

Serious Game Design to Support Children Struggling with School Refusal

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Abstract

A significant number of children worldwide struggle with school refusal. Games and digital tools represent a novel take on how to address this phenomenon. Our research aims to support children who are at risk or in an early phase of developing school refusal through serious games. In this paper we present current work, grounded in human-centered design, involving the application of a game design framework to elaborate on design elements and empirical evaluations of a serious game called Gnist (English: Spark). Based on this we discuss some implications for game design and key takeaways for researchers and practitioners working to design technologies for supporting children's well-being in attending school. We contribute to position serious games in a new context and anticipate our findings to be valuable to the Human-Computer Interaction community in general and specifically to the Child-Computer Interaction community.

Keywords: *Children, Serious games, School refusal, Prototype, Evaluation, Human-centered design*

1 Introduction

For a significant number of children, weekends and holidays are dominated by dreading going back to school. These children, who experience school attendance to be so emotionally distressing that it is highly problematic and often leads to prolonged absence from school, suffer from school refusal [1]. King and Bernstein [1, p. 197] define school refusal as: “difficulty attending school associated with emotional distress, especially anxiety and depression”. This definition limits the phenomenon to children with anxiety-based school refusal, excluding other underlying causes of school absence. School refusal is a disorder but can be associated with various diagnoses within the anxiety spectrum and behavioral disorders [2]. The definition above is individually centered containing an emotional and behavioral component, however, alone it may fail to give a precise description of the child’s actual difficulty [2]. Rather, it is important to view school refusal as a contextual phenomenon acknowledging children as members of a family, a school, and a community and hence various connected factors become relevant.

Like other phenomena, school refusal is multifaceted with different causes, effects, and treatments. A common factor, however, lies in children’s experiences of having a considerably hard time going to or attending school while the parents are well aware of the problem. Ingul, Havik and Heyne [3] define school refusal with these criteria: *a)* children’s reluctance or refusal to attend school which commonly leads to lasting absence; *b)* the child is often at home instead of being at school and the parents are fully aware of this; *c)* the child experiences emotional distress related to school attendance; *d)* there is an absence of distinct antisocial behavior and *e)* parents have tried to ensure the child’s school attendance.

Criteria *b–d* distinguish school refusal from truancy which relates to anti-school sentiments and antisocial characteristics like finding school boring and seeking more gratifying activities outside school [4]. Additionally, criterion *e* distinguishes school refusal from school withdrawal [3].

School refusal is painful and despairing with potentially serious consequences like hampered psychological, social and academic development on the child's side [5] and on the family's side difficulties of both legal and financial character, lost working hours and internal conflicts as well as parent-school conflicts [6]. Typical long-term consequences also affect society including school dropout, delinquency, limited job opportunities, substance use, economic deprivation, and psychiatric disorders [6][7].

For the last two years we, a team of designers, researchers and an entrepreneur, together with various groups of children and adults being experts by experience or profession, have designed a serious *game* called *Gnist* aimed to engage children aged 10-13 years who are at risk or in an early phase of developing school refusal. We have chosen this target group because early identification of these children is important for the outcome of the prevention or management [8]. *Gnist* seeks to (1) increase school attendance, (2) reduce anxiety, and (3) support psychological healthcare services in their assessment. We want to help children organize and solve their daily tasks in a more motivating and fun way and as such provide support to reduce anxiety. The idea is to support children, relatives and frontline professionals in education, health, and social care to collaborate via a mobile game to identify and treat mental health problems relating to children's school refusal. Currently, we have a clickable prototype that has been evaluated in two rounds.

In this article, we elaborate on school refusal as a phenomenon and its typical treatment forms. Next, we propose serious games as a suitable supplementary tool to existing treatment and describe how *Gnist* can benefit children and their families. Finally, we present findings from two evaluation sessions providing detailed feedback on the *Gnist* prototype and discuss possible implications. Our main contribution is empirical review provided by children on their opinions about the proposed game elements and their connection to school refusal, recommendations for future development as well as promoting school refusal on the design agenda.

2 School refusal

By presenting recent research specifically addressing school refusal as a distinct phenomenon as opposed to nonattendance in general or truancy in particular, this section serves as a background for *Gnist* as well as inspiring serious game designers with diverse opportunities. The initial game context is Norway, where school can be understood as an arena for many important social issues, not merely education. Mental health is part of the new curriculum of all Norwegian high schools from 2020.

2.1 The phenomenon

School refusal refers to anxiety-based absenteeism connected to separation, generalized or social anxiety [7]. Absenteeism due to illness or injury is not considered here. However, there is a grey area when it comes to somatic complaints such as headache and stomachache because many children with school refusal may suffer from physical symptoms partially caused by stress, which in turn may lead to parental acceptance to stay at home [7]. In addition to individual factors, family factors and school factors have recently received more attention.

School refusal prevalence is difficult to quantify because the phenomenon is complex and can manifest through partial absence and attendance with anxiety [7]. In addition to assessment challenges, diverse discipline terminology may lead to overlapping concepts contributing to a large span in prevalence estimates. For example, the concept 'school refusal behavior', which combines school refusal and truancy, has a prevalence estimate of

5–28% [9]. When referring to school refusal as “child-motivated school non-attendance related to emotional distress experienced in connection with academic or social situations in school” the prevalence rate estimate is 1–2% [5]. Other estimates for school refusal are 0.4–5.4% [3].

