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Exploring Simulated Provocations

Supporting Pre-service Teachers' Reflection on Classroom Management

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Abstract. The purpose of our research project is to explore the design of game-like simulations that allow pre-service teachers to explore and experiment with problematic classroom situations to develop proficiency in classroom management. The research problem for this paper is how to design a plausible, valuable to learn, and interesting game-like simulation that also is usable and opens up for reflection on and understanding of the scenarios in the simulation. We used 'research through design' and combined interaction design and game design to develop the SimProv simulation. 21 pre-service teachers were invited to evaluate it in a play session with constructive interaction and questionnaires. SimProv consists of text-based scenarios where pre-service teachers can take actions corresponding to classic leadership styles. The results show that it provides a plausible, valuable, exploratory, playful, but not always interesting experience for pre-service teachers. The participants did engage in reflective discussions about the choices they made.

Keywords. Serious Games and 3D virtual worlds for learning, Technology enhanced learning, Design, Simulation, Classroom management

1 Introduction

There is a lack of authentic learning opportunities for pre-service teachers where they can experience the provocations and conflicts that will be a part of their future professional life. Provoking such situations for practice purposes with actual students would be ethically problematic, and not allow for adequate reflection during the situation.

Lectures, seminars and books do not prepare pre-service teachers enough for the reality they are about to face when they start working. The forthcoming reality-chock, that as many as one out of five realize, gives them no other choice then leaving the profession within then first three years of service. One major reason is a lack of tools for managing students troublesome behavior and managing critical situations that may occur in the classroom. Their response to classroom conflicts might therefore be pun-

ishment even though it is not effective, which they actually have learned in their teacher education [1-3].

The purpose of our research project is to complement existing approaches to learning classroom management. We aim to explore the design of game-like simulations that allow pre-service teachers to explore and experiment with problematic classroom situations to develop a self-reflective understanding of such situations. An understanding like that is critical for developing proficiency in classroom management.

2 Theory

A benefit of computer-based simulations is the possibility to support learning by creating variation in situations that would otherwise be difficult to vary in a natural context [4]. A premise of our simulation is to allow pre-service teachers to experiment with different actions in order to explore the variation and learn to discern the aspects of the classroom situation that are critical to manage it. What we will vary are the events in the classrooms and the feedback that pre-service teachers get on their choice of strategy.

Edman Stålbrandt [5] has conducted a significant study of simulations for learning classroom management and supporting reflection on such issues. Her simulations were linear animations with sound, text and images. After engaging with the simulation her participants took part of a seminar, scaffolded by questions for discussion and reflection. Her results indicate that the sound in the simulation carries emotional content while the text carries the facts. The role of the graphics was less obvious in her results. She also observes that a scenario has to have enough complexity, and be a genuine dilemma in order to work. She furthermore concluded that theoretical reflection was difficult, even though she provided questions for discussion as scaffolding to support reflection. This points toward a need for a mentor or a teacher that can facilitate the theoretical reflection. Edman Stålbrandt also notes that a simulation needs to be embedded in a didactic structure with clear connections to relevant learning objectives. We follow Edman Stålbrandt's results, by situating our simulation in a course structure, and paying attention to what happens before the play session and afterwards. We also expand on her work by developing an interactive game-like simulation where users can make choices and observe outcomes of them.

3 Research Problem

The research problem focused on in this paper is how to design a plausible, valuable to learn and interesting game-like simulation that also is usable and opens up for reflection on and understanding of the scenarios in the simulation.

4 Method

The project spans two parts: the design work and the evaluation of the resulting proposal. Methods for these both parts are covered below.

