Virtual internships in teacher education

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Introduction

This report presents a study on virtual internships executed at the Masters programme Science Education & Communication (SEC) of the Eindhoven School of Education (ESOE, Eindhoven University of Technology). This Masters programme explicitly addresses the tension and stress experienced by student teachers during their work in class. To decrease this stress, it is important that student teachers enjoy their work as a teacher, and that they are convinced about the effect of their actions on behaviour and learning results of students. By means of a virtual internship This study investigated whether a virtual internship helps in decreasing the stress experienced by student teachers. The result of this study are affordances and hindrances of virtual internships. This in turn leads to points of attention that are valuable for teacher trainers with respect to virtual internships for student teachers.

The theoretical framework below operationalizes the most important concepts and variables of this report. Subsequently we discuss aims and research questions of this study. The methods section describes participants, instruments, research design and analyses. The design of two sessions with the virtual internship are explained, followed by a discussion of results concerning work engagement, professional efficacy and professional anxiety, resulting in affordances and hindrances. The discussion and conclusion section presents limitations and generalizations of the study, as well as suggestions for future research.

Theoretical framework

Professional anxiety
Teachers often experience their work as stressful because of amongst others unmotivated students, time pressure, workload, changes in environment and colleagues, administration, and classmanagement. This stress is expressed by feelings of fear and anxiety (Alontaga & Durban, 2013; Kyriacou, 2001). Because this stress is related to professional actions of teachers, we speak of *professional anxiety*. Student teachers also experience this type of anxiety during their apprenticeships, although they experience these apprenticeships as the most important learning experience of the teacher training programme (MacDonald, 1993).

Professional Efficacy
Among teachers a strong relation appears to exist between professional anxiety and *professional efficacy*. Professional efficacy is defined as the extent to which teachers believe that they can influence behaviour and results of students (Friedman, 2003). In case of high levels of professional efficacy, teachers experience less stress (Friedman, 2003). Therefore it is important to increase the professional efficacy of student teachers. MacDonald (1993) suggests that an increase in experience in practice reduces the stress and anxiety among student teachers.

Work engagement
In addition to professional efficacy, *work engagement* also appears to be related to professional anxiety. Schaufeli, Salanova, González-Roma and Bakker (2001) perceive work engagement as the counterpart of burn-out. Where engagement is characterised by being involved, energy and efficacy (Maslach & Leiter, 1997), a burn-out is characterised by

cynicism, fatigue, and lack of professional efficacy. This suggests that high levels of work engagement can decrease feelings of stress, and by result fear and anxiety among student teachers.

Classroom simulation

One possibly fruitful way to let student teachers experience practice and by result reduce stress, is in simulated learning environments, also known as *classroom simulation*. After all, simulations offer a safe learning environment that enables learners to experiment before they enter educational practice. Furthermore, simulations are becoming more attractive thanks to information and communication technologies (Brown, 1999). Previous research shows that self-efficacy, teaching skills and the extent to which student teachers ascribe their classroom achievements to themselves increase as a result of using simulated learning environments (Knezek, Christensen, Tyler-Wood, Fisser & Gibson, 2012).

Virtual internship

Virtual internships are an example of classroom simulations. Virtual internships are designed to enable learners to perform tasks and to behave as a professional. This performance and behaviour is subsequently evaluated with peers and mentors (Shaffer, 2007). Simulations in teacher training require a close resemblance to reality of the classroom, to make student teachers feel engaged and involved (Brown, 1999). Virtual internships integrate skills, knowledge and values, which allow learners to think and behave as professionals (Shaffer, 2006).

Aims of this study

This study is an effort by means of virtual internships to increase professional efficacy among student teachers, with the purpose to decrease professional anxiety. The research questions are:

- What is the effect of a virtual internship on student teachers' work engagement?
- What is the effect of a virtual internship on student teachers' professional efficacy?
- What is the effect of a virtual internship on student teachers' professional anxiety?
- What are hindrances of a virtual internship perceived by student teachers?
- What are affordances of a virtual internship perceived by student teachers?