2.2 Characteristics related to children

Ingul et al. [3] list a range of characteristics related to children who risk developing school refusal. *Absence or partial absence* can be a sign of emerging school refusal. Emotional distress such as *anxiety* (here comprising fear, anxiety, and worry) and *depression* are also typical signs. Egger, Costello and Angold [10] found that children with anxiety-based school refusal experienced significantly higher rates of symptoms associated with fears, worries and sleep difficulties compared to cases of pure truancy. Anxiety-based school refusers, for example, reported fears specific to school (36%), fears of what will happen at home while being at school (17%), social anxiety (9%), trouble falling or staying asleep (32%), reluctance to sleep alone (8%) and rise to check on the family during the night (26%). Moreover, *somatic complaints* are significantly associated with school refusal. Egger et al. [10] show that 27% of children with anxiety-based school refusal reported headaches and stomachaches, as opposed to 1% of non-school refusers.

Age and transitions also seem to play an important role. School refusal is common between 5 to 7 years, at 11 years, and at 14 years or above – ages typically corresponding to early schooling, transition to secondary school, and approaching the end of compulsory education [3]. In the study of Egger et al. [10] the mean age of onset for pure anxious school refusal was 10.9 years suggesting that school refusal emerged more often in childhood. However, Ingul et al. [3] emphasize how referral for established school refusal is more common among adolescents and suggest that school refusal might be more severe, complex and difficult to detect in adolescence. Transitions like age, moving, changing of schools, class or teacher, returning to school after a holiday or an illness period, departure or loss of a significant person or parental divorce represent periods of enhanced vulnerability [3].

Problematic emotion regulation is also identified as a relevant characteristic because emotional distress is included in the criteria for school refusal [3]. A study found children with school refusal to use more expressive suppression like hiding or suppressing emotional responses and less cognitive reappraisal such as changing thinking related to a specific situation to change its emotional impact [11]. Finally, *negative thinking, low self-efficacy, and limited problem solving* appear to occur more in youth with school refusal [3].

2.3 Characteristics connected to the school

Problematic student-teacher relationships combined with *unpredictability at school* pose specific school refusal risk [3]. Parents of children with school refusal experience suggest that their children have a crucial need for predictability and support yet occasionally lack these two factors in the school context [5]. Several studies show how children’s fears connect to less structured aspects of school such as break times, poorly monitored areas like toilets, and less structured activities [3][12]. School transition moments, such as entering the school building, moving between rooms, changing from individual to group work, and exposure to unfamiliar people are also identified as problematic [3]. Parents identified noisy, disorganized, unpredictable, or unsafe classrooms as demanding school factors relating to school refusal [5].

Bullying, social isolation, and loneliness are associated with school refusal [3][4]. Egger et al. [10] found that children with pure anxious school refusal, compared to non-school refusers, showed the most difficulty in peer relationships by being significantly shyer, having experience with being bullied or teased, and having difficulty with peer relationships due to withdrawal or conflictual relationships. Place et al. [13] found that youth with school refusal had few or no friends and were in social isolation, both at school and within their neighborhood.

Special education needs and poor grades are well-known risk factors for truancy, but their connection to school refusal is less clear [3]. However, studies indicate that weakened academic performance and frustration connected to language and learning difficulties can contribute to school refusal. Moreover, performance anxiety is associated with school refusal. According to Ingul et al. [3] the combined factors of predictability, absence, and *educational difficulties* represent a risk.

The positive relationship between parental involvement in their children's education and their academic achievement is acknowledged. In the case of school refusal, the parents are by definition well aware of the child's struggles to attend school and at the same time try to ensure their attendance. For many parents, this is a difficult situation that calls for dedicated *cooperation between school and home* [3].

2.4 Characteristics of family situation

Studies have shown that there are more youth with emerging, mild, and established school refusal who have a parent treated for mental health problems or anxiety disorders compared to truanting youth or those without attendance problems [3]. *Parental psychopathology* is argued to influence the development of school refusal for example by being less able to respond to signs of a distressed child [14].

Parental overprotection is a more disputed factor. Some studies report on over-involvement in the mother-child relationship of youth experiencing school refusal, whereas other studies found no connection [3].

Another factor is *unhealthy family functioning*, such as dysfunctional family communication, lack of roles, and difficulties dealing with changing demands [3]. Carless et al. [15] found problematic family functioning to be more common among families of youth with school refusal. Moreover, family conflicts, problematic communication, marital crisis, separation, and divorce are connected with school refusal [3].

2.5 Assessing and treating school refusal

Before treatment, the child's school refusal situation needs careful assessment. The most common assessment forms are *behavioral rating and observation* at home and in school by parents and teachers, and *clinical interview*, where the clinician gets information from the child and family about their thoughts, feelings, and effects of school refusal upon their daily lives. Other common assessment forms are *self-monitoring* of feelings and behavior in a diary, and *self-report scales* on anxiety levels [16].

Given the heterogeneous nature of school refusal, it is treated in various ways. The most commonly used methods are different forms of *psychosocial treatment*. The main aims of treating school refusal are to *a)* reduce the anxiety of the children or adolescents, and/or *b)* increase school attendance. Examples of common treatments are presented below [16][17].

Exposure-based interventions seek to reduce anxiety associated with school attendance by making it easier to attend school by situation exposure. There are also a number of *behavioral interventions*, such as *relaxation training* to help the child's stress managing, *social skills training* to help the child relate to their classmates, *contingency management*, where the child is trained to increase desirable behavior and reduce undesirable behavior, and *self-instruction techniques*, where the child is trained in self-statements guiding positive behavior. In *Cognitive-behavioral therapy* (CBT) the therapist helps the child to change thoughts, attitudes, and beliefs that cause anxiety. *Pharmaceuticals*, in particular various kinds of antidepressants, are in some cases used in combination with other treatments to reduce anxiety, depression, and panic attacks. However, given the lack of evidence of their efficiency, as well as the possibility of side effects and dependence, pharmaceuticals are rarely recommended.

