Discourses of Digital Game Based Learning as a Teaching Method

Design Features and Pedagogical Opportunities Associated with Teachers' Evaluation of Educational Game Apps

Jeanette Sjöberg[1] and Eva Brooks[2(✉)]

[1] Halmstad Universty, Kristian IVs väg 3, 301 18 Halmstad, Sweden
jeanette.sjoberg@hh.se
[2] Aalborg University, Kroghstræde 3, 9220 Aalborg, Denmark
eb@hum.aau.dk

Abstract. In recent years, digital games have increasingly become an important part of children's lives. As a consequence, digital game-based learning (DGBL) activities have also been merged into the school context and tried out by teachers in various ways. The pedagogical and didactical values of integrating DGBL in education are however not yet concluded. In this paper we examine how groups of teachers construct ideas about digital game-based learning as a teaching method and base for developing teaching activities. The study is drawn from a couple of creative workshops with Swedish and Danish school- and preschool teachers, in which their pedagogical design processes while evaluating and trying out different game apps have been studied. The research questions we ask in this paper are: 1). In what ways do teachers concretise their comprehension of digital game-based learning in their discussions of educational games for school children? And; 2). How are different discourses about the learning process and/or didactical potential in relation to digital games constructed in teachers' discussions while assessing game apps? Using a discourse analytical approach, the results of the study show that the teachers' were stuck by their preconceptions about games as offering different learning qualities compared to their traditional teaching practice. Teachers acknowledged that DGBL is a complex issue as also designers' preconceptions are tied to traditional qualities of game design.

Keywords: Digital game-based learning (DGBL) · Discourse analysis · Educational game apps · Game-based design · School teachers · Teaching method

1 Introduction

Digital games are an important part of children's lives. Arguments stating that games for learning can be used to provide authentic, effective, and joyful educational experiences are well documented [1–4]. By integration of learning content into games, researchers have put forward that such digital game-based learning, or DGBL, could have potentials for being motivating and engaging as well as promoting students' achievements [5, 6].

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However, the actual impact of DGBL has as well been questioned. Kickmeier-Rust and Albert [7], point to how a poor design of educational games can influence the learning process and outcome. The authors emphasize the key issue of carefully considering the learning design aspect when designing educational digital games, for example by providing learning guidance to balance the relationship between a game's gaming and learning aspects. Nevertheless, game design factors often are an overlooked matter [8, 9], for example, game mechanisms, game goals, and game narratives, as well as the way a learner interacts with and controls a game (keyboard, joystick, motion-sensing) can impact learning-related aspects [10]. The issue of how the design of a game can support learning is however less studied [11].

Beside considering game design features as crucial aspects of DGBL, it is important to point to another topic in this field of research that has gained limited attention, namely a focus on teachers and their implementation as well as facilitation of DGBL. This still remains a challenging issue [12, 13]. The present paper presents outcomes from a bigger study on DGBL in a Nordic context, including the countries of Denmark, Finland, Iceland, Norway, and Sweden. In this project, our findings show that the reason to why teachers do not apply digital games in their teaching primarily relates to that they experience a lack of pedagogical and technical capacity to decide in what ways and when digital games or gamification tools would apply to their teaching goals [14]. Relating this to the above-mentioned issue of game design shortcomes, Squire [15] points to game-based learning as a two-sided problem, where, on the one hand, game designers can develop inspiring games, but are less competent to design for games to support educational activities. On the other hand, teachers are knowledgeable about qualities of teaching material, but do not know so much about what kind of design features that make a digital game effective to use. The present paper has taken these aspects into consideration by including 12 teachers in a workshop to investigate how different discourses emerge when they are offered tools to assess digital games' pedagogical as well as design values and, further, to design a lecture including game-based learning. Through this, our intention was to study the process of teachers' discussion while assessing and designing for DGBL. It was our hope that this approach also could serve as a resource to facilitate their further understanding, awareness, and implementation of DGBL in their teaching activities.

The following sections start with a research overview of DGBL as a learning method, followed by a specification of the research questions. Next follows a description of the theoretical framework, including analytical tools for identifying design features of games supporting DGBL. This is followed by the methodological framework detailing the method design. Finally, we present the outcomes of the study followed by a concluding discussion.

2 Digital Game-Based Learning as a Learning Method

Arguments concerning beneficials and effects of using digital games for learning have increased tremendously among researchers and educational practitioners in recent years [16, 17]. Moreover, DGBL is increasingly highlighted as a contemporary alternative and effective way to develop learning. Or, as Papadakis expresses it: "Digital games are gaining wide recognition as an effective way to create socially interactive and constructivist

learning environments" [18]. The various game components that are part of DGBL, such as competition, commitment, instant reward and feedback, are elements that individually as well as together are considered beneficial for learning [16–20]. Contemporary games are developed to satisfy basic requirements of learning environments and can thus provide an important tool in supporting teaching and learning processes. Based on Van Eck [20], Nousiainen et al. [21] have pinpointed four different game-based learning approaches, namely: (1) using educational games, (2) using entertainment games, (3) learning by making games, and (4) using game elements in non-game contexts. In the same study, the authors identified possible competence areas needed by teachers to work with DGBL [21]. Their results showed that teachers' DGBL capacities should be more integral to their professional knowledge and skill repertoires. Hence the authors bring to the fore the importance of developing more knowledge about DGBL focusing on teachers' learning [21]. In our study we further this research by taking hold of facilitating teachers' awareness and professional development of DGBL. In doing so, we primarily focused on Nousiainen et al.'s first approach, where the participating teachers in our study used educational games while exploring digital game apps.