Method

Participants

The participants of the virtual internship were student teachers of the Master programme Science Education & Communication (SEC, Eindhoven School of Education, Eindhoven University of Technology). This programme focuses on preparing and supporting student teachers within the STEM domain (Science, Technology, Engineering and Mathematics). The virtual internship ran alongside the courses Pedagogical research 2 (n=28) in Spring 2016, and Pedagogical research 1 (n=16) in Fall 2016. During the second session (Pedagogical research 1) student teachers with teaching experience did not participate in the virtual internship (n=7), because the first session (Pedagogical research 2) showed that for those

students the internship insufficiently resembled reality. These student teachers worked on similar exercises, focused on their own teaching practice. Before and after both sessions questionnaires were used to measure student perceptions of the internship. After the first session a focus group (n=5) was held, and after the second session semi structured interviews were held (n=6).

Instruments

Questionnaires

The pre- and posttest questionnaires consisted of the following instruments:

- *Work engagement*: UWES (Seppälä, Mauno, Feldt, Hakanen, Kinnunen, Tolvanen, & Schaufeli, 2008; translated into Dutch by Schaufeli & Bakker, 2003; 9 items, 5 point Likert never-always. In the second session only student teachers with teaching experience filled in this questionnaire.
- *Professional efficacy*: classroom instruction efficacy scale (Friedman & Kass, 2002; translated into Dutch; 19 items, 5 point Likert never-always)
- *Professional anxiety*: Teaching Anxiety Scale (Parsons, 1973; translated into Dutch; 25 items, 5 point Likert never-always)
- *System usability*: System Usability Scale (Brooke, 1996; translated into Dutch by Sauro, 2012; 10 items, 5 point Likert never-always)
- *System satisfaction, measured on three levels*: learner community satisfaction (Wang, 2003; translated into Dutch, 4 items, 5 point Likert never-always), content satisfaction (Wang, 2003; translated into Dutch, 4 items, 5 point Likert never-always) and task satisfaction (4 items, 5 point Likert never-always)
- *System usefulness*: perceived usefulness questionnaire (Davis, 1993; translated into Dutch, 6 items, 5 point Likert never-always)
- *Open questions* about affordances, hindrances and possible improvements of the virtual internship

Focusgroup and interviews

Eight leading questions that deepened the System Usability Scale (Brooke, 1996), learner community satisfaction (Wang, 2003), content satisfaction (Wang, 2003) and perceived usefulness (Davis, 1993) questionnaires. For instance: 'What do you think of the virtual internship in relation to collaboration with fellow students?' and 'Do you think that the virtual internship supports you teaching skills? And how?'

Research design and analyses

The study consisted of two sessions of a virtual internship. Both before and after the two sessions a questionnaire was filled in by participants. Furthermore, after the first session a focus group was held, and after the second session interviews were held.

During the first session for all student teachers the average scores were computed for the scales work engagement, professional efficacy and teacher anxiety, for both the pre-test and

the posttest. By means of a paired samples t-test the mean scores of the pretest were compared with the mean scores of the posttest. This was done for the second session as well. After the first and second session the System Usability Scale, learner community satisfaction, content satisfaction, task satisfaction and perceived usefulness were measured. By means of a independent samples t-test the groups from session 1 and 2 were compared.

Analyses of the focus group results, the interviews, and open questions of the posttest were categorised into positive and negative aspects for each main theme. The main themes followed the eight principal questions in the focusgroup interviews.

