What Prevents Teachers from Using Games and Gamification Tools in Nordic Schools?

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Abstract. This study is based on a survey study distributed in the fall of 2017 in Norway, Denmark, and Iceland. The study was designed by a group of researchers from the Nordplus Horizontal project: Digital Computer Games for Learning in the Nordic Countries, to uncover teachers' perceived obstacle in regard to using digital game-based learning in teaching situations. The results indicate that the teachers included in this study did not have enough information and knowledge about games and gamification tools to be used in teaching. The findings show that technical obstacles are the most experienced hurdle among the respondents in all three countries when it comes to applying games or gamification tools in teaching activities. There are not many differences to be observed gender wise. A common difference that is worth noticing, is the difference between women and men regarding their reporting on the obstacle 'knowledge/skills', where more women claim this to be an obstacle. From these results, the paper proposes three types of digital game-based learning guidelines, namely (1) *rhetoric framing of usability and learnability*, (2) *engagement* and (3) *creating a guidance area – building a DGBL infrastructure*. In conclusion, the paper calls for further empirical studies on the actual situation presented in this paper, to reach an informed discussion about questions that are of real concern for many parties, including teachers, school leaders, children and researchers.

Keywords: Nordic countries · Computer games · Digital game-based learning Educational games · Obstacles of using games in schools

1   Introduction

This paper addresses the current limitation of research studies on digital game-based teaching and learning, in particular focusing on obstacles that still prevent teachers in the Nordic countries from using computer games in school settings. From a perspective of educational history, digital game-based learning (DGBL) has only been around for a short while, and research into the field is therefore relatively new. In spite of this, much of early debates in this field seem to be put to rest, such as questions regarding whether significant learning can take place during game use in educational practices [1, 2].

Representatives from educations in the Nordic countries seem to be more positive wards DGBL compared to their European counterparts and seemingly above the global average. While, in 2015, others assumed that DGBL would not be a topic for mainstream use in schools until approximately two or three more years, the Nordic panel reported seeing games and gamification as a "near-term horizon topic" [3]. Similarly, in the 2017 NMC report for the Nordic countries it is acknowledged that these countries have a stronghold in the gaming industry and that time of adoption of games is a year or less. Gamification of learning environments is said to be gaining support among educators that recognise that effectively designed games can encourage engagement, productivity, creativity and authentic learning [4].

1.1   Use of Digital Games in Schools in the Nordic Countries

Norway. In 2010, the Norwegian Ministry of Education and Research founded the Center for ICT in Education. The Center aims to contribute to increased quality in teaching with use of ICT for children in preschools, pupils in compulsory education and students of teachers- and preschool teacher studies [5]. To fulfil this aim, the Center initiated different ICT directed projects. An example of such a project is Digital Games in Schools (Dataspill i Skolen) targeting a mapping of good examples of educational digital games, as well as stimulating and contributing to good practice through creating networks of schools and other stakeholders [6]. In this sense, the project provides articles, lesson plans, and general practical information about digital game-based learning (DGBL). Another governmental institution, The Norwegian Media Authority, has established an entire website dedicated to digital games in school (see [7]).

A survey from Norway [8] related to the digital condition in Norwegian schools, reports that 99% of the teachers are agree that Information and Communication Technology (ICT) can have effect on possibilities for varying teaching and learning activities. 95% of the teachers who participated in the study use ICT for motivating pupils and 89% of the teachers experience that ICT makes the teaching more explorative and experimental. Further, 33% of the teachers expire that use of ICT disturb pupils learning activities, and 98% point out that there has to be explicit rules for acceptable use of ICT in classrooms. The survey also showed that ICT equipment in Norwegian schools contains an acceptable capacity (91% of the participating teachers), acceptable internet capacity (81%) and availability (72%). For digital competence among teachers, 43% reported enough skill for integrating digital learning resources for

teaching their specific subject. Lack of competence was acknowledged as a challenge for using software and games in teaching and learning activities.

