Virtual internships in blended environments to prepare preservice teachers for the professional teaching context

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This study investigated to what extent virtual internships in teacher education were able to reduce Preservice Teachers’ (PSTs) professional anxiety. Simultaneously, this study investigated how virtual internships in blended learning environments were evaluated by PSTs in terms of technological, social and educational affordances. PSTs followed virtual internships during two different Educational Pedagogy Master’s courses (27 and 16 participants) in a teacher education programme. A mixed methods design was employed, consisting of pre- and post-test questionnaires, a focus group interview and individual interviews. A significant decrease was found in PSTs’ professional anxiety after having followed Virtual Internship 2. PSTs reported they obtained a more realistic image of teaching and felt better prepared for teaching in practice. Furthermore, regarding technological affordances, system usability was considered between acceptable and good. Concerning social affordances, PSTs appreciated collaboration within the virtual internships. As an educational affordance, it appeared that learning from videos with authentic classroom events is a good preparation for the professional teaching context. According to the PSTs, the scenarios within virtual internships could be improved in terms of authenticity and personalisation by offering more details and background information. The results of this study imply that virtual internships can be useful assets for teacher education.

Abstract
This study investigated to what extent virtual internships in teacher education were able to reduce Preservice Teachers’ (PSTs) professional anxiety. Simultaneously, this study investigated how virtual internships in blended learning environments were evaluated by PSTs in terms of technological, social and educational affordances. PSTs followed virtual internships during two different Educational Pedagogy Master’s courses (27 and 16 participants) in a teacher education programme. A mixed methods design was employed, consisting of pre- and post-test questionnaires, a focus group interview and individual interviews. A significant decrease was found in PSTs’ professional anxiety after having followed Virtual Internship 2. PSTs reported they obtained a more realistic image of teaching and felt better prepared for teaching in practice. Furthermore, regarding technological affordances, system usability was considered between acceptable and good. Concerning social affordances, PSTs appreciated collaboration within the virtual internships. As an educational affordance, it appeared that learning from videos with authentic classroom events is a good preparation for the professional teaching context. According to the PSTs, the scenarios within virtual internships could be improved in terms of authenticity and personalisation by offering more details and background information. The results of this study imply that virtual internships can be useful assets for teacher education.

Introduction
During internships, PSTs are often confronted with feelings of stress and anxiety (Murray-Harvey et al., 2000). For example, classroom management issues are a major stress factor...
Virtual internships in blended environments to prepare preservice teachers (Pillen, Beijaard, & den Brok, 2013). Bridging the gap between lessons learned at the teacher education institute and entering the professional teaching practice appears to be difficult (Darling-Hammond, 2006).

This paper presents an exploratory study about the use of virtual internships in teacher education to familiarise PSTs with the teaching profession, and whether these can ease the transition from teacher training courses to the professional practice at internship schools. This research will investigate whether virtual internships can lower PSTs' professional anxiety and how PSTs evaluate this experience. The introduction operationalises the main concepts of our study.

PSTs' professional anxiety
Teachers often experience their work as stressful because of students’ lack of motivation, time and work pressure, continuous reforms, troublesome relationships with colleagues, increasing administrative activities and classroom management problems (Alontaga & Durban, 2013). We define stress related to teachers’ professional actions that manifests itself in feelings of fear and anxiety as professional anxiety. An important part of teachers’ professional anxiety concerns classroom management and interpersonal teacher behaviour (the ability to create positive teacher-student relations) (Pillen et al., 2013). Difficulty with classroom management is one of the main reasons for PSTs to leave educational practice (Evertson & Weinstein, 2006).

PSTs experience professional anxiety, in particular, during internships (Murray-Harvey et al., 2000). Often, PSTs perceive interruptions in their teaching practice, such as students’ chatter and absence of teaching materials, as stressful moments. Their most pressing stress factor is the dilemma of “wanting to care for students versus being expected to act tough” (Pillen et al., 2013). This stress relates to PSTs’ interpersonal behaviour because PSTs struggle with simultaneously taking charge of their class and building a good relationship with their students.

Practitioner Notes
What is already known
- Preservice teachers (PSTs) often experience the transition from theory at the teacher education institute to internships as stressful.
- PSTs’ anxiety can be reduced through successful internship experiences.
- Internship experiences might be smoothened via computer-based classroom simulations.

What this paper adds
- Findings indicate that virtual internships can decrease PSTs’ anxiety.
- This paper clarifies how virtual internships in blended learning environments are evaluated by PSTs in terms of technological, social and educational affordances.

Implications for practice and/or policy
- Virtual internships can reduce PSTs’ anxiety and improve preparation for educational practice.
- PSTs can learn from videos with authentic classroom events that help them develop a more realistic view of educational practice.
- Virtual internships appear suitable to offer a blended learning environment and enable PSTs to learn at a flexible pace and place.
- To design virtual internships, it is necessary to use online systems with sophisticated video, email, discussion functions and multiple screens.
On top of these, PSTs experience the prospect of assessment by supervising teachers as an extra source of stress (Morton, Vesco, Williams, & Awender, 1997). Evaluation by supervising teachers can be stressful because of inconsistencies in the evaluation process, different and/or unclear expectations concerning PSTs’ performances and a lack of constructive feedback (MacDonald, 1993).

**PSTs internships**

PSTs’ anxiety can be reduced through successful teaching experiences during their internships (Morton et al., 1997). Darling-Hammond (2006) argued that teacher education programmes should extend the duration of these internships. This is confirmed by Silvernail and Costello (1983), who reported that PSTs’ professional anxiety decreased after an extensive internship, while PSTs’ professional anxiety in a shorter internship remained high. Despite feeling professional anxiety, PSTs reported internships as the most valuable teaching experience during teacher education (MacDonald, 1993).