4.1 Design Method

The classroom simulation was developed in a process that combined interaction and game design practice in a 'research through design' process [6]. Theories, methods as well as empirical evidence from research on education have informed the interaction design and game design through a co-design approach. Fundamental design issues have been explored in a series of workshops with five participants with knowledge in teachers' education, classroom management, interactive learning environments, cognitive science, interaction design and game design. The scenarios that form the basis for the design have been developed in tight cooperation between a game design researcher, and a classroom researcher (also is a teacher and teacher educator) whom has conducted extensive field studies in Swedish classrooms. The field studies form the foundation for the scenarios in the simulation. Design artifacts produced during the process have included written scenarios, sketches, and examples of similar systems, as well as demos of possible future directions (e.g. head mounted virtual reality).

4.2 Evaluation Method

21 pre-service teachers participated in the evaluation of the simulation. 15 of them were studying to get the license as vocational teachers, and 6 of them studied to become special educational needs teachers. The vocational teachers already had experience from serving as teachers, and took part of a study program that would complement their earlier education and earn them a teacher's license. The participants collaborated in pairs or triads during the play session, which took between 1 and 2 hours depending on the discussions. Videos were recorded of the pre-service vocational teachers play sessions if they agreed to that. In-game actions and conversation in five pairs and one triad were recorded. The pre-service teachers were also invited to watch a replay of the session.

The study was conducted in collaboration with a course on social relations, leadership, conflict management and professional ethics. The play session itself was a mandatory exercise in the course, but participation in the study was voluntary.

The participants were welcomed and informed about the structure and goal of the exercise before sitting down in pairs or triads to play the game-like simulation. They played in front of a computer and explored the story together. It was necessary for them to discuss the events in the simulation and decide mutually which actions they wanted to take. This set up facilitated a constructive interaction where they shared ideas and experiences about appropriate leadership in the classroom. Between each scenario event, the participants were asked to answer three questions concerning the authenticity of the events: do you believe the event can happen in school (is plausa-

ble); do you believe the event would be valuable to be able to handle; and do you believe the event is described in an interesting manner?

After they had played through the entire scenario they were asked to individually fill out a Post-Study System Usability Questionnaire (PSSUQ, version 3) [7-8]. The three questions for each event provide an assessment of the content, while the PSSUQ is concerned with the overall usability of the simulation. Questions 7, 8, and 9 in the Information Quality category of PSSUQ were in the end excluded because 16, 5, and 9 users respectively thought the questions were not applicable to the current system. It is in PSSUQ not uncommon that the Information Quality questions are judged more harshly than the other questions and items can to a limited extent be removed if they are not applicable to the system [8].

In-game actions and conversation in five pairs and one triad of pre-service vocational teachers were video recorded. The transcribed recordings made it possible to study their constructive interaction (CI) and how they understood and reflected around the scenarios in our simulation. This is a method that Miyake [9] describes as useful to understand iterative processes of understanding.

5 Results

There are two kinds of results from our study: the resulting proposal from the design process, and the results of the evaluation of our proposed design.

5.1 Design Results

The aim of the game-like simulation, SimProv, is for pre-service teachers to learn classroom management through play and reflective discussions of experiences with their peers. The simulation consists of text-based scenarios made up of a series of events were the pre-service teachers can take actions corresponding to classic leadership styles. The scenarios depict variations of problematic situations that occur in classrooms. It is possible to redo previously made choices in order to encourage exploration of alternative approaches.

Using text as a medium for communication has a long tradition in computer game development and the first truly social Internet games where people could meet in groups and talk to each other were entirely text-based. This tradition stretches back to the 70's when the first Multi-User Dungeon (MUD) was made [10-11].

Pre-service teachers in Sweden are according to [12] less knowledgeable and have a less positive to technology than the general population in their own age range. Text was therefore seen as a suitable medium to use as it can be easily displayed in a web browser. This is beneficial from a social accessibility perspective, since most people in Sweden today use the web on a daily basis, even if they do not necessarily play computer games. Using text allows the SimProv simulation to be distributed easily to people that wants to use it without requiring large downloads or installations. From a development perspective it requires less time commitment to write text scenarios than developing full-scale 3D computer game scenarios. This allows scenarios to be built and tested without requiring a large time investments by the development team.

