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Introducing the play activity wheel: Designing social, physical and playful learning activities from digital game universes

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Abstract: This article introduces and describes the play activity wheel, developed by the authors. It was created through looking back at 19 years of personal experiences of transforming television shows, board games and digital games into pedagogical activities, and has a focus on social, physical and playful learning. The idea of developing computer games, television series and board games into physical activities arose from observing children's interests in transforming these universes into games and activities. The play activity wheel was developed in various settings with different participants, such as children aged 1–15, students in higher education, educators, researchers and other stakeholders. For the purpose of this study, the play activity wheel was tested as a tool for preservice teachers. A researcher/educator collaborated on designing a process to achieve common learning goals in a playful learning space. In this study, we present the theoretical background for the play activity wheel and demonstrate how it can be used to design playful learning.

Keywords: cocreation, computer game, physical play activity, playful learning

1. Introduction

Children often play pretend games inspired by movies, board games, digital games, television shows and other narratives. Research has documented how children frame playful activities around specific universes, such as making songs inspired by *Minecraft* (computer game released in 2011; Bailey, 2016). Educators suggest turning board games like *Stratego* (from 1946) into collaborative team games of capture the flag, and we have observed children playing catch and framing it as *Fortnite* (computer game released in 2017) or *Among Us* (computer game released in 2018).

We aim to understand whether activities that involve game universes being reframed as playing activities can inform a framework for a playful approach to learning in an educational setting. This led us to develop the “play activity wheel” presented in this study. The wheel is an outcome of looking back at our own personal experiences of transforming television



shows, board games and digital games into pedagogical activities, and has a focus on social, physical and playful learning. It is a tool that can be used by educators, teachers, pedagogues, school children, adult students and parents to transform a specific universe into a social, physical and playful activity. In this study, we showcase how the play activity wheel has been used in teacher education, and how it can be used to frame a playful approach to learning in “Technology Comprehension and Digital Bildung” (a recently developed module in teacher education in Denmark aimed at developing future teachers’ professional digital competences; Rasmussen & Hansbøl, 2021).

Playful learning is gaining prominence as a way of creating meaningful experiences and reaching participant-led learning objectives (S. Gudiksen & Skovbjerg, 2020). In 2018, in Denmark, the programme Playful Learning (run by Design School Kolding, the Lego Foundation and all university colleges in Denmark) was launched in pedagogue and teacher education, with the aim of bringing more playful qualities and approaches to learning into higher education (Danish university colleges, 2021; S. Gudiksen & Skovbjerg, 2020; Lyager et al., 2020). In Scandinavia, learning institutions challenge the idea of pre-fixed learning and the notion that the teacher knows everything. Instead, students and teachers are encouraged to look to innovative learning approaches, such as playful learning activities (Christensen & Klausen, 2020; S. K. Gudiksen et al., 2020). The Danish playful learning programme (Danish University Colleges, 2021) has developed three principles for playful learning based on educator and student collaboration (Lyager et al., 2020).

Some studies conclude that there needs to be a paradigm shift in the educational system, and a playful approach to learning must contribute to improving the educational system for teachers and students alike (M. Jacobsen, 2014). However, studies from primary and secondary schools show that teachers lack knowledge about how to implement play in their lessons (Broström, 2018).

Our focus adopts a humanities and sociocultural movement perspective. The humanities perspective is derived from anthropology and phenomenology. It is based on an understanding that movement is experienced by an individual in a historical, social and cultural context, with a focus on the individual’s joy, desire and motivation (Händel & Rechnagel, 2018; Rønholt & Peitersen, 2014). From the sociocultural movement perspective, movements are an expression of a cultural shaping of the body’s movement. The physical activities you choose thus depend on the time and culture of which you are a part (Händel & Rechnagel, 2018; Rønholt & Peitersen, 2014). In this case, the computer game world determines the shaping of the body’s movements. By bringing the computer game world in a codesign format into an educational context, it is the educators, pedagogues, school children and pre-service teachers themselves who bring the culture into the institution, and they are thus cocreators of the institution’s movement culture (Händel & Rechnagel, 2018).

In this study, we propose a way of using computer game worlds and narratives to cocreate emergent playful and physical practices with students to support competence, knowledge and skill development in an educational context. We do this by posing the question: How

can educators and preservice teachers cocreate meaningful physical play activities using digital games and framing them as playful learning?

1.1 Definitions

In this study, the term “digital games” refers to games played on a PC, laptop, mobile device or gaming console (Wimmer, 2009). The term “digital game universe” refers to the game in its broadest sense, including mechanics, dynamics, aesthetics (Egenfeldt-Nielsen et al., 2008), world, narrative and gameplay activities. As the play activity wheel is developed to redesign computer game universes, it is best used with computer games with some degree of richness to the universe.

2. Cocreation and codesigning process in an educational context

The play activity wheel is designed to be part of a pedagogical cocreation and codesigning process, with and by the students involved. Jimenez (2018) posited that cocreating games as part of the learning process can enable students to express creativity, gain empowerment, and develop a deep comprehension of the learning. The collaborative nature of the process also requires students to develop problem-solving skills, communication skills and critical thinking.

