A Step Towards Meaningful SRL Interventions for Nurses: A Vignette Study

Master Thesis

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Date: August 24, 2021

Word count: 14.774

Acknowledgement

In this foreword I would like to thank and express my appreciation to a few people who have helped and guided me throughout the process of writing this thesis. Firstly, I would like to thank my supervisor Maaike Endedijk. You did not just focus on the academic part of writing this thesis, but made it very clear it is a personal process as well. I have learned a lot about myself during this process and I want to thank you for that. Additionally, I would like to thank Nick Goossen for providing me with accurate feedback. I believe this thesis needed your critical notes in order to dive a little deeper. Also, I want to thank Katrien Cuyvers. I really enjoyed working together with you. Your work was a big inspiration for my thesis and I will forever look back on some very 'gezellige' days with you.

Of course, I would like to thank my family and friends for the mental support, SPSS assistance and spontaneous (and a little panicked) phone calls or text massages. A special thanks to Mike. You kept believing in me and put up with my mood swings when I was a little stressed. Mom, dad, and Nicole, thanks for the afternoons I could relax in your backyard during lockdown. And thank you grandma, for stimulating my academic career since I was a child (Oma, bedankt dat jij mij altijd hebt gestimuleerd hard mijn best te doen op school).

Anouk Spierenburg

Nieuwegein, August 2021

Abstract

Nurses are responsible for their own learning and keeping their knowledge and skills up to date. Lifelong professional development can be challenging but self-regulated learning (SRL) skills might help. The majority of research on SRL has focused on educational settings, while research focused on the working field remains scarce, especially for the medical field. As most learning takes place during the execution of work (informal workplace learning), insights in how learning evolves at the workplace and should be supported is important. Little is known about how to support nurses with their self-regulatory skills. The implementation of scaffolding interventions might be a useful way. However, developing and implementing meaningful interventions is a challenge. Not to mention, it is costly and time consuming. Therefore, this study aims to explore six possible interventions. With the use of vignettes opinions about these six possible interventions are gathered. The vignettes portrayed interventions that might support the learners metacognitive activities by using the scaffolding means "hints," "modeling," "questioning," and "explaining". 56 healthcare professionals filled in an online questionnaire which revealed their SRL attitude (self-regulated learning readiness; SRLR), the perceive usefulness per intervention and advantages and disadvantages of the interventions. The results indicated that all six interventions were perceived to be rather useful than not useful, since all the interventions scored higher than the scale average. The two modeling interventions (Analogue Modeling and Digital Modeling) were perceived the most useful followed by the Analogue Questioning and Explaining intervention. These three interventions are the highest perceived interventions in this study. This study also gives us reason to believe that the relationship between a SRL attitude (SRLR) and the perceived usefulness might be a complex curvilinear relationship.

Keywords: Self-Regulated Learning, Self-Regulated Learning Readiness, Scaffolding, Vignettes

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Introduction

As stated in the Dutch professional code for nurses and caretakers, nurses are responsible for their own learning: "As a caretaker, I keep the knowledge and skills required for responsible professional practice up to standard" (CGMV vakorganisatie voor Christenen et al., 2015, p.7). To maintain this professional code of lifelong professional development, nurses and caregivers need self-regulated learning (SRL) skills (Berkhout, et al., 2015; Sagasser, Kramer, van der Vleuten, 2012). SRL refers to a learner's "attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000, p.453). The majority of research on SRL has focused on educational settings, while research focused on the working field remains scarce (Littlejohn, Milligan, Fontana, & Margaryan, 2016), especially for the medical field (Van Houten-Schat et al., 2018). As most learning takes place during the execution of work (informal workplace learning) (Dornan, 2012), insights in how learning evolves at the workplace and should be supported is important.

One recent study conducted among medical specialists describes SRL in the medical environment as a performance-driven process of pro-actively, re-actively, and implicitly orienting thoughts, motivation, and actions towards achieving goals (Cuyvers, 2019). This study differentiates between four major SRL components: regulatory agents, regulatory mechanisms, regulatory appraisals, and regulatory readiness (Cuyvers, 2019). Another study conducted among nurses has shown that there is significant room for improvement concerning the self-regulation of their learning (Bloemendal, 2019). Since most SRL activities in this study were spontaneous, nurses skip the important step of planning and goal orientation. Furthermore, a more recent study among the same target group indicates similar results. This study has found that nurses' learning focuses on solving problems on the spot and that their learning is highly operational (Cuyvers, 2020). This study also indicated that improvements can be made in the way nurses are guided and supported by their work environment.

Cuyvers (2020) suggests that interventions need to be developed to guide nurses towards self-regulatory activities and become better self-regulated learners. One effective way to guide learners towards more efficient learning behavior is the process of scaffolding. Scaffolding refers to temporary assistance or direction supplied to help a student perform a task successfully. Without this assistance, the learner would not be able to finish the activity successfully (van de Pol et al., 2010). A scaffolding intervention might be a successful way of supporting learners in SRL (Ley, Kump & Gerdenitisch, 2010). Recent studies have indicated that 80% of nurses' learning moments were not planned (Bloemendal, 2019). Bloemendal found that the learners were aware of the learning experiences, but the learning moments were often not planned. This meant that the learner could regulate their learning from the

moment they became aware of the learning experience, but the first phase of planning and setting learning goals was skipped. This has a negative impact on the outcome of the learning experience (Milligan & Littlejohn, 2014). Therefore, this studies' focus lies on activities to support the forethought phase or regulatory agents (Cuyvers, 2019) that consists of perception of the task, analysis of the task, (target) goal setting, prior content knowledge/ experience activation, strategic planning, self-efficacy beliefs, goal orientation, and intrinsic interest (Pintrich, 2000; Zimmerman, 2002; Cuyvers, 2019).

In this research six possible interventions are portrayed in vignettes (short, animated videos) and presented to the participants. According to Pennings, Bottenheft, van de Boer-Visschedijk & Stubbé (2019, p.11) "Vignettes are descriptions of situations or problems and can take the form of textual descriptions, audio and/or visual representations (e.g., videos, avatars or pictures)". The use of vignettes has a lot of benefits. For example, vignettes allow for the participant to react to the situation similar to a real-life scenario (Barter & Renold, 1999). Moreover, the use of vignettes is significantly less time consuming and less expensive than designing and implementing an actual intervention. Next to that, it is beneficial to include employees in shaping, managing and owning the interventions (Von Thiele Schwarz et al., 2020). Employee participation in the early phases of designing the interventions was found to reduce resistance to change and had a positive impact on achieving the intervention goals (Lines, 2004). The implementation of an intervention is also positively impacted by employee participation, since employees will be more devoted to the intervention if they had a say in to it (Rosskam, 2009).

This study's interventions focus on guiding and helping nurses with the SRL component 'regulatory agents' (Cuyvers, 2019) and are based on the framework for scaffolded instruction from van der Pol et al. (2010). In their research, the authors make a distinction between scaffolding means (*how* is scaffolding applied?) and scaffolding intentions (*what* is scaffolded?). The vignettes in this study portray tools that can support the learners metacognitive activities by using the scaffolding means "hints," "modeling," "questioning," and "explaining".