Therapeutic sessions are often a limited resource that is only available a few times per month. Therefore, *caregiver and school involvement and training* are considered an important part of the treatment. If the situation is so severe that it seems impossible to get

the child to attend school, the school is advised to provide the necessary material for the child to work from home [18]. For several reasons, however, the child should not practice homeschooling for an extended period [19][8]. Consequences of longer absenteeism may be that the child finds other, more enriching roles to fill in everyday life than being a student [20], or that children reckon they receive all necessary academic undertakings through homeschooling [8].

A known problem when it comes to children with school refusal is that they do not attend school for long periods. This can make it difficult for teachers to achieve contact with the child required to build a good relationship [21]. The faster the school can ensure the child's presence at the school premises, the better it will be for further work. During longer periods of absence, messages from teachers, expressing that they miss the child at school will be significant [21]. It seems reasonable to assume that similar recognition from their classmates can be of importance.

3 *Serious games and gamification for emotional learning and mental health*

Screen time among adolescents has increased [22]. Children who are away from school often fill this time with games [23]. Utilizing this by making serious games designed to improve mental health can help children who do not dare to engage in treatment or lack access to it, to receive needed and targeted help [24].

3.1 *Serious games and gamification*

Following Zyda [25] and Mitgutsch and Alvarado [26], we understand serious games to be games created to fulfill a serious purpose beyond their independent aims – thus, entertainment is not their principal goal. Moreover, serious games express certain ideas and values to influence the players' thoughts and actions in real-life contexts [26]. On the other hand, gamification is the use of game design elements, such as points, leaderboards, levels, and rewards, in non-game contexts to boost motivation to solve a task [27]. The main difference between serious games and gamification is that the former are full-blown games with a serious purpose, while the latter is game elements and motivational features added to systems, such as productivity software. Both serious games and gamification mechanisms represent attractive tools that can create a strong motivating for players to learn, change behavior, and create awareness on a topic [28].

3.2 *Designing serious games*

Serious games are designed in the same way as computer games, requiring the skills of competent game developers, artists, designers and storytellers. However, there is one difference; developing serious games also require the skills of pedagogues [25] and experts on the target domain of the game [29].

Mitgutsch and Alvarado [26] offer the Serious Game Design Assessment Framework (SGDA) for analyzing formal conceptual design choices of serious games. The SGDA framework consists of six core components: (1) *the purpose* representing a pivotal starting point influencing the other components; (2) *content & information*, (3) *fiction & narrative*, (4) *mechanics*, (5) *aesthetics & graphics* and (6) *framing*. These components make up the game system and the connections between them indicate game cohesiveness and coherence.

3.3 *Serious games for health*

In the context of health, serious games can change behavior and motivate for treatment compliance [30]. Serious games for health can be (1) focused on entertainment where

improved health is a side effect, (2) focused on health, where the game is used a tool to pass on knowledge about health, or (3) focused on health acquisition and medical skills (mostly related to healthcare professionals) [31].

Serious games can be used in different stages of disease; (1) in the *susceptibility stage*, where a serious game can be used for health monitoring (2) in the *pre-symptomatic stage*, where the user can use a serious game for health detection (i.e. discover an unknown illness), (3) in the *clinical disease stage*, where serious games can be used in treatment and therapy, and (4) the *recovery or disability stage*, where serious games can be used in patient rehabilitation or to cope with their disabilities [31].

3.4 Serious games and gamification for mental health

The impact of serious games and gamification on health and wellbeing [32], including mental health [9], is increasingly researched. Although there is a lack of independent trials and direct comparisons of game-based and non-game-based intervention, there are a number of promising results showing that serious games and gamification can have positive effects on mental health, wellbeing, personal growth, stress, and anxiety [24]. The core insights from this research are presented below:

1) *Game mechanisms that are rewarding physical activity, can increase sense of well-being and be used as a form of exposure therapy.* A study on Pokémon Go, a game that ties in-game rewards to physical activity, showed that playing it was associated with increased physical activity, social behavior, and a sense of well-being [33]. The researchers concluded its potential as a behavioral activation and exposure tool for mental health treatment.

2) *People trust chatbots with their personal information.* A report from the Media Agency Mindshare shows that people are inclined to trust chatbots with sensitive information [34]. Another recent evaluation study suggests that a chatbot may meet mental health needs of youth [35]. With that in mind, our hypothesis was that children might be willing to be open about their thoughts and feelings when asked questions in a mobile game.

3) *Different personalities require different game mechanics.* People are driven by different motivations. Some tend to be motivated by goal, self-monitoring and feedback, while other are demotivated by rewards, competition and comparison. Orji et al. [36] suggest moving away from *one size fits all*, and instead tailor the health games towards the personality of the individual user.

4) *Serious games may improve behavior:* In a study, Read & Shortell [37] highlight several different games that have contributed to players' behavioral change. Further, Santamaria et al. [38] found that serious games can improve self-esteem and self-efficacy, and can lead to potential behavioral improvements for patients suffering from various illnesses.

5) *Serious games can support the therapist:* In a literature review on serious games, Lau et al., [39] suggest that such games can support the therapist in treatment, prevention and reducing symptoms of mental health disorders.

4 GNIST: A serious game targeting school refusal

We describe the serious game *Gnist* through an illustrated use scenario showing how it can help children and caregivers and a presentation of its design elements. Our human-centered design process included co-design sessions with children and professionals, conversations with experts from psychology and mental health, engagement of industrial design students developing tools for children's school refusal in their bachelor projects and involvement of a special education student doing her master project with *Gnist* as dedicated case (prototype evaluation 2) [40]. We start this section by briefly describing some central proposals from a co-creative workshop with children.

