lindqvist 2002, p.11).

2.3.2.1 Importance of transformation

There is a thought that some of the researches active in the area of cognitive development research as well as video games stress. They claim that, as the world is changing, children need to learn to adapt to it as quickly as it changes by learning to be innovative thinkers rather than learning standardized facts and terms (Shaffer, 2006). Alison Gopnik, professor of psychology and affiliate professor of philosophy, points out the clear evidence that the very first years of our lives are the most formative ones, from birth until around 6 years. We learn about the unexpected changes in the world around us, and how we can effect it too - plasticity, as neuroscientists call it. And according to Gopnik, it is the key to all kinds of human nature, from how we think to how societies work and how we interact with each other (Gopnik, 2009). Gee (2003) points out that as the world becomes more globalized it goes through a sort of Darwinism where the creativity and innovation will be vital, and as mentioned earlier, educational schemas today are not often focused on this kind of learning (Shaffer, 2006).

“The world has become a place of quick changes and rivalry that it has become more important than ever for our children to grow into self-confident, intelligent and motivated individuals that fully develop their own potential.” (Hainstock, 1978, p.74.)

In conclusion, the world needs children that can innovate and think creatively, and play enhances both through its dynamic and transformative ways. This is something games also can offer through constant challenging and ever-changing game-play.

2.3.2.2 Innovation and creativity

Similar to what Gopnik (2009) spoke of as plasticity, Salen and Zimmerman (2003) use the term *transformative play* for a kind of play that transforms with the players actions, changing structures that the player once took for granted, constantly challenging. According to Schwartzman (1978) transformation is the most important distinction of play. Salen and Zimmerman (2003) support the same thought and claim that; “The role of play is not to work comfortably within its own structure but rather constantly to develop its structure of play” (Salen & Zimmerman, 2003, page 305).

Transformative play can take place in many places, both in regular play in everyday life as Huizinga (1955) speaks of, or in chess as well as software modifications of the fundamental rules of a video game. As uncertainty is a key point in every game (Salen and Zimmerman, 2003), whether it concerns changes in narrative and choices that has to be made, challenges with coordination, reaction time, memory or strategy it offers much space for cognitive development through its flexibility. The transformative nature of play and games on roles and play objects contribute to and enhances creative skills as well as verbal intelligence (Holmes and Geiger, 2002; Levin, 1996 as quoted in Egenfeldt-Nielsen, 2009).

Learning is often combined with something boring and very distant from play and games, even though learning is something that is closely connected to the sense of enjoyment and fun. Adams (2010) states that a game will remain enjoyable as long as it *offer new things to learn*, along with game design that enables the player to do so in an enjoyable context. Further on he writes that; “A game should always provide an enjoyable context for learning; if it doesn't there's something wrong with the game.” (Adams 2010, p.24.). Egenfeldt-Nielsen also states that “[...]computer games provide strong and rich universes that are interesting to engage with.” (Egenfeldt-Nielsen 2009, p.179).

Many support this thought of the importance of play, and even see it as a fundamental condition for effective educational games (Salen & Zimmerman, 2003; Adams, 2010).

”Video games have the potential to lead to active and critical learning. In fact, I believe they often have a greater potential than much learning in school.” (Gee, 2003, p.46)

If video games are played in an active and attentive way that enables *active learning*, which signifies that the player might learn to experience the world in a new sense, see and act on it differently, be able to discuss and interact with a new affinity group, find new ways to learn and problem-solve in the new semiotic domain to which the game is related to. They are learning the internal structure of the semiotic domain, and how it relates to other semiotic domains and society in general.

Critical learning, being necessary for active learning, means focusing and reflecting over the semiotic domain as a design space. What the child may learn in one semiotic domain might be applicable to another, say a school subject, if those school subjects too are active processes and not memorizations of passive facts.

”No teaching can occur when students are simply asked to repeat what they already know”. (Hullfish & Smith 1961, p.204 as quoted in Bråten, 1998, p.95)

In this new and ever-changing world children are in need of a creative and innovative mindset. Transformative environments and game-play in games can offer the kind of transformative challenges that are required. Practice, not repetition, is necessary for learning in a deep way and children must thus be motivated to engage in practice to learn, which can be accomplished in games (Gee, 2003).

Naturally, even if a game reaches commercial success it does not necessarily mean that it can or will maintain engagement of children in educational environments, or that the educational memorization will be more effective.

Games cannot guarantee enjoyment. "[...]motivation and so fun is not in fact a property of an activity, but a relationship between that activity and the individual's goals at that moment. ", like Draper (2002) stated. Just like playing is subjective to the individual and its culture, so is enjoyment.

Even though nothing guarantees that a game is played with active and critical learning, if the internal structure of the game encourages this kind of learning and if the social surroundings of the player also encourage reflective thinking it may facilitate active and critical learning.

2.3.2.3 Situation-bound objects

In correlation to previous sections Vygotsky also believed that play is extremely important for the infant, especially play that acts as *liberalization from situation-bound actions*. By removing the situational boundaries for play the child can disconnect the meaning from the object itself and create new meanings - a piece of wood becomes a horse, the sister becomes a mother and the doll a child. A heap of sea weed becomes a cake, the brother a chef, a stone the plate. When the meaning is disconnected from the word it inherits a greater sense of independence – the child starts to separate the meaning from the visual field, which is important for e.g. language learning and understanding of social roles. When learning a new language and a new meaning for a word, object or action the child must learn the small tonal differences between the new language and native language, which also gives a better understanding the latter as well as the greater language system and the ability to understand how others understand and translate. (Bråten, 1998, p.49)

With foundation in the familiar, disconnection can take place. By understanding the concrete they can more easily understand more abstract interpretations (Bråten, 1998, p.46). The actions expand from the meaning and the child's relationship to reality becomes more free, and enables the child to simulate new situations and interpretations.

In all, this kind of play can be extremely important as it frees the child from the situational meanings and enables creation of *new* meanings and not only discover knowledge that already exists. In play the child interpret its knowledge and experience in a reversed process which leads to new knowledge. According to Vygotsky, education should be an inner continuation of play (Bråten, 1998), and so should in that sense educational games be.

2.3.2.4 Importance of independence

As mentioned previously, nothing guarantees active and critical learning in a game, or motivation as an outcome of it. Maria Montessori stands as another of the influences of the Swedish school. Montessori believes that the will to learn must come from the child and cannot be taught. Children experience spontaneous happiness in learning and no matter how standardized it is, every new object and new lesson exciting for them, simply because it presents a new challenge (Hainstock, 1978, p.55).

Montessori believes in controlling the environment rather than the child - to let the child learn in its own pace and by own nature. The child will gain the self-confidence that is a condition for competence through a controlled environment that keeps them from more than temporary failures while working from simple to more complex tasks. By creating a relaxed but controlled environment, Montessori tries to encourage self-discovery and engagement for learning in own pace and interest to give the child the possibility to realize their full potential (Hainstock, 1978). According to Montessori the first early years, from 0-6 years, are the most formative ones and education during this time should be easy, entertaining and important for the child. As children want to learn on their own and doesn't need to be motivated by rewards or punishments to learn, but by the natural will to learn and overcome the challenge itself. (Hainstock, 1978) By studying children's individual needs and building education upon that, Montessori's methods can evoke spontaneous self-discipline and give the child a fondness for structure and constructive activities (Hainstock, 1978).

In the Montessori classroom there are no gradings, and the focus lies on the individual rather than age. The classrooms are decorated with toys accordingly, from the adult world but in child size. She points out the child's natural interest and admiration for the adult world from age 3 to 6 when much copying and mimicking takes place, along with using all five senses to learn along with reading and math-readiness (Hainstock, 1978).

In this environment the children move freely between stations, interacting with each other and occasionally teachers, in a world where objects are the best teachers and where children can act freely and satisfy their own needs (Hainstock, 1978)

In Austria a study was conducted on 24 schools, 12 reference schools and 12 schools with the experimental educational theory. The experiment included a combination of free and guided play in the education, whilst the other schools had regular lessons. The purpose was to improve collaboration, motivation and to develop a creative way of thinking as well as improving the emotional relationship to school among children and teachers. Play was seen as a stress-reducing activity and a source of happiness and inner motivation for learning. After four years the children were much more pleased with school and showed a greater self-evoked motivation and interest for interaction and play with both teachers as well as other students. The teachers also felt that the children were more keen on cooperation and much less aggressive compared to the reference schools, with no difference in grading. It led to much more creative solutions to presented problems during class and led to a new curriculum in 1987 where play is compulsory in pre-school. (Trageton 1997, p.216, quoted in Lindqvist 2002, p.131)

Montessori and Trageton both speak of controlling the environment instead of controlling the students, or the player. To allow the children to play freely in an controlled environment, with partial interaction of adults the children grow into independent, collaborating, motivated and creative individuals. In terms of controlling an environment, games can do just that. As video games can act as a secure space for children, where none of the demands or pressure from the school environment exists, where they can make mistakes without repercussions, and it has shown to have both ego-boosting and self-calming effects enabling the children to learn on their own terms (Annetta et al., 2010; Egenfeldt-Nielsen, 2009).