Denmark. While not specifically acknowledging digital game-based learning or digital/educational games as examples of learning material, the Danish Agency for Digitization underlines that digital tools and learning materials should support good didactic practices and high-quality teaching. In particular, they underline that digital tools and learning materials can raise the didactic and academic level, motivate children, young people and college and university students, as well as ensure they take a more active role in their own learning [9]. Similarly, the Danish Ministry of Education generally put efforts to introduce strategies and directions towards strengthening pupils' technological understanding, digital learning, and computational thinking, rather than specifying digital game-based learning as a tool for teaching and learning. An example of these actions is a report from 2014, where the Danish Steering Group for IT in Elementary Schools, carried out an evaluation of digital teaching materials in schools, where the effects of using digital teaching materials were measured [10]. As a result of the analysis, the report offers some recommendations including characteristics of digital tools that can facilitate learning, contextual conditions that can influence pupils' digital learning, and other special needs identified through teachers' experiences of using digital tools in educational activities. Regarding characteristics of digital tools that can facilitate learning, direct feedback, game-like elements such as different levels, prices, and game universes. Contextual issues identified as potentially influencing an increased use of digital teaching materials were, among others, the IT infrastructure, the school culture, and upgrading of teachers' digital competencies. Special needs identified were digital tools to support crafts and design, and digital tools to facilitate implementation of cross-disciplinary learning activities. In regards to the latter issue, the Danish Agency for Digitization state that there during 2018–2020 will be efforts to support an implementation of a shared user portal for pupils, teachers, and parents to offer them a digital access point for learning materials, communications and other information regarding teaching in primary and lower-secondary school [9]. Furthermore, the agency states that there will be special efforts to enhance digital teaching skills for school teachers and pedagogues.

Iceland. Although there is no mention of computer games as learning materials in the Icelandic national curriculum guide for compulsory schools the curriculum does indeed emphasise the importance of play in learning and games in the context of several subjects [11]. Playing is considered to be fundamental to education at the lower grades but also a dominant factor at levels for older pupils (p. 293). Playing is furthermore considered as a means to encourage students interest. This can possibly support teachers' intension to use digital games for learning. There are few course options for teachers to learn about educational games or use of computer games in education, one DGBL-course is given every other year and mostly teaching of game-based learning is integrated into ICT courses in teacher training at the university level or made available by interested teachers through their websites. Teachers in Iceland are trusted to choose the educational material they use in teaching, providing that it is used to achieve the objectives of learning and teaching (p. 47), and computer programs, internet material and media content are remarked on in this context. Access and use of computers in the

compulsory schools has been limited, especially to students, often to just one computer in a classroom for the teacher [12]. Changes occurred with implementation of tablets, that provide access to a plethora of tools and games through online web stores and other internet resources. These conditions have affected game-based learning in Iceland and primarily inspired the use of internet game-based learning, through websites or apps. There is, however, evidence that teachers that are using games at schools report on their websites and in social media [13].

Aim and Research Questions. When implementing and engaging in DGBL, previous research has shown that teachers face several obstacles. These can vary between the Nordic countries, according to legal framework, national curriculum, educational contexts and variations in teacher education and training.

The aim of the present study is to contribute to the academic discussion of the use of digital game-based learning in school and to relate this to the identification of obstacles hindering the use of digital game-based learning. In teaching activities. The research questions posed in this study are:

- What kind of obstacles do teachers experience in regard to using digital game-based learning in teaching activities?
- How do the obstacles relate to gender?

On the basis of the findings, we will propose guidelines for developing a digital resource that can facilitate teachers in their efforts to implement digital game-based learning.

2   Research on Digital Game-Based Learning

Game studies, the study of computer games as an aesthetic, cultural and communicative form is a relatively new phenomenon, but expanding in the new millennium (Game Studies, 2018). Research into use of computer games in education is also a growing field within game studies [14, 15], that have a practical value for education and teachers, and can support their efforts in choosing, implementing and evaluating games and their potential benefits for learning. This is a necessary effort, as many computer games are not produced specifically for educational use and these, as well as educational games have to be tested and found fit for obtaining specific educational objectives. This can be an arduous task for teachers and a time consuming one, when adopting new games for learning as well as their teaching methods.