4.1 Proposals from a co-creative workshop with children

To show how design elements build on insights from co-creative work, we present proposals developed in a 3-hour workshop with six child co-designers aged 12-13 years in December 2018 (fig. 1). The workshop was conducted at their school with parental and teacher consent. Four project members facilitated the activities.



Figure 1. Co-creative workshops with children

One proposal (fig. 2 left) built on the notion of helping children master difficult situations. The app would provide tips for how one could think and reason in social situations (pretending to be alone in the classroom and training to read aloud in front of others) or in test situations (squeezing a stress ball, taking a break, talking to a teacher, positive thinking and meditation). The player would meet a character, for example a teddy or a robot, that would transform based on their age and gender. Central elements were goal setting and receiving a reward like a sticker.

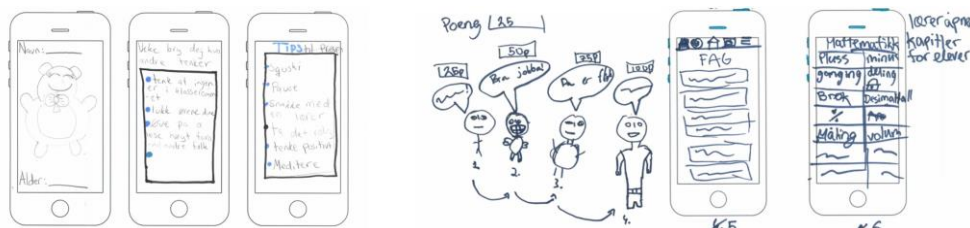


Figure 2. Tips (left) and supportive characters with points (right)

Another proposal (fig 2. right) was to help children with school subjects they find difficult. In the app children could watch videos for support. As the children manage to solve assignments the character would express supportive statements like “good work”. The sketches also show how points are central and connected to character growth.



Figure 3. Character Bernt with supportive statements

A third proposal was the character Bernt who would help children with school subjects in general. Rewards, encouraging comments and character growth were central elements in this proposal too.

4.2 Use scenario of Gnist

Gnist can help children at risk or in an early stage of developing school refusal by being a readily available tool in their own pockets throughout the day. *Gnist* assists children to

divide the day into activities and makes them more fun through gamification. *Gnist* enables children to assess activities and reflect on their day. Through earned points and interaction with a caregiver, *Gnist* can help to make some bright spots in children's days contributing to increased school attendance. Moreover, *Gnist* can make it easier to show, tell and understand how feelings relate to activities and as such contribute to targeted measures and reduced anxiety. Figure 4 depicts a use scenario.



Figure 4. Use scenario

4.3 *Gnist* design

In the following we use the SGDA [26] to describe the design elements of *Gnist*:

Purpose: *Gnist* is a game about solving everyday tasks – difficult and simple, big and small. The overarching purpose behind *Gnist* is threefold, namely to (1) increase school attendance; (2) reduce anxiety; and (3) support professionals in mapping challenges and problems. Our approach is to offer a magical universe wherein everyday activities can be framed in a playful manner. A friendly monster is ready to accompany the child throughout the entire day (Figure 5a) by breaking up the day (before school, go to school, at school, go home), encouraging the rating of perceived difficulty of activities and gamify them (Figure 5b) through collecting magical berries (Figure 5c). *Gnist* also offers messaging between the child and friends or caregivers to enable sharing of encouragements.

Content and information: refer to the game information and data [26]. *Gnist* offers and makes use of identification of daily activities (inside and outside school), in-game data on the players' perceived level of difficulty connected to activities, identification of home-school route, an overview of accomplishments related to set goals (number of days at school and number of collected berries), messages, and an overview of weekly progress shown as list or graph. Content is conveyed in a friendly and non-judgmental tone of voice.



Figure 5. a) Three friendly monsters; b) gamify everyday activities; c) collecting magical berries to feed monsters

Mechanics: represent the methods in which players are invited to interact with the game world [26]. *Gnist* invites the player to awaken the monster, get challenged by the monster to carry out the activities by competing on time or otherwise, collect as many magical berries as possible as activities unfold, feed the monster with berries so it can grow, review the day (“pretty crappy”, “alright”, “sparkly”) and redeem the earned points in the in-game store (Figure 6c) to buy monster accessories. Caregivers and children can also make agreements about other rewards that fit their specific goals and contexts better than the offered in-game rewards.

Fiction and narrative: concern the plot surrounding the universe and its characters [26]. To enter *Gnist*, the player is asked to set up a profile by choosing one of three friendly monsters to be a steady companion: “Snuble” (Stumble), “Kludre” (Clutter) and “Gruble” (Ponder). They have different personalities and tone of voice; however, their roles do not affect the plot. The message behind these is that no one is flawless and to depict imperfection as enchanting. The chosen monster guides the player to identify daily activities before going to school and rating the perceived difficulties in performing them – for example “brushing teeth”, “getting dressed”, “eating breakfast”, “making lunch” (Figure 6a). The player can add additional activities that are relevant like “walking the dog”. The activities correspond to magical berries. The monster also wants to learn about the player’s school subjects like “math” and “gym” and less structured school activities or transition

moments like “speaking aloud in class” and “talking to the teacher”. Next, the monster asks the player to set up the route from home to school on a map.



Figure 6. a) Rating difficulty in morning routines; b) Digested berries; c) the in-game accessory store.