In this pedagogical approach of redesigning computer game universes for playful, physical, social and creative learning activities, the students are involved in the entire design process (Kafai, 2006). The students’ involvement in creating playful activities and their collaboration in achieving common goals allows knowledge modelling (Romero, 2016) by linking a learning foundation with the game design elements (Boller & Kapp, 2017). The cocreation of playful educational activities or games seems to encourage student engagement and motivation, and in the cocreation process, students can gain empowerment and develop their creative skills as well as their learning skills (Robertson & Howells, 2008). A collaborative playful activity or game design process requires creative skills, communication skills, critical thinking, tinkering and problem solving, and it requires that the students persevere in the process. These are all skills that students need to develop (Hastie, 2010; Robertson, 2012). In a game cocreation process, students are continually reformulating their comprehension of the subject-specific curriculum because it has been integrated into the educational play activity they are developing (Weitze, 2018). Thus, the collaborative process of redesigning activities is a rewarding way for students to learn the curriculum (Kangas, 2010).

In cocreation, it is important to create a safe space with room to make mistakes and for a learning process that is not known in advance (Gudiksen & Skovbjerg, 2020; Händel & Buhl, 2021; Lyager et al., 2020; Tanggaard & Dilling, 2019).

Even though the play activity wheel is designed for a cocreation or codesigning process the play activity wheel could also be used as a tool to facilitate social, physical and playful learning activities without engaging the students in the design process.

3. An autoethnographic approach

Over a period of 19 years, the underlying concept behind the play activity wheel has been created, tested and refined. The narratives, experiences and observations from both work and private settings have been systematically analysed to transform these personal insights into the play activity wheel (Adler, 1987; Baarts, 2020).

The concept behind the play activity wheel has been to integrate physical activity with digital technologies using universes from board games, television shows and computer games. The play activity wheel itself was first created and named in 2021.

The underlying concepts of the play activity wheel have been tested in different settings, such as classes of students from social education and teacher education, and children aged 1–15 in both private (treasure hunts) and institutionalised settings (kindergarten and after school-centre/club, and as part of subject-specific classes in primary schools). Finally, it was presented in various settings with colleagues, researchers, consultants and conference participants. The empirical data for this study are the educator’s PowerPoints, descriptions of the learning goals, setting and content, students’ descriptions of their experiences and students’ notes from the teaching unit.

Figure 1 shows at which events the play activity wheel was created, tested, refined and analysed with the goal of creating a playful, physical, social and creative learning activity space. The play activity wheel has thus arisen through a dynamic practice-theory based process based on cocreation and codesigning processes with different participants.

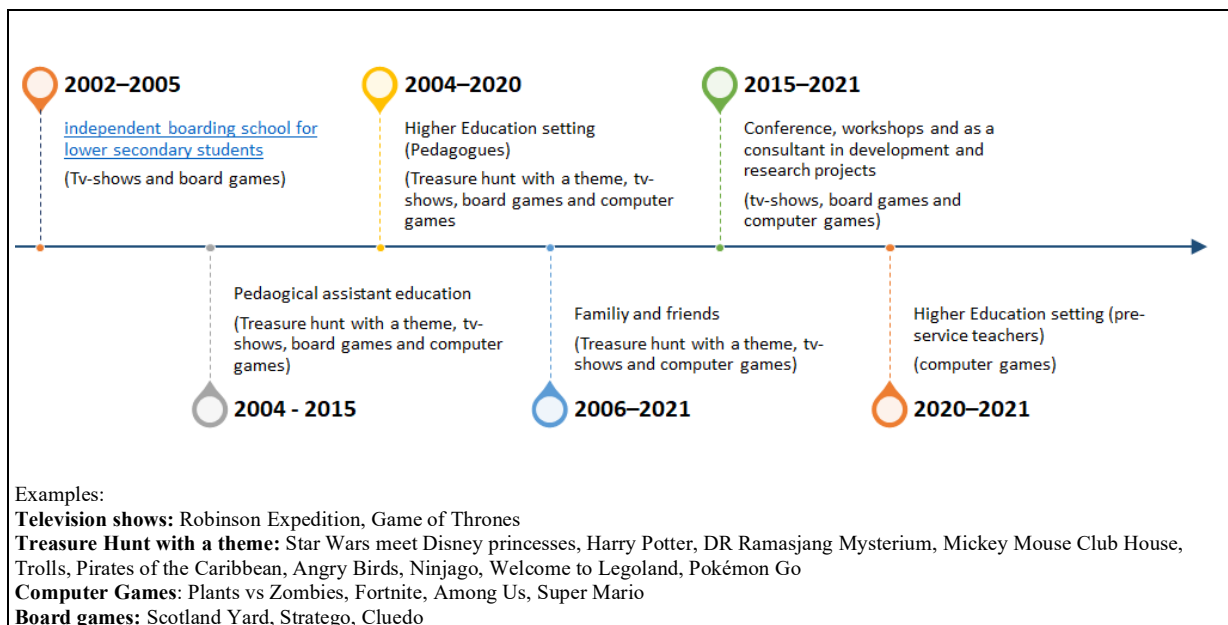


Figure 1. Timeline

4. Introduction of the play activity wheel

The purpose of this paper is to present the play activity wheel (Figure 2), a pedagogical tool for redesigning digital game universes into playful, physical, social learning activities. Anyone interested in framing a pedagogical activity where television shows or games are used as inspiration can benefit from using the play activity wheel.