Egenfeldt-Nielsen [16] identified areas of difficulty for teachers using computer games in education settings in study of a two month history course, as being time schedule, physical setting, class expectations, teacher background, genre knowledge, technical problems, experience with group work, teacher preparation, perception of games, class size and priority issues. He concluded that these factors added up to a tremendous workload on teachers that want to engage with educational computer games and demand that the teacher possesses a variety of skills.

Rice [17] carried out a qualitative review of scholarly papers exploring the use of computer games in the classroom, with focus on barriers to implementation. He

identified six major barriers, negative perceptions of video games as educational components; the difficulty of providing a state-of-the-art graphics in educational video games; a lack of adequate computing hardware in the classrooms for running advanced video games; a school day divided by short class periods which hindered long term engagement in complex games; a lack of real world affordances; and a lack of alignment with state standards. The analysis included implications for each barrier and suggestions for future research.

Among identified hindrances are teacher's own concerns about possible negative effects of gaming [18], prejudice and various scepticism towards digital games, on behalf of other stakeholders, such as fellow teachers, leaders and parents [19, 20], and even the pupils may have some reservations or tensions regarding the use of ICT and/or games in school [1, 21, 22].

Technical issues have also been identified as obstacles in the way of implementing DGBL in schools, such as resources, access to adequate technical equipment, obtaining administering rights and technological support. A variety of other practical issues such as budget issues, inflexible curricula, students not being prepared, keeping up with rapid developments in the gaming world, finding games that fit for educational purposes, shortage of supporting materials, fixed class schedules, inclusivity, and various challenges related to differences between curriculums and game contents [18, 23–25]. Whereas Takeuchi and Vaala [25] reported insufficient time as the most commonly identified obstacle, Baek [18] reported inflexibility of the curriculum to be the strongest hindrance factor.

3   Theoretical Framework

Nousiainen et al. [26] defines game-based pedagogy as a pedagogy that is grounded on different implementations of four game-based approaches: using educational games, using entertainment games, learning by making games and using game elements in non-game contexts, named gamification. Educational games have clearly defined didactic goals and objectives and broader skills like collaboration, problem solving and communication [27]. Further, entertainment games are not intended for educational purposes, but have relevant subject-related content and broader skills like collaboration. For the approach of making games, the learner construct new relationships with knowledge for making content by using technology. Gamification turns a non-game activity into a game to make it more attractive and motivating, and to engage learners. Common gamification tools in schools in the Nordic countries are quiz tools like Kahoot and Quizlet.

Dondi and Moretti [28] categorise three types of teachers in terms of integrating games in education: (1) those who use games as an integral part of their teaching and have a good understanding of their potential, (2) those who have discovered one game or one type of games that they find useful but are reluctant to venture beyond this comfort zone, and (3) those who are not at all interested in trying games and do not see games as a serious approach to learning.

Nousiainen et al. [26] defines four main area of competence in game-based pedagogy:

1. Pedagogical competence related to curriculum-based planning, tutoring and assessment according in connection to use of games and gamification.
2. Technical competence for analysing games and technical tools and for overcoming technology-related obstacles.
3. Collaborative competence for sharing and co-development within the schools and networking and collaboration beyond the school.
4. Creative competence for playful stance, ability to explore and improvise and creative orientation to self-development.

4   Method

The present study is based on a survey study distributed in the fall of 2017 in three Nordic countries, namely Norway, Denmark, and Iceland. The study was designed by a group of researchers from the Nordplus Horizontal project: Digital Computer Games for Learning in the Nordic Countries, to uncover teachers' perceived obstacle in regard to using digital game-based learning in teaching situations. The survey was administered by partners in each of the three countries. Relevant groups or associations related to digital game-based learning (DGBL) was contacted in respective country and invited to the online survey consisting of 26 questions including multiple-choice, ratings, and free-form space for elaborating on answers. The participation varied considerably between the involved countries.