The goal of this study is to determine the preferences of nurses and learning and developments specialists by gathering opinions about possible interventions and assessing the perceived usefulness of these interventions. Based on these findings, meaningful interventions can then be developed in the future to help nurses become better self-regulated learners.

Theoretical Framework

Workplace Learning

As workplaces provide opportunities for learning, they can be seen as learning environments (Billet, 2001). The way individual employees choose to engage in learning activities, with the support and guidance of their workplace is crucial to understanding these learning environments (Billet, 2001). These

learning activities should also transcend the idea of routine work and mere practice (Ericsson, 2006). It is both an individual and a social process (group and organizational) that combines everyday learning with more complex personal development (Illeris, 2003; Marsick, 2009). Workplace learning can consist of informal and formal learning experiences, but the integration of both is linked to advanced workplace learning (Tynjälä, 2008). Educational programs are a type of formal learning, as they often involve organized events with prescribed learning frameworks and reward participants through qualifications or credit (Eraut, 2000). Gathering knowledge and gaining skills can also occur in the work setting outside of organized programs. These are types of informal learning (Manuti, Pastore, Scardigno, Giancaspro & Morciano, 2005).

Workplace Learning in the Medical Environment

Hospitals have become increasingly aware of the importance of continuous education and promote nurses' learning activities through different educational programs (Yun, Kim & Park, 2019). The medical environment is complex, and learning in this environment can be challenging due to the following three aspects: patient census, time sensitivity, and the multiple and conflicting commitments of employees (Hoffman & Donaldson, 2004). There is a small number of studies that specifically describe the workplace learning activities of nurses (Bjørk, Tøien, & Sørensen, 2013). Nevertheless, researchers have found that the staff room, meeting room, and patient room were considered the environments that most afforded learning at work (Bjørk et al., 2013). The engagement of nurses in workplace learning is often prompted by the daily work, performing new/extra tasks, and learning experiences in their private lives (Pool, Poell, Berings & ten Cate, 2015). Comprehension of how a work environment is also a learning environment is strongly connected to how nurses engage in these workplaces and regulate their learning activities (Skår, 2010). Nurses learn through multiple activities, such as doing the job, applying something new, learning from theory, learning form supervision, and reflecting and learning through others (e.g., colleagues and patients) (Berings, Poell, Simons & van Veldhoven, 2007). However, most learning in the medical environment was spontaneous (Bloemendal, 2019) and therefore might not be optimal. In order for nurses to grow as professionals they require the capacity to actively engage in and manage their own learning experiences (Ericsson, 2006).

Self-Regulated Learning

Self-regulated learning is described as the process of developing understanding, incentive, and performance through various cycles over time (Cuyvers, & Endedijk, 2020). Self-regulated learners are highly active in their own learning processes on metacognitive, behavioral, and motivational levels (Jansen, van Leeuwen, Janssen, Jak & Kester, 2019; Panadero, 2017). They see possibilities in the environment or in their own learning needs, define goals, and strive to overcome obstacles to achieve

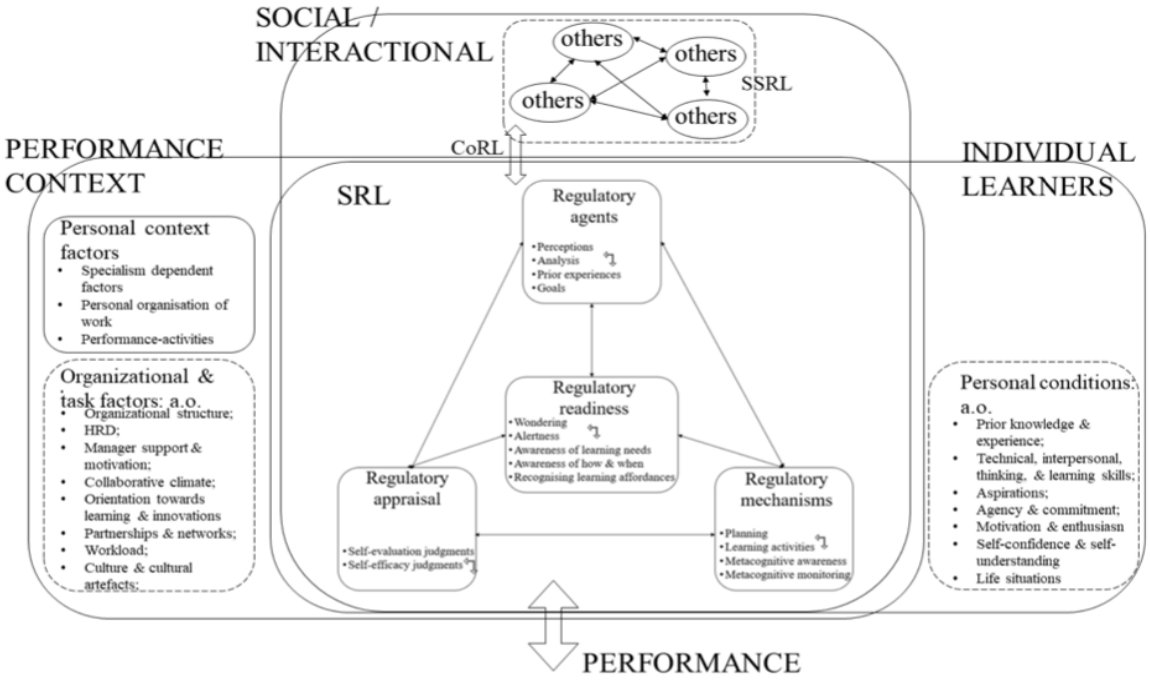
those goals. They utilize intentional learning activities and techniques, and then implement and monitor them (Raemdonck, 2006; Sitzmann & Ely, 2011). This means that learners play a significant role in shaping and controlling their own learning processes (Raemdonck, 2006). A commonly-used model to describe and study SRL is the model of Pintrich & Zimmerman (Cuyers, 2019). This model divides SRL into three phases. The first phase, *forethought,* focusses on setting goals and selecting strategies for achieving them (Zimmerman & Schunk, 2011). The next phase, *performance,* is centered around working on these specific goals (e.g., applying learning strategies and revising; Zimmerman, 2002). The last phase is *self-reflection*. In this phase, learners reflect on their learning process and evaluate their performance. This model assumes a process based on a sequence in time, which means the learners start in phase one and end in the last phase. However, as Panadero (2017) describes, there are other models that see SRL as a more dynamic process in which evaluating activities plays a central role. Evaluation and adaptation play a large role during each phase, which sometimes leads to the learner looping back to a former phase (Sitzmann & Ely, 2011).