Text scenarios do, however, come with drawbacks. Text does not necessarily capture the constant changes that happen dynamically in a classroom as a result of the interaction between students and teachers. The text is also unable to provide visual cues that more closely correspond to the behavior that can be observed directly in the classroom. The reader is instead both invited, and required, to imagine how the textual descriptions would play out in reality.

The multi-modal communicative aspects of student behavior are currently not known, so building computer-based animated avatars could lead multi-modal cues in the scenarios that are not naturally present in a physical classroom. Identifying such multi-modal cues in classrooms is a current on-going work. It is therefor, for the time being, more appropriate to invite players to instead imagine those aspects based on their experiences from the classroom.

Fig. 1. Screenshot from the first hypertext version of SimProv

The current version of SimProv is accordingly a hypertext scenario and event-focused text-based simulation of conflict and disturbances that occur in classroom environments. Figure 1 is a screenshot from the first hypertext version of SimProv.

It currently contains two scenarios; the first scenario consists of six interlinked events that take place in the morning at the start of a class, and the second scenario consists of seven events that take place during a lesson when the class is just about to change from one task to another. Each event is presented with an introduction text that describes what is currently happening in the classroom together with four different choices that the pre-service teachers can choose between. These four choices correspond to the classical manager styles authoritative, authoritarian, democratic, and laissez-faire styles [13]. When one of these are selected the pre-service teachers are taken to a new screen that shows the progression of the event together with 1-4 new choices that are variations of the previously selected teaching style. After a choice is selected the pre-service teachers playing the simulation are taken to the resolution of that particular event, and they can continue in the scenario with the event that follows.

The idea behind the simulation is that it is explored rather than played and it is therefore possible to not only move forward through the events, but also step back and redo earlier choices to explore alternative ways of resolving the events.

The scenarios are not intended to be normative, so there are no scores for the different choices. The classroom is seen an environment that is complex and dynamic. It has a unique context depending on the participants and their histories, and situations can unfold and change rapidly. It was therefore more natural to make descriptive scenarios as authentic as possible so pre-service teachers can make choices that feels suitable for them, reflect on those choices, and use them as discussion points when talking about leadership with other pre-service teachers.

5.2 Evaluation Results

The evaluation of our proposed design has two quantitative parts with questionnaires, and one qualitative component where we have analyzed the constructive interaction in play sessions with the pairs and triads of pre-service teachers. The three parts are described below.

Is the Event Authentic? Figure 2, shows the results of the three questions asked after each event regarding its authenticity: Do you believe the event can happen in school (Exists); do you believe the event would be valuable to be able to handle (Valuable); and do you believe the event is described in an interesting manner (Interesting)?

The participants rated that they believed that the described events could happen in school, with the exception of event 5, and to a lesser extent event 4. Event 5 unfortunately contained a bug that linked about half of the participants directly to event 6, which caused a lot of participants to give blank answers. Most participants believed it would be valuable to be able to handle the situations described in the events well. Participants that did not agree had different and varied reasons for objecting. For example that they believed they could handle it already, or that there were worse situa-

tions to worry about. The last question asked was whether they thought that the events were written in an interesting way, and the responses here were more critical with at least 20 percent of the participants answering no to this question for every event. The overall impression is that the participants see the scenario events as authentic, but that the storytelling needs improvements to make the events more interesting.