2.3.2.5 Importance of social interaction

In continuation of previous section and its mentioning of the combination of free and guided play in education, Vygotsky also pointed out the importance of social interaction for cognitive development. He claimed that social interaction between humans is what enables us to assimilate and incorporate other's experiences, and that the social dimension of the mental processes are more important than the individual one. Social interaction mediates *higher psychological processes*, which he considered to be cultural and cognitive tools such as writing, language, storytelling, drawing etc., as well as traditional cognitive processes such as logical memory, selective attention and concept formations (Bråten, 1998, p.14).

According to Vygotskian theory, in a child's cultural development, both individually and socially, every new function always appears first inter-psychologically, that is between people on the social level, and later it appears intra-psychologically, on a personal level inside the child, hence the importance of social interaction (Bråten, 1998, p. 106).

James Paul Gee (2003) also argues for the social importance of learning, through *affinity groups* of *semiotic domains*. *Semiotic* meaning that different signs and symbols (anything that can take on meaning, as babies, mothers, gestures, sounds, images or icons) have different meaning in different depending on the situation; as cultures, groups, contexts or historical periods, as the colour red might be associated with love in one culture whilst danger in another. *Semiotic domains* is simply a certain practice, that has adopted a certain kind of interpretation of relevant symbols. A semiotic domain might be a certain scientific field, with its own meta-language and interpretation of objects, words or symbols or it might be the community of a certain game, or game-genre. An affinity group is the people associated with the semiotic domain, that share a similar set of goals, endeavours, values and norms.

Andersen and Kampmann (1996) also speaks of this social domain of play and games. They define two kinds of play; deep play and social play.

Deep play is defined as a complete absorption with play, a state that has different names such as immersion, spatial presence or flow (e.g. Adams 2010; Cairns 2004; Csikszentmihalyi 1990) where the player loses track of time and actions and effects in play or games matter as much as those in real life. Social play, often being underestimated according to Andersen and Kampmann, is defined as the surrounding activities that support and ease deep play through gaining more knowledge of the subject through social interaction, through what Gee (2003)

calls affinity groups.

Through introducing a social aspect in educational games, it could aid deeper knowledge of both the game and the semiotic domain surrounding it, and through that of other semiotic domains.

2.3.2.6 More Knowledgeable Other

In correlation to this Vygotsky advocated social and mental development through the help of scaffolding and an *MKO – More Knowledgeable Other*. In the Social Development Theory a child which cannot complete something independently *but* with the help of another, someone with more knowledge, a MKO, the child can develop skills that they later will use on their own. In comparison to Gee (2003), this person can be seen as a person from the affinity group of the semiotic domain connected to the subject.

“What a child can do with assistance today, she will be able to do by herself tomorrow.” (Vygotsky, 1978, p.87)

This state is known as the *Zone of Proximal Development*, and is most of the support should be given to the child. Scaffolding in Vygotskian theory includes;

1. Evoking the child's interest for the task
2. Simplifying the task so the child can deal with parts of it
3. Maintaining and pursuing the initial ambition through motivation and guidance of the activity.
4. Making clear what differs between what the child has achieved from the ideal solution.
5. Controlling frustrations and risks
6. Demonstrating the idealistic execution of the task.

Bråten 1998, p.111.

Effective scaffolding depends greatly on the MKO's ability to recognise when the learner was in need of help of different degrees and conformed the scaffolding to it. In an experiment where observations were made of how mothers interacted with their children when acting as MKO's, it was proved that general encouragement, specific instructions and direct demonstrations of the task were all important for effective scaffolding when matched to the needs of the learner rather than used separately. Freud also supported the idea of scaffolding as one of his studies showed that children assisted by their mother in earlier tasks later on preformed much better with a more difficult task independently, compared to the children who did not receive any scaffolding (Bråten ,1998).

“Among children there exists a equal respect and an absence of competition which enables the children to learn from each other.” (Hainstock, 1978, p. 60)

The absence of competition and presence of mutual respect is important for scaffolding, as well as observations and adaptation to the player – which is possible in a game environment. Through the use of *NPC's* (Non-Playable Characters), narrators and/or *AI* (Artificial Intelligence) as well as other players the player can be scaffolded and helped when needed, while introducing a social aspect as well.

2.3.2.7 Importance of processing

In relation to the ideas of scaffolding combined with play, Gunilla Lindqvist has conducted many studies where famous media- or other previously encountered characters and narratives are brought in to the school environment through dramatised events and work-shops. During the events the visiting character may need help finding something, solving a problem or creating something new. During several weeks the children play, create and discuss things concerning the event.

One of her studies consisted of two test groups of pre-school children. Both groups attended a theatrical play, but only one of the groups played and processed it afterwards. The first group played, discussed and did work-shops concerning the story and characters when back in pre-school – while the other group did not. The results showed that active methods are needed to help the children relate the opus with reality, and that second, non-processing group did not absorb the thoughts and moral of theatrical play as well as the first group (Lindqvist, 2002, p.30).

In Lindqvist's (2002) studies the adults, the teachers, had a very important role of scaffolding the play-related events that occurred after the visit to the theatre. They would drive the story forward and explain different situations that occurred. These events were supposed to create a link between the child's ipseity and the world, to enhance conciousness for reality.

Being able to connect the thought of studying and playing simultaneously is proved to give better result than when not being able to make this connection. This connection and balance between the two are necessary to build relevance and engagement to make the learning process more effective, regardless of general game features – and scaffolding might just be able to help create this connection. In these cases it is required of the instructor to be able to see and strive towards this connection (Egenfeldt-Nielsen, 2009).

This once again points out the effectiveness of the combination of free- and teacher lead play, rather than the entirely free play that Brubacher (1947) and Fröbel (quoted in Lindqvist 2002) mentions. If this method of teaching takes place it contributes to effective learning, cognitive development, motivation, self-esteem, creativity and will to collaborate. This also applies to games, and the concept of this combination of play and possibility for processing should be included in educational game design.

3. Purpose

By studying four tablet computer games made with educational purposes for children age 6, and one game made for entertainment for the same age group this thesis aims to analyse how the tablet game industry incorporates the element of play in comparison to the educational theories concerning play in a traditional school environments.

As the educational games are chosen from Swedish top-lists on educational tablet games and the literature chosen mainly concerns pedagogic thoughts of play in Sweden this thesis also acts as a sample of playfulness in educational games compared to school education in Sweden today. Are the games playful enough compared to the directives given for Swedish preschool, and recommended by educators and professors studying the area? How can they become more playful? Should they become more playful?

4. Method

This section describes first how the games were chosen, secondly how they were studied with general attributes and a scaffolding section and lastly and how the result was analysed.

4.1 Choosing the games

This thesis is a comparative study of four games from the educational tablet games for children age 6 in Sweden, and one game with no educational purpose made for children age 6 in Sweden. The educational games were chosen randomly from the educational section of the app market for Android devices, Google Play. This thesis aims towards acting as a sample of the educational tablet games for children genre on Android in Sweden, thus the educational games are picked randomly and not selectively chosen. The fifth game, chosen from the game section with purpose to entertain rather than educate was chosen to point out the difference between the two and their approach on playfulness.

The fifth, non-educational game, was chosen from the entertainment section for games for children. It was chosen for comparison between the educational genre and the non-educational one to act as an example of playfulness. The game chosen was Pippi's Villa Villekulla (see Appendix A for more information about the game, along with the other chosen games).

The educational games were selected from the "paid" section of the app market, which might cause the study might not present an entirely accurate representation of the the educational genre, also not including other platforms such as iOS. The choice to conduct the study on games with no in-game purchases and pre-paid methods was firstly to filter out games that are not made by a proper game studio with a proper educational purpose for the game, and escape in-game commercials, pop-ups and other possibly interfering or disturbing features. As paid apps also usually requires a larger effort, dedication and investment from the buyer these apps tend to make sure to give much quality for the money.