SRL in the Medical Environment

Self-regulation improves motivation, confidence, autonomy, and the development of lifelong learning skills. These are all important traits for healthcare professionals (O'Shea, 2003). Nevertheless, studies and theories concerning SRL in the medical environment remain scarce (Cuyvers, 2019). Learning in the medical environment is complex due to the many factors that intervene in the process (van Houten-Schat et al., 2018). Some factors, such as time pressure and patient-related factors, only exist in the medical environment (van Houten-Schat et al., 2018). One study among healthcare specialists states that SRL in the medical environment is initiated by performance-related challenges or demands and the need to respond to these challenges or demands (Cuyvers, 2019). These findings align with the findings of Bloemendal (2019), who states that nurses' learning activities are spontaneous. Moreover, SRL in the medical environment is influenced by individual learner factors, performance context factors, and social interactional factors (Cuyvers, 2019). Based on these findings, Cuyvers (2019) developed a SRL model (figure 1). Regulatory readiness is in the center of this model since this is conditional for SRL to take place. Without regulatory readiness, other SRL activities will not be initiated. It is required before a task or scenario can be identified as a possible learning setting, learning goals can be established, or an SRL process can begin (Cuyvers, 2019). Within regulatory readiness, being alert, wondering, and being aware of learning needs are all important factors. It also includes being aware of how and when learning can take place. The utilization of resources such as special programs, question banks, and medical websites can help with this (Cuyvers, 2019). The model also consists of three other SRL components: "regulatory agents," "regulatory mechanisms," and "regulatory appraisals."

Figure 1

Model of Self-Regulated professional Learning (SRpL) for the clinical context (Cuyvers, 2019, p 169).



To help healthcare professionals with their self-regulated learning capabilities, adequate guidance needs to be provided. This guidance should preferably be adaptive and personalized to the learner.

Scaffolding

Scaffolding can be described as the support given to a learner throughout the learning process. It is a student-centered instructional method, as the support is adapted and tailored to every student's individual needs (Reiser & Tabak, 2014). Van de Pol et al. (2010) explain the concept through its metaphorical meaning in relation to the construction field:

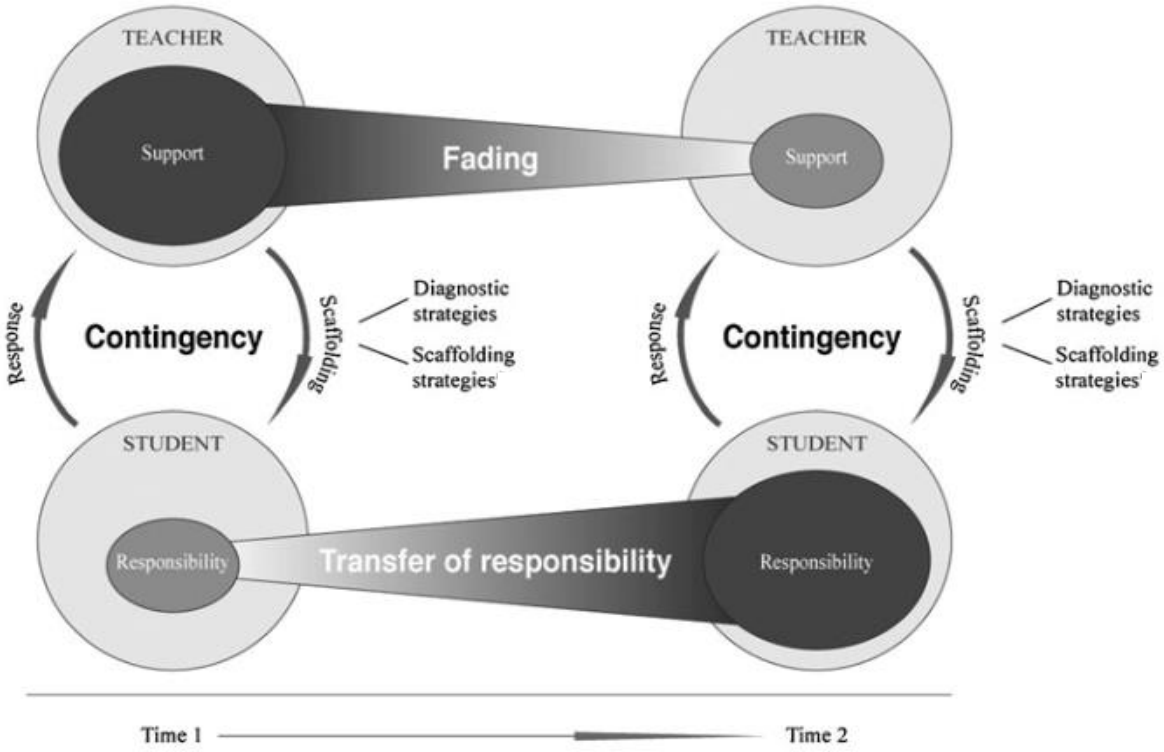
> a scaffold is a temporary structure erected to help with the building or modification of another structure, the use of scaffolding as a metaphor within the domain of learning refers to the temporary support provided for the completion of a task that learners otherwise might not be able to complete. (van de Pol et al., 2010, p. 1)

Scaffolding is a dynamic intervention that is adapted to specific situations and individual students in educational contexts. It is an interactive process including a teacher and student who both participate actively and collaboratively in the process (van de Pol et al., 2010; Wood & Wood, 1996; Beed, Hawkins

& Roller, 1991). Van de Pol et al. (2010) incorporated the three most common characteristics of scaffolding in the conceptual model shown in figure 2. The first characteristic is *contingency*, which refers to the adaptivity of the support. To provide the right amount and form of support, teachers need to diagnose the students' current level of competence (van de Pol et al., 2010). This idea stems from Vygotsky's theory about the zone of proximal development (ZPD) (Wood & Wood, 1996; Beed, Hawkins & Roller, 1991). This theory states that the difference between what students can do without support and what they can do with direction and encouragement from a qualified partner is referred to as the zone of proximal growth. To effectively support learners in this zone, teachers need to make an assessment of the current skills and knowledge (Wood & Wood, 1996; Beed, Hawkins & Roller, 1991). The second common characteristic of scaffolding is *fading*, which refers to the gradual decrease of support over time (van de Pol et al., 2010). The support provided to the learner must be temporal and decrease over time until the learner is independent (Pallinscar, 1986). Fading is thus also connected to a *transfer of responsibility,* which is the third characteristic (van de Pol et al., 2010). Since the level and amount of support decrease over time (*fading*), the responsibility is slowly transferred to the learner. This leads to students taking more control over their own learning (van de Pol et al., 2010).

Figure 2

Conceptual Model of Scaffolding (van de Pol et al., 2010).



An important component of the model for this current study is *scaffolding strategies*, developed by. Van de Pol et al. (2010). This framework makes an important distinction between the *means* and *intentions* of scaffolding. The six *means* of scaffolding reflect *how* scaffolding takes place, and the five *intentions* of scaffolding reflect *what* is scaffolded. An explanation of the different means and intentions are summarized in table 1. The combination of a scaffolding mean and a scaffolding intention is called a scaffolding strategy.