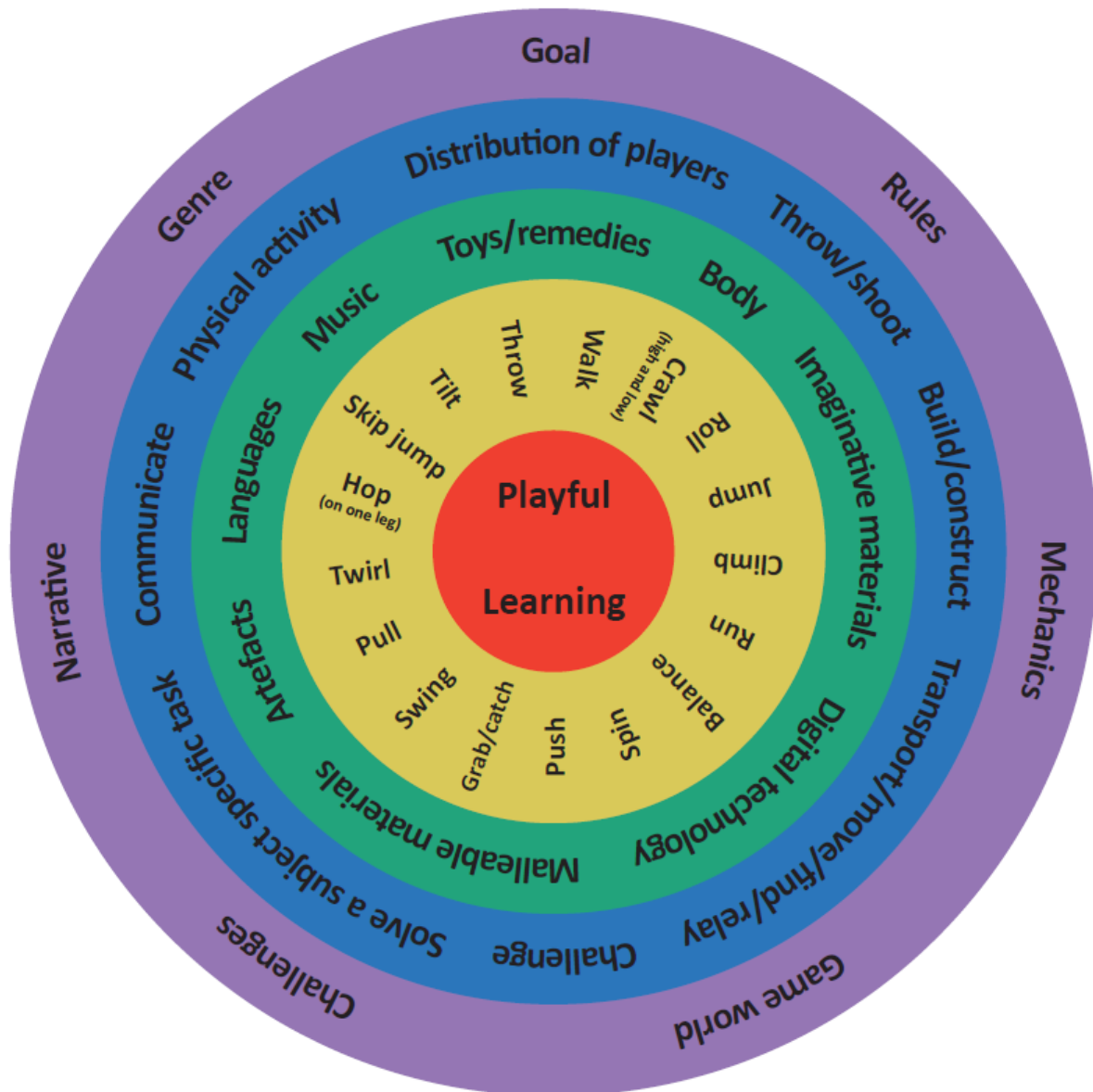


Figure 2. Play activity wheel (designed by authors)

The play activity wheel consists of five circles. The purple circle contains seven game elements, the blue circle contains eight play activity elements, the green circle contains eight play media elements, the yellow circle contains 18 basic movement elements, and the red circle in the centre is a synthesis category aiming the activity towards a playful approach to learning (see Figure 2 and Table 1).

Table 1 Play activity wheel: Categories and components

Type of category	Components in the category
7 game elements Describing building blocks that are characteristic of games (Purple)	Goal Rules Mechanics Game world Challenges Narrative Genre
8 play activities Describing activities that can be selected to help reframe the game universe (Blue)	Distribution of players Throw/shoot Build/construct Transport/move/find/relay Challenge Solve a subject-specific task Communicate Physical activity
8 play media Describing physical objects/materials/artefacts in the activity (Green)	Toys/remedies Body Imaginative materials Digital technology Malleable materials Artefacts Languages Music
18 basic movements Describing the gross motor development skills and physical movement of the body in the activity (Yellow)	Walk, crawl (high and low), roll, jump, skip jump, climb, run, balance, spin, push, grab/catch, swing, pull, twirl, hop on one leg, tilt, throw
Playful learning (red)	Synthesis category

The play activity wheel visualises different play elements for designing social, physical and playful learning activities originating from digital game universes. It is not a description of how to facilitate teaching and learning, nor does it directly address didactic thinking, such as academic goals or student and teacher positions. There are many situational constraints influencing the establishment of a play space, the design processes, and what can emerge. Elements such as the teacher's ability, motivation and desire to facilitate a playful approach and the students' self-determination in participating are crucial to consider for successful playful learning to occur.