Design virtual internship session 1
Webapplication

The first session of the virtual internship ran as a webapplication ('Professional practice simulator'). This application was built around simulated e-mail messages, a notebook and a chat function (see Figure 1).
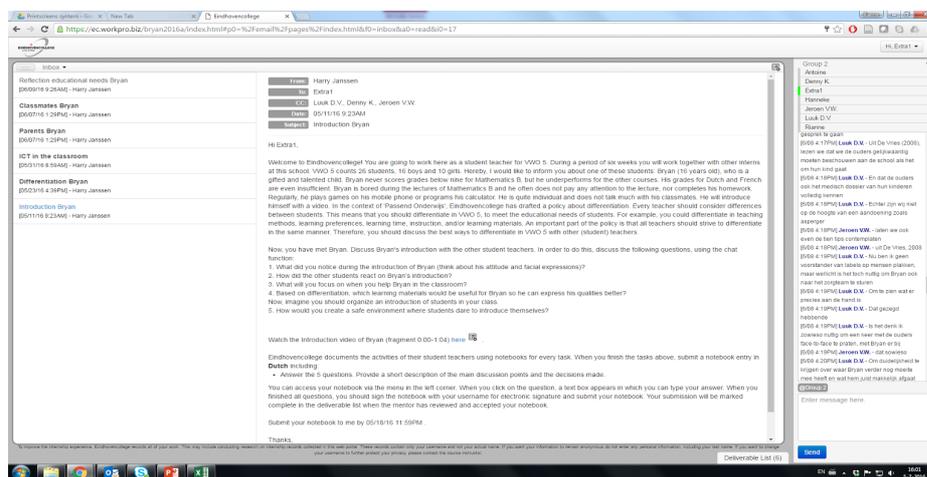

Figure 1: E-mail inbox and chatscreen in the webapplication of the virtual internship for Pedagogical research 2

The e-mail messages contained a simulated correspondence and assignments that invited to supervise and support a fictitious special needs student. Most e-mail messages referred to additional sources. These sources could be opened from the e-mail messages or the menu, into a new screen of the application. Furthermore, the student teachers could use the menu to navigate into their notebook, where assignments could be made. The notebook then appeared in a new window (see Figure 2).
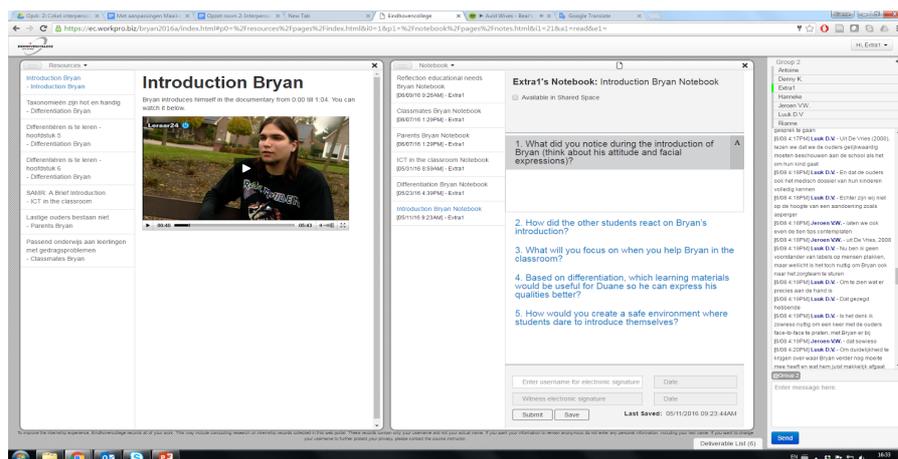
Figure 2: Introductionvideo, notebook and chatscreen in the webapplication of the virtual internship for Pedagogical research 2

In the 'shared space' student teachers could look into the notebooks of team members. The lower right corner of the screen showed a list with the status of all assignments ('deliverable list'). This provided participants with information about submission and reviewing of their assignments. The virtual internship's language was English.

Activities in the virtual internship

All activities during the virtual internship were an integrated part of the course Pedagogical research 2. During this course student teachers played to be apprentices at the fictitious 'Eindhovencollege'. Eindhovencollege had as part of 'No Child left behind' defined regulations about differentiation. Student teachers had to explain how they would differentiate for special need students. At the start of the virtual internship student teachers could choose between two students: Duane, a student with autism, or Bryan, a gifted student. 'Harry Janssen', the fictitious principal sent e-mail messages to the participants. These messages contained background information, assignments with specific questions and references to additional sources such as videos, books, or articles. The e-mail messages introduced the special need student to the participants.