Table 1

Descriptions of the Framework Components for the Analysis of Scaffolding Strategies

Component	Description
Scaffolding intentions	
Support of students' metacognitive activities	
A. Direction maintenance	Directing the attention of the learning to a specific target and attempting to keep this attention on that specific target.
Support of students' cognitive activities	
B. Cognitive structuring	Providing belief structures in order for the learner to organize and justify them accordingly.
C. Reduction of degrees of freedom	Removing the parts of the task a student is not yet able to perform in order to reduce the difficulty of the task.
Support of student affect	
D. Recruitment	Creating or increasing students' interest in a specific task and helping them meeting the requirements of that specific task.
E. Contingency management/frustration control	Facilitating strong student performance with the help of a reward and punishment system along with motivating them by minimizing frustration.
Scaffolding means	
1. Feedback	Providing information about student performance to the students themselves.
2. Hints	Providing clues or suggestions to help the student progress. The clues should not be too detailed, however, since it is important to not provide the entire solution.
3. Instructing	Telling the student what to do and how to do a specific task as well as explaining why the task has to be executed this way.

4. Explaining	Suppling the student with more detailed information or more extensive clarification.
5. Modeling	Demonstrating the desired behavior in order for the student to imitate this behavior. This sometimes includes the demonstration of specific skills or tasks.
6. Questioning	The student asking specific questions to the teacher or trainer regarding the specific task or topic.

Even though research on this topic is limited, the principle of scaffolding can be translated from the educational context to workplace contexts (Siadaty, Gašević & Hatala, 2015). Previous research suggests that individual learning can be supported by recognizing and scaffolding weak areas in learners' skills to control their own growth as well as weak areas in the organization's learning culture (Lombardozzi, 2016). The vignettes in this current study are focused on supporting the learners metacognitive activities. The scaffolding means “hints,” “modeling,” “questioning,” and “explaining” are used because they can be applied best in informal learning setting such as the workplace. Some of these scaffolding means can already be found in the medical environment.

Hints. Hinting or prompting students to help them progress further toward their learning goals is a common instructional scaffold. Systems with adaptive hints are proven to be effective in enhancing learner development and increasing learner abilities (Ueno & Miyasawa, 2015). It is important that the hint is not too detailed (van der Pol et al. 2010) to avoid ‘prompt dependency’ (Webster, 2021).

Modeling. Modeling is defined as a demonstration that is then imitated by others afterwards. Modeling has been present within the healthcare sector for centuries. Its most visible way is the master-apprenticeship model, where a master teaches an apprentice how to function in the profession by demonstrating all the different skills involved (van der Zwet et al., 2011). While strong role models were highly important centuries ago, they still play a large role in educating healthcare professionals (Mohammadi et al., 2020).

Questioning and explaining. Questioning and explaining are two scaffolding means that this study combines into one intervention. Both questioning and explaining are two skills a coach uses with clients. Gijbers, Raemdonck, Vervecken, and van Herck (2012) suggest that coaching is a possible way to stimulate SRL attitude. A coach tries to provoke behavioral chance in clients to help them progress towards their goals. For instance, coaches ask questions that challenge the clients’ current ways of thinking and acting (Thompson, Wolf & Sabatine, 2012).

Vignette studies

Vignettes are short scenarios, concrete examples, or stories about situations that portray (fictional) people and their behavior (Miles, 1987). They can be textual descriptions, audio fragments, or visual representations (Jackson, Harrison, Swinburn, & Lawrence, 2015). They are also most likely used in combination with other methods of data collection (Hughes, 1998). A strong vignette needs to feel real to the participant. It also needs to contain enough context information for the participant to sufficiently understand the situation (Barter & Renolds, 1999). According to Pennings et al. (2019), successful vignettes lead to a stronger sense of involvement from the participant, which makes vignettes a more effective, valid, and reliable instrument to measure opinions as compared with other instruments (Jackson et al., 2015).

Vignette studies have existed in the field of education and educational science for a long time. They have been used for many different purposes ranging from exposing policy issues to study individual behavior (Veal, 2002). Vignettes have also been used in the field of healthcare research. Most vignette research in the medical context has focused on the decision-making processes of doctors or other medical specialists. This includes decisions about the diagnoses of patients and the best possible treatments. The main function of vignettes is to reveal the opinions, perceptions, attitudes, and beliefs of participants when they comment on scenarios or situations portrayed in these vignettes (Barter & Renolds, 1999). Pennings et al. (2019) in use vignettes to discover which informal learning interventions were most preferred by military personnel. They visualized real life scenarios, including the proposed intervention, in a comic strip. They used these vignettes to sketch a possible scenarios of when the interventions would be implemented. In this current study the six vignettes portray interventions supporting the learners metacognitive activities with the help of four scaffolding means (hints, modeling, questioning and explaining).

The present study

This study aims to gather information about how six different SRL interventions based on scaffolding techniques are perceived within the medical environment. The focus of these interventions is set on the first phase of SRL (forethought, regulatory agents). It is important to not only gather opinions and information from nurses but also from the people that will eventually facilitate the interventions. They have to believe in the usefulness and the importance of these interventions. Therefore, nurses and learning and development (L&D) specialists are included in this study. The main research question of this study is: *How do nurses and L&D specialists within the health care sector perceive different SRL interventions based on scaffolding techniques?*

In order to answer this question we have formulated some sub-questions. The first sub-question aims to determine the perceived usefulness of the interventions. We formulated the following question: *(1) Do the interventions differ in usefulness from one another?*

The second question focusses on a SRL attitude in relation to the interventions. The idea of scaffolding is to provide a learner with just the right amount of support based on their level. Therefore we incorporated the level of a specific SRL attitude namely, Self-Regulated Learning Readiness (SRLR) in this study. Participants that score high on SRLR might be more open to interventions due to the fact that they are already actively regulating their learning process. However, a high SRLR score might also mean that the interventions are not relevant to the learner since they have already developed regulatory skills without the interventions. We want to see if the level of SRLR has an effect of which intervention is most suited for the learner. Therefore we formulated the second sub question: *(2) What is the relation between the perceived usefulness of the interventions and the respondents' SRLR?*

A main goal of this study is to obtain opinions about the interventions. What aspects of the intervention do the participants like, and what aspects of the intervention do the participants dislike? Based on these opinions, future decisions about developing the interventions can be made. Therefore the third sub-question is: *(3) What advantages and disadvantages do the respondents mention when judging the interventions?*

Combining the information from the three sub-questions will give us an answer to the main research question.

Methodology

Research Design

This study has a mixed-method research design, gathering data from an online questionnaire with both open-ended and closed questions. The questionnaire includes six interventions visualized in one-minute animated videos. This research is explorative in nature since SRL among nurses has seldom been studied before. The aim is to gain new insights on nurses' preferences concerning SRL interventions by analyzing the data retrieved from the online questionnaire. The collected data contributes to the current knowledge on SRL-interventions, which interventions are preferred and consider useful by nurses, and why.

Before conducting the main study, a pilot study was conducted. The pilot study took place via videocall and email to test the clarity of the questions and vignettes. The participants mainly provided feedback about the vignettes. Based on this feedback some changes has been made. For example, the vignettes has been made more objective by removing phrases such as: "This *great* intervention will…" and "Carla *really likes* this intervention because..." Also, one video was re-recorded because the narration

was too fast. The script from another video was also modified to better align with the remaining videos.