However, it appears difficult for PSTs to bridge the gap between teacher education lectures and professional practice during their internships (Darling-Hammond, 2006). This is caused by a lack of automatic transfer from theory to workplace. In addition, PSTs experience tension while changing their role from student to teacher (Pillen et al., 2013). Consequently, three challenges confront PSTs during internships (Darling-Hammond, 2006). First, PSTs should understand that being a teacher differs from their own experience with teachers when they were students. Second, PSTs not only have to think but also act as teachers. Third, PSTs need to develop an understanding of the complexity of classrooms.

**Computer-based classroom simulations**

We argue that the transition from theory to practice (and from institute to internship school) can be improved with computer-based classroom simulations. The last decade saw a growing trend in classroom simulations to prepare PSTs for educational practice (eg, Dalgarno, Gregory, Knox, & Reiners, 2016; Rayner & Fluck, 2014). However, none of the studies in a recent literature review on computer-based classroom simulations and PSTs’ well-being has reported effects of these simulations on PSTs’ professional anxiety (Theelen, van den Beemt, & den Brok, 2019).

Simulations for learning are popular and effective in all domains and levels of education and other disciplines (Mayer & Mastik, 2007). Examples are learning how to build seaports (Bekebrede & Mayer, 2006), how to install residential electrical wiring (Liu & Su, 2011) and how to bridge the gap between entrepreneurial theory and practice (Westera et al., 1999). Specifically, for teacher education, computer-based classroom simulations support the improvement of PSTs’ classroom management skills and increase practical knowledge on how to manage classroom disruptions (Dalgarno et al., 2016).

Computer-based classroom simulations are often simplified versions of real classroom situations (Clark & Mayer, 2011). Within these simulations, PSTs and teacher educators can have control of content, training structure and timing of events. These simulations offer safe learning environments for PSTs to experiment before entering the actual teaching context (Rayner & Fluck, 2014). Therefore, PSTs can make mistakes without harming their relationship with students. In addition, a supervising teacher is physically absent within a computer-based simulation, which possibly reduces the prospect of assessment as a source of stress. Furthermore, classroom simulations appear attractive for teacher education because they provide PSTs with authentic tasks and real-life experiences (Herrington & Oliver, 2000). Also, simulations are increasingly accessible due to the rise of ICT (Brown, 1999). PSTs benefit from classroom simulations when they support
self-efficacy, locus of control and specific teaching skills (Knezek, Christensen, Tyler-Wood, Fisser, & Gibson, 2012).

Virtual internships

Virtual internships are an example of computer-based classroom simulations. They offer learning tasks that require students to think and act as professionals and simultaneously familiarise them with the culture and community of (teaching) occupation (Shaffer, 2007). We define virtual internships in teacher education as online environments in which PSTs think and act as teachers through assignments based on authentic classroom contexts. Virtual internships are based on the theory of situated learning (Sadler, 2009), which can be defined as the nature of knowing and learning in relation to being situated in a specific environment. Situated learning assumes that students learn best in authentic contexts, where consequences follow actions. Because PSTs often experience difficulties when acting as teachers (Darling-Hammond, 2006), virtual internships could be useful in teacher education. It is suggested to make these virtual internships a part of blended courses (Beckem & Watkins, 2012). Blended learning combines online materials with face-to-face instruction and support (Driscoll, 2002). The main advantages of blended learning are improved pedagogy, learning in any place, at any time and reduced costs (Graham, 2006).

Designing virtual internships

When designing virtual internships or simulations, the affordances of ICT are important. These affordances can be defined as the perceived and actual properties of the virtual internship that determine how it could be used (Salomon, 1993, as cited in Conole & Dyke, 2004). Discussion forums and chat functions are examples of affordances that can be used to stimulate PSTs to engage with each other (Conole & Dyke, 2004). Three types of affordances can be distinguished: technological, which relate to the system itself; social, which offer opportunities for social interaction; and educational, which determine how learning takes place using ICT (Kirschner, Strijbos, Kreijns, & Beers, 2004).

Furthermore, it is important to focus virtual internships on learning outcomes. To focus online tool development on learning outcomes, Kearney and colleagues (2012) created a pedagogical framework that consists of three features: personalisation, authenticity and collaboration. Personalisation implies that ownership, agency and autonomous learning are important aspects when designing online tools. Authenticity highlights the opportunities for contextualised, situated learning. Collaboration captures the connected aspects of online tools. Use of time and space are central elements of the pedagogical framework. Online tools offer opportunities to learn in a variety of “spaces,” using virtual environments, which makes learning time and place independent (Kearney et al., 2012). Hence, learning is not restricted to classrooms or teaching periods, as is the case in traditional learning during internships. The virtual internships in this study were designed along the framework of Kearney and colleagues (2012).

Evaluating virtual internships

For a virtual internship to contribute to PSTs’ professional development, it requires a purposefully designed system (Brooke, 1996). Design of educational ICT systems is evaluated by three different concepts: system usability (Brooke, 1996), learner community satisfaction (Wang, 2003) and content satisfaction (Wang, 2003). To assess the design, it is desirable to evaluate the design in terms of the three affordances. We argue that system usability can be considered as an evaluative measure for technological affordances. Social affordances can be evaluated by the satisfaction with the learner community facilitated by the system, because this addresses the
extent to which learners communicate and collaborate with each other in the virtual internship. Lastly, satisfaction with the content offered in the system can give more insights into the educational affordances.