Alltogether participants received six assignments by e-mail. The participants had to discuss the information and assignments in groups of two to five in the chatscreen. After that they had to complete the assignment individually in their notebook and submit. A few days later they would receive feedback by e-mail. Assignments were graded with fail, pass or excellent. Furthermore textual feedback was sometimes provided. The feedback message was followed by a message with a new assignment.

Design virtual internship session 2

Canvas

The second session of the virtual internship ran in learning management system Canvas (Figure 3). This webapplication is the new LMS in use at Eindhoven University of Technology.

Figure 3: Screenshot of Canvas

Activities in the virtual internship

Learning materials accompanying Educational research 1 were provided both in Canvas and during class. This course emphasized interpersonal teacher-student behaviour. Participants worked in Canvas on the assignments A, B and C. Assignment A consisted of 9 smaller assignments and was different for both sections. Student teachers without teaching experience (section 'virtual internship') saw in Canvas videos of teachers in a class. Student teachers observed these videos and reflected on the interpersonal behaviour of these teachers guided by a number of questions. Their experiences were discussed in groups of 4 participants in the discussion forum. Subsequently student teachers individually submitted their answer in Canvas. Student teachers with teaching experience and a personal recording of a lesson (section 'students with teaching experience') received a similar set assignments, with the assignment to observe and reflect on their own recording. They did not participate in the discussion forum. To make the virtual internship more realistic, all assigments were performed in the context of 'Eindhovencollege'. 'Harry Janssen', the fictitious principal provided student teachers with assignments. Assignment B was the same for both sections. Student teachers had to write an integrated vision on learning, teaching, and education. For assignment C student teachers were asked to analyse a video of their own teaching guided by the theories central to the course.

Results

Work engagement, professional efficacy and professional anxiety

The aim of this study was to measure the effect of virtual internships on work engagement, professional efficacy and professional anxiety among student teachers. To this purpose, the mean scores of the scales work engagement, professional efficacy and professional anxiety of the pretest were compared with mean scores on these scales of the posttest. The analyses only included data of student teachers that participated in both pretest and posttest. The first session counted 27 participants, and the second session counted 16 participants for professional efficacy and professional anxiety, and 4 participants for work engagement. Tables 1 and 2 present the mean scores, standard deviation for the scales work engagement, professional efficacy and professional anxiety, for both pretest and posttest, as well as for session 1 and 2. To examine the results of all measurements, t- and p-values were included in the table, applying a 95%-reliability interval.

Table 1 Means and SD for scales, pre-test and posttest, session 1

	voormeting		*nameting*			
	M	*SD*	*M*	*SD*	*t(df)*	*p*
work engagement	*3.89*	*.41*	*3.84*	*.48*	*.99(26)*	*.33*
professional efficacy	*3.50*	*.30*	*3.51*	*.37*	*-.21(26)*	*.83*
professional anxiety	*2.29*	*.43*	*2.28*	*.48*	*.16(26)*	*.88*

Tabel 2 Means and SD for scales, pre-test and posttest, session 2

	voormeting		*nameting*			
	M	*SD*	*M*	*SD*	*t(df)*	*p*
work engagement (n=4)	*4.14*	*.17*	*4.14*	*.33*	*-.02(3)*	*.99*
professional efficacy (n=16)	*3.53*	*.30*	*3.62*	*.35*	*-1.29(15)*	*.22*
professional anxiety (n=16)	*2.47*	*.36*	*2.35*	*.35*	*2.46(15)*	*.03*

Table 1 shows no significant difference between pre- and posttest for all three scales. The first session of the virtual internship did not directly affect work engagement, professional efficacy and professional anxiety of the student teachers.