Respondents

Nine respondents participated in the pilot study. From those nine respondents, two are currently-employed nurses, one is a former nurse, and six are educational scientists.

168 respondents participated in the questionnaire for the main study. From this initial sample, 56 responses were completed 100%. The majority (N = 31) of the respondents were nurses or other caretakers. The other participants (N = 25) were learning and development (L&D) specialists in the healthcare sector. Among this sample of 56 participants, 89.3% were female and 10.7% were male. The participants worked an average of 29.4 hours a week and had 18.7 years of experience working in the healthcare sector. A summary of other characteristics from the sample can be found in table 2.

Table 2

Age and Level of Education

		N	Percentage
Age			
	16-25 years old	6	10.7
	26-35 years old	11	19.6
	36-45 years old	8	14.3
	46-55 years old	19	33.9
	56-65 years old	12	21.4
	Total	56	100.0
Education			
	Mbo 3	2	3.6
	Mbo 4	7	12.5
	In-service	6	10.7
	Hbo-Bachelor	25	44.6
	Hbo Masters/ Hbo +	5	8.9
	University Masters	11	19.6
	Total	56	100.0

Instruments

Questionnaire. An online questionnaire was developed for the data collection of this research. The first component of the questionnaire is demographic questions. These questions ask about the nurses'

work experiences in healthcare, the average amount of hours they work per week, their function, gender, age, and prior educational level. The second component of the questionnaire is the SRL readiness scale (Raemdonck, 2006). The participants fill in fourteen statements concerning their perspectives on learning and learning behavior (e.g., "I will never be too old to learn something new for my job."). The third section of the questionnaire presents six vignettes to participants, which are detailed below. The respondents then use the seven-item usefulness scale after every vignette. Pennings et al. (2019) developed this scale to measure the usefulness of interventions. The interventions were rated on a 5-point Likert scale (1= totally disagree, 5= totally agree). An example of an item is as follows: "This intervention helps me to develop myself further." One small adjustment to one of the statements was made to make it more applicable for this study. The seventh item in this scale was: "The interventions fits well in my organization." This has been changed to: "The intervention fits well on the ward." After every vignette, the participants filled in the usefulness scale for that specific vignette. In the study of Pennings et al. (2019) four principal components analyses (PCA) were performed on the items. The PCA showed one underlying factor for each intervention, meaning that the seven-item usefulness scale indeed measures usefulness. The reliability of the usefulness scale was also sufficient with the Cronbach's alpha varying from α=.92 to α=.94 per intervention. The questionnaire also consisted of two open-ended questions. After each vignette, the participant (a) listed all the positive aspects or advantages of the possible intervention and (b) listed all the negative aspects or disadvantages of the possible intervention. The last question from the questionnaire was a ranking question. The participant had to rank the six interventions in a sequence from most favorite intervention (rank 1) to least favorite (rank 6) intervention.

Vignettes. This study uses six vignettes. The interventions portrayed in the vignettes are based on four different scaffolding means: hints, modeling, questioning, and explaining (van de Pol et al., 2010). This study also distinguishes between a digital intervention and a face-to-face intervention. An overview of the six vignettes and the principles on which they are based can be found in table 3. A description of the vignettes with a link to the videos can be found under table 3.

Table 3

Overview of the vignettes.

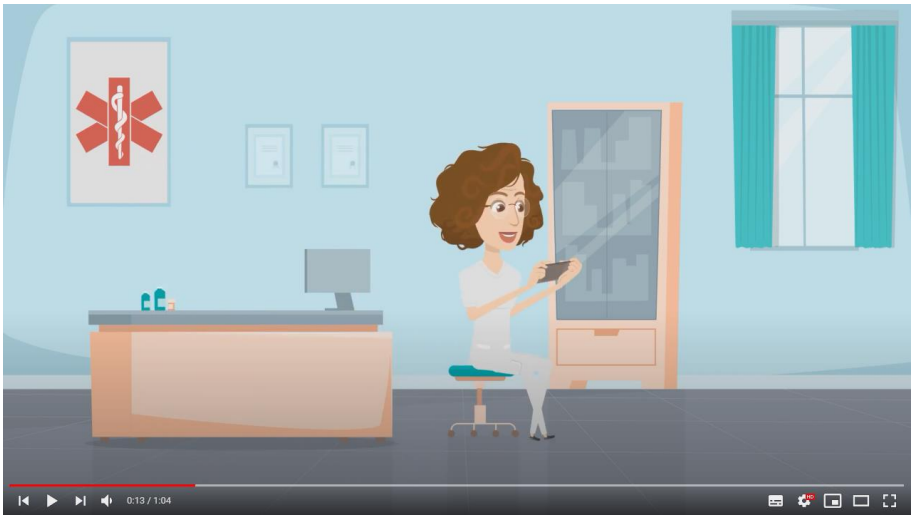
		Way of intervening	
		Digital	***Face to face/ Analogue***
Scaffolding means	**Hints**	1) Hints via smartphone app (DH)	2) Coasters in the staffroom (AH)
	Modeling	3) Videos with a	4) A live demonstration

		demonstration (DM)	from a coworker (AM)
	Questioning and Explaining	5) The digital coach (DQE)	6) Personal coaching sessions (AQE)

1. Hints via smartphone app. The first vignette demonstrates a digital intervention based on the scaffolding mean 'hints'. The intervention is centered around the principle of providing the learner with useful hints whenever they need them. Within the app, the learner registers their learning experiences each day. When the learners feel that they need a bit of extra guidance with filling in their learning experiences, they can ask the app to provide a hint. The hints are personal and adaptive to provide the best possible guidance for the learner. The goal of this intervention is for the learner to gain insights about their learning behavior and recognize learning opportunities more often. This helps them become less dependent on the hints and take responsibility over their own learning process. Click here to watch the video.

Figure 3

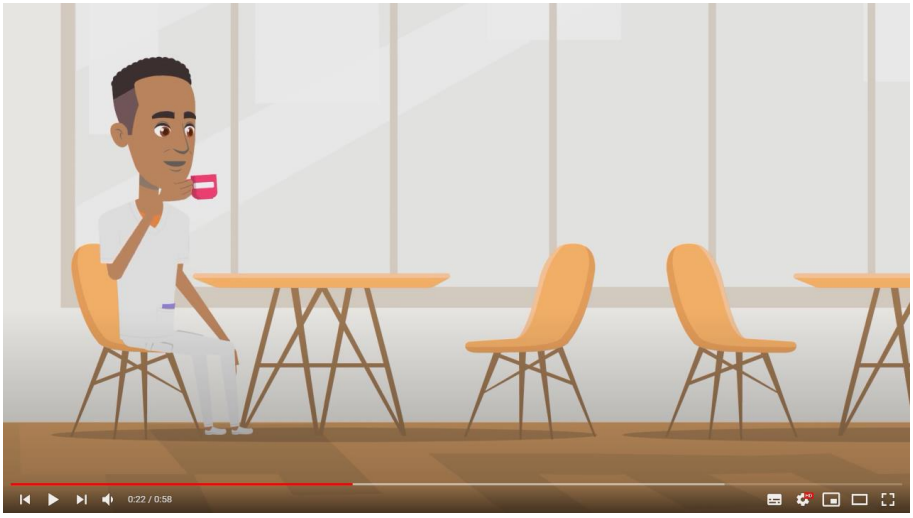
Screenshot of the Digital Hints vignette



2. Coasters in the staffroom. The second vignette is centered around the same scaffolding mean as the first vignette. However, the hints in this intervention are not presented to the learner via a smartphone app but rather via coasters in the staffroom. On the top of the coaster, a subject is written. On the bottom of the coaster, a hint about that subject is written. The learners can turn a coaster around whenever they feel like they need a hint concerning the specific subject mentioned on the coaster. This helps the learners progress in their learning process. Click here to watch the video.

