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Speculative Design as a Method of Inquiry in an Online Workshop Setting

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Abstract: This paper presents an empirical study and the resulting insights from a speculative design process in online workshops with students from a K1–12 teacher education programme. The empirical investigation consisted of five online workshops with the purpose of exploring Augmented Reality. Each workshop had a duration of 2.5 hours, with three to six participants per workshop. The theoretical frame was speculative design workshop and methods of inquiry inspired by Dewey, as well as the utilisation of storyboard and design tools for personal reflection. This paper explores three interrelated research questions: What are the implications of conducting an online speculative design workshop? How can speculative design be used as a method of inquiry? What are the potentials and challenges of the tools and exercises used? The research investigates the knowledge that speculative design workshops bring into play, as seen from two perspectives: the participants' learning process and the knowledge the workshops bring to the research field. It also investigates the implications of conducting speculative design workshops in an online setting, where it becomes essential to apply structured facilitation, and provide common tools that allow for creative and material exploration. Though the literature argues that speculative design provides an opportunity where the potentials uncovered are less influenced by the current implementations of the context under investigation. This research shows that working with speculations on preferred futures in various contexts is a challenging endeavour. The findings also show that the format can bring new insights for the participating students, and that it is essential to consider participants' well-being, learning frustrations, and keeping participants on track during the workshop.

Keywords: speculative design, online workshop, inquiry

1. Introduction and research questions

This empirical study materialised due to the need for knowledge closely linked to a local context, namely, investigating the learning potentials of Augmented Reality (AR) in a Danish K1–12 setting. It was therefore desirable to obtain input from people close to this context, who were not only able to think about but also develop existing practices, and who had the time and energy to do so, which made student-teachers (K1–12 students) a relevant choice. Furthermore, from a surrounding society perspective and the learning objectives of the teacher study programme, it is important that these student-teachers acquire technological understanding in general, and particularly knowledge about new technologies such as AR, and about how to work with teaching school children such understandings.

The intention of the study was to plan for workshops within the frame of the specific context (here AR and schools) that would engage participants in an online process of inquiry through speculative designs, supported by reflective, dialogical, and explorative design tools, such as storyboards, to investigate the learning potentials. This resulted in three interrelated research questions: What are the implications of conducting an online speculative design workshop? How can speculative design be used as a method of inquiry? What are the potentials and challenges of the tools and exercises used?

The investigation had a participatory and design-oriented perspective, and due to the futuristic perspective of wanting to investigate and speculate about possibilities and learning potentials, the research design took point of departure in a speculative design workshop (e.g. Auger, 2013; Dunne and Raby, 2013) in an online format. Workshops can function as both a research method that enables researchers to investigate the phenomena in question and to allow participants to acquire capabilities in and develop their own practice about those phenomena (Ørngreen and Levinsen, 2017). However, when planning the details of such workshops, it became clear that the speculative design approach seldom specified approaches in a detailed manner (Piet, 2019), or addressed tools that allowed for a concrete level of inquiry for the participants and the researchers in the role as facilitators of the workshop. In this study, the objective was to engage participants in the social process of making inquiries and thinking about educational design in their context. In this light, the theoretical work

became inspired by Dewey, and his work on “how we think” (1920/2011). However, the level of abstraction was still somewhat high, and there was a need for input on which tools and thinking processes could aid in the workshops. Consequently, the workshop design turned to design tools for further inspiration, and more specifically storyboards (Truong, Hayes and Abowd, 2006), with the intention of finding formats that worked in online workshops.

Below, brief theoretical insights are provided (Section 1.1–1.3), followed by information about the research design (Section 2) and a presentation and analysis of the overall workshop (presenting the workshop programme), then analysis of the findings by first offering insights into two participants with different experiences, examples of storyboards, and the potentials and challenges for online speculative design inquiries (Sections 3 and 4). The paper ends with a discussion of the findings and conclusion (in Sections 5 and 6), which highlight the challenges regarding the knowledge required about the field before experiencing being able to speculate, about the exercises and tools used in the study, and about the online environment. Our findings also suggest that these workshops can inform both the current state of a situation or topic and direct future inquiries in the research field.