A major point regarding the effectiveness of including games in learning processes has to do with the principle of situated cognition and the fact that the learning takes place within a meaningful context [20]. Since the subject matter is directly related to the learning environment, the gained knowledge is both applied and practiced by the learner. Van Eck states that "games are effective in learning not because of what they are, but because of what they embody and what learners are doing as they play a game" [20]. However, in order to successfully integrate educational methods and game design, there is a need for an in-depth understanding of the various possibilities that digital games might provide [17]. In order to fully capture what games have to offer, Plass et al. [22] claims that a combination of cognitive, motivational, affective, and sociocultural perspectives is necessary for both game design and game research. Even though many positive claims have been made about DGBL, there are, as previously mentioned, some sceptical opinions towards using games as educational tools [7, 23]. Critics question the viability of DGBL and argue that research has been slow to provide empirical evidence on its effectiveness. Van Eck writes:

"Scepticism about games in learning has prompted many DGBL proponents to pursue empirical studies of how games can influence learning and skills. But because of the difficulty of measuring complex variables or constructs and the need to narrowly define variables and tightly control conditions, such research most often leads to studies that make correspondingly narrow claims about tightly controlled aspects of games" [20].

Another side to this has to do with the idea that research within the area still is scarce [24, 25]. One such area is related to teacher knowledge [26–29]. Hébert and Jenson [29] argue in their study that there are little to none research that examines either teacher pedagogies in relation to digital game-based learning, or professional development for teachers on DGBL either focus on pedagogy or study the impact of professional development on teacher practice. Conclusively, DGBL as a learning method is not yet totally defined.

In this paper we examine how groups of teachers construct ideas about DGBL as a teaching method and base for developing teaching activities. To do this we followed

their pedagogical design process while they evaluated and tried out different digital game apps. The research questions posed in this paper are as follows:

1. In what ways do teachers concretise their comprehension of digital game-based learning in their discussions of educational games for school children? and;
2. How are different discourses about the learning process and didactical potential in relation to digital games constructed in teachers' discussions while assessing digital game apps?

3 Design Features Supporting Digital Game-Based Learning

Inspired by Shi and Shih's literature review [8] focusing on higher level game design concepts that are not restricted by genre, we have identified what we consider as essential when designing for DGBL in school settings. These concepts form the analytical lens of the present study. As a core concept of game design features, which all design factors should be based upon, Shi and Shih [8] assign game goals. These kinds of goals should provide learners with certain gaming experiences to inspire them to, for example, explore game content and also for them to experience satisfaction of achieving goals of the game. Hartmann and Klimmt [30] point to that gaming achievements, in general, means that the learner gains some kind of power, gathers game objects, or competes with others. Game goals from a learning point of view stipulate how such experiences may relate to curricula to support specific learning goals. In other words, game goals resonate with teaching objectives and the experiences these objectives are supposed to provide for the learners. The overall game goals can be divided into three categories, game mechanisms, game fantasy, and game value [8] and will be further elaborated in the below text.

Game mechanism refers to how the game enables a learner to smoothly navigate in the virtual game world. This means that the learner, through interacting with the game, can experience how it is triggered to generate relevant feedback [8]. From a learning point of view, the game's interface becomes a crucial design feature, for example by displaying hints on the screen and providing game characters that can assist and guide the learner throughout the game. In other words, the design feature of interaction determines the learner's gaming process and provides feedback and, in this way, allows for the learner's autonomy. This kind of autonomy enables the learner to, for example, create, select, and change, increasing his or her sense of engagement [31]. As such, game mechanisms and its subcategories of interaction and autonomy are influential to learning processes [32].

Game fantasy involves a game's environment and background. From a game-based learning perspective this means that elements of the game must be integrated into an imaginary world, where the learner becomes immersed in the game. This means that the learner's experience is closely related to the game fantasy feature. This is also where the game's narrative becomes a key as it describes what happens in the game world [8]. For games that target learning, narrative is important to provide the learner with informative knowledge. However, Shi and Shih [8] and Hoffman [33] highlight the importance of having the teaching aspects well connected into this rather than being added and thereby disconnected. Thus, teaching content should match the narrative to establish a game that in a meaningful way supports learning [34]. Sensation constitutes another aspect of

a game's fantasy and, based on the narrative, it refers to audio and aesthetics, such as graphical elements, which is supposed to increase the learner's motivation [35].