All games were picked from the app market for Android devices simply due to technical

restrictions during the study, as well as lack of reliable sources for collective statistics of games from both platforms. There might also be a possible difference in performance on the different platforms that might affect the relevance of the study.

Date of purchase

4.2 Studying the games

Based on the previous research the focus points mentioned below were chosen due to the expressed importance of these matters in previous research, concerning playfulness, learning and computer games. The results are entered into a matrix (see Appendix B), either with answer *yes* (the game completely includes the mentioned attribute), *partly* (if game partly includes the mentioned attribute) and *no* (if the game does not include mentioned attribute). The different answers were given different value to give the games an overall score. "Yes" gives 1 point, "Partly" gives 0.25 points as it is more easily obtained and not as valuable as "Yes". "No" gives 0 points. Along with this observations were taking to argue for the answers given (see the 5. Results).

Some of the most prominent definitions of play also mentioned in previous research, such as its voluntary nature, self-evoked, that it is interesting, intriguing and meaningful as well as delightful, enjoyable and episodic were not included in the study. All of these attributes are either cultural and personal, or are a given part of playing a game. In this essay they were excluded from the chosen focus points for studying the games for this reason, and also to delimitate the focus and length of the essay.

Playing games should be voluntary to ensure pleasure and enjoyment and should also be of voluntary nature to enable the child to learn by its natural wish to learn, to choose subjects of their own liking and only engage it as long as they are interested. This should be a part of the initialization of playing the educational game, as well as the game being interesting, intriguing and meaningful in the sense that something in the game interests the child, maybe setting, theme, challenges or a social factor. Keeping the player interested may also partly be included in the transformative nature of a game, the social opportunities offered, its similarity to intriguing parts of real life, or as a escape from it, depending on the players interests. The attributes of being delightful and enjoyable are in the individual nature dependant on adjustability to players performance, to keep the difficulty just right along with choosing a game that is within their interest, may it be intriguing graphics, audio, play mechanics, familiar or foreign nature. Some of the attributes may be on the verge of passing as a yes, no or partly and here a decision has to be made, hence some games that may have some e.g. transformative properties but still be classified as "no".

Here follows an overview of the attributes chosen for the study, followed by a more defined explanation;

General Attributes

- Transformative
- Social Opportunities

- Compassionate Approach
- Reality Related
- Liberation from Situational Meanings
- Safe Environments

This section is based on Vygotsky's five guidelines for scaffolding, supported and broadened by other researchers and adjusted to suit video games.

Scaffolding

- Adjusted to player's needs
- Encouragement
- Explanations
- Deep Learning
- Processing of Knowledge

Definition of General Attributes

Transformative

A transformative environment constantly exposes the player to new situations and challenges, and forces the player to analyse, test and evaluate the environment as well as their actions. The mind is from birth very flexible, dynamic and changing and remains so during the first years of infancy (0-6) and in the ever-changing globalized world they are born into they will need such skills (Gopnik, 2009; Vygotsky as quoted in Lindqvist 2002). The children of today need to be innovative, think creatively and see options and solutions where no one else does. Transformative games or play changes with the player and the choices that are made, constantly changing the structures that once were taken for granted, may it be changes in game input, rules, mechanics or narrative. This both keeps the player interested by offering new patterns to understand and master (Gee, 2003; Shaffer, 2006; Ziehe, 1992). And a game is only enjoyable as long as it offers new things to learn (Adams, 2010; Salen & Zimmerman, 2003) so transformation is important for both enjoyable games as well as learning through them.

Social Opportunities

Social interaction enables children to better understand social situations and rules and improves understanding of other's experiences, the surroundings and also for expressing and understanding ourselves (Vygotsky, as quoted in Lindqvist, 2002). By encouraging or enabling social interaction within a game possibilities for interacting with affinity groups as well as spontaneous scaffolding becomes possible and thus learning more and deeper about the game, its structure and design (Gee, 2003). Through social interaction and imitation it also mediates higher psychological processes, such as writing, reading and logic memory (Vygotsky, as quoted in Lindqvist, 2002).

Compassionate Approach

To approach children solidarily is very important for learning in general, to gain a

mutual respect and understanding, to create the safe space needed for learning (Lindqvist, 2002). When the adult, teacher or other leading role (such as an narrator or character) does not encourage or participate in play it indirectly affects the child, which removes possible situations for processing knowledge (Bae 1985; Henckel 1990 as quoted in Lindqvist, 2002). Between children a safe and compassionate relationship exists by nature, enabling them to learn from each other. By creating an environment where the child can relate to the other participants in the game (characters as well as other players) a neutral learning space can be created where "social" learning is possible. The game must also address the child on equal level, not acting as a hector or more superior one, deciding what the child must do and when in the game and challenges. The child is free to do what is chosen, and when, without punishment. The child must engage by choice, and not be forced to do so (Gee, 2003; Egenfeldt-Nielsen, 2009).

Reality Related

As mentioned above, having familiar objects but in new situation may be one way to help the child think and act in new creative ways. In turn, reality can also be a good starting point, where the familiar can help the child relate and understand new and more abstract interpretations (Vygotsky as mentioned by Lindqvist, 2002; Hainstock, 1978). At age six the child has a natural interest and admiration for the adult world, thus the relation to reality is extremely important, as well as possibility for mimicking and copying it (Hainstock, 1978).

It may also be easier for the child to bring the new knowledge back to their daily life if the material is reality related, and thus practice these skills further as well as enabling social interaction. It might be through actions, events, situations as well as characters or narratives that exists in other parts of the child's life (Lindqvist, 2002).

Liberation from Situational Meanings

One of the most important aspects of play when it acts as a liberalization from actions and meanings that are bound by their situation. By removing these boundaries the child can disconnect the object or meaning from its situation (the sister becomes a mother, a synonym to a word is learnt but in a new language,) and enables the child to make new connections, and in comparison to the old meanings both becomes more clear (Vygotsky, as quoted in Lindqvist, 2002). As meanings may differ in cultures and in different semiotic domains it is important to learn both the reflective thinking this entails as well as the tonal difference in the interpretations. This may be by using familiar objects or words in new situations and new ways, to disconnect to then simulate, pretend and reconnect meanings freely (Gee, 2003; Lindqvist, 2002).

Safe Environments

The environment surrounding the child was one of the factors mentioned on numerous occasions in previous research (e.g. Lindqvist, 2002; Bråten, 1998; Gee, 2003; Hainstock, 1978; Shaffer, 2006). This section only concerns internal environment (included in the game or play; feedback, difficulty of challenges, attitude of characters) and not the external environment (social factors, encouragement, guidance) which is covered in the "Social Opportunities"-section.

Providing a safe environment where the child can engage with what interests them, in their own pace is crucial to help build the self-confidence which is needed for learning, analysing and thinking and working creatively. The environment is controlled to make sure the child only encounter temporary failures while inspiring to learn and to keep them motivated and interested, through both narrative, characters, environments and game-play.

Vygotsky's Scaffolding

Adjusted to player's needs

As mentioned under "Safe Environments" many stress the importance for analysing adjusting the scaffolding to the learner. By studying the player's actions, successes and failures, and adjust the amount of scaffolding and game difficulty accordingly to enhance learning (Bråten, 1998; Hainstock, 1978; Lindqvist, 2002).

Encouragement

Keeping the child's interest and motivation is a delicate matter, and without proper encouragement and own participation in children's play as well as learning may prove hurtful for the educational as well as the compassionate atmosphere. Encouragement both as in keeping the child interested and focused on the task and for controlling the child's frustrations. (Lindqvist, 2002; Bråten, 1998)

Explanations

In continuation on previous section "Encouragement", explanations are the step that follows and are likewise important for controlling frustrations and interest when the task is difficult, (but in a controlled environment) but balanced so the child can learn with assistance – through explanations and demonstrations of the task, striving for the ideal solution to the problem.

Active Learning

While offering processing of acquired knowledge, this processing should aim for a deeper understanding – firstly, of the educational values that the game inhabits, what is to be learned - to be able to make this connection is very important for absorbing the knowledge (Egenfeldt-Nielsen, 2009; Gee, 2003). Secondly to understand the internal structure of the game, to use reflective thinking to understand the internal structure of the game, its rules and functions to be able to analyse it and use it in new, creative ways, which is also important to later be able to discuss this structure in the semiotic domain to gain further knowledge, and later relate this domain to other (Gee, 2003; Vygotsky as quoted in Lindqvist, 2002).