The potential of the play activity wheel is its usefulness application for designing social, physical and playful learning activities from digital game universes. This can enable a togetherness in a playful learning environment, which promotes preservice teachers' renegotiations of their own learner roles and encourages them to engage in new positions requiring framing and facilitation from both educators and students (Händel & Buhl, 2021). As such, the categories are not static or fixed, but serve as a source of inspiration. It is up to the participants in a teaching situation to decide whether some of the categories need to be replaced, changed or adjusted.

5. Theoretical background for the categories in the play activity wheel

Here, we present and elaborate the theoretical background for the categories in the play activity wheel.

5.1 Game elements

The "game elements" category represents the computer game universe. As Deterding et al. (2011) suggested, the definition of game elements can be tricky, as many individual elements are found elsewhere, and few are present in all games. As such, this category risks being either too inclusive or too exclusive. One solution is to understand game elements as building blocks that are characteristic of games in the sense that they "are found in most (but not necessarily all) games, readily associated with games, and found to play a significant role in gameplay" (Deterding et al., 2011). This category invites participants to think broadly about the concept of the game in question, including the formal rules, how it is played, and what cultures emerge from the contexts in which the game is played (Salen & Zimmerman, 2011).

5.2 Play activities

The "play activities" category represents the basic structure of the playful activity (Hovgaard, 2017). It contains context-specific activities that can be included. Participants should ask themselves which characteristics of the digital game should be in the physical playful activity and why. The eight play activities do not explain how they should be integrated into the

game, because that varies from game to game and is combined with the seven game elements.

5.3 Play media

It is important to consider play materials in playful approaches (Quilitch & Risley, 1973), and this category is intended for participants to consider why an artefact is used and its function in the activity (Hovgaard, 2017). We understand that different materials have different kinds of interaction. In play, different materials are used in specific play practices. A doll is played with through a different play practice than a trampoline, for example (Skovbjerg, 2020). Different materials have different advantages, disadvantages and constraints for play (Skovbjerg, 2020). Including the play media category in the tool is a way to enable participants to reflect on what materials are useful for their play idea, and what and how they contribute to the activity. Choosing may provide some constraints to the play activity, but a wide range is also meant to inspire people to think about different play media.

5.4 Basic movement

The play activity wheel presents 18 basic movements (see Figure 2 and Table 1). These 18 basic movements focus on gross motor development skills (Andersen & Brøndsted, 2009). Many research projects have examined physical activity in promoting learning among children (Gal et al., 2018; Schoeppe et al., 2016). It has been indicated that movement and active play are effective in learning, such as learning-supporting activities where subject-specific competence, skills and knowledge can arise through a playful approach (Jacobsen et al., 2017). Basic movements help determine how players move in the game and activities (Hovgaard, 2017).

5.5 Playful learning

Playful learning is a central synthesis category illustrating the pedagogical approaches in the activity. We have a broad perspective of play as a) the pedagogical-psychological perspective of play, where play itself has the potential to contribute to the player's learning and development (Broström, 2018; Jessen & Karoff, 2008; Knoop, 2009; Schiller & Henriksen, 2014); b) a cultural, anthropological and phenomenological approach with a goal of understanding play from the individual's experiential context (Broström, 2018); and c) the five characteristics of learning through play, which posit that play should be: 1) actively engaging (to encourage focus), 2) socially interactive and encouraging of peer feedback, 3) iterative (testing, changing, critical thinking), 4) joyful (intrinsic motivation), and 5) meaningful in terms of what students are doing and learning (Mardell et al., 2019; Zosh et al., 2017).

6. Cocreation with preservice teachers in higher education

In this section, we present an empirical example of how the play activity wheel has been used to cocreate with preservice teachers in a higher educational setting. The play activity

wheel was presented in the module “Digital comprehension and digital bildung” (In Danish: Teknologiforståelse og digital dannelse). One of the content areas in the module is “Design thinking and complex problem solving: Design processes, iterations and reflection.” The overall principles of the teaching unit were based on the three principles within the playful learning programme.

- **Imagining together** (media, materials and mood function as didactic fellow players)
- **Daring to embrace unpredictability** (open and unpredictable processes)
- **Insisting on meaningfulness** (all involved in the process are seen as equal, allowed to redesign and rethink the contents to create professional meaningfulness and promote ownership of learning)

Two additional principles were added by the researcher/teacher: **the notion of ‘fail-ability’** (being brave enough to fail and make mistakes) and **learning through an experimental practice**. Educators and students should create a safe space for experimentation and be brave enough to fail, learn from mistakes and work with unfinished or even unsolvable tasks (S. Gudiksen & Skovbjerg, 2020; Händel & Buhl, 2021; Whitton & Moseley, 2019). It is through the students’ own experiments and activities that learning takes place (Lyager et al., 2020; Tanggaard & Dilling, 2019).