Figure 4

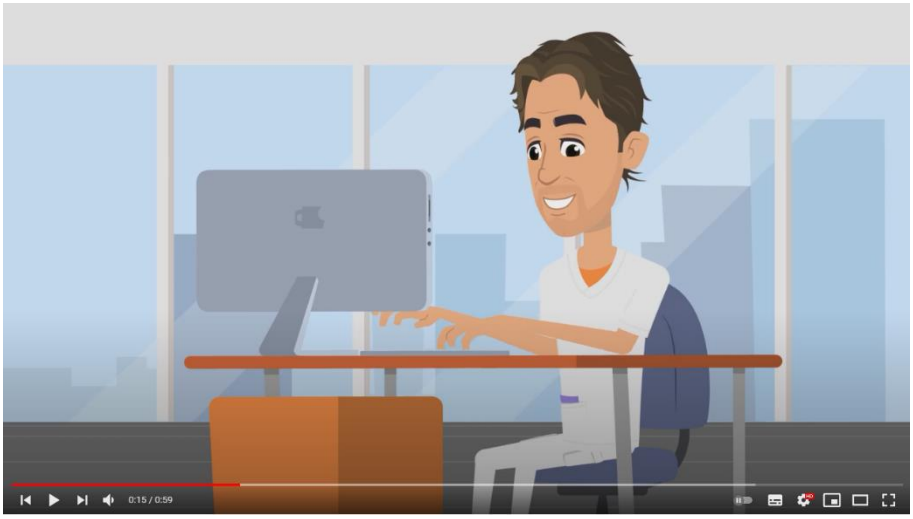
Screenshot of the Analogue Hints vignette



3. Videos with a demonstration. The third vignette demonstrates a different scaffolding mean, namely "modeling." This is a digital intervention involving pre-recorded videos where other nurses demonstrate a particular skill. These videos are uploaded to a central cloud. Every nurse knows where to find the videos. Whenever they feel as though they would benefit from a short demonstration, they can search for a video and watch it. Alongside the demonstration, they also hear step-by-step tips on how to learn the skill. This makes the skill easier to learn, as it has been divided into smaller steps. Click here to watch the video.

Figure 5

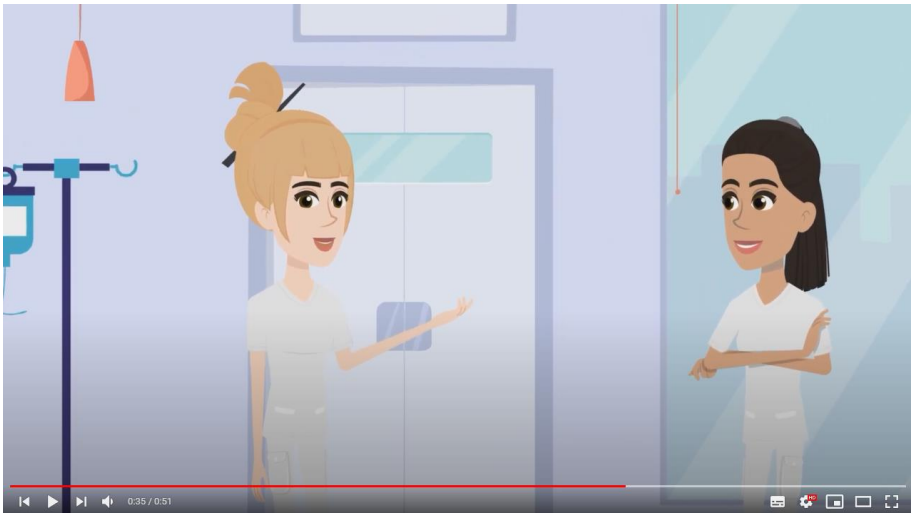
Screenshot of the Digital Modeling vignette



4. A live demonstration. This vignette also involves the scaffolding mean "modeling." This intervention, however, is not digital. Instead, the learner can ask a colleague to demonstrate a particular skill. This is an easy and informal way to learn. The demonstration helps the learner better understand the skill. Click here to watch the video.

Figure 6

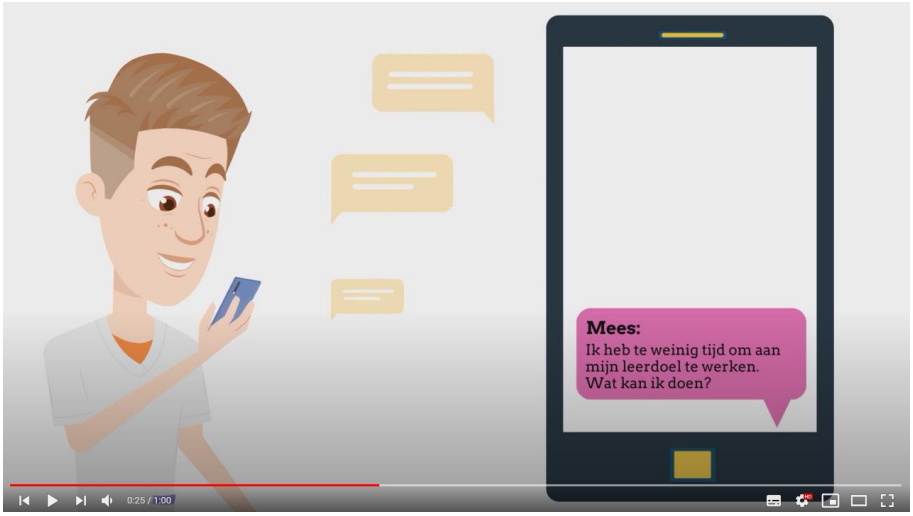
Screenshot of the Analogue Modeling vignette



5. The digital coach. This fifth intervention focusses on two scaffolding means: "questioning" and "explaining." The two means are combined into one type of intervention: coaching. Since this is a digital intervention, it entails a digital coach. Whenever learners needs help with their learning process, they can ask this digital coach for help. This takes place via chat. The digital coach is developed with AI, which means that it can ask relevant questions and provide the right information based on the information provided by the learner. Click here to watch the video.