Game value attracts learners to start playing the game and represent special features that only exist in the game and as such they are the reason why a game is experienced as joyful [8]. Expressed differently, game value is a core factor for learners to generate motivation and engagement [36]. To obtain game value, the learner achieves rewards by, for example, managing tasks and challenges, and reaching goals. Challenges must be meaningful for the learner to generate game value and should be considered in regard to the learning objectives that are in focus as well as to the learners' skills [8, 32]. Sociality as a game feature is vital to nurture collaborative learning. A game can be designed for sociality through, for example, its interface to support communication or competition between learners. This is done through a game's mechanism [8]. In other words, sociality needs to be designed to elicit learners' collaborative activities.

In the context of the present study, we have involved primary school teachers, preschool teachers/leader, and a teacher educator to evaluate digital games targeting learning in classroom settings. We have asked them to consider different games' learning objectives, interface design, aesthetics, game mechanisms, and game values. These are vital factors of DGBL for teachers to choose a specific game and for learners to enjoy learning while playing a digital game. This and other methodical issues will be further elaborated in the following text.

4 Method

The present study is based on qualitative research including two creativity workshop cases (Case 1 and Case 2) designed to provide a framework for primary- and preschool teachers to assess potentials of digital game-based learning. Accordingly, a number of selected apps in the areas of math, language, and science were introduced to the participating teachers aligned with an assessment framework to value the apps' learning designs in terms of content and form. They were divided into groups to choose a game and to jointly evaluate this game.

Case 1 included nine female primary school teachers from schools in south-west Halland, Sweden. The nine teachers (three from preschool and six from primary school) were divided into three groups (two in group 1, four in group 2, and three in group 3). The group of four teachers included teachers from the same school and teacher team. The remaining groups included participants from different schools. *Case 2* included three male participants, a preschool teacher, a leader of preschools, and an assistant professor in a teacher education programme focusing on mathematics. In addition, a female toy- and game designer participated in Case 2. The Case 2 participants worked together in one group.

Each group had a designated workstation where a fixed camera facing the table centre was set up and recorded the activities at each workstation. In total, we gathered 400 min of video data. Additional 80 min of video data from Case 2 were lost and, therefore, the four participants in Case 2 were interviewed a while after the workshop to capture their further insights on the topic of DGBL in classroom settings. In addition, the empirical data consist of the participants' final presentations as well as field notes by the two authors.

4.1 Apparatus

The teachers received some background material before starting the game app workshop. First, they got a general introduction to game-based learning, for example that it is not a new phenomenon, but has been around for decades. Chess, for example, was used in the middle Ages to teach strategic thinking. Further that the origin of preschools, mid 19th century, was based on Friedrich Fröbel's ideas about learning through games and play. In addition to this, the introduction included some general information about game mechanics and their implications in a learning context, for example that a game-based approach is based on rules, clear goals and includes choices that end up with different consequences. A game designed for learning is supposed to offer opportunities for teachers and students to collaborate around specific game contents and in this way add depth and perspective to the student's gaming experience. However, even though students, in general, spend lots of time on digital game play, this does not automatically mean that they appropriate the learning that teachers have assigned to a DGBL session. Finally, the teachers were introduced to the purpose of different kinds of games, for example winning games, achieving goals games, collaborating games, explorative games, and problem-solving or strategizing games. After this introduction, the teachers were divided into groups and started the workshop activities.

4.2 Procedure

The workshop was divided into four parts, where in particular parts two and three beside a research goal also targeted to serve as a method that the participants should be able to use also after the workshop. This is due to the fact that our previous study [14] showed that teachers ask for knowledge about and framework for assessing teaching and learning values of digital games. Thus, our method applied in part two and three of the workshop included questions about the game's design as well as its teaching and learning potentials, i.e. considering a combination of both game and learning designs. Table 1 illustrates the design of the workshop.

Table 1. Workshop design

Time	Activities
14:00–14:15	Introduction of the workshop and selected apps. Establishing the workshop framework and climate
14:15–14:30	Workshop part 1: Exploring the different game apps
14:30–15:20	Workshop part 2: Playing and assessing the chosen game app focusing on game design and teaching and learning potentials
15:20–16:10	Workshop part 3: Development of a teaching activity by means of the chosen game app
16:10–17:00	Workshop part 4: The groups present their resulting teaching activity for each other arguing for their design choices. Closing and evaluation of the workshop

The introduction of the workshop consisted of clarifying definitions of DGBL as well as the goal of the workshop. Moreover, the chosen game apps were presented to the participants. Considering our previous study [14] where we identified that digital games primarily were used in the fields of mathematics, language, and science, these became the areas of apps for the present workshop. Tables 2 and 3 describe the specific games in Case 1 (Sweden) and Case 2 (Denmark).

Table 2. Game apps used in Case 1 (Sweden).