In the game, the player awakens the monster who is cheerful and ready to get a good start to the day. The story is linear, following the structure before school, go to school, at school, go back home. Throughout the day the universe offers several opportunities to feed the monster with berries, keeping it healthy and happy. These opportunities are linked to the daily activities that will be perceived as more or less challenging depending on the player’s capabilities and struggles. Different conversations between the monster and the player will take place when the player feeds the monster, reviews daily achievements shown as digested berries in the monster’s gut (Figure 6b), and gets feedback from the monster. Other potential conversations facilitated by the game are those between player and family/friends/therapist, sending the player encouraging messages.

Aesthetics and graphics: deal with the audiovisual language of the game such as aesthetic characteristics, imagery, and style preferences [26]. *Gnist* offers a 2D universe centering around the brightly colored cartoon monsters, magical berries with simple flat icons and sparklers. The monster makes satisfying sounds, farts or burps, and grows and develops as it gets more berries. The audiovisual language takes a cheerful and humorous tone. The game has a limited amount of text, which is framed in speech bubbles. Further, the text is, to some degree, supported with audio. We have tried to avoid referring to gender stereotypes in terms of characters and aesthetic elements. These choices are intended to ensure relevance for a broad group of children.

Framing: refers to the game elements in relation to the target group’s play literacy [26]. *Gnist* seeks to address children aged 10-13 years who are at risk or in an early phase of developing school refusal. In general, *Gnist* is suitable for an audience with basic skills, comparable to casual games, and as such is expected to be subordinate to children’s digital competence. The challenges will hardly be connected to digital skills or gaming experience. The true challenge will lie in performing certain activities that children acknowledge to struggle with and finding pleasure in overcoming struggles in a playful and gamified frame. The anticipated lifetime of the game for an individual player will span from a few days until a few months. The children can take the time they need to establish new habits and routines in order to solve everyday tasks – difficult and simple, big and small. Breaking up the day into many small parts allows for recognizing and celebrating progress no matter how minor it may seem. The goals are set by the players together with an adult (parents, therapist) and the game will make itself available according to the pace of the player.

Using the classifications from section 3.3 [31], we consider *Gnist* a serious game with the main focus on mental health as a side effect. Even though we target early phase anxiety-based school refusal and hence relate to the susceptibility stage, *Gnist* can be used in: (a) the pre-symptomatic stage for assessments of healthcare professionals and schools, in (b)

the clinical disease stage as a supplement to treatment and therapy, and (c) in the recovery stage to prevent relapse.

5 Research process

As part of our iterative design and research process, this paper draws on two initial evaluations of an early prototype of *Gnist*.

5.1 Prototype evaluation 1

Recruiting children

The topic of school refusal is sensitive and hence the process of recruiting children who struggle with it is ethically comprehensive and time-consuming. Pending this process, we were interested to get feedback from a broader group of children for assessing the game concept. We contacted a number of elementary schools with a request to perform evaluations with children aged 10-13 years. However, we got many rejections because of tight programs at the schools or lack of resources.

Eventually, we were contacted by a secondary school teacher who had become acquainted with *Gnist* through one of the dissemination channels such as website, social media, presentations at various conferences, and reviews in the media. As a teacher he had experience with students' school refusal and considered the use of serious games to be a promising solution. We were invited to conduct the evaluation with a 9th-grade school class (14-15 years). Even if these students were older than the intended target group, we considered their evaluations and input highly valuable. Listening to and involving children and their peers is a core idea in childhood studies [41]. In our case, the teenagers can be seen as peers holding firsthand experiences with the current school system and being students. Enabling peers to act as consultants on the topic at hand is a renowned method in participatory studies [41]. Here, children are repositioned as social actors and experts on their own lives, but at times also on adjacent problems and issues. Teenagers are considered competent social actors within their own lives, making them key informants surrounding the dynamics and complexities to various aspects of childhood culture. Acknowledging teenagers' positions as experts on their own lives and holders of empathic skills makes their contributions to our research both relevant and appreciated.

Recruiting children who have personal experience with school refusal and connected professional treatment was an important next step. That said, many of the participating teenagers confirmed, through their statements and examples, that they were often able to relate their feedback to the school refusal issue. This was evident both in their overall impression of *Gnist* and throughout the various parts.

Research context, participants and data

The evaluation was conducted with 21 students, 8 girls and 13 boys, in a 9th-grade school class at a secondary school in December 2019 in Norway [42]. Four of the authors facilitated the evaluation. Upon arrival we got access to a large room and a small meeting room. We presented ourselves and *Gnist* for the whole class, and clearly expressed that we were not looking for the students' personal experiences, but rather wanted help with assessing the game concept. We emphasized the value of obtaining feedback from their perspective as teenagers. Moreover, we suggested they could imagine having a friend or younger sibling who somehow struggled to attend school and evaluate *Gnist* with this person in mind.

The teacher selected the order of the participating students – four at a time. Each student was coupled with an adult from the team. We had four separate seating groups divided between the two rooms. Fruit and cookies were offered. The students used our phones on

which *Gnist* was installed. They were asked to play through the main parts of the game. We used a pre-filled task booklet to ensure guidance of a logical order throughout the game and related questions. Questions were formulated openly, like “What do you think about this part of the app?” and “Was there anything you liked/disliked in particular about this part?” As the students played, we asked questions along the way and asked them to think aloud. We wrote down all answers by hand in separate booklets for each student. The individual evaluations lasted from 10 to 30 minutes.

Concerning the process of providing information and consent, the teacher initially discussed the project with the children and sent an information letter to all parents in due time before our visit. The teacher and staff were careful to inform both children and parents about voluntary participation and the opportunity to withdraw at any time. Upon our visit, we made sure to repeat these terms to the whole class. During the evaluation we tried to be attentive to body language and statements that could be interpreted as lack of interest or willingness. The national data protection services did not require notification because we did not collect any personal information.