**Aim and research questions**

The focus of this study is on PSTs’ learning experiences while engaging in virtual internships and the effects of these virtual internships on PSTs’ anxiety. To explore the use of virtual internships, we evaluated the effect on PSTs’ learning experiences and anxiety with two different types of online virtual internship environments, each featuring different characteristics. The purpose of these virtual internships was to make PSTs familiar with different aspects of teaching before PSTs enter the teaching context, rather than to substitute the real-life work situation with a virtual internship. Instead of using a whole-task approach, each virtual internship focused on familiarising PSTs with one sub-aspect of teaching (differentiation and observing interpersonal behaviour, respectively). This is also known as the decomposition of practice, which means that PSTs’ learning process is focused on only one element of teaching which enables them to identify and use elements of teaching more effectively (Grossman et al., 2009).

The main research question is: How can virtual internships in blended learning environments support PSTs’ preparation for their work as teachers? The following sub-questions were examined:

1. What is the effect of virtual internships in blended learning environments on PSTs’ professional anxiety?
2. How are virtual internships in blended learning environments evaluated by PSTs in terms of technological, social and educational affordances?

**Design of virtual internships**

Within this exploratory study, two different types of virtual internships were implemented at a teacher education programme in the Netherlands, during the courses: “Diversity in the classroom” (Virtual Internship 1) and “Classroom management” (Virtual Internship 2). Virtual Internship 1 (further: VI-1) and Virtual Internship 2 (further: VI-2) were variants of the concept “virtual internships,” rather than VI-2 an iteration on VI-1. When interpreting the results, some caution needs to be taken as the virtual internships differed in multiple ways. For example, the contents of VI-1 and VI-2 differed because they were offered as part of two different, yet related courses. Table 1 provides an overview of the characteristics of VI-1 and VI-2. The aim was to investigate and evaluate the two virtual internships separately to explore how the aspects of virtual internships are evaluated by PSTs. The discussed pedagogical framework (Kearney et al., 2012) was used for the internships’ design.

**Virtual Internship 1**

VI-1 was designed in the Syntern web application (Shaffer, Ruis, & Graesser, 2015), consisting of email functionality, notebooks and chat function (Figure 1). Syntern was used to simulate a virtual internship. To create authenticity, VI-1 took place at the fictitious school “Eindhoven college.” The virtual internship was text-based following a fixed path with all virtual characters pre-designed.

The activities in VI-1 were integrated with lectures of the course “Diversity in the classroom,” creating a blended environment, in which PSTs were instructed to differentiate for a special educational needs student at Eindhoven college. PSTs could personalise their internship by choosing
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between two cases: Duane, an autistic student, or Bryan, a highly gifted student. PSTs received emails from a fictitious principal of Eindhoven college, containing the student’s background information, assignments for PSTs and additional resources.

PSTs received weekly assignments in English by email, for a period of six weeks. The first assignment asked PSTs to make a differentiation plan. Each new assignment was a reaction to this plan, for instance by complaining parents. Although VI-1 was scenario driven, the system did not allow to make changes in the assignments during the internship. As a result, not all assignments corresponded exactly with the development of PSTs’ individual scenarios.

Table 1: Characteristics of VI-1 and VI-2

|                      | VI-1                                      | VI-2                                      |
|----------------------|-------------------------------------------|-------------------------------------------|
| system               | Syntern                                   | Canvas                                    |
| collaboration tool   | chat function                             | discussion forum                          |
| authenticity (context) | scenario driven: Eindhoven college        | scenario driven: Eindhoven college        |
| personalisation      |                                            | choice in order of assignments per week   |
| feedback             | standardised feedback emails              | rubrics                                   |
| number of assignments| 6                                          | 9                                         |
| cohesion between     | non-corresponding assignments             | corresponding assignments                 |
| assignments          |                                            |                                           |
| number of videos     | 1                                          | 8                                         |
| within the internship|                                            |                                           |
| content              | diversity in classrooms                    | classroom management                       |
| duration of internship| 6 weeks                                    | 4 weeks                                   |
| language             | English                                    | Dutch                                     |
| participants         | PSTs with prior teaching experience       | PSTs with no or little prior teaching experience |

Figure 1: Screenshot of Syntern [Colour figure can be viewed at wileyonlinelibrary.com]
Collaboration was facilitated by the chat function, which enabled groups of two up to five students to discuss assignments. Guided by the group discussions, PSTs completed each assignment individually in a digital notebook. The teacher educator gave graded feedback per assignment: insufficient, sufficient or excellent. Subsequently, PSTs received a new assignment.

Virtual Internship 2

VI-2 was conducted within the university’s learning management system “Canvas” (Figure 2). PSTs were already familiar with this system, and therefore no additional system for the virtual internship was needed. Authenticity was created similar to VI-1, by providing assignments in the context of “Eindhoven college.” VI-2 was integrated in the lectures of the course “Classroom management” creating a blended environment.

VI-2 consisted of nine assignments in Dutch, which asked PSTs to evaluate video fragments of experienced teachers (e.g., videos with authentic classroom events) regarding interpersonal teacher behaviour. These videos contained classroom events which PSTs perceive as stressful (e.g., disruptive students, lesson start) (Admiraal, Wubbels, & Korthagen, 1996). To stimulate collaboration, PSTs could discuss their evaluations in groups of two up to four peers in the discussion forum. These tasks were based on the observation model of Baeten and Simons (2014), which assumes that observing another teacher and discussing about these observations is one way for PSTs to gain an understanding about effective teaching behaviour. Furthermore, PSTs also experienced the difficulty of noticing and interpreting relevant classroom events. The decomposition of the teaching practice (Grossman et al., 2009) and the use of videos with authentic classroom events (Seidel & Stürmer, 2014) enabled PSTs to develop this professional vision. PSTs received two or three assignments per week. Afterwards, PSTs handed in their assignments individually online. The teacher educator gave graded feedback for all assignments at once with an assessment.