Swedish language	Mathematics	Science
Spelling game (Stavningslek)	Math bakery 1, 2, and 3 (Mattebageriet)	Chemist
School writing (Skolstil)	Critter Corral	Twitter (Kvitter)
Letter puzzle (Bokstavspussel)	Scratch Jr.	Butterflies (Fjärilar)
Yum letters (Yumbokstäver)		

Table 3. Game apps used in Case 2 (Denmark).

Danish language	Mathematics	Science
Leo & Mona Reading fun (Leo & Mona Læsesjov)	GOZOA - Play and learn mathematics (GOZOA - Leg & lær matematik)	The hero of nature (Naturens helte)
The letter school (Bogstavskolen)	Pixeline - The labyrinth of the number master (Pixeline - Talmesterens labyrint)	
	Scratch Jr.	

While Case 1 included a mixture of digital games and digital tools, Case 2 included only digital games.

In the workshop part 1, the participants had time to test the different apps and choose one of them to assess as well as to design a teaching activity. This was followed by a longer session (workshop part 2) where they should more in detail play and assess the game design to get ideas about how the game could be used for a specific teaching activity. This part of the workshop was assisted by a list of questions to guide the evaluation:

- What is the goal and value of the game - is it clear and pedagogically convincing? Why or why not? What kind of learning goals can the game cover?
- The game interface - is it easy and efficient to navigate?
- What are the rules, control and other mechanisms of the game? How can the player learn and understand those rules and mechanisms?
- Is the game balanced by offering different game levels? If so, in what way?
- What kind of mechanisms or values would encourage the child to play it again?

- In what way has the game an aesthetic value?
- What kind of game - Is it based on exploration, problem solving, contesting, or a mixture?
- In what way is the game engaging, motivating?
- As a pedagogical expert, would you use this app in your teaching activities? Why or why not?

Part 3 of the workshop had designated time for the participants to develop a teaching activity which should be based on the chosen app. Here, they did not get any guidelines but were told to apply their pedagogical knowledge and competence, in particular related to the learning goals that would apply to the chosen game (Fig. 1). This was followed by workshop part 4, where the participants presented their digital game-based teaching activity design for each other and argued for the included choices, game design features as well as pedagogical benefits and/or restrictions (Fig. 2).

Fig. 1. Participants from the Danish case developing DGBL designs.

The participants were informed about the study in writing and agreed to having the workshop sessions video recorded by signing informed consent forms. In line with ethical guidelines, all names of the participants as well as of their workplaces are anonymized, and accordingly no identifying information is provided.

Fig. 2. Participants from the Swedish case presenting their DGBL designs.

4.3 Data Analysis Approach

The methodological approach used in our analysis of the video recordings originates from discourse theory [37–39], and partly from discursive psychology [40, 41]. Within discourse analysis, language use is formed in social contexts and viewed as a tool by which people construct the social world [37–39]. These processes are performed in a non-mechanical and heterogeneous way, and according to Fairclough [38], numerous discourses coexist and contrast each other as well as compete with one another in various social domains. When it comes to discourse analysis, language and language relations are referred to each other in understanding the reality of social actions, where the individuals are the actors who produce the discourses. The focus can be both on micro- and macro perspectives. In the present study, however, the focus is on the micro level since it revolves around teachers' specific reasoning and their way of seeing and understanding the reality in which they live, in contrast to a macro perspective that rather would illuminate a larger area of the society. From this perspective, constructions of discourses should be examined out of the assumption that discourses jointly created leads to certain positions and actions are made possible, while other positions and actions are made impossible within a specific practice, an assumption that stems from a social constructionist perspective [42]. The basis of social constructionism is to study the general relationship between man and society based on language as a significant and central tool, which means that reality is socially constructed and that people through language construct their own world [42]. Wetherell [43] emphasizes that discourse is something that inspires and is supposed to have a good foundation to stand on, but it is also provocative and difficult to interpret. To assist the analysis process we followed five analytical steps (see Table 4). To get an overview of the empirical material, the video data was transcribed verbatim (step 1). This was followed by step 2 where we, through colour coding, identified discourses in

the material. To identify recurring patterns of constructions, we next carried out a joint review of the data (step 3). Out of the identified patterns we ordered them into themes and analysed excerpts in line with discourse structure (step 4). Finally, as step 5, we chose representative examples from the excerpts and decided which of them to include.

Table 4. Analytical steps in the discourse analysis

Steps	Activities undertaken	Foci guided by analysis
Step 1	Transcription of video recordings, total material	Overall view of the material
Step 2	Colour coding of specific content	Identifying discourses in the material
Step 3	Joint review to discern patterns	Identifying recurring patterns of constructions
Step 4	Organization of themes out of patterns	Analysing excerpts in accordance to discourse structure
Step 5	Selection of representative examples of excerpts	Deciding which excerpts to include

To further help us in our analytical process we have used a couple of discourse analytical concepts: *interpretation repertoire* and *constructions*. The purpose of interpretation repertoire is to understand how humans and the world around them are constructed in connection with social actions and interactions [44]. The analysis thus focuses on how interpretive repertoires are built up and understood in a specific context through language as action - by analysing language and how interpretive repertoires are built up and maintained, the presupposed knowledge is thus challenged [42]. When it comes to the concept of constructions, there is a basic principle within discourse psychology where man is considered to be able to construct different versions of the same event and the same phenomenon [44]. This can be regarded as a consequence of language being constructed in different ways and it is thus not considered problematic that stories and arguments can vary in a text. In this study, constructions refer to the teachers' varied ways of talking about the same thing - the phenomenon of digital gaming apps - and how they present these variations in their discussions.