Structuring data

After the evaluation session, the team discussed the recent impressions and transferred all the hand-written notes from the 21 booklets to a shared digital document. The teenagers were given fictional names. All answers were collected under each respective question connected to each game part and a brief summary of the main trends was prepared. This was a collaborative effort among the authors. The findings represent a compound rendering of the teenagers’ feedback. We have structured the findings according to the task booklet to maintain a logical order following the game flow.

5.2 *Prototype evaluation 2*

A second prototype evaluation of the game was conducted in a master’s project [40]. The study aimed to investigate how children with established school refusal experienced scheduled actions and measures including the use of *Gnist* as a specific measure. A request for study participation was sent to 13 schools and 2 units of the pedagogical–psychological services. Of these, four students from four different schools wanted to participate. The four participants were all boys and they all struggled with school refusal.

Table 1.

Participant (fictitious name)	Grade
Håkon	6.th
Ola	9.th
Sebastian	9.th
Peder	9.th

The interviewer had no prior knowledge of the participants. The interviews were held at the children’s schools as an attempt to secure the students. We were given access to a group room at the school, and the participants were given the opportunity to bring a person they trusted. Two of the participants used this opportunity. The interview was semi-structured, enabling some general questions asked to all as well as the opportunity to follow up on topics raised by the participants. The interviews were audio recorded with consent.

The interview started with the participants playing through the prototype while being asked about their thoughts on the game. The part of the interview dealing with *Gnist* lasted about 20 minutes. The interview was subsequently transcribed in Nvivo 12 and analyzed. A theme-centered approach was used for the analysis in which data dealing with the same topics were clustered in categories. One of the main topics in the study was called *Gnist* and these are the specific findings that will be presented further in this article.

6 Findings

6.1 Findings from prototype evaluation I

First impressions

The teens' first impressions of *Gnist* were generally positive, i.e., the game flow was considered good, it was clear what to do and it seemed orderly. The posed questions appeared suitable, it was for example pointed out that it was good to ask different questions and that it was cool with an app asking about different things connected to school. Nadia said, "*Seems very appropriate for people who are struggling, that they can put more words on what is difficult, often it is a bit like "can't go to school and don't quite know why".*" Furthermore, it was appreciated that the game adapts in line with the player's answers. Several teens considered the characters and the universe to be inviting and fun to play.

The characters

The characters were described as cool, funny, weird and easy to like. Some assumed they would be suitable for the target group (10-13 years), but others thought they would appeal better to younger children. It was considered positive that the characters had different personalities for the player to choose between. Humor was also highlighted as important for gaining players' confidence. Ella put it like this: "*I am more comfortable responding when the character has a bit of humor than if the characters had been too serious.*"

Sorting of activities

Many teens stated that activity sorting would give the players an opportunity to say what they think about daily tasks in an honest way. Several expressed how they liked to sort things in a simple way, as Oscar put it: "*Felt good sorting the different things.*" The sorting itself was generally considered to be simple, but an extra category or more alternatives between "easy" and "difficult" was suggested.

Gaming morning routines

The teens appreciated how the game provided an overview of morning routines and that completing them released points. Hanna said, "*Liked that you could see what you have already done and what lies ahead.*" Ella stated, "*This part is fun. Especially liked that you earn points for the things you do.*" Thomas emphasized how it could "*make chores a little easier and that is motivating*" and Jack said, "*You manage to get up and get to school.*"

Several teens anticipated this to be useful for the target group. Nacira said, "*Seems good for someone who is struggling*" and Nora reflected, "*In a way, they get a checklist for planning what you are going to do, so you can take it step-by-step.*"

Others were unsure if playing early in the morning was realistic or how this would benefit the intended audience. Ben figured, "*If you do not get as many points or low scores then you can get some bad thoughts about yourself if you compare yourself with a friend who has more points.*"

Gaming the way to school

The idea of gaming the school way was valued and anticipated to be significant for the target group. Nadia said, "*Good with points, gives such a boost, that you want to achieve something. For each day, for example, surprises in the form of new designs on berries. Something to look forward to, work towards, gets motivated by collecting things.*" Oscar stated, "*Think it would have been motivating with rewards along the way*" and Jessica reflected, "*Think they [berries] would have made them want to go to school.*" It was considered necessary to increase the number of berries and to show a clear development of the character as it is fed.

Gaming the school day

The teens were positive to self-reporting and many said that it provided an opening to lighten one's heart. Samuel thought that *Gnist* provided an "Easier way to get your thoughts out of your head and to express yourself." According to Jessica, "Not all parents ask what it is like at school, so it's really nice that an app does just that." Jack said, "You could say how you felt at school. That's good because then you don't have to lie." Mia thought it could be "Motivating to reflect on how things went." These statements suggest that young people think it may be easier to share their own everyday experiences with an app than directly with peers or parents. Several teens thought this part of the game could be expanded. Ahmed suggested, "Could also ask what went well in the subject and what went bad?" and Adam said it would be "Great if you get extra positive feedback after tests and hand-ins."

It was pointed out how the game could encourage the particular target group. Ella said, "It highlights good days, and it can make a student think about why he does not go to school more often as he actually does have good days" and she continued to propose "When responding "alright" regarding a subject, the app could have asked why. Was it because of stress for example?"

Gaming the way home

There was not detailed feedback on this part, but several stated that it was "good" and "easy." Suggestions for improvement included adding more monsters, berries and obstacles within the map and enabling joint gameplay.

One teen, Michael, considered this a less important part of the game: "Is it necessary to get points on the way home? Needless when everyone wants to go home anyway."