Processing of Knowledge

Practising and processing of learned knowledge is extremely important for assimilating and absorb new knowledge as well as mastering it. (Gee, 2003; Lindqvist, 2002) Practice does not necessarily mean skill-and-drill, repetitions or weekly glossary tests but simply to use previous acquired knowledge in a new way, in a different situation. To enable this kind of practising the children need to be motivated to do so,

which is something games can do by presenting an enjoyable environment, new interesting challenges and situations to solve with previously learned knowledge (Gee, 2003; Shaffer, 2006).

4.3 Analysing and comparing the the data

The data received from the conducted study was analysed and compared with help from the created matrix (see Appendix B) along with the notes taken in the result section while also looking at game ratings, descriptions, downloads and pricing on the app store, trying to find common patterns in relation to their inclusion of playfulness and the educational effectiveness.

5. Results

For further information concerning the selected games, see Appendix A. To see the matrix created from the results of the study, see Appendix B. Below follows more detailed comments on the different attributes from the study.

5.1 Kids Logic Land Adventure

General Attributes;

Transformative

Kids Logic Land Adventure does not pass as transformative, even as it does constantly introduce new challenges, though only in mathematical problems and not in game-play, new environments, situations or characters to keep the player interested. It may be transformative in the educational sense but not in entertaining and playful sense. The mathematical problems also remains the same through out the game, only the difficulty is higher, and doesn't introduce new situations to master the knowledge in.

Social Opportunities

Logic Land doesn't offer or encourage any social opportunities, unless the children themselves engage to do so.

Compassionate Approach

Logic Land does not have any *active* characters, that is moving, speaking or interactable characters that the child can relate to, there is no real narrator present to address or motivate the child.

Reality Related

The game has no real connection to reality, neither the setting, game-play, objects or characters. Even if the front page features two children, they have no real purpose in the game other than acting as buttons to continue to the next challenge, just like the setting of treasure hunting.

Liberation from Situational Meanings

There are no real opportunities or encouragement for the children to disconnect and reconnect meanings, as the only objects that exist are different shapes with different patterns. The objects are rarely reality related, or have any setting or meaning to the child and thus new interpretations are difficult with nothing to build on.

Safe Environments

Logic Land has no time limits, social interactions, or pressuring elements of any kind, and is in that sense safe. Though as it does not offer any proper scaffolding or control of the child's frustrations, and the game-play mostly consists of trial-and-error if one cannot figure out what to do, it might not be perceived as a calm and educating

environment. When not being able to successfully solve a problem one has to return to the main menu and restart that level from the very beginning.

Scaffolding;

Adjusted to player's needs

Logic Land does not have any settings of difficulty, or any systems that register and studies the child's behaviour and adjust the challenges accordingly. However, the player cannot proceed to the next level without mastering the previous one – this is not a feature that is adjusted to the player's needs but rather the opposite.

Encouragement

Logic Land does not give any encouragement during the challenges, and the feedback is only made up by simple audible response.

Explanations

The explanations offered in Logic Land are only the first introduction of the task, stating what the child must do, only explained in text and sometimes only differ from other explanations by one word that radically change the task such as "How does the shape look from below/above" – there are no demonstrations or further explanations or tips on how to reach the ideal solution.

Active Learning

As Logic Land does not offer any encouragement or explanations during challenges the game does not have any possibilities of encouraging a more deeper understanding of the game and its design structure.

Processing of Knowledge

Logic Land does offer processing of the acquired knowledge through constant repetition of previous challenges but with increasing difficulty. However, the game does not provide the enjoyable context mentioned in previous points of study important for motivating the child to participate in practising.

5.2 Lola's Math Train

General Attributes;

Transformative

Lola's Math Train offers, in the same sense as Kids Logic Land Adventure, transformation in educational challenges but not in game-play or aesthetic values. The mechanics stays pretty much the same the whole game, apart from sometimes dragging things, sometimes popping things, but this as you go around the same visual "train track" even the new input quickly falls into a pattern as a repetition occurs each lap of every previous challenge. The player has no effect on the outcome of the game or the challenges other than the scores.

Social Opportunities

Lola's Math Train does not encourage any social interaction, either through game-play or words.

Compassionate Approach

The game does not really have a compassionate and solidary nature, even if the characters are animals and addresses the child and asks for help, it does not really invite or encourage the player in any sense, the child cannot effect the "outcome" of the game, but only press buttons, get a score before told that "Lola has to play with her friends now".

Reality Related

The game has no real connection to reality or to a child's daily life, other than if any of the characters by chance resemble a toy or teddy.

Liberation from Situational Meanings

The only real disconnection from reality that Lola's Math Train offers is the fact that the characters are animals that speaks, wear clothes and are friends.

Safe Environments

The game partly offers a safe environment – even if the child has to use trial and error to get through the challenge, or fail a challenge it does not affect the game other than giving a different score in the end of each level. Child can continue even if making wrong decisions, the environment is neither negative nor positive.

Scaffolding;**Adjusted to player's needs**

The game has options for adjusting the difficulty of the game between hard, medium and easy. However, it makes no difference how many times one does wrong, but it does recommends a different app if score is too high/low.

Encouragement

No encouragement is given during the challenges.

Explanations

No further explanations are given during the challenges other than the initial one which is repeated when the child has pressed something unrelated or the wrong answer two times in a row. This explanation is both written and said, as well as numbers and equations are also spoken out loud. No demonstrations are made.

Active Learning

Through both speaking and writing out the mathematical terms the child becomes accustomed to the language used in the affinity group of mathematics, which can

enable discussions and social learning. The game does not, however, do this actively or encourage such actions or to understand the educational purpose and internal structure of the game alone.

Processing of Knowledge

Just like Logic Land the challenges of the game remains similar throughout the game but with more difficult mathematical problems, and enables the child to practice, however (as mentioned in Logic Land) it does not motivate the child to do so.

5.3 Peppy Pals

General Attributes;

Transformative

Peppy Pals can constantly introduces the player to new environments, challenges and situations, even if the game-play does not change much but constantly involves clicking things in the right order. In every level the player is introduced to new emotional situations and must learn to read the characters body language to see the event through.

Social Opportunities

The game itself does not encourage social interaction through game-play, but does however do it in the "about" section. Here the player and those surrounding the player are encouraged to participate in the game. This clearly states that child might benefit from social interaction – though it is not encouraged or initiated by game-play.

Compassionate Approach

Peppy Pals has a very compassionate nature, the child is constantly looked to by the characters during the challenges, driving and engaging the child to take action to help. The game does not address the child from a hector, navigating the course of the game, demanding that one task must be done before starting the next, but lets the child at any time return to the main screen to try another task which in also progresses the game (in the beginning you have three options, and as one is completed, more become accessible).

Reality Related

Peppy Pals introduces environments (both social and physical) that most likely are familiar to the child either through own experiences or through media. The physical environments may be a playground, a river, a farm or a park while the social environments range through all the different emotions and are evoked by situations. These situations, both social and physical, are something the child can relate to their own life, or if not, relate to and understand through previous knowledge.

Liberation from Situational Meanings

The game does, just like the previous game analysed (Lola's Math Train) offer

disconnection through the characters, but also through the fact that they have more advanced emotions, acting like humans, having likes and dislikes even though they are animals. The fact that they are animals might be the right kind of disconnection needed to create the understanding of the relationship to real life and those surrounding the child, especially through the suggested scaffolding of relating the emotions seen on the screen to the child's own feelings.