Having analysed the data, it was possible to - after the visualization of patterns and linguistic expressions in the teachers' discussions - identify three emerging themes in the material: *game design as persona, game design as form* and *game design as pedagogical function.* These themes, presented below, are connected to different perspectives of the concept of game design and should be seen in relation to the aim and research questions in the present paper.

5 Results

Theme 1: Game Design as Persona
This theme is related to the discourse constructed in the teachers' discussions about the game's design and the way in which they talked about it. Fairclough, [38] who theoretically positions himself between the structural and the socio-cultural perspectives, describes this discourse as a discourse practice. This should, on the one side, be understood as a way in which game designers produce texts, and, on the other hand, representing a socio-cultural practice, i.e. how players pick up or use the game design. In this case, the discourse is constructed by the teachers as they reflect on the text (i.e. the game app). This is to say that the game design itself (e.g. what kind of choices it offers, the mechanics, whether it is a single or multiplayer game, and so on), and when the teachers pick up this game design, they move between text and social construction or action. When the teachers talked about the game apps, the border between the text and sociocultural aspects blurred in terms of games/apps becoming personalized. This is to say that the text was not only framed as a text but over-layered with subject-like signs. A common feature that emerged in the recorded material is that the participants often refer to the game app as "it" or "they" and in several cases in relation to personal characteristics, as is exemplified below in Excerpt 1.

Excerpt 1:
Case 1, group 2. In this example, the four teachers in this group have individually been trying the game app 'Math bakery' (a math game app) for a while, and are now discussing their experiences of that as well as the advantages and disadvantages with the game app in relation to learning.

> Teacher 1: *If you move the cookies, you get results that are shown on the number line in a clear way…*
> Teacher 2: *So, yes, it is not totally dumb…*
> Teacher 3: *Should I show mine too? I think it is clear, to...* [she points to the screen] *...here we train multiplication, here I choose…different kinds of cookies, so here I actively choose which table Iwant to train on. Then rungoes on as you also have with stars and so on. And here it's great, here they show the different ways…*

In this excerpt, the teachers refer to the game as being 'clear' and not (being) 'totally dumb', which are human qualities that they attribute to the game itself. In addition, teacher 3 also refers to the game app as 'they' ('they show'), which also points to how the teachers construct the game's persona. In doing so, the teachers construct a discourse of the game in which the game is presented as a subject rather than an object. In applying this kind of personalized attributes to the game app, it is worth noting the teachers reproduced a discourse producing a kind of hybrid 'thing', which was inflected by embodied attributes. This blended conceptualization of the game app is, however, problematic as it produces an indeterminate way of talking about game apps as this is not distinct enough to draw attention to the issue of using games in learning activities. It is worth noting that themes 1 and 2 spanned between the teachers' views on a game app as a persona and the game apps' design, i.e. what they communicate, offer, and what is possible to do with them. This, in turn, leads to the inherent pedagogical opportunities

(theme 3). Thus, next follows theme 2 focusing on the teachers' perspectives on what the game apps' design offered.

Theme 2: Game Design as Form

A game's structure enables learners to navigate and interact in a game, i.e. tied to a game's goal, this structure forms the game's rules offering the player different choices to navigate throughout a game. In this way, goals, rules and choices are tied to more complex procedures that all in all form the content of gameplay. However, unlike other media, the form of digital games still does not have an established structure, for example, they can vary in their mechanics, narrative, scope, topic, or number of players. This can create difficulties for teachers to determine what it is that constitutes a game, in particular when it comes to educational games. Considering this, the theme 'game design as form', addresses the issue whether a game actually is a game or not, and it is constructed by the teachers' discussions about what a game is, or what it is that constitutes a game. As they are talking (sometimes almost negotiating) about what really makes out a game, they are constructing a discourse of the game in which they are positioning the game app as either a (real) game or as something else (for example a puzzle or a pedagogical tool). This is exemplified below in Excerpts 2–4.

Excerpt 2:

Case 1, group 1. There are two teachers in this group and they have chosen the game app 'Letter puzzle' (a language app focusing on spelling progression) and are discussing the qualities of it in relation to the characteristics of what makes out a game. Their discussion is guided by the questions handed out in the beginning of the session.