6.1 The play activity wheel in teacher education

In the teaching unit, the play activity wheel was used as a framework for creating and redesigning a computer game universe (in this case Fortnite [Epic Games, released in 2017]) into playful, physical, social and creative learning activities. The teaching unit was organised as a design thinking process (Stanford d.school, 2013) to help preservice teachers 1) empathise, 2) define, 3) ideate, 4) prototype and 5) test.

The first part of the unit was a presentation about computer game universes, children’s game playing habits in 2020 (Hollerup et al., 2021) and different game elements, as well as goals, rules, mechanics, game universes, challenges, narratives and genres. This was followed by the authors’ own elements, developed through the many iterations of transforming digital games to playful activities. The preservice teachers were then introduced to activity development using Mads Hovgaard’s (2017) activity wheel, creative learning processes (imagine, create, play, share, reflect, imagine, etc.; Resnick, 2018), design thinking (Stanford d.school, 2013) and finally, an introduction to the play activity wheel.

In the second part of the unit, the preservice teachers used the design thinking process to redesign a computer game by reframing the universe into a playful, physical, social and creative learning activity in collaboration with the educator. Preservice teachers were actively engaged in this task, approaching it with curiosity and focused attention, asking questions and continuously reflecting on the possibilities of using this process with primary school children.

First, the preservice teachers imagined themselves using this approach as teacher, in a learning environment in the primary school. The students asked why and how (empathise) to establish a meaningful context for their playful activity. Second, they chose a computer game and discussed the potential of the game elements and which they wanted to apply to their own design (define and ideate). Third, in collaboration with the educator, they used the play activity wheel to create, play, share and reflect on the design (ideate, prototype and test). The researcher/teacher observed that the preservice teachers were engaging in the design process, being socially interactive and getting involved in the learning activities by allowing themselves to redesign and rethink learning content, while also giving and receiving peer feedback. These observations will be discussed and elaborated in the following section.

6.2 The play activity wheel: Step by step

Here, we present how one group of preservice teachers used the play activity toolbox to redesign the game universe. The curriculum of the day was focused on design thinking and computational thinking. The teaching took place in a play and learning laboratory (PlayLab). PlayLab is designed to “invite, inspire and insist on quality in play and learning activities” (Lyager et al., 2020) and is filled with materials to support a playful approach to learning (e.g., digital artefacts, toys, makerspaces with pencils and paper, etc.).

First, the group collaborated on identifying the game elements (purple circle) in their chosen digital game (Fortnite). This was done to find a joint understanding of how the key characteristics of digital games were present in Fortnite. The preservice teachers created a table that visualised the elements from the game and how these should be reframed in their physical play activity (see Table 2).

Table 2. Student notes from the teaching unit

The game element category	Elements in Fortnite	Reframing of the Fortnite-inspired activity
Goal	Win the game Have an amazing outfit Solve missions Last man standing	Survive to win the game. Choice between battle royal (last man standing) or cooperative (in teams)
Rules	It was hard finding the Fortnite rules (game rules), but there were many rules about online security, online safety and sportsmanship policies.	Players have three lives (a pedagogical decision to avoid dying after meeting the first opponent). The goal is to be last person standing. The game is set to last 10 minutes, providing room for an iterative process.

Mechanics	Collect Build Challenge an opponent	Collect building blocks, build small houses and challenge an opponent using the game rock, paper, scissors
Game world	Different islands	Played outside, with game area getting smaller as time progresses
Challenges	Solve different tasks Eliminate other players Build your avatar	Can't find items or killed by an opponent Can't find a perfect outfit
Narrative	Story is told entirely through the world itself, and is enacted through characters, mood and atmosphere within the game.	We wish to tell a story that feels like it's being told in the moment, live events, single-player missions, environmental storytelling and traditional techniques like cinematics, audio logs and nonplayer characters you can chat with.
Genre	Four different game modes: <i>save the world</i> (cooperative game), <i>battle royal</i> (player vs. player), <i>creative</i> (sandbox), and <i>party royal</i>	We wish to take different elements from the first three game modes.

With a joint understanding of the game elements, the preservice teachers used the play activity circle (blue) of the play activity wheel which describes play activities that can be selected to help reframe the game universe. The students found it useful in visualising the different activities that are usually in a computer game, which helped them understand the specific activity they should include.

The preservice teachers focused on distribution of players; shoot, build, find, challenge; and solve a subject-specific task, and developed a strategy to include these play activities. First, they made distribution of players part of the game, and decided it could either be played as battle royal or as a cooperative game (they would let the players decide). Next, they discussed the shooting part of the game, with suggestions to use guns with soft arrows or small bean bags. The play activity wheel helped them understand shooting in Fortnite as a way to challenge other players (win or lose). Therefore, they decided to use a micro:bit (small single board-computer; <https://microbit.org/>) to enable players to challenge each other in a game of rock, paper, scissors, and in this way, use the micro:bit as a weapon (the students had to

programme the micro:bit themselves and did not have any experience in doing so. Using the micro:bit was inspired by the educator). Next, they focused on the building part of Fortnite. They wanted their players to build huge forts, but without suitable materials, they decided to build miniature houses/forts with wooden building blocks. They decided that all the materials should be hidden in the game area, so a challenge for the players would be to find the materials. They decided that players should also find a sheet of paper with a subject-specific task for L1 (Danish language), which instructed participants to create a poem. The preservice teachers then moved on to focusing on the play media (green) and explored the PlayLab space to find, test and experiment with different materials, including dressing up as Fortnite players.