1.1 Speculative design

The purpose of design, according to Auger (2013), is traditionally to solve problems or invent new products in relation to a commercial market. By extension, design has primarily been regarded as a problem-solving practice (Mitrović, 2015) and is usually aimed at problems detected by other professions (such as economics, sociology, and philosophy). However, according to Dunne and Raby (2013), designers must act speculatively when facing complex problems or attempting to open a dialogue about how the world can be (Dunne and Raby, 2013). Speculative design is an activity in which imagination or speculation is recognised as knowledge, in which futuristic and alternative scenarios can convey ideas, and in which the goal is to emphasise the consequences of ‘thoughtless’ decisions (Dunne and Raby, 2013). As shown in Figure 1, speculative design has much in common with other design approaches (Auger, 2013), except it differs from traditional design in its outlook towards the future.

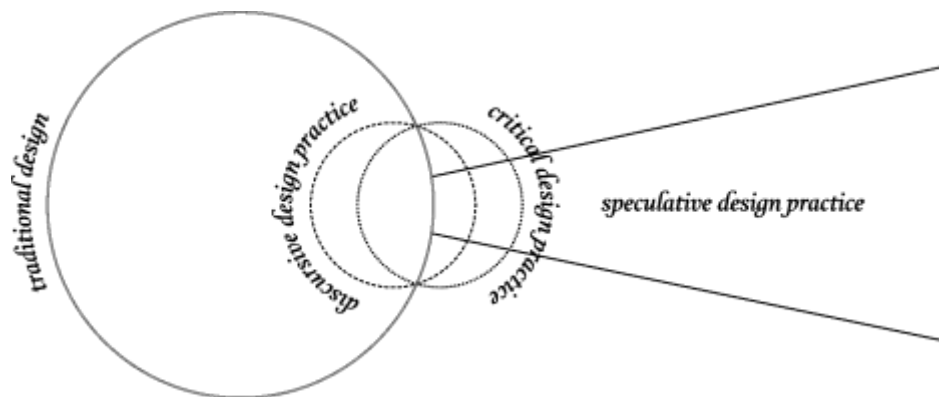


Figure 1: Traditional design vs speculative design (Source: Figure 1 in Mitrović, 2015, p. 9)

With a view directed towards the future, it becomes central for speculative design to propose, suggest, or offer something. Design is well suited to outline possibilities, and although the proposals are based on thorough analysis and research, they must retain their imaginative, improbable, and provocative qualities (Dunne and Raby, 2013). Design can play an important role in expanding the perception of what is possible by integrating ideas, ideals, and ethics into speculative proposals (Dunne and Raby, 2013). Speculative design is not about predicting the future but about allowing all possible possibilities to be discussed and used to jointly define a preferable future for a given group of people (Dunne and Raby, 2013).

With Figure 2, Dunne and Raby (2013) attempted to illustrate the position of the preferred future relative to other ways of thinking about the future. Most designers work within the middle cone, as it represents *the probable*, and it also describes what is most likely to happen. The next cone represents *the plausible* future, and is the space for what can happen, using methods such as scenario planning and foresight to explore alternative futures to be prepared. The broadest cone represents *the possible*, where the key is to create a connection between the existing world and the imagined world through the description of a series of credible actions (even if these are fictitious). Outside this cone is pure imagination, which is the source of much literature, film, art, and

others. The cone that overlaps the area of the probable and the plausible represents *the preferable* future. Within this area, speculative design can suggest and discuss what a preferred future might look like.