Figure 7

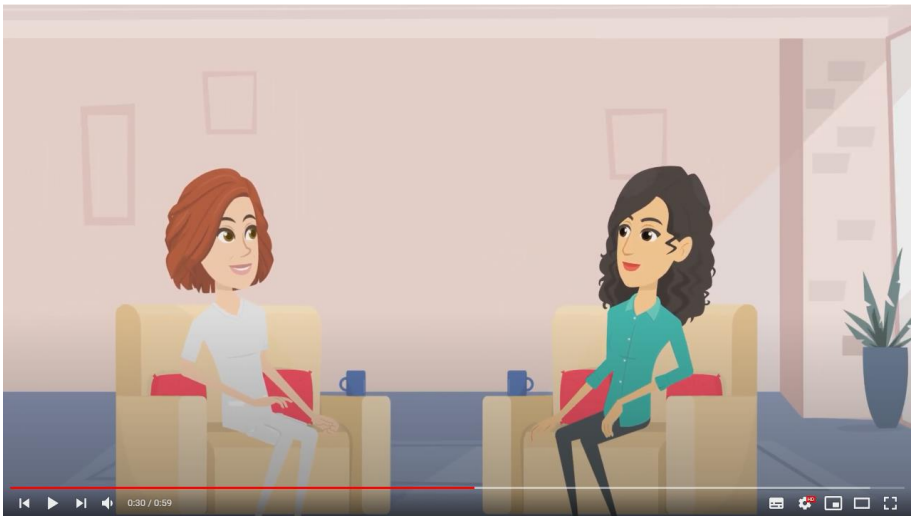
Screenshot of the Digital Questioning and Explaining vignette



6. Personal coaching sessions. The last intervention is also centered around the scaffolding means "questioning" and "explaining." Learners can plan personal sessions with a coach whenever they feel like they need help or guidance with their learning process. This coach is an expert in the field of SRL and nursing and helps the learners progress in their learning process. Click here to watch the video.

Figure 8

Screenshot of the Analogue Questioning and Explaining vignette



Procedure

The recruitment of participants was divided into two phases. The first phase included the distribution of the questionnaire via social media platforms (e.g., LinkedIn) and the personal network of the researcher. The second phase included the distribution of the survey within a Dutch hospital. The questionnaire and an information letter were sent via email to the employees, including both nurses and L&D specialists. The email that contained the link to the questionnaire also provided information about

the content of the study. In both phases of the recruitment, the participants were informed about their rights, such as the possibility to end their participation in the study at any given moment. The participants had to actively provide consent to gain access to the study. When they actively consent to participate, the first questions they had to answer were some general background questions (e.g., age and educational level). Second, they measured their self-regulated learning readiness through the survey questions developed by Raemdonck et al. (2006). The participants then viewed the first vignette video. The viewing order of the vignettes was randomized, to prevent question order bias. Therefore, the first vignette video is not the same vignette for every participant. The vignette was designed to provide participants a clear understanding of the possible SRL intervention. After the video ended, the participants filled in the seven-item usefulness scale (Pennings et al., 2019). They then answered two open-ended questions about the advantages and disadvantages of the intervention. This procedure was repeated with every vignette. The last question contained the ranking question, where participants sorted the interventions from most to least favorite. The questionnaire ended with one final question concerning the willingness to participate in a follow-up interview. The participants who wanted to participate in the follow-up interviews left their email addresses in the designated answer box at the end of the questionnaire.

Data Analysis

Quantitative analysis. This study analyzed the quantitative data using the Statistical Package of the Social Sciences software (SPSS Version 27). The first step was to test the reliability of the different scales used in the survey. The Cronbach's alpha for the SRLR scale was .91, and it ranged from .91 to .96 for the seven-item usefulness scale (Pennings et al. 2019) depending on the intervention. The assumption of normality was tested with Kolmogorov-Smirnov tests (with a significance level set to $p<.05$). As the usefulness scales were not normally distributed, this study applied non-parametric tests. The non-parametric Friedman's test and the Wilcoxon matched-pairs signed-rank test were used to compare the usefulness scores per intervention. The last step was to apply Kendall's Tau-B to measure the association between the score on the usefulness scale and the rank and SRLR of the participants.

Qualitative analysis. The qualitative data analysis followed the method described by Boeije (2010). She suggests a combination of open, axial, and selective coding. After collecting the first dataset, the analysis was started. This involved a coding software called ATLAS.ti. The first step was to start open coding. The aim of open coding is to "break down, examen, compare, conceptualize and categorize the data" (Strauss & Corbin, 2007: p. 61) in order for the researcher to familiarize with the data and explore the field (Boeije, 2010). During this process of open coding, the data was read and re-read, and codes were assigned to the first segments of data. When no new codes were needed to describe the data (point of saturation), the second phase was started: axial coding. With axial coding, connections between the

different codes are made to place them into categories. After defining the different categories, the process of selective coding was started. The selective coding assisted in determining important categories. The main purpose of selective coding is "The reassembling of data in order to answer the research question and realize the research aim' (Boeije, 2010: p.118). This form of coding is an iterative process, meaning that it may involve needing to go back to a previous phase to make adjustments. The final code tree is included in appendix 2. For the analysis of the codes, various categories of advantages and disadvantages were created. Then the total of disadvantages that were mentioned per intervention was looked at. The percentages of comments belonging to a specific category were calculated. The same method was applied for the advantages. This resulted in an overview of what type of comments were most prevalent per intervention (appendix 3).

Results

Firstly, the results from the quantitative data (N = 56) analyses will be presented, starting with the descriptive statistics. These will provide a general overview of the usefulness scores and rank scores. The second section of this results chapter will elaborate on the differences in usefulness between the interventions. Thirdly, we look at the relation between the self-regulated learning attitude SRLR and the interventions. Lastly, the results of the qualitative data analyses will be presented.

Descriptive Statistics

In table 4 the mean and standard deviations of the usefulness and ranking per intervention are shown. The usefulness scores range from 4.52 to 3.11. With a score of 3 being the mean of a 5 point Likert scale, all the interventions score on the higher side of the scale. None of the interventions scored lower than the scale mean. Participants scored the Analogue Modeling intervention the highest and Analogue Hints interventions the lowest. The rank scores range from 2.30 to 4.64. The participants also scored Analogue Modeling the highest on rank, therefore it was the most favorite intervention.

Table 4

Average Usefulness and Rank Score per Intervention

	Usefulness		Rank	
Intervention	*M*	*SD*	*M*	*SD*
Analogue Modeling	4.52	.53	2.30	1.25
Digital Modeling	4.28	.57	2.45	1.28
Analogue Questioning Explaining	4.20	.59	2.87	1.57
Digital Hints	3.53	.88	4.19	1.57
Digital Questioning Explaining	3.23	.80	4.55	1.17

Analogue Hints	3.11	.93	4.64	1.56

Note. A lower score on the ranking question means that the intervention was more preferred.