In *Norway*, the survey was spread through e-mailing principals and teachers in all schools in the areas of Nord-Trøndelag and Sør-Trøndelag (161 schools). Furtermore, e-mails was sent to principals in all upper secondary schools in the area of Nordland (20 schools). In addition, the survey was spread through various Facebook pages in groups were many Norwegian teachers are members (approximately including 50.000 teachers). Finally, 220 Norwegian teachers responded to the survey, where 165 completed the survey.

In *Denmark*, the survey was initially distributed via relevant Facebook groups to localise as many potential respondents as possible. In total the administrators of 24 Facebook groups were addressed. A broad group of participants was targeted, from early primary school level up to secondary school level. 13 of the 24 administrators responded and approved the questionnaire, which thereby was sent out through the Facebook group site. In addition, 22 primary and lower secondary schools were contacted. As a result, 93 teachers responded to the survey, where 65 of them fulfilled the questionnaire and 28 did not, but chose to interrupt their participation.

In *Iceland*, the survey was emailed to all pre-school teachers (N = 2270) and primary and lower secondary teachers (N = 4717) by their professional unions. It was furthermore emailed to 70% of upper secondary school teachers (N = 1550) by their school principals. In total 8063 Icelandic teachers received the survey, of those 270 responded (3,34%). In Iceland, 181 respondents (67%) completed the survey, but 89 (33%) did not complete.

All in all in the three countries, 583 participants responded to the survey, of which 411 completed all questions in the survey and 172 did not fully complete it. Clearly, the survey was implemented with different approaches in the different countries. This may be regarded as a weakness in the methodical process, but at the same time it can be regarded as a strength as the results are based on a more varied approach toward the population.

Disadvantages of online survey studies are related to the risk of non-responses and the challenge of accessing the relevant participants. Thus, there is a risk that the participants represent a limited sampling and respondent availability. However, an advantage is that the collection of data is convenient for the respondents and takes less time for the investigator compared to a traditional survey. Furthermore, it offers an automation in data input and handling.

5   Results

The results section is divided in two sub-sections, where the first describes the respondents reasons for not using digital games or gamification tools in their teaching activities. The second sub-section presents obstacles that respondents experienced when they used digital games or gamification tools in classrooms. This section also describes gender differences related to experienced obstacles.

5.1   Why Not Using Games or Gamification Tools in Classroom Settings?

Table 1 shows an overview of reported reasons teachers give on why they are not applying games or gamification tools in the three involved countries. The respondents have different reasons for not using games or gamification tools in their classrooms, and some of the respondents report several reasons. In all the three countries about 1/3 of the respondents claims that the schools have not resources for this. Reasons connected to available games are higher in Norway (22%) and Iceland (17%) than in Denmark (7%). Also reasons connected to that games do not fit the subject area(s) or age group are higher in Norway (28%) and Iceland (22%) than in Denmark (4%).

Table 1. Reasons for not applying games or gamification tools in classrooms.

Why are you not using games or gamification tools in your teaching?	Denmark	Iceland	Norway
# of respondents	*27*	*76*	*64*
My school does not have resources for this	33.3%	31.6%	34.4%
There are no good games available in the market	7.4%	17.1%	21.9%
I do not believe that games can advance learning	0.0%	3.9%	9.4%
Games do not fit with my teaching style	3.7%	13.2%	12.5%
Games do not fit with the subject area(s) or age group i teach	3.7%	22.4%	28.1%
Other	59.3%	32.9%	21.9%

In response to this question, 59.3% (n = 17) of the Danish, 32.9% (n = 26) of the Icelandic teachers and 21.9% (n = 18) of the Norwegian teachers cite other reasons for not using games in their classrooms, giving more detailed responses through the open-ended response possibility.

Statements on themes like "Lack of competence" and "Do not know any relevant game" are the main reasons for not applying games or gamification tools in the classroom. 14 of 18 Norwegian teachers, 13 of 26 Icelandic teachers and 10 of 17 Danish teachers post this type of statement.