Safe Environments

Peppy Pals also offers a safe environment, as the child is not punished for doing wrong, no high scores are given and the child receives the same reward every time no

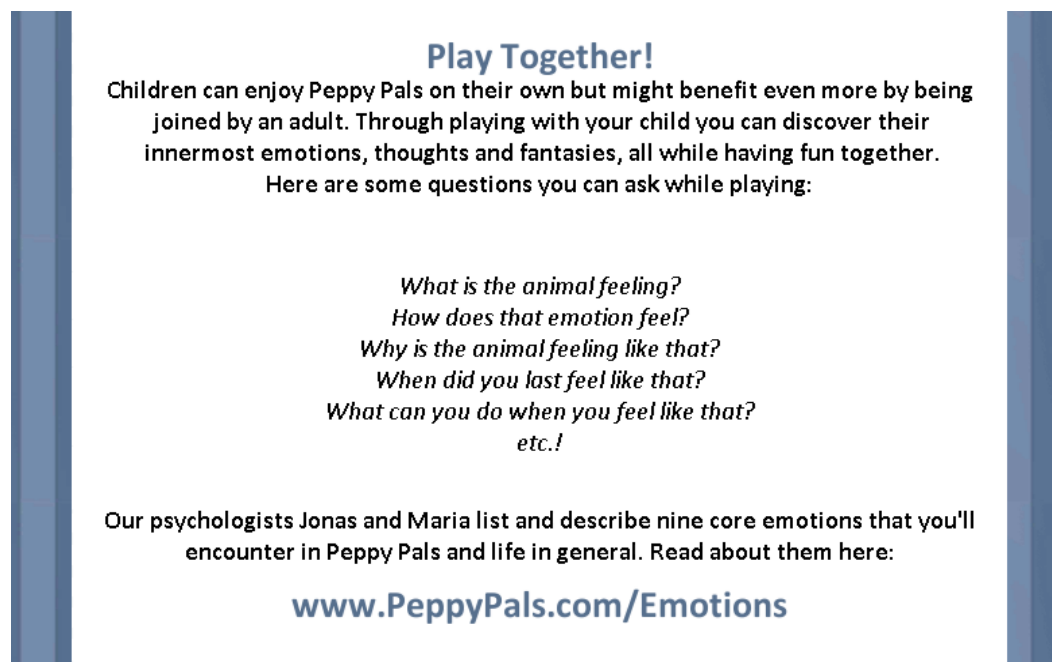


Illustration 1- Peppy Pals; Encouragement to play together

matter their performance. The child can exit any challenge without question to continue on to the next one, to come back later without punishment. The over-all environment and feedback has no negative ring to it when the player presses the wrong thing, as in fact nothing is wrong – the characters react to all objects or input given to them differently, based on their personalities.

Scaffolding;

Adjusted to player's needs

No, Peppy Pals does not offer any adjustments to the difficulty of the game. Even if the child can end any challenge at any point, come back later or skip them it is still the child that has to adjust to the game, and not vice-versa.

Encouragement

The game offers some encouragement through out the game, through positive sounds and visual feedback when the player presses something unrelated (the object which should be pressed gives a little wink). The characters also looks to the player when the player should interact with it, encouraging the child to do so.

Explanations

Peppy Pals does not offer any explanations or demonstrations of the task, other than the visual and audio feedback.

Active Learning

As the game is somewhat reality related, the child may relate these situations to real life and real situations, and the educational purpose of the game is to comprehend the different emotions and what evoked them, which the game strives to do by presenting the emotions in different situations to give a broader understanding of them. Together with the encouragement for social interaction the game may very well offer opportunities for active and deep learning and understanding of the game.

Processing of Knowledge

Peppy Pals also offers processing and practising of acquired knowledge, both through the repetition of the emotions in new situations, and through the social interactions that are encouraged, helping the child relate these emotions to real life. The game also has a practice section where the child can try to interpret different emotions that the animals do and press the corresponding emoticon.

5.4 Dr. Panda's Restaurant 2

General Attributes;

Transformative

Dr. Panda's Restaurant partly passes as transformative, as it does offer new challenges through what meals have to be made, with various ways to make them, though the game quickly falls into the pattern of taking orders, making food, serving food, repeat.

Social Opportunities

Dr. Panda's Restaurant does not encourage any social interaction, either through inside or outside game-play. However, as the game is partly reality related it might encourage the child to engage with people around them, but this is entirely up to the child.

Compassionate Approach

Dr. Panda is clearly the child's superior, knowing the craft and nodding approvingly or disapproving by shaking his head if the child does wrong. This does not really promote a compassionate nature where the child and the character are equals and can learn from each other. The child cannot either choose when to make food, what food to make (if the customer wants soup, the soup base is compulsory).

Reality Related

The game has a reality related setting, where the child is impersonating a chef, and creating meals that may exist in the child's daily life. The child can experience the life of a chef and restaurant owner, of taking orders, pleasing customers and making food.

Liberation from Situational Meanings

Dr. Panda's Restaurant stays very realistic through the game, as all the meals are realistic and only disconnection from reality is the characters, as they are animals, acting as humans.

Safe Environments

The game passes as some what competitive as the child in fact can do wrong, and receives money for it. The child is always monitored by Dr. Panda, who comments on what is good and what is bad, even if the child can choose freely which ingredients to use and how to prepare them, the child cannot create a meal completely from scratch.

Scaffolding;**Adjusted to player's needs**

Dr. Panda's Restaurant has no settings for difficulty.

Encouragement

The game gives no real encouragement during the challenges, other than a happy nod if the child does right.

Explanations

Dr. Panda demonstrates visually how to do some of the tasks, such as using the knife or the shredder, if the child does not act when entering the scene. It also provides visual feedback in the shape of sparkles when a ingredient is done, for most of the meals. The player also gets to see what the customer liked/disliked when the meal is finished, as well as during the game when choosing the ingredients, to compare the two.

Active Learning

The active learning in the game is mostly based on its connection to reality, through recognition and imitation, but not through social interaction or encouragement to understand the structure or the educational intention of the game.

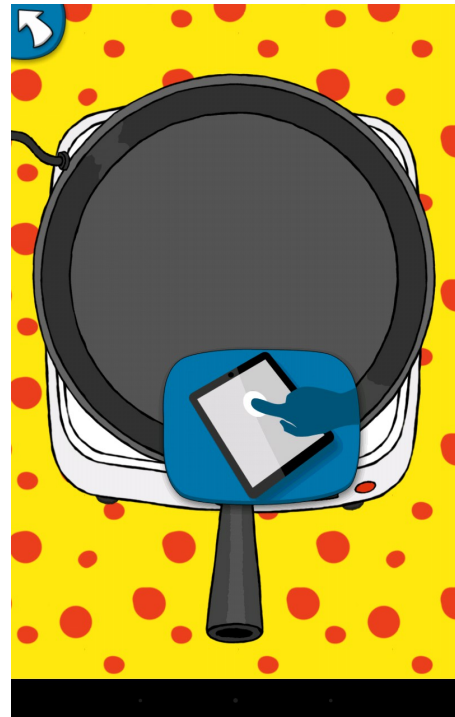


Illustration 2- Pippi's Villa Villekulla; Demonstration of making pancakes.

Processing of Knowledge

The game gives opportunity to process the new knowledge, through constantly re-using the new skills when making new meals with the same ingredients or techniques.

5.5 Pippi's Villa Villekulla

General Attributes;

Transformative

Pippi's Villa Villekulla constantly introduces new elements and challenges to the player, both in environments, characters to play with, as well as in game-play, from trying to catch falling plates with Mr. Nilsson, bake gingerbread or pancakes with Pippi, curse with Pippi in the cupboard or play hide and seek with all of them. As there is no correct answer to any of the tasks, room for play is created where the child sets the rules of what to create while the game offers the possibility to do so.

Social Opportunities

This game actually invites the player to play hide and seek with someone who is not playing, by having the child hide the device, and then have another person find it (that is, find Pippi). Through this it gives opportunity for social interaction, and thus both scaffolding and learning through each other, as well as bringing the game world into the reality and into the every day life of the child.

Compassionate Approach

In Villa Villekulla the player is approached as a child playing with Pippi, with sentences like "When I throw a party, everybody's invited. Please, go ahead and eat!", the child is introduced to Pippi's home as if actually being a visitor, playing all the game Pippi normally plays, making cookies for the children, playing music with them – here the child is the one who knows what to do and always does right. In Villa Villekulla the child makes the rules as there is no correct solution to any task.

Reality Related

Pippi's Villa Villekulla is very reality related, as its setting is a real house, the characters are other children and challenges are things familiar to the child, only slightly more silly, bolder and braver, such as making pancakes with nails, or flower seeds in it. Or throwing out bulgwers, walk the tightrope on the roof or paint on the walls. Through this the child can relate the game events to reality, compare and analyse the differences, and through the social interaction gain further knowledge.

Liberation from Situational Meanings

Being in Pippi's house offers many opportunities to disconnect from reality, and reconnect freely, as much of the actions in the game is a different interpretation of reality, as what to put in a cake or food, that Little Buddy and Mr. Nilsson (the horse and the monkey) also are participants in playing, eating pancakes, decorating the

Christmas tree with gingerbread cookies, shoes and spoons, eating "squiggly beans" so you never have to grow up, or composing music with the pots and pans in the kitchen. By comparing these action with the reality they know, new knowledge can be acquired both about their surrounding as well as the game, combined with the social offered through the game. By understanding the rules that are allowed in Pippi's mansion, but discussed as being exclusively for that environment the child can learn about the norms of reality through understanding the abstract ones in the game.