Figure 2: Screenshot of Canvas [Colour figure can be viewed at wileyonlinelibrary.com]
rubric, using the criteria: completeness, accurateness and quality of the assignments, relevance for teacher practice and profoundness of the discussions.

**Method**

**Participants**

Participants in this study were PSTs of two cohorts of a teacher education programme for secondary education in the Netherlands (N = 43; Table 2). VI-1 PSTs already had previous teaching experience within real-life internships, contrary to VI-2 PSTs who had no prior teaching experience. The virtual internships were conducted as part of the first cohort’s course “Diversity in the classroom” (N = 27; spring 2016) and the second cohort’s course “Classroom management” (N = 16; fall 2016). This study followed the research guidelines of social scientific studies from Eindhoven University of Technology (2014), and the Association of Universities in the Netherlands (2014). Participants took part voluntarily and gave informed consent.

**Questionnaires**

To gather insight into PSTs’ experiences, data from a questionnaire with 46 statements about professional anxiety (Teacher Anxiety Scale; Parsons, 1973) and affordances (Systems Usability Scale—Brooke, 1996; E-learner Community Satisfaction—Wang, 2003; Content Satisfaction—Wang, 2003; Task Satisfaction—self constructed) of the virtual internships were analysed. Table 3 gives an overview of the questionnaires, for each scale sample items and its internal consistency, which was good. Items were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). High scores imply positive experiences, except for the Teacher Anxiety Scale, where high scores indicate a high level of anxiety. In addition to these questionnaires, PSTs answered two open-ended questions about affordances and hindrances of the virtual internship.

**Focus group and individual interviews**

To gather more insight into PSTs’ experiences with the virtual internships, a focus group was organised after VI-1 (N = 6), and semi-structured individual interviews were conducted after VI-2 (N = 9). The number of respondents met the minimal requirement for theoretical saturation (Guest, Bunce, & Johnson, 2006) and respondents were selected via convenience sampling. The focus group was recorded on video, and the interviews were recorded on audio. The focus group and individual interviews consisted of 11 questions about technical, social and educational affordances, and professional anxiety. Example questions include: “What did you think about collaboration within the virtual internship?” and “To what extent did the virtual internship influence your professional anxiety?”

**Analysis**

A mixed methods design was used for this study. Questionnaires were analysed with IBM SPSS Statistics 22. Regarding the Teacher Anxiety Scale (Parsons, 1973), the results of the pre- and post-tests for each virtual internship were compared using a paired samples t test. Because of the

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**Table 2: Participants**

|       | pre- and post-test | focus group | interviews |
|-------|--------------------|-------------|------------|
| VI-1  | 27: 10♀           | 6: 1♀       | —          |
| VI-2  | 16: 8♀            | —           | 9: 3♀      |
| Questionnaire                                      | Theoretical concept          | Sample item                                                                 | Language                                                                 | Number of items | α pre-test VI-1 | α post-test VI-1 | α pre-test VI-2 | α post-test VI-2 |
|---------------------------------------------------|------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------|----------------|----------------|----------------|----------------|
| Teacher Anxiety Scale (Parsons, 1973)              | Teacher anxiety              | I feel uncomfortable when I speak before a group                            | Dutch (verified via back-translation)                                     | 24*             | .83            | .88            | .86            | .83            |
| System Usability Scale** (Brooke, 1996)            | Technological affordances    | I thought the system was easy to use                                        | Translated into Dutch by Sauro (2012)                                     | 10              | .80            |                |                | .87            |
| e-learner community satisfaction (Wang, 2003)       | Social affordances           | The e-learning system makes it easy for you to discuss questions with other students | Dutch (verified via back-translation)                                     | 4               | .72            |                |                | .83            |
| content satisfaction (Wang, 2003)                  | Educational affordances      | The e-learning system provides useful content                               | Dutch (verified via back-translation)                                     | 4               | .84            |                |                | .79            |
| task satisfaction***                               | Educational affordances      | Assignments within the system exactly fits your needs                      | Dutch                                                                     | 4               | .73            |                |                | .64            |

*This questionnaire originally consisted of 25 items. The item “I’m less happy teaching than I thought I’d be” was excluded for further analysis because PSTs without prior teaching experience could not answer this question.

**The output of the survey is a score between 0 and 100 (SUS-score); high scores relate to high system usability and vice versa.

***The task satisfaction scale was self-constructed based on e-learner community and content satisfaction questionnaires.
small sample size, the non-parametric Wilcoxon signed-rank test was used to determine the difference between pre- and post-scores. Descriptive statistics were calculated for system usability, learner community, content and task satisfaction.

With respect to the analysis of the qualitative data, sensitising concepts (professional anxiety, technical, social and educational affordances) were derived from the theoretical background and used to categorise answers from interviews, focus group and open-ended questions in an analysis matrix. The categorisation was validated by four of the authors, by continuous discussion and evaluation. For example, if the statements concerned the discussion forum or the chat function, they were categorised as a social affordance because such functionalities are used to collaborate. If statements concerned learning or activities on collaboration or the desire to work independently, they were coded as social affordances. When statements by PSTs were made about for example the compatibility with Internet browsers or the video and audio quality, they were categorised as a technological affordance because these kinds of statements are related to the technological aspects of the virtual internship environments. To increase the reliability of this qualitative analysis, the authors collaborated closely in the process. Points of debate and uncertainty were discussed until consensus was reached.

Results

Professional anxiety
The first aim of this study was to investigate if PSTs’ professional anxiety could be reduced using virtual internships.