In summary, the results indicate that the teachers included in this study do not have enough information and knowledge about games and gamification tools to be used in teaching.

5.2   Experienced Obstacles When Using Games or Gamification Tools

Many teachers report on different obstacles when they use games and gamification tools in the classroom. In Iceland, 158 respondents claim to having applied DGBL (out of 239 responses). Further, 111 respondents answers the question if they have experienced obstacles, where 61 (54.9%) claim to have experienced obstacles. In Norway, 128 respondents claim to having applied DGBL (out of 194 responses). Further, 108 respondents answer the question if they have experienced obstacles, where 60 (55.5%) claim to have experienced obstacles. In Denmark, 58 respondents claim to having applied DGBL (out of 87 responses). Further, 43 respondents answers the question if they have experienced obstacles, where 30 (69.7%) claim to have experienced obstacles.

We can read from the table that Technical obstacles is by far the most experienced obstacle when applying games or gamification tools (73.3%–86.7%), whilst obstacles regarding broadband issues are more often reported in Denmark (37%) and Iceland (31%) than in Norway (22%). We also see that time/management obstacles (49–55%) are fairly equal in all countries.

The table below (Table 2) shows what teachers report on obstacles experienced when applying games or gamification tools.

Table 2. Typical obstacles experienced when applying games or gamification tools.

Obstacles	Denmark	Iceland	Norway
# of respondents	*30*	*61*	*60*
Technical obstacles	73.3%	82.0%	86.7%
Social/organizational obstacles	6.7%	14.8%	25.0%
Knowledge/skills obstacles	50.0%	39.3%	26.7%
Time/management obstacles	50.0%	49.2%	55.0%
Lack of digital games	46.7%	32.8%	45.0%
Broadband issues	36.7%	31.1%	21.7%
Other obstacles	10.0%	8.2%	8.3%

The findings show that technical obstacles are the most experienced hurdle among the respondents in all three countries when it comes to applying games or gamification tools in teaching activities.

From the category "Other obstacles", the following statements exemplify what was mentioned: "PEGI rating being too high", "Many pupils are not interested in gaming", "System updates are challenging", "Parents", "Internet connection problems", "Some children get too attached to the game", "Not enough iPads", "Children are too young".

We further looked for possible gender differences in regards to the reporting of obstacles. The table below (Table 3) shows what teachers report on obstacles experienced when applying games or gamification tools.

Table 3. Obstacles and gender

Obstacles	Denmark		Iceland		Norway	
# of respondents	Females 24	Males 6	Females 46	Males 15	Females 32	Males 27
Technical obstacles	71%	83%	83%	80%	81%	78%
Social/organizational obstacles	8%	0%	11%	27%	25%	22%
Knowledge/skills obstacles	63%	17%	43%	27%	41%	11%
Time/management obstacles	54%	33%	43%	67%	50%	48%
Lack of digital games	46%	50%	33%	33%	44%	33%
Broadband issues	38%	33%	30%	33%	28%	15%
Other obstacles	8%	17%	4%	20%	0%	15%

There are not many differences to be observed gender wise. The difference that is worth noticing, which seems to be common for all countries, is the difference between women and men regarding their reporting on the obstacle 'knowledge/skills', where more women claim this to be an obstacle. As we can read from the table, 41% of the Norwegian female respondents say that Knowledge/skills is an obstacle, vs. 11% of the male respondents. From the Icelandic responses, 43% of the female respondents say that Knowledge/skills is an obstacle, vs. 27% of the male respondents. The pattern is even stronger amongst the Danish responses, showing that 63% of the women report Knowledge/skills as an obstacle, vs. 17% of the men.

6   Discussion and Conclusions

The present study makes a contribution to the discussion about the use of games and gamification tools in Nordic schools (Denmark, Iceland and Norway). Through a survey, we investigated what kind of obstacles teachers experience in relation to using digital game-based learning in teaching activities. Moreover, we examined how such obstacles related to gender. The study shows that the main reason for not using games

or gamification tools in Danish, Icelandic and Norwegian classrooms has to do with that teachers consider themselves not having enough resources or knowledge to apply a game-based learning approach. When it comes to the teachers' experience of obstacles when using games or gamification tools, the results indicate that technical obstacles was the most experienced reason across the three countries. Furthermore, the findings show that the females included in this study experience lack of knowledge about the topic as a major obstacle to a higher extent compared to the males. In general, the results were similar in the three countries.