Table 2 shows that the second session participants score significantly lower on professional anxiety compared to the pretest. The scales work engagement and professional efficacy did not show a significant change between pretest and posttest. The virtual internship in Canvas did only affect the participants' professional anxiety.

Results of System Usability Scale, learner community satisfaction, content satisfaction, task satisfaction and perceived usefulness

To chart the participants' experiences with the virtual internship mean scores on the scales system usability, system satisfaction (learner community satisfaction, content satisfaction, task satisfaction) and perceived usefulness were compared for session 1 and 2 (see Table 3). To control for differences between both sessions the t- and p-values for all scales with a 95% reliabilityinterval were included as well.

Table 3 Mean scores and SD of the participants' experience with the virtual internship for session 1 and session 2

	eerste sessie (n=28)		*tweede sessie (n=16)*			
	M	*SD*	*M*	*SD*	*t(df)*	*p*
system usability (SUS-score) (n=16 2e sessie)	*62.23*	*14.25*	*64.69*	*13.35*	*-.56(42)*	*.58*
tevredenheid met het systeem	*3.03*	*.64*	*3.49*	*.49*	*-2.45(41)*	*.02*
learner community satisfaction	*3.03*	*.83*	*3.15*	*.77*	*-.48(41)*	*.64*
content satisfaction	*3.12*	*.82*	*3.73*	*.58*	*-2.58(41)*	*.01*
task satisfaction	*2.94*	*.86*	*3.58*	*.57*	*-2.61(41)*	*.01*
perceived usefulness	*2.73*	*.98*	*3.39*	*.62*	*-2.34(41)*	*.02*

Table 3 shows that participating student teachers in session two (in Canvas) scored siginificantly more positive on system satisfaction, content satisfaction, task satisfaction and perceived usefulness compared to participants in the first session (in Syntern). The scales system usability and learner community satisfaction did not show significant differences between the two sessions.

Results open questions posttest session 1 and session 2

During the posttest three evaluating questions were asked:

1. *What were benefits of the virtual internship?*
2. *What were negative aspects of the virtual internship?*
3. *How can the virtual internship be improved?*

Benefits virtual internship - session 1

Twent-four participants answered this question. Two of the. Did report to not see any benefits in the virtual internship. Thirteen participants mentioned the chat functionality as a benefit. Comments were made about discussions without physically meeting each other.

Furthermore, 2 participants mentioned as a benefit the option to browse through previous discussions. Six particpants perceived working with real life cases as a benefit, because it made the "learning materials authentic". Six participants saw advantage in the link with materials and content of the classes. Three participants saw the online learning environment itself as a benefit. The use of multiple windows and clear organisation of the environment were mentioned as well. Finally, 1 participant mentioned as a benefit getting acquainted with alternative learning activities.

Hindrances of virtual internship - session 1

Twenty-four participants answered this question. One participant did not report any disadvantages. Nine participants experienced the chat functionality as hindrance. Participants' comments concerned the chat functionality for collaboration, such as: "difficult for extensive sharing of experiences", or "difficult to find suitable moment for meetings". One student did not think the chat to be usable for a brainstorm.

Twenty-two participants were dissatisfied with the assignments. Nine participants reported the assignments as unclear and some questions as duplicates. Two participants mentioned that they did not like the assignments in English. One participant reported that the assignments were incomplete. One other thought that the case did not fit the content of the course Pedagogical research 2, and two participants mentioned a case as too limited, which resulted in superficial assignments. Four participants reported that the cases did not come to live as result of limited details and context. Finally, three participants reported the hindrance that sequences of assignments did not follow previously submitted answers.

Eight participants provided feedback about the learning environment. For instance, one respondent mentioned that the pdf-files were presented too small, two participants thought the chat window too small and one participant reported the learning environment as not user friendly. Four participants mentioned that the deadlines were incorrect.

Four participants thought that the assessment criteria were unclear and that they did not receive clear feedback. One participant said "I had no idea whether my approach would work".