Reviewing the day

The teens found it positive to see what one has achieved during a day and summarizing it with the monster's gut. Ahmed said, "If you feel you have had a bad day you can look at the summary and realize that you actually have completed some things." Nacira reflected, "Positive with the comments from the characters, it is motivating that he says "will do better tomorrow". It can be tough for someone to share what the day has been like but motivating to see that one can do better and better." Ben however questioned whether the summary would have the intended effect among the target group, "May not be the most purposeful thing to do for someone who is struggling."

The game store was considered cool and potentially interesting.

Progress

According to the teens it made sense to display the player's performance over time and seeing the overview could give motivation. Daniel reflected, "It makes it easier to explain how things went because you can't remember everything." Nora said, "Nice comparison - shows very easily how the days have been in relation to each other. Benefits? She sees how she improves and feels every day."

However, some teens questioned whether the game could reinforce a feeling of defeat. For example, Hannah said, "Think it could have worked well with a progress page. If you have many good days, you will want more. Not sure how you would react if you had many bad ones."

Samuel mentioned the role of parents: "Kind of fun to see how things have gone. How many days you have managed to be in school. Parents can benefit from that."

Messages from friends, relatives and teachers

Most were positive to an integrated message account for communication with close ones. Such a function was associated with motivation, promotion of self-confidence and experiencing encouragement and belonging. Eddie reflected, "My friend would have been happy, encouraged, accomplished a little more during the day." Ahmed said, "I liked the

message page. Knowing that someone loves you. It makes you proud. «You are good the way you are».”

However, some also pointed out that such messages may contribute to experiencing increased pressure to come to school which could also be a negative outcome. Some believed that students could feel the urge to lie to their parents as a response to such messages, pretending to be doing better than is actually the case.

Overall impressions and improvement proposals

The teens generally gave an affirmative review of *Gnist* and expressed confidence in the concept as a whole. Nadia provided a thorough summary: *“Although I am 14-15, I could imagine using it, I have struggled a bit myself. I would have liked using it [...] It is not directly childish, [but] more suitable for 10 years of age [...] Think the idea is really good. If you don't have an app everything seems so big, that you can't think day-by-day. With this app, you get to slice up the day, get to clean up [...] Small motivation boosts”* She continued to underscore the relevance of *Gnist* when asked what she would have prioritized if she was a designer on the team: *“Make one for the youth [an update], but first, make sure to get it out there because there are many who need this app.”*

Reviewing the day, the reward system, the gaming morning routines part, the animations, the characters, messages from game characters and close ones were all given as examples of what the teens liked about *Gnist*.

Nora summarized the overall impression as follows: *“Seems very useful for people who are struggling to get to school. You get different goals and see how you can manage to get close to them. Points and rewards also work well, then you have a goal with what you do [...] You get a measure on how you manage from day to day, and you get an overview of how you do it, I like the concept of the app a lot – that is, you get help to go to school if you have problems.”*

Further work on gaming the school way and upgrading the store was proposed. Some wanted more obstacles to make the school way more exciting and others would like more things to buy for the characters such as clothes and animals. There were also suggestions to facilitate more direct contact with others. Finally, a suggestion to implement guidance for dealing with difficult situations or anxiety was posed.

6.2 Findings from prototype evaluation 2

The findings of the master's study [40] may indicate that *Gnist* can help with getting children to attend school. This is partly due to the reward method used in the game. According to Peder, rewards could be a motivation to go to school: *“You want points (...) so then you will also go to school for those points”*. All the participants pointed out that they liked the reward factor, and that they could use the points they had saved up for stuff in the in-game store. Håkon also appreciated the possibility that the game could help structure everyday life: *“Because you can sort of enter like, enter your plan, and what you are supposed to do, so that you know what to do at school. In a way, you also get a reward on the app for doing that thing.”*

Ola expressed a somehow more skeptical view toward the game than the other participants. He pointed out, among other things, that he was afraid the game would just be another thing he had to complete before he could go to school. However, there were some parts of the game he liked. He was positive that one can collect points to complete the morning routine and go to school. He explained that such a function could help to see the benefit of doing those things.

Sebastian believed that the game could increase the motivation to go to school, especially if there was an opportunity to compete against friends in the game. Sebastian had struggled with school refusal for several years when the interview was conducted and thought that in his situation it was probably too late. His habits were so ingrained, and the absenteeism so extensive over many years. However, he believed that the game could work if it were to be introduced at an earlier stage.

Based on the conducted study it may seem that the game can contribute positively to the school situation for some. In summary, it seems that the reward factor plays an important role. Looking at previous research, it may indicate that if the reward is appropriate [23] in addition to significant enough [43] it may contribute to children with school refusal getting motivated to carry out everyday routines and attending school.

7 Discussion

The two prototype evaluations have given us insight into how a group of teenagers viewed *Gnist* from a peer perspective holding firsthand experiences with the school system and how a group of children assessed the relevance of *Gnist* based on their personal experience with school refusal and connected measures. Here we discuss commonalities and differences of the findings and present some key takeaways for researchers and practitioners working to design technologies for supporting children's well-being in attending school.

All the participants who had personal experience with school refusal confirmed that they liked the reward factor. It was specifically stated that such a reward system could be a motivation to go to school. Motivation is also an important factor to sustain engagement with a game over long periods [44]. Furthermore, the same participants appreciated how the points could be used to buy stuff in the in-game store. The importance of the rewards was also clearly expressed by the teenagers in the first prototype evaluation. They recognized that earning points before and on the way to school could be a crucial motivation for managing to get up in the morning and get to school. Through points and rewards the children are provided with new goals to reach. This connects with research showing that attending school is an important factor in work with school refusal [21].