When the teachers experience barriers they, above all, experience a lack of pedagogical and technical capacity to consider whether, how, and when digital games and gamification tools can be applied in an teaching activities. When it comes to technical barriers, infrastructural hurdles were emphasised rather than the teachers' own technical skills. The latter was primarily related to pedagogical obstacles, i.e. the lack of pedagogical competences to use technical tools. Furthermore, the teachers put forward various scepticism towards digital games referring to parents and children's potential reservations for using games in a school setting. It is interesting to notice that collaborative and creative competences were not put forward as barriers. From this results, how would it be possible to promote the use of digital games and gamification tools in teaching activities? This section summarises three types of digital game-based learning guidelines emerging from the empirical study, namely (1) *rhetoric framing of usability and learnability*, (2) *engagement* and (3) *creating a guidance area – building a DGBL infrastructure*.

6.1 Rhetorical Framing of Usability and Learnability

Many of the teachers are not using digital games or gamification tools in teaching activities due to experiencing technical infrastructure hurdles. Thus, the leadership of the school district should improve usability and learnability issues of the technological infrastructure and make it easier for the teachers to apply digital games and gamification tools as an alternative to traditional learning material. A rhetorical approach [29] places a broader focus on the pedagogic role of the teacher, which shifts the focus away from technical reasons that can be solved elsewhere in the organization. Thereby, a focus on rhetorical (i.e. pedagogical) strategies offers an account of the overall organization of the implementation of digital game-based learning in teaching activities and emphasizes a pedagogical entrance for teachers to learn about digital games in education.

6.2 Engagement

Engagement, involvement, interest, and motivation are all concepts used to describe aspects of a user's experience, mostly in the context of digital games. In line with Price and Falcão [30], we stress that it is necessary to move beyond engagement as something that is fun or enjoyable as it does not reveal the activities or thoughts that teachers have when trying to understand the pedagogical value of using digital games or gamification tools in teaching activities. We suggest that there is a need for a deep pedagogical analysis to disclose the educational value of digital game-based learning.

This includes giving teachers the opportunity to develop such competences and, thereby, capacity to make informed decisions about how, when, and why to apply game-based learning as a tool for their teaching activities. Through the questionnaire, it is obvious that no intrinsic educational effectiveness of digital game-based learning can be assumed.

6.3 Creating a Guidance Area – Building a DGBL Infrastructure

Yelland [31] states that learning requires more than teachers providing children with materials (such as digital games). Teachers need guidance in choosing how to use such materials. Directions from peer teachers can help newcomers to become familiar with digital game-based learning materials. In this regard, an online community resource as a guidance surface for the teachers would be helpful. However, building such a DGBL infrastructure, needs to be carefully designed as many members of online communities are passive users, regularly logging in but seldom posting. The organization of a specific DGBL focused guidance area to promote high level teacher-teacher online knowledge sharing and dialogues in relation to building competence is, also, a matter of building a DGBL attitude. A study by Amichai-Hamburger [32] shows that creating conditions for such an attitude is something that is important for maximizing the DGBL opportunities available to teachers within online communities.

6.4 Concluding Remarks

Further studies are needed to explore the mechanism of digital game-based learning (DGBL) barriers from pedagogical perspectives. Furthermore, the influence of experienced obstacles for using new kinds of educational media in teaching activities should be discussed. Moreover, the effectiveness of engaging and guiding strategies should be further evaluated, and suggestions are needed for methods to select suitable strategies to engage teachers in contributing in online knowledge sharing communities. Based on this, we call for further empirical studies on the actual situation presented in this paper, to reach an informed discussion about questions that are of real concern for many parties, including teachers, school leaders, children and researchers.

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