Three times the literature in the virtual internship were mentioned. Two participants thought that too little time was available for the necessary reading. One participant reported the literature as tedious. One participant noted that "references appeared more important than the answers". Two participants gave feedback on the required time. One participant thought that the virtual internship required more time than regular assignments, and one other noted that is unrealistic to get more time to find a solution. This participant said "this is also not the case in practice".

Improvements virtual internship - session 1

Twenty participants provide points to improve the virtual internship, and two participants could not find improvements. Five participants would like a better connection between answers and subsequent questions. Another improvement would be to provide feedback not

as standard response. Five participants thought that the phrasing of questions could be improved. One participant adviced less obscure questions about emotions. Five participants would like more depth in the cases. They suggested to probide more background information, more extensive descriptions of situations, and more video material. One participantwould like the assignments to contain less text and more images.

Three participants advised a different organisation of the discussions. For instance, by allowing discussion outside the chat functionality. One participant would like to see good examples shared with the whole class. One other wanted the course content closer related to the students' needs. One participant wanted to see new assignments straight after submitting a completed assignment.

Two participants gave feedback on the authenticity of the virtual internship. One participant said: "I learn more by teaching than by writing text". One other mentioned that "the standard design for some parts did not help the feeling of authenticity*"*.

Affordances virtual internship - session 2

Fifteen participants answered this question. Eleven participants reported that they learned from watching fragments of other teachers' class, because it shows different approaches. One of these participants said that "discovering how teachers approach a class, end learning to recognize the different aspects of things to look out for is a positive thing". One other found the analyses of fragments easy accessible because of watching someone else instead of oneself. Two participants reported that the questions in the internship were easy to find, easy to answer, and forward from the system.

One participant mentioned that the virtual internship enabled practicing despite not having an apprenticeship, or not having videos of your own lessons. One participant reported to enjoy making the assignments from home at your own speed. Finally, two participant reported that to option to share results with others was good. One other enjoyed the discussion forum.

Hindrances virtual internship - session 2

Fifteen participants answered this question. Eleven participants reported difficulties with the discussion forum. This was reported to work clumbersome and did not function as a chat. "Chatting with group members. We had to refresh the page to see if they had answered". One other participant called the discussion forum lacking live. Two participants reported to feel little connection with the teachers from the fragment. One of them mentioned that this leads to objectivity, but alo to disinterest and decreasing intrinsic motivation.

One participant thought that the aspects of interpersonal teacher behaviour were easy to recognize in the video fragments, however it appeared difficult to report this information in a structured way. Finally, one participant reported that the assignments in the virtual internship consisted of much reading and listening.

Improvements virtual internship - session 2

Eight participants advised to improve the discussion forum. One of them suggested meeting times for the forum, and one other suggested that it would be better to see directly the answers of group members. One participant advised a deadline for opening the disucssion forum. One other mentioned that "it would be better to use fragments with clear situations, without exageration, but absolutely clear what the main intention of the fragment is". One participant wanted more straightforward questions with the video fragments. Finally, one participant mentioned the need for clear starting points for formulating and reporting the observations. One other wanted the possibility to ask teachers froms the fragments questions.

Focusgroep virtual internship session 1

In a focus group interview (n=5) the affordances, hindrances and improvements were discussed. The results of the focusgroup are presented here as advice and considerations for designing a virtual internship.

Advice and considerations virtual internship

- Offer options for discussion. When these discussions take place online, it is good to schedule timeslots.
- Use realistic cases.
- Provide a connection between the virtual internship and classes by means of blended learning.
- Offer assignments in the students' native language.
- Provide cases with extensive background information and position this within a authentic context.
- Make often use of video materials.
- Use clear evaluationcriteria, such as rubrics.
- Give personalised feedback, rather than standardized feedback.
- Provide sequential assignments, if possible with a decision tree.