Finally, the preservice teachers chose some basic movements (yellow) that were allowed in the game: running, walking, jumping, crawling and climbing. In their iterations of testing their playful activity, they discussed making rules for all players to move in the same way. One preservice teacher suggested including a gamemaster who would communicate that all players should crawl until told otherwise. The group decided that when their playful activity started, they should, as much as possible, stay in the game world. Therefore, they also included distributing players as part of the playful activity to ensure that the energy, mood and atmosphere from the digital game could emerge as playfulness.

7. Discussion

This article introduced the play activity wheel, a tool for educators, teachers, pedagogues and other stakeholders to utilise for creating playful pedagogical activities based on digital game universes, television shows or boardgames as a design for emergence.

7.1 Understanding play: Designing for emergence

Our pedagogical principle behind the play activity wheel is to create a playful learning environment that motivates students and challenges their understanding of what teaching can be in a meaningful learning environment (Hanghøj et al., 2021; Lyager et al., 2020). Our principle is based on both increasing interest in using digital games in school and the concept of having more movement-based teaching in subject-specific teaching.

In recent years, there has been much interest in incorporating digital games into teaching, both as a new way of designing learning experiences and as a new didactic approach to learning (Gee, 2003; Hanghøj, 2021). This interest may be due to the great importance of digital and analogue games in the everyday lives of children, young people and adults (Hanghøj et al., 2021; Medierådet, 2021). However, it seems that commercial computer games are inherently more interesting than their educational counterparts, as these are designed to engage and entertain the players (Deterding et al., 2011; Rigby & Ryan, 2011). With the play activity wheel this engagement in commercial computer games is a central aspect of how it is used as a tool to design for emergence.

Although there are many advocates for using computer games in educational settings (Devlin, 2011; Gee, 2003), it is often reported to be a resource-demanding task that is difficult to implement (Kenny & McDaniel, 2011). Using computer games in education can thus be a difficult endeavour.

A number of research projects have dealt with whether physical activity can promote learning among children, and in recent years, some have examined how playful learning can positively influence children's learning and development, physically, mentally and socially (Csikszentmihalyi, 2008; Gal et al., 2018; Kangas, 2010; Resnick, 2018; Schoeppe et al., 2016; Zosh et al., 2017). Furthermore, it has been concluded that physical activity, in connection with teaching, can be advantageous for active play, such as heart rate training, brain breaks and learning-supporting activities, where curriculum is learned in a playful way (Jacobsen et al., 2017).

Our prediction is thus that if we take people's interest in digital games and combine it with physical activity in a meaningful, social learning environment, the play activity wheel can be used for the design and emergence of playful learning.

7.2 Learning design, subject-specific tasks and limitations

Implementing a playful approach to learning in the educational system must be supported by an ongoing pedagogical and professional dialogue and discussion, examining the benefits, limitations and barriers that a playful approach to learning can bring to an educational setting (S. Gudiksen & Skovbjerg, 2020; Händel & Buhl, 2021; Händel & Rechnagel, 2018). When educators design pedagogical learning activities, the learning design perspective and subject-specific tasks and constraints for learning are important themes to address. The play activity wheel is a tool for creating playful learning activities, but it is also a tool for initiating such discussions. Used as a learning design model, the play activity wheel can be used to consider, formulate and create relations between goals, learning conditions, settings, contents and learning processes. In this way, the play activity wheel can support students' learning outcomes and well-being through participation in a learning session (Händel & Rechnagel, 2018; Hiim & Hippe, 2007). The pedagogical approach used to implement the wheel in the examples above is rooted in specific learning design principles that the wheel itself does not address (Händel & Rechnagel, 2018; Hiim & Hippe, 2007; Hovgaard, 2017), such as design thinking (Stanford d.school, 2013) and creative learning processes (Resnick, 2018).

Educators and students face many situational constraints in creating a safe playful learning environment, such as relationships (Historic, power background), roles (position, characters, preferences), regulations (formal goals, curriculum, security), culture (language, rituals, habits), structure (objects, sequences, conditions), time (priorities, accessibility, focus; S. Gudiksen & Skovbjerg, 2020; Händel & Buhl, 2021). The play activity wheel can help educators and students make such constraints visible and structure activities within them.

A crucial part of engaging in a playful learning activity is awareness of the mood, atmosphere and energy in the situation (Händel & Rechnagel, 2018; Hovgaard, 2017; Skovbjerg, 2010),

which is affected by specific cultures, tensions, dynamics between participants and qualities in the activities, as well as the place and materials. This means that you cannot guarantee that a specific energy, mood or atmosphere will be present in a situation, but only design for the emergence of these (Händel & Rechnagel, 2018). In any activity, game or learning session, the mood, energy or atmosphere is constantly changing, from situations where the students are highly engaged and motivated to situations where there is less engagement and interest. When facing a situation where the mood, energy or atmosphere is changing, the teacher or educator needs to consider how to adjust the learning activity (Händel & Rechnagel, 2018; Hovgaard, 2017; Skovbjerg, 2010). When designing for emergent play, this must be done with a sensitivity for the kind of play that emerges in the unfolding of the activity.