Table 4 shows no significant difference between the pre- and post-test scores on PSTs’ professional anxiety of VI-1. Note that these PSTs already gained previous teaching experience within real-life internships. Table 4 does show a significant difference in professional anxiety between the pre- and post-test scores for VI-2 (PSTs with no prior teaching experience) with an average effect size ($d = 0.6$). The Wilcoxon signed-rank test confirmed these outcomes for VI-1 ($Z = −0.819, p = .41$) and for VI-2 ($Z = −2.276, p = .02$).

Concerning PSTs’ professional anxiety, the qualitative data revealed that especially VI-2 PSTs felt better prepared for the professional teaching context by watching other teachers, which was also highly appreciated. Fourteen VI-2 PSTs reported in the open-ended questions and the interviews (nine and five PSTs, respectively) that they gained a better and more realistic impression of the teaching practice. For example, one VI-2 PST said: “Not all classes resemble each other; the teacher’s behaviour makes a difference.” Watching other teachers gave these VI-2 PSTs peace of mind because they felt better prepared to teach themselves. The virtual internship caused some PSTs to know better what to expect from teaching practice, which made them feel more relaxed. In the

Table 4: Mean score and standard deviations on professional anxiety

|                | pre-test | post-test | t(df)  | p    | d    |
|----------------|----------|-----------|--------|------|------|
| professional anxiety VI-1 ($n = 27$) | 2.28 | 0.42 | 2.27 | 0.46 | 0.14(26) | .89 | ns. |
| professional anxiety VI-2 ($n = 16$) | 2.46 | 0.36 | 2.35 | 0.35 | 2.45(15) | .03* | 0.6 |

*p < .05.
interviews, four VI-2 PSTs noted that after observing other teachers, they knew much better to which classroom events attention should be paid. It also made them more conscious about their own attitude in front of the classroom. Furthermore, one VI-2 PST reported that it was easier to analyse the behaviour of other teachers than your own. Two VI-2 PSTs even reported that after the virtual internship their enthusiasm for teaching increased. Finally, VI-1 PSTs believed that the virtual internship is especially interesting for PSTs with little or no teaching experience to familiarise them with the teaching practice.

Affordances of virtual internships
The second aim of this study was to determine how PSTs evaluate virtual internships in blended environments in terms of technological (system usability), social (learner community satisfaction) and educational (content and task satisfaction) affordances (Table 5).

Technological affordances
Table 5 shows the SUS scores for both virtual internships (63.43 and 64.69). Bangor, Kortum, and Miller (2008) offer guidelines for interpreting these SUS scores. SUS scores below 70 are considered suitable for improvement. However, the acceptability of the SUS scores of both internships was, considering these guidelines, between acceptable and good, even though they do suggest the need for further improvement (Bangor, Kortum, & Miller, 2008). Overall, the results suggest that PSTs from both internships experienced the learning environment sufficiently user-friendly.

The qualitative analysis provided more in-depth information about the technological affordances. Two VI-1 and three VI-2 PSTs appreciated the possibility to complete tasks within the internship in their own pace and place. Furthermore, one VI-1 and three VI-2 PSTs reported that the virtual internship enabled them to be already engaged in the school context without a real-life internship.

Although five VI-1 PSTs were satisfied with the online environment, eight PSTs reported technical hindrances in the open-ended questions. For example, one PST noted hindrances with the compatibility of the virtual internship with different types of Internet browsers. Eleven VI-I PSTs reported that for virtual internships, online systems with good working video, email, discussion functions and multiple screens are necessary. Furthermore, in the focus group, all six VI-1 PSTs disliked the standardised feedback offered by the system and preferred more personalised feedback. This was adopted within VI-2 by using assessment rubrics. In the second internship, all PSTs were satisfied with the feedback functionality.

| Table 5: Mean scores and standard deviations of the System Usability Scale, Learner community, content and task satisfaction |
|---------------------------------------------------------------|
|                                                               |
| VI-1 (n = 27)                                                    |
| VI-2 (n = 16)                                                    |
|                                                               |
| system usability scale                                         |
| (SUS-score)                                                   |
| M                  | SD       | M               | SD       |
| 63.43              | 14.20    | 64.69           | 13.35    |
| learner community satisfaction                                |
| satisfaction       | M       | SD       |
| 3.03               | 0.84    | 3.19    | 0.76    |
| content satisfaction                                    |
| M                  | SD       |
| 3.12               | 0.84    | 3.77    | 0.57    |
| task satisfaction                                           |
| M                  | SD       |
| 2.98               | 0.72    | 3.56    | 0.47    |
Social affordances
PSTs in both internships found collaboration beneficial for their learning outcomes, which was also reflected in the outcomes of the sub-scale, learner community satisfaction (Table 5). Yet the standard deviations show a high variation in scores between the PSTs.

After completing VI-1, 12 PSTs reported that collaborating through the chat function was beneficial. Responses to the open-ended questions showed that these PSTs appreciated working together without being at the same place by sharing good examples of assignments with peers and being able to read back their discussions. Eight VI-1 PSTs disliked the chat function because it was inconvenient to find a moment to meet online, and it appeared difficult to exchange experiences intensively. Two VI-2 PSTs also reported to appreciate sharing their findings with peers. However, in this internship, five PSTs reported in the interviews they disliked the discussion forum because it did not function as a chat. Discussions did not take place real-time, and these five PSTs sometimes had to wait hours before peers responded. In addition, it appeared difficult to navigate through the discussion forum. As a result, the discussion forum was not lively. After both internships, five VI-1 and three VI-2 PSTs reported in the open-ended questions that they preferred face-to-face discussions that offered more in-depth discussions and enabled them to see their peers’ emotions, allowing for faster communication verbally in comparison to typing on a computer.