Consideration when opting for a web application

Prefere:

- a system that allows video materials, sending e-mail messages, and discussion
- multiple windows
- integrated sources
- a browser savvy system

Interview virtual internship session 2

Participants' experiences on 10 aspects of virtual internship were charted with interviews (n=6): technical aspects, collaboration, content, context, coherence between assignments, teacher feedback, effect on teacher skills, additional curriculum value, integration in the course, and effect on professional anxiety. All six participants reported to be in general positive about the virtual internship.

Technical aspecs
Two participants reported that some video fragments had bad sound. One participant did not like the use of multiple documents such as a reader, assignment, and place to provide answers. One participant experienced problems with enrolling for the course on Canvas. Two participants mentioned that the discussion forum needed to be refreshed to see responses of group members. This hindered that online conversation.

Collaboration
Five participants did not see added value in the discussion forum. One of the mentioned that face-to-face discussions are more in-depth because of visual clues. Also this participant felt inhibited because the teacher also could read the discussion and the content would be evaluated and graded. Two participants mentioned the lack of a decent discussion because everyone posted messages at different moments.

Content
All participants were satisfied with the virtual internship's content. Five participants reported that the topics from the course were well represented in the assignments of the virtual internship. One participant would have liked fragments of classes that did not go well, because in practice she encountered difficult to handle groups. One participant said: "Many things were discussed. That was good. Also because the fragments were short."

Context
The participants mentioned that the context within the virtual college did not provide added value to them. Three participants did not realise they received assignments from a fictitious principal en the others read over this. One participant thought the context was childish. One participant thought the videofragments of the cases were a bit outdated.

Coherence between assignments
Four participants thought that the coherence between assignments was good. Two participants saw no coherence between the assignments. All participants found the assignments logical in relation to the course topics.

Feedback by the teacher
The participants were satisfied with the general feedback by the teacher. One participant mentioned that the evaluation criteria were vague. One other participant reported that some assignment parts were not evaluated and graded. One participant mentioned that the criteria were hard to find in Canvas.

Teaching skills

Five participant thought that the virtual internship added to developing their teaching skills. Two of them mentioned that it supported self-reflection and awareness of their behavior in class. Three participants reported that they liked to see how other teachers act in class. One participant thought that this would be less informative for students with teaching experience. One participant reported that the virtual internship did not contribute to her teaching skills.

Added value for the curriculum
All participants mentioned that the virtual internship mainly has added value for participants without apprenticeship or experience. One participant said: "For students without experience this has added value because they can try out safely. You develop experience without actual experience".

Inbedding in het vak
One participant experienced the assignments for the virtual internship as much work. He wanted to perform excellent and did not have enough time for that. One other participant thought eight assignments as too much for a virtual internship. One participant experienced unequal time investment for assignments. Three participants did not see problems with the required time investment.

effect on professional anxiety
Four participants experienced anxiety to start teaching. They mentioned that the virtual internship did not take away this anxiety, but that is comforted them in seeing other teachers behave in class. Two participants felt like teaching as a result of the virtual internship.

Discussion and conclusion
This study aimed at understanding affordances and hindrances, and the effectiveness of a virtual internship in teacher education. The research focused on five questions. First, the effect of a virtual internship on work engagement, professional efficacy and professional anxiety of participants was examined. Subsequently, affordances and hindrances of a virtual internship were charted.

The first research question concerned the expectation that participants work engagement would increase after using the virtual internship. The results did not confirm this effect. Both platforms used for the virtual internship did not cause significant effects on work engagement.

The second research question was: What is the effect of a virtual internship on participants' professional efficacy? The hypothesis that professional efficacy of student teachers would increase after using the virtual internship is not confirmed by this study. Participants did not report increased professional efficacy. This is not in line with previous research on classroom simulations (Knezek, Christensen, Tyler-Wood, Fisser & Gibson, 2012) that showed that simulated learning environments would positively effect professional efficacy.