Safe Environments

The environment in Villa Villekulla is very forgiving, with no right or wrongs only the thought that everybody is different and likes different things, and Pippi seems to like everything. There are no high scores, no negative feedback and no punishments – no matter what the child does it is always an accomplishment. The child moves through the game with total control of when or how to engage with a challenge, can quit at any time without negative consequences.

Scaffolding;

Adjusted to player's needs

Pippi's Villa Villekulla does not offer adjustment of difficulty. However, since most of the tasks does not have any correct answer and the child makes the rules the game will only be as difficult as the child makes it. In every room the child can press a question-mark for an explanation of the room or the challenge.

Encouragement

During some tasks Pippi exclaims joy and saying things like "There we go!", "It went



Illustration 3: Swearing with Pippi in Pippi's Villa Villekulla
well this time too!", "I couldn't have made it better myself!", "Good!" or "Give it a

try!” which motivates the child as well as creates mood of solidarity which fosters a good educational environment. Since the player always is addressed as a valued participant by the characters a positive mood is created.

Explanations

Explanations are given in the beginning of every task, and mostly also with visual demonstrations. During some challenges further explanations are given, such as ”No, they can't stay – out through the door with them!” when noting is done about the burglars. However, these demonstrations are not conformed to when the child actually needs help.

Active Learning

Pippi's Villa Villekulla does encourage the child to understand the deeper values nested in the game, such as not to swear:

”I've been told its awfully wicked to curse – but here in the closet, where no one can here us, you can say words so nasty that the wall paper will start to curl! Try piecing together the nastiest words you can in the speech bubble.”

This teaches the child that swearing is not a appreciated action in environments other than in Villa Villekulla, when consuming pastries that the player has created, Pippi points out that everybody has different taste. Pippi approaches serious matters in a playful and relaxed way but along with its connections to reality and social interaction the child is directed towards deeper understanding of the educational values the game tries to convey. By resembling things in the child's natural habitat the game values can be brought back into daily life, analysing and comparing the two worlds to gain new knowledge. Through its free nature the game enables the child to use the tools provided to create new things, to play with them in new ways. While playing hide and seek with the characters, the child gets accustomed to numbers, encouraging the child to listen, to pay attention or be careful.

”First daddy Erfrim shows us the moves, then we perform them. You need a good memory for this, and it gets harder and harder – so pay attention! Let's start dancing!”

Processing of Knowledge

All tasks or challenges are repeatable, but most values and skills learned in one exercise often reappears in another, such as rhythm practice in while making music, dancing with Daddy Erfrim and playing the magic flute, while presenting an enjoyable and free environment to do so. Though social interaction the processing may become even deeper though discussing and analysing the new knowledge in relation to reality.

6. Discussion

Previous research mentions among other things the importance of education based on the child's or player's level of knowledge and need for help. None of the games analysed the players performance and educated accordingly, and without proper scaffolding and monitoring of the player's performance frustrations may occur, lowered self-confidence and interest for the game. Surprisingly few of the games possessed more than half of the attributes selected for the study of this essay – only Peppy Pals: Empathy Adventure and Pippi's Villa Villekulla did so.

Logic Land, the game with the most downloads was the game that possessed least of the chosen attributes for the study. It contained no attribute fully – those it possessed partly was offering a safe environment and possibility to process knowledge. The safe environment comes from barely interacting with the child, therefore not giving negative influences, nor positive ones. Lola's Math Train follows in a similar pattern, both games offers ways to process knowledge but they seem to echo the skill-and-drill approach that exists in many schools today, by repeating the same challenges, only with more parts or more complicated shapes. They does not seem to strive for any kind of playfulness, focusing only on the educational values of the game.

The two last mentioned games, Logic Land and Lola's Math Train were however also the games with the lowest price as well as Google Play rating – 4 and 4.1 (together with Pippi's Villa Villekulla). The price may be one of the explanations for the many downloads, and with many downloads the ratings also becomes more accurate – in comparison to Peppy Pals, which has the highest Google Play rating (4.5 out of 5), but only has 100-500 downloads. Peppy Pals is also second most expensive game, but also the second best game in the conducted study (score 7.5). There are so many factors concerned in amount of downloads of a game, such as price, exposure, marketing, release date and rating – which all say nothing about the actual content of the game.

However, if one looks at the description of the games (see Appendix A), the two games that scored the lowest in the study (Logic Land and Lola's Math Train) both stress the educational values much more in their description, the development of logical reasoning, mathematical ability and spatial intelligence as well as memory and attention. Logic Land only describes educational challenges in their “key feature” section, and focuses on the importance for the child to *learn*, not if and how the child will be engaged to want to learn by own nature. The only mentioning of engagement is through “the colourful graphics, variety of tasks and feelings of progress”, which, if actually included, may engage the child, but cannot hinder frustration. Attention is not a given outcome of playing a game, it comes from interest.

Lola's Math Train approaches less from the educational view point and mentions both “fun filled environment of bright colours”, “interactive characters” and “fun and engaging”. The claim of “interactive characters” may be discussed. As mentioned in previous research, fun and engagement is something that is culturally conditioned and thus depends on the individual per say, hence the two attributes are not something that can be promised in the game description. Still, mentioning these attributes also points to the knowledge of the importance

of them.

Peppy Pals also mentions fun, exciting, pleasant and meaningful as features in the game, but apart from this it also mentions “playing with your new friends, helping them out in various situations” as well as “learning and exploring an exciting game without 'right or wrong' set in a relaxed and pleasant environment” - these point to a compassionate approach and a calm environment, which the game also offers, even if relaxed and pleasant likewise depend on the player. Only one of the key features speaks of the educational focus of the game, the rest of creating a pleasant environment for the player.

Naturally, all this does not mean that games should not mention what educational values they try to convey – after all they are educational games. However, equally much focus should be put on the educational environment surrounding.

For an educational game to work, to harvest the positive effects of the game media, it must first and foremost pass as a *good game*. It must engage the player, intrigue and amuse the player, be diverse and transformative to give the player something to discuss in affinity groups and to wonder about. To be able to experiment, create new rules within the game universe, create new meanings and through that come to a deeper understanding of the world. The game needs to give room for experimenting, mastering knowledge, creating and finalizing own projects, to work out of own interest with what the child finds interesting - not only mastery through trial and error by pushing the right buttons. The child's own interest for learning must be evoked and nursed, and thus by nature wonder and come to understanding how they can effect and be affected by the world around them, understanding the internal structure of the game to later understand the grander structures surrounding them in real life.

6.1 School, parents and game industry interdependencies

One may wonder how much the attitude towards educational games of both parents, teachers and other more knowledgeable others may effect the effectiveness of the game. Not only attitude whilst in the presence of a player, as social influence, but their influence on the game industry itself. As the consumers of the Google Play market are either adults, teachers or other adults it results in one-sided ratings, comments and download statistics.

The transformative nature of the game, support and encouragement and other of the mentioned attributes might be harder to relate to educational success for those unfamiliar with the concept. As parents possibly rate games based on how much educational focus the game has, in comparison to engagement and interest of their child, those games receive more exposure due to high ratings or amount of downloads. This indirectly affects the educational game-genre, as these games gain more profit as well as more exposure for other similar apps. It may be that the educational games that present a very traditional approach to teaching and promote it strongly are more popular due to their resemblance to the school curriculum, and their claimed contribution to the child's progress in school subjects which all speak to the adults' wishes for their child without considering the child's own interests.

If parents do rate games based on the educational focus of the game, it may be due to that parents' may be affected by the attitude towards play that exists in many schools today along with the dominating values during their own childhood. Many remain unaware of the importance of motivation and interest which is also seen by looking at the children's own views on play in Birgitta Qvarsell's (1987a, b) studies, probably affected by both school and parents – we all know the argument "No play before your homework is done". It becomes a genre dominated by the adults expectations and wishes for their child to learn, without consideration of *how* and *why*.

As consumers cannot solely take responsibility for the effect this has on the educational game-genre, it is important for game developers to carefully manage their products. Game developers need to take more responsibility when creating educational games, to make sure they follow the school curriculum, or maybe more importantly the research made in cognitive development for children and in other important areas. Instead of benefiting from consumers ignorance on the subject, saving time and money on more traditionally focused game designs they should stand example for the educational school systems, that with difficulty tries to implement these new thoughts into an area that is much older and less flexible than games can be.