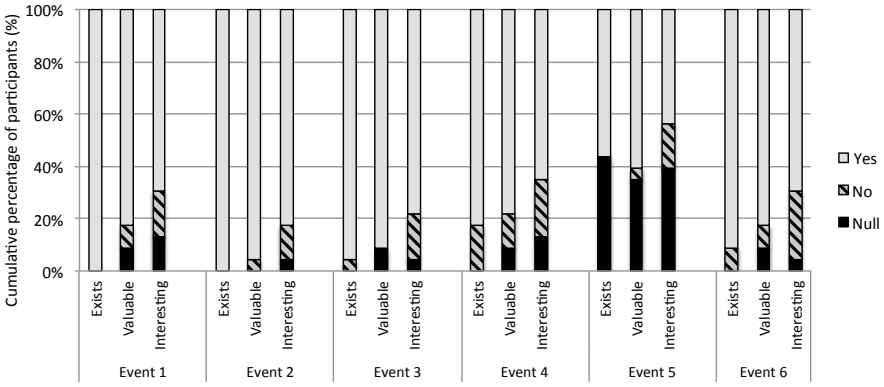

Fig. 2. All participants' self-reported perception of the authenticity of the events

Is it Usable? The PSSUQ results on the dimensions of System Quality, Information Quality, Interface Quality, and Overall Quality are presented in Figure 3. Mean values from Lewis' database [7] of other systems evaluated with the PSSUQ are included for the readers' benefit as a general indication of the level of usability of the current design.

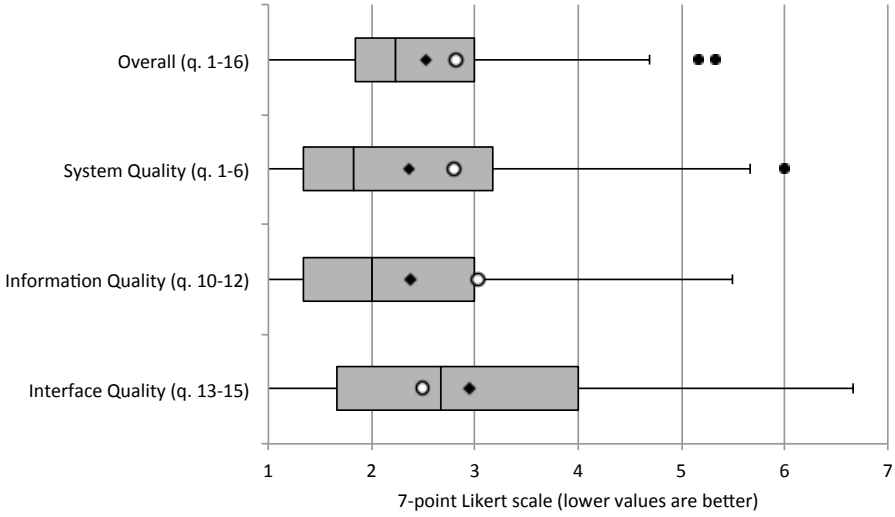

Fig. 3. All participant's responses to the Post-Study Usability Questionnaire

The median line in the box plots separate the 2nd and 3rd quartiles while the black diamonds show the mean values. The mean values from Lewis' database are shown with the white circles. Each of the 16 items on the questionnaire is answered on a 7 point Likert-scale. A value of 1 means that the participant agrees strongly with the statement, and a value of 7 means that he or she strongly disagrees. Lower values are better than higher values. The particular questions that make up a category are given in the parenthesis.

The Overall Quality median for all items was 2.23. The System Quality median was 1.83. The Information Quality median value was 2.00. The Interface Quality category median value was 2.67. The mean values from Lewis' database was for the Overall Quality 2.82 compared to our system's 2.53, System Quality was 2.80 compared to our system's 2.37, Information Quality was 3.02 compared to our system's 2.38, Interface Quality was 2.49 compared to our system's 2.95. SimProv scores accordingly as good or better than the average system on all dimensions with the exception of Interface Quality.

Does it Open Up for Reflection and Understanding? The Constructive Interaction of the pre-service vocational teachers showed that the simulation worked well in stimulating reflective discussions on how to understand the classroom situations, on options, and on reactions from the pre-service teachers. The example below shows a couple of pre-service vocational teachers discussing how to start a lesson, where two students, Philip and Oliver, is missing:

Excerpt 1.