Educational affordances
Table 5 shows that PSTs of both virtual internships were satisfied with the content and the tasks in the internship. Yet the standard deviations of both scales measured after VI-1 show a high variety in answers between the PSTs.

Several advantages in relation to the content of virtual internships were identified, such as the content of the assignments, learning experiences and video fragments. Seven VI-1 PSTs perceived the authentic cases as an advantage because this made the course content realistic which they believed to be a better method to prepare themselves for the professional teaching context. However, three VI-1 PSTs thought the cases were not realistic because of limited details and context information, rendering the internship somewhat shallow. These PSTs felt a need for more in-depth cases, and suggested doing this by sharing more background information, describing situations more extensively and using more video fragments. Furthermore, two VI-1 PSTs had difficulties with the language (English) of the assignments. PSTs mentioned they preferred assignments in their mother tongue (Dutch). Despite this dissatisfaction, one PST reported the link with theory from the lectures as a positive learning experience. Finally, two VI-1 PSTs reported that assignments were not logically aligned. This was because the Syntern system did not give the option to adjust assignments during the internship. These issues were addressed in the design of VI-2.

After VI-2, all PSTs reported in the open-ended questions and the interviews satisfaction with the content of the internship, and that there was a good match between the lecture topics and the assignments in the virtual internship. Eight VI-2 PSTs reported in the open-ended questions that it was a good learning experience to watch other teachers. These PSTs learned from the mistakes teachers made in the video fragments, and from being confronted with different teaching styles. An added advantage reported by one VI-2 PST was that the virtual internship gave PSTs the opportunity to engage in the course, even when they did not have real internships.

What is noteworthy is that six VI-2 PSTs in the interviews reported that the scenario-driven context of the internship (Eindhoven college), such as emails from the principal, did not add value. Most of them did not read the email messages entirely, but only read the actual assignment, implying they missed a part of the context.
In conclusion, PSTs found that virtual internships improved their teaching skills, and that they were a good preparation for educational practice. PSTs considered it useful to watch other teachers, and that virtual internships especially offered added value for PSTs with little or no teaching experience. PSTs appreciated that they could practice in a safe setting and were able to gain teaching experience before entering the real workplace.

Discussion and conclusion
This study attempted to gather insight into how different types of virtual internships in blended environments could support PSTs’ preparation for educational practice. The present study was designed to investigate the effect of virtual internships on PSTs’ professional anxiety, and to determine how virtual internships in blended environments were evaluated by PSTs in terms of technological, social and educational affordances. Virtual Internships 1 and 2 were developed in two different online systems. Although VI-1 and VI-2 were variations of the concept “virtual internship,” they were evaluated individually because of the importance of context in relation to the usability of virtual internships (Brooke, 1996). Both virtual internships took place in different settings, used different systems and were followed by different groups of users. Therefore, the two virtual internships were investigated and evaluated separately as two exploratory variations of the same tool (virtual internship).

The first aim of this study was to identify whether PSTs’ professional anxiety reduced after virtual internships. A significant decrease was found in PSTs’ professional anxiety for VI-2, consisting of PSTs with little or no teaching experience. However, no significant differences were found in VI-1 PSTs’ professional anxiety, who were PSTs with some previous teaching experience. These results partially support the theory of MacDonald (1993), which assumes that teaching experience reduces PSTs’ anxiety. The inconsistency between differences in professional anxiety for both virtual internships may be due to the differences in the online learning environments. VI-1 PSTs reported many technical hindrances, which possibly distracted from the virtual internships’ content. Our findings suggest that a higher degree of personalisation (eg, mother tongue, a familiar learning environment, personalised feedback) and video content in order to observe other teachers teach of VI-2 contributed positively to reducing PSTs’ professional anxiety. It is noteworthy that both the quantitative and the qualitative data from VI-2 reveal that a virtual internship is especially interesting for PSTs with little or no teaching experience. These PSTs reported that the virtual internship contributed to a more realistic image of educational practice and feeling better prepared. We can thus infer that virtual internships can be a useful method for teacher education to reduce PSTs’ professional anxiety provided that they have little or no teaching experience.

The second aim of this study was to determine how virtual internships in blended environments were evaluated by PSTs, in terms of technological, social and educational affordances. Regarding technological affordances, system usability was considered between acceptable and good, following the guidelines of Bangor, Kortum, and Miller (2008). However, these guidelines also suggest that further improvements are needed for SUS scores lower than 70, as was the case in our study. Improvements to the used tools are needed to minimalise the experienced hindrances, especially for VI-1. Due to the small sample size, it is not possible to generalise to the population at large (Bangor, Kortum, & Miller, 2008).

Although there were technical hindrances within VI-1, PSTs in both courses reported the virtual internship as sufficiently user-friendly. The stated usefulness of flexible time and space in virtual internships, as mentioned in the pedagogical framework of Kearney and colleagues (2012), was supported by PSTs in this study. Virtual internships can engage PSTs in a course about teaching strategies and make PSTs familiar with the teaching context without a real-life internship.
Furthermore, PSTs appreciated learning without being physically present, in their own pace and place.

In both systems, PSTs appreciated the social affordance of collaboration, which is one of the key features in the pedagogical framework for learning with online tools (Kearney et al., 2012). Collaboration was attractive because of the opportunity to share examples and discuss with peers. Since data sharing and conversation are important elements of collaboration in the pedagogical framework, it contributes positively to learner experiences. However, PSTs were also facing technical hindrances during their virtual internship. Because learning was time and place independent, it was hard for PSTs to meet at the same time online, which led to PSTs preferring face-to-face discussions instead. Furthermore, PSTs experienced technical hindrances related to collaboration online. For example, VI-2 PSTs disliked the discussion forum because it did not function as a chat. PSTs experiencing both social advantages and disadvantages possibly led to the high variation in scores between the PSTs on the learner community satisfaction questionnaire.