7.3 Other perspectives on the use of the wheel

The play activity wheel can help create an overview of what to consider when transforming a game universe, narrative or story into a physical, social and pedagogical playful activity. Throughout this paper, we have provided examples that can be used as inspiration for cocreating physical activities. Our purpose with the play activity wheel is to enable transformation of computer games into physical play activities, but the play activity wheel can also be used for redesigning new, unique games (either in a cocreative practice or by the educator themselves) and for constructing and creating individual computer, physical or analogue games. In our examples, we presented the use of the wheel in a linear fashion to explain the categories, but the use of the wheel benefits from a dynamic approach where the categories are continually visited and refined. As Hanghøj et al. (2021) pointed out, designing learning experiences with games is seldom linear, but rather a shifting process between different considerations. In our case, one consideration would be to change the starting point to any of the other categories, for example, starting with the play media elements and finding materials and locations before deciding which game and game elements will be useful.

Another use of the wheel is to create opportunities for cocreation by selecting categories or elements at random. To highlight this opportunity, the wheel could be redesigned as dice or cards similar to the MeCaMInD project (European Commission, 2020). To point the students towards specific goals, educators can also choose specific elements for them to work with.

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8. References

- Adler, P. A. (1987). *Membership roles in field research*. Sage.
- Andersen, K., & Brøndsted, B. (2009). *Leg så hjernerne banker: Legebog for børnehavebørn* (1. udgave). Dafolo.

- Baarts, C. (2020). Autoetnografi. In S. Brinkmann & L. Tanggaard (Eds.), *Kvalitative metoder en grundbog* (3rd ed., pp. 203–216). Hans Reitzels Forlag.
- Bailey, C. (2016). Free the sheep: Improvised song and performance in and around a Minecraft community. *Literacy*, 50(2). <https://doi.org/10.1111/lit.12076>
- Boller, S., & Kapp, K. (2017). *Play to learn: Everything you need to know about designing effective learning games*. ATD Press.
- Broström, S. (2018). Fri leg og lærerig leg i skolen. In H. H. Møller, I. H. Andersen, K. Bjerring Kristensen, & C. S. Rasmussen (Eds.), *Leg i skolen: en antologi* (Møller,). Unge Pædagoger (Unge Pædagogers serie B, Bind 125).
- Christensen, O., & Klausen, M. T. (2020). Roller og positioner i eksperimenterende praksisser: udvikling af aktiv teknologiforståelse. *Unge Pædagoger*, 2020(1).
- Csikszentmihalyi, M. (2008). Flow: The psychology of optimal performance. In *Optimal experience: Psychological studies of flow in consciousness*. <https://doi.org/10.1017/CBO9781107415324.004>
- Danish University Colleges. (2021). *Playful learning*. <https://playful-learning.dk/>
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining 'gamification'. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9–15. <https://doi.org/10.1145/2181037.2181040>
- Devlin, K. J. (2011). *Mathematics education for a new era: Video games as a medium for learning*. A K Peters.
- Egenfeldt-Nielsen, S., Smith, J. H., & Tosca, S. P. (2008). *Understanding video games: The essential introduction*. Routledge.
- European Commission. (2020). *Method cards for movement-based interaction design*. <https://Ec.Europa.Eu/Programmes/Erasmus-plus/Projects/Eplus-Project-Details/#project/2020-1-DK01-KA203-075164>.
- Gal, R., May, A. M., van Overmeeren, E. J., Simons, M., & Monninkhof, E. M. (2018). The effect of physical activity interventions comprising wearables and smartphone applications on physical activity: A systematic review and meta-analysis. *Sports Medicine—Open* 4(1). <https://doi.org/10.1186/s40798-018-0157-9>
- Gee, J. P. (2003). What video games have to teach us about learning and literacy. *Computers in Entertainment*, 1(1). <https://doi.org/10.1145/950566.950595>
- Gudiksen, S. K., Skovbjerg, H. M., & Legaard, J. F. (2020). *Framing play design: A hands-on guide for designers, learners & innovators*. BIS.
- Gudiksen, S., & Skovbjerg, H. M. (2020). Prologue uncovering the qualities of play design. In S. Gudiksen & H. M. Skovbjerg (Eds.), *Framing play design: A hands-on guide for designers, learners & innovators* (pp. 15–36). BIS Publisher.
- Hanghøj, T., Kjellow, T. N., Melgaard, S., Møller, L. D., Henningsen, B., & Jensen, E. O. (2021). *Sæt skolen i spil: Brug af computerspil og gamification i undervisningen*.
- Hastie, P. (2010). *Student-designed games: Strategies for promoting creativity, cooperation, and skill development*, *Human Kinetics*. Champaign, IL.
- Hiim, H., & Hippe, E. (2007). Hiim og Hippes didaktiske relationsmodel. In *Læring gennem oplevelse, forståelse og handling*.
- Hollerup, C., Thiele, Thiele., Løvind, S., Granholm, K., & Green, K. (2021). *Børns spillevaner 2020*.
- Hovgaard, M. (2017). *Aktivitetudvikling i idræt: innovation i praksis* (1. udgave). Samfundslitteratur.
- Händel, V. D., & Buhl, M. (2021). Playful Online Learning Environments Promote Student Teachers' Renegotiation of the Learner Roles. 20th European Conference on E-Learning - ECEL 2021, PhD and Masters Colloquium.
- Händel, V. D., & Rechnagel, E. R. (2018). Idræt og bevægelse i et pædagogisk perspektiv. In F. B. Olsen (Ed.), *Sundhedsfremme og bevægelse* (pp. 189–217). Frydenlund.