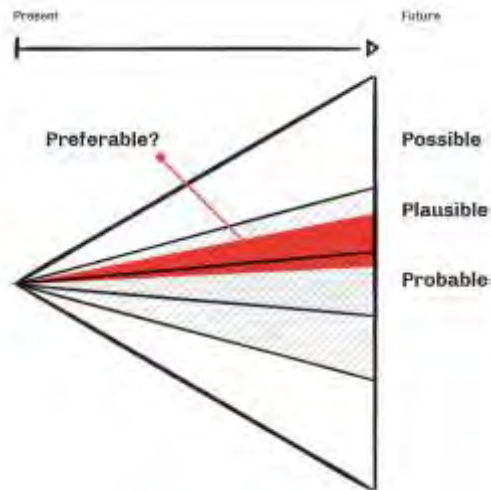


Figure 2: Model of potential futures (source: Figure 7 in Johannesen, 2017, p. 9)

1.2 Methods of inquiry in a Deweyan interpretation

According to Dewey (1938), the world is a place of constant change and development, which makes the world uncertain and changeable, which is why action and change are central elements in the ontology of pragmatism (Goldkuhl, 2012). We are in the world as beings of action who, through participation and reflective thinking, can master how the world changes and develops (Brinkmann, 2007). The process by which one actively intervenes in the world and feels the consequences was described by Dewey as experience, and is something one can actively try to create, whereby one produces knowledge (Brinkmann, 2007). Through exploration, one can gain knowledge about a world marked by action and change. Dewey called the practice of changing an indeterminate and uncertain situation into a determinate and certain situation an inquiry (Brinkmann, 2007).

Dewey identified five steps, later recognised as the five steps of inquiry, in which people relate experience, reflective thought, and action: “(i) a felt difficulty; (ii) its location and definition; (iii) suggestion of possible solution; (iv) development by reasoning of the bearings of the suggestion; (v) further observation and experiment leading to its acceptance or rejection; that is, the conclusion of belief or disbelief” (Dewey, 1910/2011, p.73). Dewey’s inquiry, as well as his and fellow researchers’ thoughts on pragmatism and experience (among others, Pierce, James and Lewin), takes point of departure in that experience offers a method of exploring the world and acquiring knowledge not only about what exists but also towards what ‘could be’ or towards a possible but not yet realised world (Goldkuhl, 2012).

1.3 Tools and exercises in the workshops—exemplified with storyboards

The literature on speculative design practice is inspired by art, but little has been described about the details of how to carry out such designs (e.g. Dunne and Raby, 2013; Auger, 2013), and this point was also raised by Piet (2019). In Nadia Piet’s work, she provided an overview plan for a three-four hour workshop on “Exploring potential AI futures”. However, she did not sketch out in detail which tools could be used or how and with which learning. Piet’s workshop was therefore used as a starting point and template but further developed to address which tools and exercises can be used. The template was filled using tools that have previously proved themselves successful in design processes and that have been used in educational design and collaborative processes for critical design thinking (Lupton and Leahy, 2019). In this context, storyboards seemed to be an adequate option that was worth exploring.

A storyboard can be described as a short graphic representation of a narrative, and in a design process, storyboards often illustrate how a situation unfolds (Truong, Hayes and Abowd, 2006). Storyboards can show how a user interacts with a product in a specific context over a given period and use a common visual language that people with different backgrounds can ‘read’ and understand (van der Lelie, 2006). According to Truong, Hayes and Abowd (2006), storyboards are characterised by five features:

- 1. Details - Quantity of details needed to be able to convey the desired narrative.
- 2. Text - Text can be used to convey context, dialogue, or time.
- 3. People and emotions - Creating empathy by including people and their emotional reactions in the situation.
- 4. Number of pictures or slots.
- 5. Visual time - Portray time or show transitions.

2. Research design

In this section, the setting of the empirical study, the data collected, and the steps in the analysis are briefly described. The project's knowledge approach was based on pragmatism (cf. Section 1), and the research process had an overall abductive approach. The empirical data consisted of various data sources over a four-month period in 2020, within the frame of the specific context (here, AR, and schools).

At first, a state of the art and a literature review on AR were conducted, which contributed to the identification of the potentials of using AR in learning situations. The review also included speculative design approaches (on which very little has been described). Second, two in-depth interviews with experts were conducted, with the intention of gaining deeper knowledge about learning situations in a K1–12 setting (Lise Dissing Møller, Lector at KP) and AR as a technology (Lucas Nygaard, Founder of Hololink). Third, five workshops with K1–12 students attending the course "Technology Literacy and Digital Formation" (Rehder et al. 2019) were held, with the purpose of investigating the use of AR in a learning situation, using a speculative method in an online setting, as well as an investigation of the use of speculative design as a method of inquiry. Each of the five workshops was 2.5 hours in duration.