As an educational affordance, PSTs appreciated the connection between the lectures and the virtual internships within the blended environment. Furthermore, online tools made it possible to learn from authentic and personalised cases (Kearney et al., 2012). Both virtual internships had two components which made the internship authentic: a scenario-driven case and the use of videos. It appeared that learning from videos with authentic classroom events was a good preparation for educational practice (Blomberg, Sherin, Renkl, Glogger, & Seidel, 2014). However, scenario-driven cases within the virtual internships did not come entirely to life. A lack of details and background information created a realism deficiency. In addition, due to non-corresponding assignments within VI-1, the opportunity of personalisation was also missing. Cases can become more authentic and personalised if they offer enough details and background information. It is important to give clear coherent assignments in PSTs’ mother tongue; otherwise, it may lead to confusion as demonstrated in the study results.

Contrary to expectations, PSTs in this study reported that the scenario-driven cases of the virtual internships did not add value for some PSTs. Some PSTs even overlooked the context of the case and only read the actual assignments. This can be explained possibly from a neuropsychological view: irrelevant details can distract beginners from the actual task and cause cognitive overload (Gulikers, Bastiaens, & Martens, 2005). It seems that beginner learners can learn, without an authentic case, if only the task itself is authentic.

Despite different types of virtual internships, it stands out that VI-2 PSTs had higher scores on learner community, content and task satisfaction. A possible explanation for this is that VI-2 used Canvas, a familiar LMS to students. Furthermore, VI-2 provided a higher degree of personalisation (eg, use of mother tongue, using a familiar learning environment, personalised feedback) which contributed positively to reducing PSTs’ professional anxiety. In addition, the topic of VI-2 (classroom management) appealed possibly more to PSTs because of their struggles with classroom management issues and the use of videos made the course content more realistic.

Where prior studies about classroom simulations mainly focused on cognitive outcomes, the present study contributed to the field by showing that virtual internships can decrease PSTs’ professional anxiety and which characteristics of virtual internships supported a positive evaluation of technological, social and educational affordances. PSTs felt better prepared for the teaching context and their professional anxiety reduced. Due to the virtual internships, PSTs had a better impression of teaching as a profession as they could learn from authentic cases, developed a more realistic image of the teaching context and could benefit from collaborating with peers. Virtual internships appear suitable in a blended environment as PSTs can learn in their own pace at
home. Furthermore, it is highly recommended to use online systems with good working video, email, discussion functions and multiple screens.

Virtual internships are context related. However, some aspects are transferable to other contexts: general design principles, such as the use of first language, usefulness of video fragments and the use of discussion forums. Furthermore, the reliability of these findings may be limited by the relatively small group of participants. Due to limited generalisability, a follow-up study with more participants is recommended. However, our results do serve as an illustration for the use of virtual internships in teacher education. Finally, it is important to bear in mind that virtual internships are not isolated activities. The virtual internships in the present study were conducted in blended environments and therefore other aspects of these blended environments could have influenced the results as well.

Our study gained more insights about virtual internships in blended environments for supporting PSTs’ preparation for their work as teachers. Virtual internships can already be a valuable addition to PSTs’ preparation during their study. There are, however, still many unanswered questions regarding the specific elements of virtual internships that help prepare PSTs for educational practice. With the findings and recommendations from PSTs within this study, further research will eventually lead to more effective virtual internships to prepare PSTs for their work as teachers.

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Statements on open data, ethics and conflicts of interest
a. Access to the database will be provided by the first author on request. Solicitations should contain information about the research aim and the type of analysis.

b. This study followed the research guidelines of social scientific studies from Eindhoven University of Technology, and the Association of Universities in the Netherlands (2014). Participants took part voluntarily and before giving consent were informed that data collection was in accordance with data protection policies and that data were anonymised prior to storage and analysis.

c. There were no conflicts of interest in this study.

References
Admiraal, W. F., Wubbels, T., & Korthagen, F. A. J. (1996). Student teacher behaviour in response to daily hassles in the classroom. Social Psychology of Education, 1, 25–46.
Alontaga, J. V., & Durban, J. M. (2013). A self-assessment of the professional stress among elementary school teachers. Presented at the DLSU Research Congress 2013, Manila. Association of Universities in The Netherlands (2014). The Netherlands Code of Conduct for Academic Practice. Retrieved from December 21, 2017, http://www.vsnu.nl/en_GB/netherlands-code-of-conduct-scientific-practice.html
Bangor, A., Kortum, P. H., & Miller, J. T. (2008). An empirical evaluation of the system usability scale. International Journal of Human-Computer Interaction, 24(6), 574–594.
Baeten, M., & Simons, M. (2014). Student teachers’ team teaching: Models, effects, and conditions for implementation. Teaching and Teacher Education, 41, 92–110.
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Beckem, J. M., & Watkins, M. (2012). Bringing life to learning: Immersive experiential learning simulations for online and blended courses. *Journal of Asynchronous Learning Networks, 16*(5), 61–70.

Bekebrede, G., & Mayer, I. (2006). Build your seaport in a game and learn about complex systems. *Journal of Design Research, 5*(2), 273–298.

Blomberg, G., Sherin, M. G., Renkl, A., Gloger, I., & Seidel, T. (2014). Understanding video as a tool for teacher education: Investigating instructional strategies to promote reflection. *Instructional Science, 42*(3), 443–463.

Brooke, J. (1996). SUS-A quick and dirty usability scale. *Usability Evaluation in Industry, 189*(194), 4–7.