- Jacobsen, M. (2014). Design-based research sponsoring innovation in education. *Education Canada*, 56(4).
- Jacobsen, R. H., Bjørnholt, B., Andersen, M. M. Q., & Jordan, A. L. T. (2017). Lærere og pædagogers oplevelse af den længere og mere varierede skoledag i folkeskolereformens tredje år. In *Kortlægning, 2017*.
- Jessen, C., & Karoff, H. S. (2008). Playware and new play culture. *Proceedings for BIN Conference: Æstetik Og Kultur*.
- Jimenez, A. P. M. (2018). Game co-creation with young music students: A pedagogic approach to promote creativity and engagement. *European Conference on Games Based Learning*, 792–799.
- Kafai, Y. B. (2006). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture*, 1(1). <https://doi.org/10.1177/1555412005281767>
- Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking Skills and Creativity*. <https://doi.org/10.1016/j.tsc.2009.11.001>
- Kenny, R. F., & McDaniel, R. (2011). The role teachers' expectations and value assessments of video games play in their adopting and integrating them into their classrooms. *British Journal of Educational Technology*, 42(2). <https://doi.org/10.1111/j.1467-8535.2009.01007.x>
- Knoop, H. H. (2009). *Leg, læring og kreativitet: hvorfor glade børn lærer mere* (2. udgave). Aschehoug.
- Lyager, M., Heiberg, T., & Lehmann, S. (2020). *Playbook 1*. Københavns Professionshøjskole.
- Mardell, B., Lynneth Solis, S., & Bray, O. (2019). The state of play in school: Defining and promoting playful learning in formal education settings. *International Journal of Play*, 8(3). <https://doi.org/10.1080/21594937.2019.1684157>
- Medierådet. (2021). *Fra computerspil til fysisk aktivitet*. Medierådet for Børn Og Unge i Samarbejde Med Center for Digital Pædagogik Og Red Barnet i Forbindelse Med Sikker Internet Dag 2021.
- Quilitch, H. R., & Riskey, T. R. (1973). The effects of play materials on social play. *Journal of Applied Behavior Analysis*, 6(4), 573–578.
- Rasmussen, H. F., & Hansbøl, M. (2021). Perceptions of technology comprehension: Observations of Danish teacher educators perceptions of technology comprehension. *Nordic Educational Research Association (NERA)-2021*.
- Resnick, M. (2018). Lifelong kindergarten. In *Lifelong kindergarten*. <https://doi.org/10.7551/mitpress/11017.001.0001>
- Rigby, S., & Ryan, R. M. (2011). *Glued to games: How video games draw us in and hold us spellbound*. Praeger/ABC-CLIO.
- Robertson, J. (2012). Making games in the classroom: Benefits and gender concerns. *Computers and Education*, 59(2). <https://doi.org/10.1016/j.compedu.2011.12.020>
- Robertson, J., & Howells, C. (2008). Computer game design: Opportunities for successful learning. *Computers and Education*, 50(2). <https://doi.org/10.1016/j.compedu.2007.09.020>
- Romero, M. (2016). *Jeux numériques et apprentissages*. Editions JFD.
- Rønholt, H., & Peitersen, B. (2014). *Idrætsundervisning: En grundbog i idrætsdidaktik* (2nd ed., Vol. 5). Museum Tusulanums Forlag.
- Salen, Katie., & Zimmerman, Eric. (2011). *Rules of play game design fundamentals*. TPB.
- Schiller, F. von m. fl., & Henriksen, O. L. (2014). *Tekster om leg* (1. udgave). Akademisk.
- Schoeppe, S., Alley, S., van Lippevelde, W., Bray, N. A., Williams, S. L., Duncan, M. J., & Vandelanotte, C. (2016). Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1). <https://doi.org/10.1186/s12966-016-0454-y>
- Skovbjerg, H. M. (2010). *Skovbjerg, Karoff, H. (2010). Leg som stemningspraksis*.

- Skovbjerg, H. M. (2020). Play design insight 1: Designing for play moods in a ludotorium. In S. Gudiksen & H. M. Skovbjerg (Eds.), *Framing play design: A hand-on guide for designers, learners & innovators*. BIS Publishers.
- Stanford d.school. (2013). An introduction to design thinking process guide. *Institute of Design at Stanford*.
- Tanggaard, L., & Dilling, J. (2019). *Samskabelse -med børn i fokus*.
- Whitton, N., & Moseley, A. (2019). *Playful learning: Events and activities to engage adults* (N. Whitton & A. Moseley, Eds.). Routledge.
- Wimmer, J. (2009). Simon Egenfeldt-Nielsen / Jonas Heide Smith / Susana Pajares Tosca (2008): Understanding video games. The essential introduction. New York / London: Routledge. *M&K*.
<https://doi.org/10.5771/1615-634x-2009--377>
- Zosh, J. M., Hopkins, E. J., Jensen, H., Liu, C., Neale, D., Hirsh-Pasek, K., Solis, S. L., & Whitebread, D. (2017). *Learning through play: A review of the evidence*.

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