The data consisted of observations and audio recordings of the workshop sessions, visual storyboards created by the students, the students' written documentation of five creative exercises during the workshop, and field notes written after the workshops. Fourth, a thematic analysis of the workshops investigated the AR learning potentials that the K1–12 students identified and visualised through storyboards. Furthermore, the analysis focuses on the K1–12 students' experiences with the speculative design in an online workshop format to identify potentials and challenges.

3. Designing the online speculative design workshop

The type of empirical evidence obtained in a workshop is different from the empirical evidence produced through observations, interviews, or interventions in the participants' everyday practices. A workshop provides an opportunity to address issues through presentations, experiments, and discussions, where the researcher can advantageously create space for contemplation and collaboration. This can provide an opportunity to continuously identify new factors that neither the participants nor the researchers were aware of before the workshop. Through a workshop, the researchers have an opportunity to inquire into and immerse themselves in the process (Ørngreen and Levinsen, 2017). With room for presentations, experiments, and discussions and the ability to create space for contemplation and collaboration, the workshop format can be used as a frame for engaging in inquiry in the form of speculative design (Lupton and Leahy, 2019; Piet, 2019).

Due to unforeseen circumstances, the speculative design workshop was held in an online setting, which gave the opportunity to gather the participants without them gathering in a specific physical location. This also required contemplation of how to transfer the template for the speculative design workshop into an online setting, with the opportunities and challenges this setting presented.

To provide the K1–12 students with an understanding of AR as a technology and its possibilities and limitations beforehand, a flipped learning approach was chosen, where the K1–12 students could prepare before participating in the workshop. Two videos on AR and speculative design were developed and recorded, which the students could watch asynchronously, and at their own pace acquire knowledge about speculative design, storyboards, and AR before the workshop. Two academic texts on speculative design and storyboards were used, as well as a brief description of the purpose of the workshop and how the workshop supported the goals of their course. The intention was to incorporate knowledge from the material into the workshop and build on this knowledge through the planned exercises.

For the online workshop exercise, templates, and a document for sharing and taking notes were used, and the participants chose to use either pen and paper or storyboardthat.com for creating their storyboards to visualise their ideas and speculations. These tools were chosen to create a shared space for collaboration and mutual inspiration as well as because of their usefulness in an online setting.

Students' learning objectives

The participants consisted of K1–12 students attending the course “Technology Literacy and Digital Formation” (Rehder et al. 2019), and the workshop was designed to align with some of the learning objectives of the course where the students should have the opportunity to “be critical and to explore the intentionality of the technology” and “develop and test teaching courses with iterative design process” (Rehder et al. 2019). It was also meant to provide the participants with knowledge about the speculative design method and storyboards to give them the opportunity to reflect on learning, technology, and what a desirable learning situation with AR looks like.

The programme

Based on inspiration from Piet (2019) and considerations of conducting a speculative design workshop in an online format, the following programme with the approximate time was created:

- 1. **Introduction** - 15 minutes
- 2. **Build the world** - 15 minutes
- 3. **Story making** - 20 minutes
- 4. **Anticipating the consequences** - 30 minutes
- 5. **Build the future scenario with storyboards** - 35 minutes
- 6. **Reflection** - 20 minutes

The intention was to become more and more concrete through exercises within the set framework: the use of AR as a learning support technology in the year 2030. The exercises are elaborated on in Table 1, in which the experiences of two participants are shared.

4. Analysis of data

4.1 Presentation of two different experiences of the speculative design workshop

To elaborate even further on the workshops, the following presents a walkthrough of the exercises and highlights two participants' experiences. The two participants were chosen based on their very different experience with/approach to the workshop, where one was more agreeable/accepting of the premise of the workshop/the framework than the other.