The third research question hypothesized that the participants' professional anxiety would decrease after using the virtual internship. This hypothesis is confirmed by the research

results. Canvas as a platform lead to a significant decrease in professional anxiety. MacDonald's (1993) theory appears to be confirmed by these results. This theory is based on the assumption that experience in practice decreases anxiety among teachers. One possible explanation for the difference in effect between Canvas ans Syntern, is the extensive participants' teaching experience of students who used Syntern. This was not the case for participants who used Canvas. Furthermore, the scenario of the Syntern session consisted special needs students, which caused a more realistic image of teaching practice together with possibly more anxiety among teachers.

Finally the last two questions concerned affordances and hindrances of a virtual internship. The results show that participants experienced technical problems with Syntern. English appeared a barrier for students, en because of standardized sentences in English, the switch to Dutch appeared difficult. Furthermore, the lack of a decision tree did decrease the authentic experience of a virtual internship. Finally, the system did not allow for interim amendments to assignments, which sometimes caused confusion because deadlines could not be adjusted.

Based on the limitations that participants experienced a amended version was developed for the second session of the virtual internship. This version ran on Canvas. The switch to Canvas was perceived as an advantage, because it is used as LMS in other courses at Eindhoven University of Technology as well. Furthermore, Canvas was also used for other assignments in the course. Canvas' language is Dutch, and assignments can be changed over time. The results partially confirm the hypothesis that participants in the second session of the virtual internship were significantly more positive about system usability, system satisfaction, learner community satisfaction, content satisfaction, task satisfaction and perceived usefulness compared to the first session participants. Participants who used the second session of the virtual internship were more satisfied with the system (Canvas) compared to participants of the first session (Syntern). Furthermore, participants of the second session were significantly more satisfied with the content, task and perceived usefulness compared to participants in the first session. For system usability and learner community satisfaction no significant differences were found between the two sessions. Despite some technical hindrances, both online systems were experienced as user friendly. Participants reported no added value in the discussion forum on Canvas. The technological hindrance of needing to refresh pages to see responses, and the preference for face-to-face discussion were mentioned as main points. After session 1 the opinions about the chat functionality varied. Some participants enjoyed to option to read through previous conversations, while others prefered face-to-face meetings.

Virtual internships teacher education

Relatively little is known about classroom simulations, and especially virtual internships in teacher education. Although the results of session 1 contradict the elsewhere found result that simulated environments increase professional efficacy (Knezek e.a, 2012), current research provided additional understanding of affordances and hindrances of virtual internships.

Limitations

The first session of the virtual internship did not effect work engagement, professional efficacy and professional anxiety of participants. One possible explanation could be the design of the virtual internship. Participants experienced English, and the lack of a decision tree as a hindrance. During the second session it was not possible to measure work engagement because not all participants had teaching experience. Furthermore, session 1 caused amendments, and a different system. By result the results of both sessions can not easily be compared and interpreted. Finally, the small sample size might have influenced validity of the results.

Generalisability

To chart the effect of the virtual internship on work engagement, professional efficacy and professional anxiety of participants, this study was performed among students of the Masters programme Science Education & Communication. The limited setting of this study might influence generalisability. Furthermore, the gender division within this study was unequal. Possibly a larger sample, with equal gender division could cause different results. The design of the virtual internships was strongly context bound. A virtual internship with different content could possibly give different results. However, general design principles, such as using native language, the use of video materials and the use of a discussion forum, are applicable in other contexts as well. These design principles form a valuable contribution to other disciplines within the Technische Universiteit Eindhoven (TU/e). Virtual internships could well be used in other disciplines to provide practice experiences in a safe context (Shaffer, 2007). Furthermore, this kind of virtual internship could be used by TU/e to train its own teachers. Finally, to increase generalisability, a mixed-method design was applied. The qualitative methods were intended as deepening the results of the quantitative instruments.

Future research
Because this study was performed with a small sample it is advised to perform future research with a larger sample. Furthermore, in future research virtual internships could be improved based on the results of our study. For instance, it could be examined how a virtual internship with decision three relates to professional anxiety, work engagement and professional efficacy.

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