6.2 The game industry

Some positive trends may however be seen when analysing the study (see Appendix B). A clear pattern can be observed - a relation between price and attribute score. Lower price means less included attributes. One can also almost see a pattern between attribute score and rating – less attributes means lower rating, for all but Pippi's Villa Villekulla, but as this game also belongs to a different genre ratings cannot be compared. This might actually mean that more expensive games in the educational game-genre usually means more thoroughly thought out designs, more research and time devoted to implementing the educational elements in a playful sense, while giving proper support to enhance learning. This also means that there exists an understanding of the importance of play among the developers in the educational game-genre on google play, as well as among the buyers.

As the cultural luggage decreases with time for the educational game-genre the amount of paying customers may rise if this trend continues, leading to a higher standard and possibly increased revenue in the educational game-genre. This might lead to increased utilization of new media in educational situations, which might be the breakthrough schools need to implement these new theories into the school curriculum.

6.3 The educational game-genre

The theories presented in this study demands much of environment – educational games need to, in the same sense that play does, act as an outlet and a mediator for the children's inner thoughts and wishes. Just as play is a collaboration between children, their wishes and rules, so must play in educational should games be. It has to be, among other things, transformative, adjustable to the child's needs, reality-related, give opportunity to disconnect object from

meaning, as well as being engaging. Many of these things are in general very hard to fit in to one single game. As one game cannot please the wishes and needs of all children, the choice of game must be a part of the educational route. The children must choose a game which is to them interesting and intriguing. This game must then, as all educational games should, provide a safe, challenging and transforming environment, along with the other attributes chosen for the study conducted in this essay. In choice of game, the child can mediate their thoughts and wishes which can then be presented more thoroughly in actions in the game, and through the social possibilities offered.

This also means that the educational game-genre has to be broader, offering as many sub-genres as the traditional game section on Google Play, to offer settings and environments that engage different children and their needs while living up to the educational requirements needed to teach effectively.

It should also be pointed out that educational games are, in the same sense as any lesson conducted in school, only a part of a child's learning process. One educational game cannot teach a child a new skill entirely on its own, connect it with other semiotic domains and other areas of use. Educational games should be seen as an aid for learning, and should be given as much thought and investment by teachers and parents as any other part of the child's education if to be effective. It may give the child the self-confidence and the mindset of interest and passion for education necessary for effective learning, along with the creative and innovative way of thinking needed in our world today.

7. Conclusion

In all, the educational tablet game industry does very seldom incorporate the element of play in educational games, just as the Swedish school system. The games possessed very few of the attributes mentioned in the study. The focus seems to be on educational values and not on the environment surrounding the child as seen in the games' descriptions on Google Play. The knowledge does, however, partly exist among game developers as seen in the mentioning of some of the attributes from the study in the games' descriptions but none of the games actually include all of them, and only two includes more than half. This strong focus on educational values may arise from personal experiences, expectations and wishes of parents, teachers and other purchasers of educational games which effects the market on Google Play. These games are more exposed, has more downloads and thus receives more ratings, and through it more revenue. However, a correlation was seen between the amount of attributes included in a game and the price and the rating of the games. Investing time and money in researching and implementing the mentioned attributes in a game may lead to higher rating and larger revenue.

Both for the effectiveness of the educational games and for the educational game-genre it is very important for the child to be a part of choosing and rating the games, and Google Play should be optimised to enable this. Meanwhile the game industry has to take responsibility for the educational modernity, effectiveness and focus of their games and present these truthfully and well-described on Google Play.

Just as with different subjects in school, educational games are effective in teaching in their own way and in their own subject, in their own time. A game for children that teach them emotional facial recognition should not be in the same section as educational games teaching first-graders' math, just as a fantasy game should not be in the same section as shooter games. Educational games, being the second most popular genre on Google Play Market, should just as the game-genre be separated into several different sub-genres that makes it easier to find a game that suits children's' needs and ways of learning.

While it is important for the child and the adults to have a conversation about the game, and make a common purchase, rating and comments it may also be suitable for Google Play to introduce an educational rating on the games based on the mentioned attributes, to enhance the educational standard of the genre. This educational rating, combined with child-governed choice and rating of the games, along with adults and teachers comments and observations of the children in the act of playing will give a more honest representation of the game.

By incorporating the attributes from the study in the games, and introducing children to Google Play ratings and allowing them to choose games, educational games can become more play-like, while teaching effectively. Through the choice of game, playing becomes more voluntary and games that are interesting and engaging for the player is chosen, bringing on motivation and enjoyment, along with the transformative and challenging nature that are well adjusted to the child's changing needs. While offering a safe and equal environment they also enable and encourage social interaction. Through their free nature within their sub-genre they enable the child to express their inner thoughts and wishes, and when these merge with the

game universe and its rules, it creates a playful environment.

Without the playfulness the games lose much of the educational benefits it brings along, as much of the traits of play are extremely important for a relaxed and effective educational environment. Even if games that evoke deep immersion may impede the effectiveness of the education, with proper scaffolding, both from surrounding adults and from the game itself active and deep learning can take place. This kind of controlled playfulness should definitely be strived for by all educational games, in comparison to what is seen in the educational game-genre today.

Even if this would require much work, it should be stressed that educational games should be given as much thought as any other educational investment, both by consumers and creators. As the cultural luggage of educational games decreases and the quality is heightened in the genre the utilization of the media will increase, generating more revenue, and higher investment in educationally effective games.

Further research should definitely be done on the subject of adult influence on the educational game-genre, to find what parents look for and why, what is defined as "educational" in relation to modern thoughts of effective learning. The influence and effect of cultural attitude towards educational games is another aspect that should be studied and a more suitable system for ratings and descriptions of educational games should be considered.

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Appendix A

Kids Logic Land Adventure

Hedgehog Academy, version 1.0.8.



Look at the pictures and memorize them.

For more information and examples of game-play, please visit;
<https://play.google.com/store/apps/details?id=com.hedgehogacademy.shapesfree&hl=en>

Description:

Help Jack and Alice to find the treasures in Logic Land! In each of the five locations, interesting puzzles and brain games await you.

“The author of the game is a child psychologist specializing in preschool training. The tasks are aimed at the development of logical reasoning, mathematical ability, and spatial intelligence as well as memory and attention in kids 5, 6 or 7 years old. Many of the tasks may remind you of IQ training materials, yet they are age-optimized. Your kid will be engaged by the colorful graphics, variety of tasks and feelings of progress as each task is solved. We recommend the game both to parents and to education professionals. Teachers can use the app as an additional learning material in math class for 1st or 2nd grade elementary school. This logic game can also be used in preschool / kindergarten (5-6 year olds).

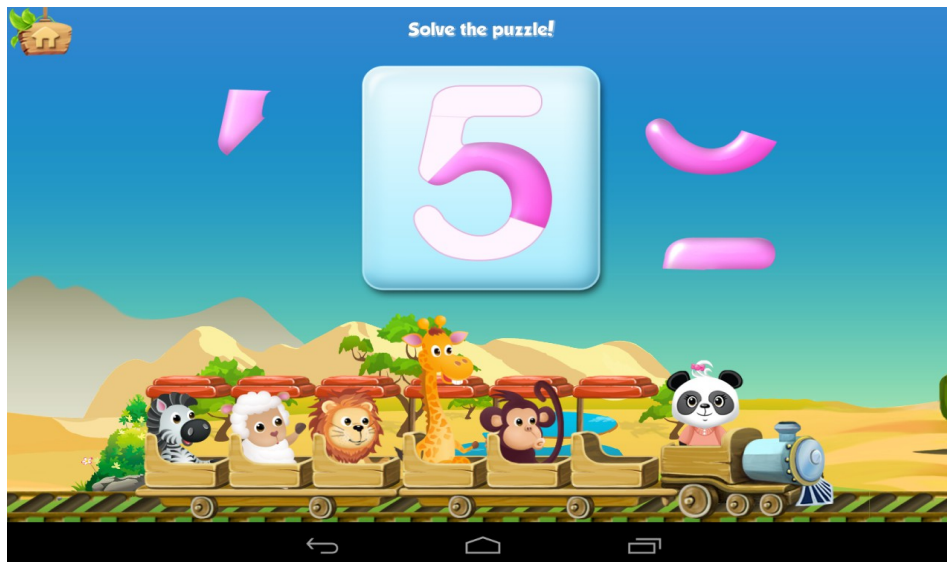
In order to succeed at school, children need to be able to gain new skills and learn new facts quickly. This can only be achieved if the basic cognitive processes (reasoning, concentration, memory, spatial intelligence) are well trained. Modern electronic devices are a great medium for pedagogical apps and interactive books which can effectively train abilities of young kids.