The design element of breaking up the day into gamified tasks and activities seems to be relevant in a school refusal context. One of the participants, Håkon, represents our intended target group both in terms of having personal experience with school refusal as well as being within the envisioned main age range. Håkon clearly articulated the benefit of getting help to structure everyday activities as offered by *Gnist* and being rewarded for undertaking them. The idea of breaking the day into smaller fragments appealed to the teenagers in the first prototype evaluation as well. Many pointed out that it seemed useful to identify everyday activities taking place before, during, and after school. They reflected along the same lines as Håkon, associating it with a checklist, a step-by-step approach, day-by-day thinking and slicing up the day. Research shows that the two factors of predictability and support in the school context may be particularly important in the case of school refusal. Uncertainty about the time schedule can be a challenge after long periods away from school [45]. The overview of the game can contribute to predictability, which is perceived as important for children with school refusal [23].

Two of the participants who had personal experience with school refusal were more uncertain about the relevance of *Gnist*. Even though collecting points seemed appealing, Ola's uncertainty was connected to the concern that playing *Gnist* would be yet another thing to deal with. Uncertainty about the realism of playing in the morning or how this would benefit children with school refusal was also voiced by some of the teenagers in the first prototype evaluation. Some figured that in cases with low scores and progress, *Gnist* could contribute to children's negative thoughts or bad feelings. This reminds us of the importance to give the player a sense of mastery from their particular position. It is essential to give positive feedback to the player regardless of the outcome. Finesse and tact in the formulations adapted to the player's situation are vital. At the same time, *Gnist* seeks to prompt reflective conversations both between the player and the monster as well as between the player and caregivers. Providing opportunities for such common reflections – reviewing daily achievements, assessing them according to set goals and receiving points and rewards, was considered an important design element for the intended target group by many of the teenagers in the first prototype evaluation. Many also suggested that content related to self-

reporting could be more detailed. Tips-based guidance for dealing with anxiety, which is more strongly linked to the professionals' targeted work and mapping, was not implemented in the prototype at the time of evaluation. One teenager suggested that this would be beneficial. Several teenagers in the first prototype evaluation mentioned the role of the parents, both that it seemed advantageous for them to get an overview and that the player was given a more immediate opportunity to address questions and thoughts inspired by the game. Sebastian's concern was related to the particular timing of introducing such games in a school refusal development process. He thought *Gnist* could increase motivation to go to school and be especially interesting in a multiplayer version. In his own case, however, with several years of school refusal, Sebastian thinks it would be too late. This supports our intended scope for *Gnist*, namely addressing the existing gap of tools and measures in early stages of anxiety-based school refusal. Early identification of children in an initial phase of developing school refusal and early intervention is crucial for the outcome of prevention and treatment [40][23][46][47][21][8].

Based on these two evaluations it seems serious games can play a positive role in a school refusal context. In the case of *Gnist*, we envision it can serve as a relevant hub for connecting children, school, family and therapist in the process of understanding underlying reasons, finding the right treatment form and altering behaviors, feelings, and mindset. Given that many of the existing therapies are based on a collaboration between children and close adults (parents, teachers, therapist) in combination with training, the game can serve as a supplement both in the form of being a link between the various actors and by offering the child more control within the treatment process. It is advantageous to actively register absence for getting an overview of potential patterns of typical days or subjects related to absence [3][48]. *Gnist* provides such an overview which might help to create an understanding of how or why some days might be perceived as more challenging.

Gnist is first and foremost the child's tool. Many children, including children with established school refusal, are skilled players holding a considerable gaming experience [23]. As such, games are likely to be perceived as a familiar arena and hence lend themselves as suitable entrances for approaching a challenging and distressing situation. Therefore, we assume a number of children at risk or in early phase of developing school refusal to be more receptive towards a game than more traditional ways of sharing information along a training or treatment trajectory such as a paper-based form, an interview or through a diary.

On a last note, the current global pandemic situation with COVID-19 has implied various forms of full or hybrid distance education. How this has affected the specific phenomenon of school refusal has yet to be investigated. Recent studies show that social distancing and isolation has affected the public's emotional reaction broadly, causing a deterioration in mental health including anxiety and mood symptoms [49]. Upon children's return to the classrooms, the world might experience increased numbers of school refusal. However, a positive finding in favor of serious games is that the use of telehealth has been shown effective to diminish and manage emotional and anxiety symptoms in youth as well as parents [49]. In this regard the research of Fleming et al. [24] is highly relevant suggesting that mobile games can work well to reach children who would otherwise not receive help.

8 Conclusion and further work

Based on the initial evaluations of *Gnist* and the analytical review of serious game elements it seems promising that serious games can contribute to help children at risk or in an early phase of developing school refusal. To verify this notion, further work needs to involve a more extensive field evaluation of *Gnist* with children in elementary school, aged 10-13, who are struggling with school refusal by following long-term use and connected interaction with their parents, teachers, and potential therapists. Today, there is a lack of

digital tools targeting school refusal. Viewing school refusal as a contextual phenomenon implies recognising the importance and responsibilities of multiple stakeholders surrounding the child, namely family, teachers, peers and school actors as well as clinicians and healthcare services. *Gnist* is a digital tool that can benefit the collaboration between all involved stakeholders through enabling a flow of communication and information based on the child's daily experiences. This can support existing forms of assessment and treatment, both in terms of quality and efficiency. Our ambition is to help more children at an earlier stage and to enable children's increased management of school refusal by providing them with their own tools readily available in their pockets – as emphasized by one of the participating teens: "There are many who need this app."

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