4.2 Presentation of three exemplary storyboards from the workshops

The 20 participants created 20 storyboards in all, with 7 of them involving learning situations without the use of AR. Below are three examples of visualisations of learning situations from the workshops. They show different ways of creating storyboards, depending on the tools used, and show different levels of detail.

4.3 Analysis of potentials and challenges

Several challenges and potentials emerged through the analysis of the data from the workshops. First, because speculative design is an approach, there was a need to frame and fill in the workshop with exercises that support the participants' speculative exploration. In this case, some of the exercises worked well to encourage collaboration between the participants, especially since the participants could then follow the development of the ideas in a collaborative way, and they could choose any of the discussed ideas to visualise through storyboards. However, the findings show that some of the exercises were too abstract, as observed in participant B's experience of the workshop (Table 1).

Table 1: A trail of the exercises, their content, and two participants' reflections on the workshop

Exercise	Participant A	Participant B
<p>World building is used to frame the workshop, and encourage the participants to think within the framework (i.e. AR-technology).</p> <p>Within the context the participants answer two questions: A. Where and how does learning occur? B. What forms of technology-assisted learning exist?</p>	<p>The participant chose to elaborate on question A. He finds that AR is an obvious possibility to be shown a new way of doing things, and to learn through that.</p> <p><i>"...in augmented reality you can just point out where the mistake lies (...), and that way you can just show people how to learn something new (...) It will be much easier to complete the learning, I think."</i></p>	<p>The participant found it difficult to answer question B, because she thought of everything as technologically supported.</p> <p><i>"So I find it very difficult to define definite technological support of learning processes because it just becomes a big part of it all the time no matter what one does."</i></p> <p>She also finds it difficult to separate AR and VR.</p>
<p>Story making uses some of the findings from the last exercise to create a learning situation (using AR)</p> <p>Using an answer from the questions A and B from the last exercise the participant creates a learning situation.</p>	<p>The participant chose: <i>"learning occurs when you are shown a new way of doing things + using the camera on a Smartphone = individually tailored learning based on the student's learning positions."</i> He elaborates on the learning situation, and points to the lack of development in machine learning, that would be essential for the process (and how the technicalities might not be there yet)</p>	<p>The participant did not complete the exercise as she <i>"... do not think one should use technological support unless it is very much necessary. So, I think it's very difficult to relate to"</i></p> <p>She also tells us that she finds it very difficult to understand it all.</p>
Exercise	Participant A	Participant B
<p>Anticipating the consequences uses one of the learning situations created in the previous exercise, where the goal is to explore and anticipate the consequences.</p> <p>The participants elaborated on two different exercises; A: mapping the positive and negative consequences of the learning situation, B: identifying contradictions in the learning situation based on part A - both positive and negative / intended and unintended within the identified contradictions.</p>	<p>He points to the contradicting relation of being problem solving-oriented and answer-oriented, as a possible negative consequence of always being able to ask a teacher or a programme.</p> <p><i>"You could go and become dependent on getting the technology to solve the problem"</i></p>	<p>She finds it difficult to find possible contradicting consequences by herself, but with the support of the facilitators finds the contradiction of technology as both a motivation and demotivation <i>"... because it is harder to understand because you have to include the virtual as well"</i></p>
<p>Build the future scenario with storyboards using the findings from the previous exercises. The participants visualize and create a storyboard (depicting a concrete learning situation using AR)</p>	<p>The participant points out the need for a human teacher when he explains his storyboard <i>"... he wants to learn some physics and then he turns on his iPhone (...) he can press a lot of different things and get a lot of explanations about what is happening in the room around him. (...) But what he then eventually finds out is that he cannot move on because there is something he does not understand and he has no one to ask. And augmented reality as such does not understand the question, it has to be programmed by a human so he has no one to ask and that is of course a problem."</i></p>	<p>The participant chose to elaborate on another participant's idea of a learning situation from the earlier exercise. In the elaboration it becomes clear she is not clear on the difference between AR and VR.</p>
<p>Reflection on the process and the workshop</p>	<p>Speculative Design Workshop <i>"I think it's very good, the thing about looking like 10 years into the future (...) You are not so bound by what is actually going to happen, you are just bound by your notion of what is going to happen. So, you are quite free to imagine for yourself how mechanisms can develop and what you can do in 10 years, and then you can assess it yourself, and look at the consequences that could then be of the possible development that things could take from there. It has been quite creatively stimulating."</i></p> <p>AR <i>"So, I think that augmented reality can support a student if the students themselves want it to help their learning, but if they do not care, then I also think it is an easy way to skip it because, you need not to listen to your iPad, you have to listen to your teacher, right?"</i></p>	<p>Speculative Design Workshop The participant found it helpful that each exercise built on the last exercise, <i>"...because now it was something we had talked about beforehand. So, I think it was very good that you kind of went back to the same thing (...). It had a bit of that red thread through it all, so it wasn't all that fluffy"</i>.</p>