Key features:

- guess how a shape looks from above or below
- find two pieces which together build a square
- continue a sequence of shapes
- guess which strip of sides makes a cube
- sudoku with shapes
- determine of how many cells a shape consists
- find the odd shape
- find similar shapes and other logic games and puzzles

Lola's Math Train

BeiZ, version 2.3.1.



For more information and examples of game-play, please visit;
<https://play.google.com/store/apps/details?id=com.beiz.lolasmath&hl=en>

Description:

Join Lola on her journey as she makes her way through a fun filled environment of bright colors, interactive characters and creative problem solving to get all of her friends to a party! Specifically designed for children 3-7 years old, Lola's Math Train encourages children to learn key skills like adding, subtracting and puzzle solving all while having fun!

Key Features:

- o Nineteen exciting mathematics games with Lola Panda™
- o Various levels to choose from
- o Advancing difficulty as children's skills improve

- o Child friendly usage experience: No in-app purchases or third party advertising
- o LOLA PANDA™ Progress Tracker keeps you updated on your child's progress.

Lola's Math Train encourages children to learn mathematical key skills like adding, subtracting and puzzle solving all while having fun! While playing the games child becomes more associated with numbers and counting. As the child's skills improve, the games gets more challenging, but still manages to be fun and engaging! This must be one of the best ways to teach children how to add and subtract.

Peppy Pals: Empathy Adventure Equidz, version 1.



For more information and examples of game-play, please visit;
<https://play.google.com/store/apps/details?id=com.equidz.peppypals&hl=en>

Description;

Peppy Pals is a fun adventure game for children ages 2 to 6 about emotions and friendship in which you meet four quirky animals. There's plenty to do in this colorful and exciting world, be it playing with your new friends, helping them out in various situations, or enjoying a mini-game.

Peppy Pals is rooted in empathy, emotions, and social skills and has been created with the help of both experts and psychologists. You might have heard of emotional intelligence or social and emotional learning ("EQ", "EI", or "SEL"), and research indicates that these skills

are an important factor for success and happiness, as well as reduce the chance of being bullied or bullying others.

Peppy Pals is a unique way of learning and exploring an exciting game world without “right or wrong”, set in a relaxed and pleasant environment. Without any language, Peppy Pals reaches out globally with focus on high quality visuals and simple, fun and meaningful interactions.

Key Features

- Help the characters in various situations.
- Play with the animals and plenty of toys.
- Several mini-games and surprises.
- High quality visuals and animations.
- Rooted in emotional intelligence.
- Kid-friendly interface.
- No text or language.
- No external links.
- No third party advertising.
- No in-app purchases.

Dr. Panda's Restaurant 2

TribePlay, version 1.5.



For more information and examples of game-play, please visit;
<https://play.google.com/store/apps/details?id=com.tribeplay.pandarestaurant2&hl=en>

Description:

Dr. Panda's Restaurant is re-opening, and this time all the choices are yours! Make the pizza of your dreams, a pasta dish to rave about, or a soup so spicy your customers will breathe fire! Sweet or salty? Spicy or bitter? It's up to you!

Kids can take charge in their own kitchen in Dr. Panda's Restaurant 2! Future fine chefs have the freedom to choose what they want to prepare and exactly how they'd like to prepare it! Chop, grate, blend, fry and more with over 20 ingredients and create the perfect dish! Feed them to your customers and pay attention to how they react--it'll be different every time! In Dr. Panda's Restaurant 2 you can be a master chef, so get cooking!

Key Features:

- Choose from over 20 ingredients: Fish, kiwifruit, eggs, peppers, tomatoes and more!
- Chop, bake, boil, fry and more to make the perfect dish!
- Experiment and have fun! No time limits or scoring.
- Check out how customers react to what you use and how you cook! Dozens of different reactions to see!
- Vegetarian mode included!
- Safe for kids! Absolutely no third-party ads!

Educational Values:

- Learn the basic steps of making all sorts of different foods!
- Get familiar with how different recipes and kitchen tools work!
- Pick up on facial cues and choose what things customers want to eat!

Pippi's Villa Villekulla

Filimundus AB, version 1.11.



For more information and examples of game-play, please visit;
<https://play.google.com/store/apps/details?id=se.filimundus.pippivvkh&hl=en>

Description;

Explore Pippi Longstocking's amazing house Villa Villekulla! In here there are no rules. Bring out your inner child and do whatever you want!

- ★Dress up Pippi and her friends in all sorts of crazy outfits!
- ★Bake your own wacky cakes and serve them to Pippi and her friends – did they like it?
- ★Juggle with the best china or why not make a lovely painting on the walls.
- ★Make your own music in the kitchen or dance with the sailors the living room.
- ★Don't want to go to bed? See who can stay awake the longest!
- ★What happens up in the attic? Maybe you want to play hide and seek the Pippi way?
- ★Don't miss the closet where you can hide and curse together with Pippi...
- ★Why should Christmas and birthdays only happen once a year – in Villa Villekulla every day is a special day!

Pippi Longstocking is the world's strongest girl and she certainly has her own way of doing things! Pippi lives in the big house Villa Villekulla with her horse Lilla Gubben and her monkey Mr Nilsson and every day her friends Tommy and Annika comes to visit.

- ✓20 different games and activities!
- ✓Extremely long playtime!
- ✓Explore Pippi's amazing house and discover all the fun inside!
- ✓Voices in English and Swedish.
- ✓Kid-friendly interface!
- ✓No in-app purchases.
- ✓No ads. No in-app purchases.
- ✓Suitable for the whole family!

Appendix B

Possible Answers:

Yes = 1

No = 0

Partly = 0.25

The game...	Kids Logic Land Adventure	Lola's Math Train	Peppy Pals: Empathy Adventure	Dr. Panda's Restaurant 2	Pippi's Villa Villekulla	Score
Price	7 kronor	17.85 kronor	22 kronor	18.99 kronor	28 kronor	
Installs	50,000 – 100,000	10,000 – 50,000	100 – 500	10,000 – 50,000	10,000 – 50,000	
Rating	4 out of 5 stars	4.1 out of 5 stars	4.5 out of 5 stars	4.2 out of 5 stars	4.1 out of 5 stars	
Transformative						
...changes while played, constantly presenting new challenges.	No	Partly	Yes	Partly	Yes	2.5
Social Opportunities						
... offers/encourages external social interaction such as multiplayer opportunities, communities or forums to connect with affinity groups.	No	No	Partly	No	Yes	1.25
Solidary nature						
...approaches and addresses the child on equal ground for identification possibilities.	No	No	Yes	No	Yes	2
Reality Related						
... gives opportunity for imitations, impersonation, new productions, relate to reality.	No	No	Yes	Yes	Yes	3
Liberation from Situational Meanings						
...enables the player to disconnect object from meaning, presents opportunities for new assimilation.	No	Partly	Yes	Partly	Yes	2.5
Safe Environment						
...offers an environment where the child is not punished for mistakes, or feels external pressure.	Partly	Partly	Yes	Partly	Yes	2.75
Score	0.25	0.75	5.25	1.75	6	

Scaffolding	Kids Logic Land Adventure	Lola's Math Train	Peppy Pals: Empathy Adventure	Dr. Panda's Restaurant 2	Pippi's Villa Villekulla	
Adjusted to Player Needs						
...is adjustable to the players level and need for help.	No	Partly	No	No	Partly	0.5
Encouragement						
... gives encouragement to the child during challenges.	No	No	Partly	No	Yes	1.25
Explanations						
... gives explanations or demonstrations to the child if needed, points out differences to ideal solution.	No	Partly	No	Partly	Partly	0.75
Deep Learning						
... tries to help the child relate acquired knowledge to educational intention and reality.	No	Partly	Yes	Partly	Yes	2.5
Processing of Knowledge						
... gives opportunity for processing the knowledge received through similar challenges.	Partly	Partly	Yes	Yes	Yes	3.5
Score	0.25	1	2.25	1.5	3.5	
Total Score	0.5	1.75	7.5	3.25	9.5	