Brown, A. H. (1999). Simulated classrooms and artificial students: The potential effects of new technologies on teacher education. *Journal of Research on Computing in Education, 32*(2), 307–318.

Clark, R. C., & Mayer, R. E. (2011). E-learning and the science of instruction. Proven guidelines for consumers and designers of multimedia learning. San Francisco: Pfeiffer.

Conole, G., & Dyke, M. (2004). What are the affordances of information and communication technologies? *Research in Learning Technology, 12*(2), 113–124.

Dalgarno, B., Gregory, S., Knox, V., & Reiners, T. (2016). Practising teaching using virtual classroom role plays. *Australian Journal of Teacher Education, 41*(1), 126–154.

Darling-Hammond, L. (2006). Constructing 21st-century education. *Journal of Teacher Education, 57*(3), 300–314.

Driscoll, M. (2002). Blended learning: Let’s go beyond the hype. Retrieved from http://www-07.ibm.com/services/pdf/blended_learning.pdf

Eindhoven University of Technology. (2014). *TU/E Gedragscode wetenschapsbeoefening*. Retrieved December 21, 2017, from https://static.tue.nl/fileadmin/content/universiteit/Over_de_universiteit/integriteit/Tue_Gedragscode_Wetenschapsbeoefening_21-1-2015.pdf

Evertson, C. M., Weinstein, C. S. (Eds.). (2006). *Handbook of classroom management: Research, practice and contemporary issues*. New York: Lawrence Erlbaum Associates.

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *Handbook of blended learning: Global perspectives, local designs* (pp. 3–21). San Francisco, CA: Pfeiffer Publishing.

Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shaham, E., & Williamson, P. W. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record, 111*(9), 2055–2100.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18*(1), 59–82.

Gulikers, J. T. M., Bastiaens, T. J., & Martens, R. L. (2005). The surplus value of an authentic learning environment. *Computers in Human Behavior, 21*(3), 509–521.

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development, 48*(3), 23–48.

Kearney, M., Schuck, S., Burden, K., & Aubusson, P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in Learning Technology, 20*(1), 1–17.

Knezek, G., Christensen, R., Tyler-Wood, T., Fisser, P., & Gibson, D. (2012). *SimSchool: Research outcomes from simulated classrooms*. Presented at the Society for Information Technology & Teacher Education International Conference 2012, Austin.

Kirschner, P., Strijbos, J.-W., Kreijns, K., & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology Research and Development, 52*(3), 47–66.

Liu, H.-C., & Su, I.-H. (2011). Learning residential electrical wiring through computer simulation: The impact of computer-based learning environments on student achievement and cognitive load. *British Journal of Educational Technology, 42*(4), 598–607.

MacDonald, C. (1993). Coping with stress during the teaching practicum: The student teacher’s perspective. *Alberta Journal of Educational Research, 39*(4), 407–418.

Mayer, I., & Mastik, H. (2007). Organizing and learning through gaming and simulation: Proceedings of ISAGA 2007, Delft: Eburon.

Morton, L. L., Vesco, R., Williams, N. H., & Awender, M. A. (1997). Student teacher anxieties related to class management, pedagogy, evaluation, and staff relations. *British Journal of Educational Psychology, 67*, 69–89.
Murray-Harvey, R., Slee, T., Lawson, M. J., Silins, H., Banfield, G., & Russell, A. (2000). Under stress: The concerns and coping strategies of teacher education students. *European Journal of Teacher Education, 23*(1), 19–35.

Parsons, J. S. (1973). *Assessment of anxiety about teaching using the teaching anxiety scale: Manual and research report.* Presented at the Annual Meeting of American Educational Research Association, New Orleans.

Pillen, M., Beijaard, D., & den Brok, P. J. (2013). Tensions in beginning teachers’ professional development, accompanying feelings and coping strategies. *European Journal of Teacher Education, 36*(3), 240–260.

Rayner, C., & Fluck, A. (2014). Pre-service teachers’ perceptions of simSchool as preparation for inclusive education: A pilot study. *Asia-Pacific Journal of Teacher Education, 42*(3), 212–227.

Sadler, T. D. (2009). Situated learning in science education: Socio-scientific issues as contexts for practice. *Studies in Science Education, 45*(1), 1–42.

Sauro, J. (2012). *Dutch version of the SUS.* Retrieved August 17, 2016, from http://www.measuringu.com/System%20Usability%20Scale%20-%20Dutch.pdf

Seidel, T., & Stürmer, K. (2014). Modeling and measuring the structure of professional vision in preservice teachers. *American Educational Research Journal, 51*(4), 1–33.

Shaffer, D. W. (2007). *How computer games help children learn.* New York: Plagrave.

Shaffer, D. W., Ruis, A. R., & Graesser, A. C. (2015). Authoring networked learner models in complex domains. In R. Sottilare, X. Hu, & A. C. Graesser (Eds.), *Design recommendations for intelligent tutoring systems: Authoring Tools* (pp. 179–191). Orlando: U.S. Army.

Silvernail, D. L., & Costello, M. H. (1983). The impact of student teaching and internship programs on preservice teachers’ pupil control perspectives, anxiety levels, and teaching concerns. *Journal of Teacher Education, 34*(4), 32–36.

Theelen, H., van den Beemt, A., & den Brok, P. (2019). Classroom simulations in teacher education to support preservice teachers' interpersonal competence: A systematic literature review. *Computers & Education, 129*, 14–26.

Wang, Y.-S. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management, 41*(1), 75–86.

Westera, W., Sloep, P. B., & Gerissen, J. (1999). The design of the Virtual Company: Synergism of learning and working in a networked environment. *Innovations in Education and Training International, 37*(1), 24–33.