Table 2: Three storyboards from the workshops (reproduced and translated for anonymity)

	<p>Storyboard made in storyboardthat.com which illustrates an AR situation</p>
	<p>Storyboard made with pen and paper, where the participant did not incorporate AR in the learning situation</p>
	<p>Storyboard made in storyboardthat.com which illustrates a VR (not AR) situation</p>

Another issue to consider is the topic (here AR) and choice of participants for the speculative design workshop, and the relation between topic and participants. The workshops needed to be framed in a way that made sense for the participants and at the same time challenged them to go beyond and engage in speculation. The topic, AR, was a difficult and elaborate technology that was too challenging to comprehend for some. Moreover, AR and virtual reality were not separate concepts in the minds of all the participants. The lack of understanding can make it difficult for the participants to visualise details when they are not familiar with or have a complete understanding of the technology. However, innovative or new ideas might emerge because the participants are not bound by the limitations of the technology. In this case, the participants were mostly limited by their understanding or misunderstanding of the technology, as the examples in Table 2 show, and as observed in the high number of storyboards visualising a learning situation without the use of AR (7 out of 20).

The use of a template, such as storyboardthat.com, also influenced the visualisations the participants created. Some found the template helpful, as it offered backgrounds, pre-existing characters, and items, giving the possibility to visualise their ideas in great detail without drawing, which some participants expressed was a challenge. Others found that the template required too much effort to navigate and chose to use pen and paper, which was then shared as a picture in the shared document. The use of templates offers many choices, and there is a risk of the participants becoming too engaged in the choices, and they might end up using too much time on making the storyboard look just right and not focussing on conveying the concept of the idea in a clear way. However, this issue did not present itself during the workshops.

Using a template, as well as the opportunity to use pen and paper for creating the storyboards, offers a materiality to the participants' ideas. The findings show that by using storyboards, the ideas of the participants became clearer, and more details were revealed through the visualisation than through the verbal explanation of the idea. For example, participant A described an idea where learning arises when you, through the use of AR and the camera in a smartphone, can tailor the learning experience to suit the individual. Through image recognition, the smartphone enables students to engage the surroundings. Even though this participant was quite adept at explaining the idea, details, and context, new perspectives were revealed when participant A was asked to create a storyboard outlining the idea. The first storyboard in Table 2 shows how the character, Oliver, can see different examples of applied physics in his surroundings through the smartphone, which supplies details to participant A's idea. The storyboard also shows that, when Oliver meets something, he does not understand, he needs someone to ask. The creation of the storyboard revealed something new about participant A's idea, and the idea became more substantial.