> Teacher 1: *The purpose* [with the game] i*s that the letter sounds can be sounded together, into words.*
> Teacher 2: *Yes.*
> Teacher 1:*… and connect words and pictures also maybe. That this is the next step to writing. 'What kind of game is it?'* [Teacher 1 reads from the sheet of paper with questions].
> Teacher 2: *Well, you get rewards when you're right, the balloons .... but there are no clear rules.*
> Teacher 1*: Is it a game at all when there are no rules?*
> Teacher 2: *You mean if this is really a game?*
> Teacher 1: *So, I would not really call it a game, it depends on how you define it. It's more of a puzzle.*

In this excerpt the two teachers are reasoning whether or not the game app really is a game or not. They are highlighting different criteria for what constitutes a game, such as the fact that you get rewards when you are right and that there are no clear rules. The last criterion, however, seems to weigh heaviest and they agree that the app does not really live up to what constitutes a game since there are no clear rules.

Excerpt 3:

Case 1, group 3. Here, the three teachers in this group are discussing the app 'Scratch Junior', which is more of a programming app than a game app - it is not a game in itself,

but it admits people to make and play games with it. They are discussing what the game app is actually about, what you can do with it, and whether or not it actually is a game.

> Teacher 1: *It is probably more problem solving… But there are no given problems. It is not the case that you go into the app and have to solve different problems and advance to different levels. That is not the case.*
> Teacher 2: *And you should not collect points or… It is more like an educational tool. Perhaps more that than a game.*
> Teacher 3: *If we choose problem-solving, it is very clear. The problem is being formulated.*
> Teacher 2: *Yes, you decide the problem yourself.*
> Teacher 3: *Then it can become very clear to those who will work with it. That we do it so that we can solve this or that.*
> Teacher 1: *Mmm. You add a purpose.*
> Teacher 2: *But if you think about it, is it a game?*

Here, as in the previous excerpt, the teachers are referring to fundamental criteria for what makes a game (e.g. when teacher 1 talks about advancing to different levels and teacher 2 talks about collecting points). Thus, the teachers are constructing a discourse of the game which contains a common understanding of what (really) constitutes a game, namely the game mechanics. Consequently, this discourse also implies a clear marking of what does not constitute a game. According to the teachers, if a game does not have a clear goal or gameplay and rules it is not a game.

Excerpt 4:
Case 2, group 1. Like in excerpts 2–3, the teachers talk about game mechanics, but in more general terms compare to the previous excerpts. They firmly state that the digital games for young children are based on simple mechanics and, even though the technique is available, they do not offer the needed aesthetics or explorative narratives to be regarded as a real game. Similar to the two previous excerpts (Excerpt 2–3), they discuss this in relation to game criteria. As detailed in the method section, case 2 teachers participated in a follow-up interview, excerpt 4 is an extract from this interview.

> Teacher 1: *It is a challenge to find good games that not only focus on learning, but also have explorative opportunities. Most of what we find includes that the child shall manage a level in a game and if you do not manage it, then, it is just a pity. You have to find something else to do. This creates a bit of an A and a B team of game players. If you cannot manage a level, you are out and not part of the playing team. Beside this, you cannot be curious about something in these kinds of educational games. A game consists of rules, that's how it is, you cannot be curious about something, I mean, on something that you jump into while playing.*
> Teacher 2: *Something that we discuss a lot, in relation to how, that you on the one hand have the necessary technique* [to develop games that are more explorative] *and, on the other hand this about right or wrong answers or choices when you play this kind of game. And if you transfer this to pedagogical thinking, then we come to that while playing this kind of game the child will do something right or*

wrong. And the more you make the wrong choice or answer wrong on a question in relation to what is expected from the game design, the less explorative you become. You'll stop exploring. What we lately have talked a lot about in relation to level-based games is what is called sandbox-games. This kind of game offers exploration for you to take your own initiatives towards what you yourself think would be exciting to do or explore. There are no right or wrong answers. Not anything that needs to be solved in a certain way. If you cannot solve it you leave it to another time and move on. Unfortunately, there are not so many games in this genre. They are coming though. But where they are coming is in relation to adult players, not children.

Teacher 1: *Yes, that's right. It is like this. In relation to technical issues, there are many high quality, complex game alternatives for adult game players, but if we look at it in relation to children, these games are simple, very simple. Regardless what game you choose. There are no details like in adult games. So, children miss out on this extra dimension, the aesthetics. Adult players can be involved in aesthetically designed games, but not children.*

The three examples in excerpts 2–4 combined show how the discourse of what a game really is emerges in the teachers' discussions and how they, through their speech, construct a truth about games in which games are defined. While excerpts 2 and 3 acknowledge the mechanics of a game design to decide whether a game is a game or if it is something else, excerpt 4 highlights the aesthetics and narrative of a game as crucial for meaningful games. The teachers emphasize that if a game does not offer exploration and ignites curiosity, the game becomes simplistic in its game design and children lose their interest and curiosity, i.e. a game is more than its mechanics.