712	1: I don't know what do you think?
742	2: I don't know anyone?
746	1: which one suite the best, no
753	2: Hmm
808	2: Could be
823	2: Perhaps this is the best one (points at option number 3)
824	1: Yes, I think so to, because one those after all reflect about, I am pretty sure, or
832	2: But, the fact is that it is Tuesday morning, where they out of school during the Monday and no on Tuesday?
837	1: Hmm
838	2: Or is it every Tuesday?
840	1: Hmm
844	2: It, but eh, but I do not know, I perhaps mostly get stuck on the fact that
858	1: It depends on how one interprets it
901	2: Yes, but eh, but even so probably would, I think I would choose that one (points at the screen)
918	2: Because just being silent, accordingly
920	2: I never ever just sit and wait

The excerpt above, two minutes out of a session that lasted 53.16 minutes, shows how two vocational teachers move between understanding and non-understanding. The excerpt starts with an interaction where they try to find out how the other one understands the scenario. In this part both of them express their non-understanding. That shifts in line 823 where one of them expresses how he thinks, based on his reflection on the scenario. In the following lines the pair of them jointly articulate their shared understanding. This can be described as *identification*. This goes on to line 844 where one of them raises a question, based on his non-understanding. The other one states then that it depends on how one interprets it. This can be described as *objection*. Then in line 901 there is a new shift, towards understanding, where one of them express how he would choose. The other one follows up the argument by saying that sitting quiet is not an option. This could be described as a *suggestion*.

During the sessions some of the participants discussed the choices and what they actually would do in a situation as the one described. The following excerpt shows such a discussion with a pair of vocational teachers. They are discussing a situation where a student during the teacher's instructions for lesson raises his hand and asks if they cannot do something fun during the lesson.

Excerpt 2.

1145	2: What shall, I just point at an option that I think we could do and then we can have a discussion (points at an option on the screen)
1212	1: Yes
1215	1: Yes, it depends, sure I can change my behavior depending on the students way to behave, depending on the students situation, but if I mean that it is important to clear this thing out, then it would be, then this would be the right thing to do (point as one option)
1225	2: I would be irritated at the him; asking what we should do even before I had had a chance to explain that
1230	1: Hmm
1231	2: Yeah, then I should be irritated on him
1235	1: Yes… hell, the you must be irritated every day
1238	2: Yes I am (laughs)
1239	1: Because I get such a, every day I actually get such, if I have 20 student then 19 of them would as such a thing
1247	2: Okay, yes, no, but, hey, one can be irritate in different ways
1252	1: Yes
1253	2: One can be irritated without being aggressive so to say
1255	1: Yes of course, eh, ok (points at the first opinion on the screen)
1303	2: Or that one (points at the second option) when get astonished about such as question (laughs)
1310	1: Yes, yes, one can actually chose that option, but if one has written, in this situation we actually had written the content and mode on the white board, then why should they ask
1322	2: Hmm

1325 1: Then one becomes a little bit like that (points once again at the second option on the screen) I would have done hat, I think
1330 2: Hmm
1332 1: To react
1334 2: You don't react, you just continue
1337 1: Yes, eh
1338 2: Okay, yeah that's right
1340 1: Eh, I would stand beside my list, and if they, if they have such a question I would point at the list, in principle
1346 2: Me to, but I would be irritated when I stand by that point (laughs)
1351 1: Okay, (laughs), yeah but, yes but we perhaps can add that (points at option two)
1404 1: Let me know if you disagree, no, no (points at option three)
1411 3: It's okay
1424 1: If I didn't react then I wouldn't loose my track
1425 2: No
1433 2: I like that idea about a stop sign
1434 1: Yes
1441 1: Yes, but I won't choose anyone of these options
1442 2: No
1446 1: But eh, it of course depends on the situation and in what way the students ask their question
1452 2: Hmm
1457 1: Shall we move backwards and try another one.