Other implications arise when conducting a speculative design workshop in an online format. After conducting five online speculative design workshops, it was clear that muted microphones, turned off cameras, and a lack of nonverbal communication meant that the facilitator did not get enough feedback from the participants to deduct the participants' involvement in and understanding of an exercise. The structure and management of the workshop had to be precise, and the facilitator had to engage the participants directly, as the online format could be construed as a barrier to the participants engaging in the exercises and dialogue. It showed that it is important to actively and regularly ask about the participants' understanding to gauge where they are in their involvement in the workshop. The use of preselected examples coupled with thorough explanations helped facilitate the participant's understanding of the exercises and foster engagement. The structured facilitation of the online workshops and the direct engagement of the participants ensured that every participant was heard and involved in the different exercises, and consequently, the involvement was more evenly distributed between the participants. Facilitating more workshops (here five) with fewer participants (here three to six) also gave the participants the possibility of following the development of the ideas. It would be difficult for the participants to follow the development of each other's ideas in the same way if the workshops were conducted with 20 participants and breakout rooms. The facilitators would face similar challenges gauging the participants' understanding of and engagement in the exercises when they had to divide their attention across the different breakout rooms. However, such setups may be difficult for others to replicate, as they require more resources (time).

5. Discussion

Dunne and Raby (2013) argued that a designer must act speculatively when attempting to open a dialogue about how the world can be. The presentation of speculative design by Dunne and Raby (2013) is somewhat abstract and does not support the designer with concrete ways to explore. With the intention to support engagement, action, critical reflection, and visualisation, a more inquiry-based approach was sought, one that would support the phases of action and reflection (cf. Section 1.3). The initial investigations in this research project, and prior to the workshops showed a clear need for framing speculative design. In studying other practitioners' approaches, the format of Nadia Piet (2019) was found to be useful, as it had a hands-on descriptive level. However, even here, concepts were not described in detail, and some aspects were found too abstract for this context, with the double purpose of learning about a subject (here AR) and the participants' own learning (here K1–12 students) (cf. Section 1.). Storyboards were found to support the two modes: thinking (future) actions and reflecting on them in collaboration. Through the use of design tools, the speculation became much more concrete, had more detail, outlined the context of use, and revealed new perspectives or what might be missing in the implementation of the idea. A speculative design workshop combined with the use of design tools allowed the researcher to frame the speculation in such a way that knowledge and learning from the exploratory design approach were gained.

The analysis of the data shows that the participants were scaffolded in the inquiry process through exercises and facilitation. In the workshop, the participants became engaged in a process of inquiry and speculative design became an exploratory design approach. In the workshops, some participants (K1–12 students) engaged in this inquiry positively, while others were more reluctant. This is for example observed in participant B's experience (Table 1). This participant was critical of technology in education in general, and knew little about the chosen topic (AR). There is no doubt that this student felt frustrated and not aligned during the process; however, this person still went through an inquiry, and the critical thinking and inquiry processes were present, nevertheless.

Interestingly, that same student also commented positively that the workshop had a clear narrative and structure. In addition to being careful about which topic is chosen (here AR), speculative design might be too different or too abstract a concept to participate in.

Thus, the research found that the speculative design approach challenges the common understanding of design (cf. Section 1.1), and therefore using this approach can place the participants in a position where they experience a conflict between the different ways of viewing/conducting design. A participant said that when reflecting on the process, "...I put a lot into, maybe just doing something that can be realised (...) and maybe forgot a little about the speculative part...". When using speculative design as a method of inquiry with structured scaffolding, there is a risk of losing the potential of "going wild" and taking speculation to the extreme. However, applying inquiry to speculative design scaffolds a process in which participants can follow and engage.

6. Conclusion

The paper explored three interrelated research questions: What are the implications of conducting an online speculative design workshop? How can speculative design be used as a method of inquiry? What are the potentials and challenges of the tools and exercises used?

Conducting a speculative design workshop in an online format requires explicit scaffolding through a progressional programme with exercises and structured facilitation. This online setup enables the facilitator, when conducting workshops with a limited number of participants, to engage and involve the participants in a more direct manner. As speculative design is not a method of inquiry in itself, there is a need for exercises, scaffolding, and reflections that enable the inquiry process. In this project, design tools were used to expand speculative design into a method of inquiry. The main challenges of the tools and exercises are whether they can work with the complexity of the speculative design approach and the chosen topic in such a way that the participants are able to engage in inquiry and speculate on a preferable future. The found potentials include design tools, such as storyboards, which offer a way of engaging in inquiry in a way that lends materiality to otherwise abstract ideas and scaffolds the speculative design process in which the participants can engage.

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