Theme 3: Game Design as Pedagogical Function

This theme focuses on the teachers' interpretation repertoire and construction of how they can go about using DGBL, i.e. how the game design functions pedagogically. The ways teachers talk about the usage of games' in a classroom context put forward their collaborative, practical, and subject appropriate functions as foundational. The teachers emphasize that the collaborative function is not built into the game design, but rather needs to be designed by the teachers as an additional function outside the games. The practicalities related to the usage of game apps refer to that there is not a tablet for each child, which means that there might be several children using the same tablet. This hinders children's progression in the game. Referring to Burr [42], this should be understood in relation to when the teachers on the one hand consider that digital games can support pedagogical functions (e.g. learning math) and sometimes not (e.g. fostering progression in learning math). In addition, teachers are strongly bound to curriculum, both when it comes to content and progression. In this way, the teachers position themselves and create interpretive repertoires based on their own pedagogical beliefs or on the surrounding institutional context.

Excerpt 5:

Case 1, group 2. In this excerpt the teachers are talking about how to introduce their game app to their students in a teaching activity. The three of them have tried out the

game apps Math bakery 1–3, and are discussing how these apps can be integrated in the learning context.

> Teacher 1: *For our third graders, we would say that here you have the opportunity to rehearse differently, because here* [in math bakery 1] *you do not have to go through line-up and such, but if it had been new, you would have had to talk about how to set up … and have a lesson first, or if you have never worked with multiplication before. Then you would have had to go through it. But multiplication is not put in the hands of someone who has not done it before.*
> Teacher 3:*… if you have a lesson and say 2x6 or 6x2, it does not matter because it is the same. I think it's good here* [in Math bakery 3], *it explains a lot, you can clearly see that it does not matter.*
> Teacher 1: Y*ou need to connect it to a smartboard and show them* [the school children]*, or that you as an adult explain. So they know what they can get out of it. Otherwise it will just be like, now you can play a little, that they focus on the game.*
> Teacher 2: *Here you want them to test, so they can see how to line up.*
> Teacher 1: *Yes, but then you have to show them and explain.*

In this excerpt, the teachers highlight in what way the game app can be introduced in a meaningful way depending on the previous experiences of the children. This put forward the importance of the teachers role. The scenario that unfolds here is that if the teacher does not take the lead, the DGBL will be 'just like playing around' rather than instructional learning. Another matter that the teachers' discussion draws attention to is the material process of solving mathematical problems. Here, they underline that the game is clear and properly explains that 2×6 and 6×2 are the same. These examples show how the pedagogy of the game design is constructed as traces of social practice.

Excerpt 6:
Case 2, group 1, where the excerpt is taken from the follow-up interview with the teachers. In this extract teacher 1 is concerned that children in fact do not learn anything from the game apps that currently are available, i.e. their pedagogical function does not exist. Teacher 2 agrees and acknowledges that learning always happens, in particular if the focus is on the process rather than on a specific end product.

> Teacher 1: */.../ what it means when you can discover and find your own way, what does it mean when you actually can learn something from itbased on your own curiosity? The point relates to the existing culture around these games. The most important is to challenge the concept around learning. There is too much learning that is stupefying. And that is if we only look for the correct result, we risk to miss what else is around us. Take for example mathematics. Many researchers say that children don't handle mathematics, they just have skills to count. They have not learnt to understand math as a concept. /.../ And it is the same with game apps for children. We really want to teach them something, but we focus too much on the end result and forget to give the children opportunities to understand the surrounding world.*

Teacher 2: *Yes, one doesn't necessarily need to focus on learning - it comes as a bonus, no matter what. There are more opportunities for learning if one doesn't focus on learning. It's a paradox.*
Teacher 1: *There is another kind of game that is not so apparent within game apps for children, namely social games. Where many children can play at the same time. Where they can explore together. /.../ That's fascinating* [to do]. *Educational games for children don't have a child perspective. /.../ The kind of sandbox games, for example, there are games* [for adults] *that have inbuilt physical laws like when building a bridge, if it is not correctly done, it will fall apart. And I can try out another solution /…/ These kinds of games would inspire children to learn by collaborating or discovering.*

This example illustrates that the pedagogical function in game apps for children does not exist. The core is how the teachers' interpretative repertoire is inflected by the sociocultural context within which they are situated. This context is based on regulations and perspectives that highly acknowledge pedagogical aspects such as collaboration, learning through exploring, acknowledging children's interest and curiosity. Thus, this excerpt draws attention to the significance of the sociocultural framing, both in questioning the meaningfulness of existing educational game apps as well as questioning the culture of game designs as such.

Excerpt 7:
Case 1, group 1. In this excerpt, the teachers are comparing two language apps focusing on spelling progression ('Spelling game' and 'Letter puzzle') in order to choose one of them to work with. They are talking about the difficulties of the games in relation to the children's level of knowledge.