This excerpt with three pre-service vocational teachers shows three aspects (a) how pre-service teachers moved back and forward between options in the scenario, (b) how they actually would do in such a situation, and (c) a degree of playfulness. The excerpt describes parts of a discussion about different ways to handle the first 5-7 minutes of a lesson. The excerpt also shows different strategies for the pre-service teachers. In this excerpt two of the participants shared and argued about ideas while the third one mostly listens.

This excerpt shows how some of the pre-service teachers experimented, moving back and forward between the options in the scenario events. The three pre-service teachers tried all four options, before choosing which one they actual would pick. While figuring that out, they read and discussed the consequences that followed on each of the four options. These, more or less, authentic reactions forced them to describe, argue and put forward their thoughts on the scenario and on proper ways to act as manager of the classroom.

The excerpt also contains information about how pre-service teachers choose between options in the scenario and what they think they actually would do in such a situation in real life. The discussion in the excerpt shows different standpoints about provocations and what a provocative behavior could be. In line 1235 where one of the vocational teachers questions the others' idea about being irritated and the conse-

quences that would follow of being an irritated teacher. With questions like that this triad also discussed ways of conduct as a manager of a classroom.

Finally, the excerpt also contains a degree of playfulness. In line 1346 one of the pre-service teachers argues for a way of managing the situation. The other pre-service teachers find that argument reasonable in one way, but they would like to add the right to be irritated. This argument, or way to behave, was actually presented by that pre-service teacher. This represents another level of social playfulness, where participants challenged each other's approaches to managing the classroom situation.

6 Discussion

The purpose of our research project is to explore the design of game-like simulations that allow pre-service teachers to explore and experiment with problematic classroom situations to develop proficiency in classroom management. The research problem focused on in this paper is how to design a plausible, valuable to learn, and interesting game-like simulation that also is usable and opens up for reflection on and understanding of the scenarios in the simulation.

We designed SimProv with the aim of supporting pre-service teachers' learning of classroom management through play and through reflective discussions of experiences with their peers. The simulation consists of hypertext scenarios made up of a series of events where the pre-service teachers can take actions corresponding to classic leadership styles. The scenarios depict variations of problematic situations that occur in classrooms. It is possible to redo previously made choices in order to encourage exploration of alternative approaches.

In the evaluation, the majority of the participants thought that the scenario events could happen, and that they were valuable to learn to manage. The majority found the descriptions interesting, but improvements can be made to the event descriptions. The simulation was also on the whole considered usable. In the constructive interaction, the participants moved between articulating understanding and non-understanding. They also experimented by testing different choices in the scenario events. The interaction indicated a degree of playfulness in discussion around choices made in the simulation and the possible choices that could be made in an actual classroom and their consequences.

Our approach follows Edman Stålbrandt's results [5], by situating our simulation in a course structure, and paying attention to what happens before the play session and afterwards. In contrast to the work by Edman Stålbrandt, SimProv offers the pre-service teachers choices with observable outcomes and opportunities for play. The constructive interaction between the peers also shows a level of reflection on their choices. These results are indeed promising, but further thought needs to go into if and how more scaffolding for reflection is needed after the play session, and how that relates to concepts introduced before the session. Scaffolding for reflection could include questions for discussion or support by a mentor.

Future work in the project will focus on improving the scenarios, making sure they are experiences as existing events that are interesting and valuable to learn to manage.

It would do well to focus time in future iterations on improving the quality of the writing of the events. As noted by Edman Stålbrandt it is also important to make sure that the simulation has sufficient complexity and true dilemmas to be interesting [5]. Issues left to investigate include the relative merits of adding graphics, sound and dynamic behavior to the currently hypertext simulation. It would be interesting to see if that would lead to improvements in Interface Quality.

To conclude, the SimProv game-like simulation for classroom management provides an exploratory experience. It is a viable candidate for complementing more traditional education in classroom management, since the pre-service teachers engaged each other in reflective discussions about the choices they made and consequences. Reflection is necessary for successful experiential learning, which SimProv successfully helps to facilitate.

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