Teacher 1: *Letter puzzle, the one with the sheep, we have that, we have used it quite a lot.*
Teacher 2: *Yes, because this one* [refers to the app she plays, 'Spelling game'] *still feels a bit complicated. I think like this, that when they* [the school children] *already have a hard time spelling and so the letters are hidden too…*
Teacher 1: *Yeah.*
Teacher 2:*… so that you do not even see, you must first search for the letters…*
Teacher 1: *Yes...well, it's both, it can be that they think it's a bit fun too, that it will be… for the other is very simple, if you say you have the letters there, you only have to put the pieces together.*

This excerpt exemplifies how the teachers construct an interpretive repertoire about their common understanding of DGBL and how it can be used pedagogically in the classroom. In this example, their interpretive repertoire is based on the adaption of the game app in relation to the school children's knowledge level. Teacher 2 is concerned that one of the game apps might be too hard for the school children, while teacher 1 points out that it must not be too easy for the school children, and states that what is difficult can also be fun. In all, excerpts 5–7 constitute different examples of how the teachers

are constructing an interpretive repertoire which reflects a socially constructed ideology about learning and how it is (best) supported for enhancement in a classroom context.

To sum up, these three themes illustrate different perspectives of the concept of game design. The first theme, *game design as persona*, shows how game attributes became personalized by the teachers by conceptualizing them as 'hybrid things' with embodied qualities. The second theme, *game design as form*, acknowledges teachers' views on what it is that makes a game to a game. Here, on the one hand, game mechanics, such as clear goals and rules, were qualities that decided if a game was a game or something else (e.g. a puzzle). On the other hand, it was highlighted that a game is more than its mechanics and that aesthetics and narrative of a game are crucial aspects if a game should be a game. Finally, the third theme concluded that the *pedagogical function of game design* is constructed as traces of social practice. This was articulated partly through teachers beliefs in their instructional tradition and partly through a critical approach to current educational game apps as too simplistic in their design resulting in the fact that a meaningful pedagogical function does not exist.

6 Conclusive Discussion

By following four groups of teachers' pedagogical design processes while they were evaluating and trying out different game apps, we wanted to examine how ideas about DGBL as a teaching method and base for developing teaching activities were constructed by them. We wanted to investigate the teachers' views on the didactic potential of DGBL. In addition, our intention was to offer the participants a structured form to contemplate games with didactic eyes. Hence, while exploring the game apps together with colleagues they were establishing an organized way of evaluating and implementing DGBL in their teaching activities.

Related to the first research question ("In what ways do teachers concretise their comprehension of DGBL in their discussions of educational games for school children?"), the analysis showed that the teachers' were stuck by their preconceptions about games as offering different learning qualities compared to their traditional teaching practice. They tried to put the game apps into a pedagogical framework and their discussions concerned how they could be used for activities that they used to implement. Thus, they identified limitations of the game apps as they did not supply traditional activities. However, the teachers try hard to understand the principles of games, but run into problems when they find that they are not completely compatible with traditional methods. This confirms related work [15] highlighting that teachers are competent when it comes to qualities of traditional teaching material, but not so much about how digital games can foster learning. Squire [15] also points to another problematic side of DGBL, namely that designers are knowledgeable in developing inspiring games, but have limited knowledge about designs for learning. Related to the second research question ("How are different discourses about the learning process and/or didactical potential in relation to digital games constructed in teachers' discussions while assessing game apps?"), one of the groups pointed to that designers' limited competence of games for learning also influenced the games' design resulting in games with little or no relevance for teaching activities. In this regard, it is arguable that DGBL concerns more than an effective game mechanics,

which is confirmed by related work [8], which points to the importance of game narrative and game value in terms of, among others, sociality.

6.1 Implications for the Field

We already know that, for instance, Nordic teachers for various reasons do not use DGBL to any great extent in their teaching [14]. The most evident reason is that they lack the knowledge about both the gaming context itself and about what it might enable in terms of learning potential, hence more knowledge about DGBL is needed for teachers to increase the use of games in school teaching. Accordingly, we argue for the necessity to view DGBL as an alternative method to be considered based on its specific attributes rather than approaching it in terms of traditional ways of teaching. Otherwise there is a risk that digital gaming aspects of learning disappear into a fuzzy pedagogical framework and the gaming aspects thereby become as fuzzy. This is to emphasize that the two-sided problem expressed by Squire [15] risks to become even more complex considering that it might be that both teachers' and designers' competences are tied to traditional qualities of pedagogy respectively game design instead of putting on new spectacles and consider DGBL for what it is rather than something traditionally framed.

We found that our workshop design encouraged a discussion and insight into games and their learning potential among the participating teachers- which it looked like they did not initially have - and we argue that our workshop design actually facilitates the use of DGBL as well as reduces the gap between games and pedagogy. Furthermore, the game apps used in our workshop design were chosen on the basis of what types of games people usually use [14] which we wanted the teachers to choose from, based on their own interest. This was related to the idea that they, in the workshop, should design a teaching activity which included the chosen game app and which they were going to carry out in their respective classroom. The next step to further this research is to perform follow up-interviews with the participating teachers in order to investigate how their teaching activities actually unfolded in the classroom.

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