Differences between interventions. Friedman's ANOVA shows that there is a significant difference in usefulness between at least two of the six interventions, $X^2(5) = 126.476$, $p = .000$, $N = 56$. To explore how the six interventions significantly differ from each other, a post-hoc analysis with Wilcoxon signed-ranks test for the usefulness score was conducted. A Bonferroni correction was applied, which resulted in setting the significance level at $p < 0.003$. Median perceived usefulness scores were 4.7 (4 to 5) for Analogue Modeling, 4.0 (4 to 5) for Digital Modeling, 4.0 (3.9 to 4.9) for Analogue Questioning and Explaining, 3.7 (2.8 to 4) for Digital Hints, 3.3 (2.6 to 3.7) for Digital Questioning and Explaining and 3.1 (2.4 to 3.9) for Analogue Hints.

A significant difference between at least two interventions in rank was also found using Friedman's ANOVA, $X^2(5) = 87.911$, $p = .000$, $N = 53$. A post-hoc analysis with Wilcoxon signed-ranks test for the rank scores was also conducted. The significance level was again set at $p < 0.003$. The results from this data did not differ much from the usefulness scale data and will therefore not be reported. We will only focus on the usefulness scale data from this point.

Differences in usefulness. All the results from the Wilcoxon signed-ranks test can be found in appendix 1.

In addition to the table, we will discuss the significant differences in usefulness between the interventions in this section. We will start with the highest rated intervention. The Wilcoxon signed-ranks test indicated that the Analogue Modeling intervention was rated more useful than the Analogue Question Explaining intervention ($Z = -3.484$, $p = .000$), the Digital Hints intervention ($Z = -5.550$, $p = .000$), the Digital Questioning Explaining intervention ($Z = -6.134$, $p = .000$) and the Analogue Hints intervention ($Z = -6.132$, $p = .000$). Secondly, the Digital Modeling intervention was rated more useful than the Digital Hints intervention ($Z = -4.872$, $p = .000$), the Digital Questioning Explaining intervention ($Z = -5.979$, $p = .000$) and the Analogue Hints intervention ($Z = -5.914$, $p = .000$). The third intervention we compared is the Analogue Questioning and Explaining intervention. This intervention was rated more useful than the Digital Hints intervention ($Z = -4.560$, $p = .000$), the Digital Questioning Explaining intervention ($Z = -5.654$, $p = .0000$) and the Analogue Hints intervention ($Z = -5.616$, $p = .000$).

Differences between nurses and L&D specialists. In order to determine if nurses and L&D specialists perceived the usefulness of the interventions in the same way two Friedman's ANOVAs were performed. They showed that there is a significant difference in usefulness between at least two of the six

interventions when looking at the data from the nurses, $X^2(5) = 73.540$, $p = .000$, $N = 31$ and the L&D Specialists, $X^2(5) = 59.036$, $p = .000$, $N = 25$. Two post-hoc analyses with Wilcoxon signed-ranks tests for the usefulness score were conducted to explore where these differences can be found and the Bonferroni correction was applied again to maintain a significance level of $p < 0.003$. The results of the Wilcoxon signed-ranks test on the usefulness score of the interventions can be found in appendix 1.

In this section we highlight three differences in the perceived usefulness score from the nurses compared to the perceived usefulness score from the L&D specialists. The first difference can be found when comparing the Digital Hints intervention to the Digital Modeling intervention. Both the nurses and the L&D specialists perceive the Digital Modeling intervention as more useful than the Digital Hints intervention. For the nurses this difference in usefulness was found significant ($Z = -4.364$, $p = .000$). The second difference between the nurses and L&D specialists can be found between the Digital Hints and Analogue Questioning and Explaining intervention. Again the Digital Hints intervention is perceived as significantly less useful by the nurses ($Z = -4.468$, $p = .000$). The last difference between the data from the nurses and the data from the L&D specialist can be found between the Digital Hints and Digital Questioning and Explaining interventions. The nurses perceived the Digital Questioning and Explaining intervention to be more useful. The L&D specialist found the Digital Hints intervention to be significantly more useful ($Z = -2.999$, $p = .003$).

Correlation between interventions and SRLR. The results concerning the relation between the usefulness score of the interventions and SRLR can be found in Table 5. This table shows the correlations among the six different interventions for the whole dataset.

Table 5

Kendall's Tau Rank Correlation Coefficients and significance levels

	Digital Hints	Analogue Hints	Digital Modeling	Analogue Modeling	Digital Questioning Explaining	Analogue Questioning Explaining	SRLR
DH	-						
AH	.183 (.059)	-					
DM	.274* (.007)	.172 (.090)	-				
AM	.240* (.019)	-.007 (.941)	.140 (.191)	-			
DQE	.124 (.203)	.266* (.006)	.148 (.146)	-.001 (.988)	-		
AQE	.277* (.022)	.037 (.703)	.111 (.285)	.359* (.001)	.045 (.650)	-	
SRLR	.414* (.000)	.062 (.518)	.169 (.094)	.203* (.044)	.059 (.536)	.128 (.191)	-

Note. $N = 56$. $*p < 0.05$ level. Significance levels are presented in brackets. The correlations for the two subgroups (nurses and L&D specialists) did not differ much from the correlations of the whole dataset.

There are two significant correlation between SRLR and the interventions. A significant, low correlation ($r = .30$ to $.50$; Uzun et al., 2016) can be found between SRLR and the DH intervention ($r = .414$; $p = .001$). SRLR shows a significant, negligible correlation ($r = .00$ to $.30$; Uzun et al., 2016) with the AM intervention ($r = .203$; $p = .044$).

Qualitative analysis

Regarding the qualitative data analysis, the results show more categories of advantages than disadvantages. Moreover, nurses in general gave more elaborate answers that covered multiple aspects as compared with L&D specialists. Some categories of advantages were present in all six interventions (e.g. awareness and adaptative/personalized). For the disadvantages, this applies to the categories "time," "highly dependent on learner," and "applicability/accessibility." These two disadvantages were present in every intervention.

A clear preference for three interventions can be found based on the quantitative analysis. The interventions AM, DM, and AQE scored the highest on usefulness and were ranked as the most favorite by both the nurses and L&D specialists. The below paragraphs discuss the most recurring advantages and disadvantages for these three interventions using quotes from the respondents. The three other interventions (DH, AH, and DQE) scored lower on the usefulness scale and were ranked as the least favorite. We also analyzed the advantages and disadvantages mentioned for these interventions. A complete overview of the categories and the percentage of times the advantages and disadvantages were mentioned by the nurses and L&D specialists are included in appendix 3.

Analogue modeling. The most common advantage for the AM intervention was "learning together." Participants mentioned this advantage 28.91% of the time. Two example quotes are "Learning from each other is very effective" and "Learning from each other is very nice and useful." The second most common advantage was "supporting the learning process" (19.53%). One respondent said that "I'm an advocate for working with the actual materials. Hold it in your own hands, feel how they work, where you make a mistake and how you can improve." "Safe" was another advantage participants mentioned often (10.16%). An example quote is "This will improve the learning climate." Regarding disadvantages, participants mentioned "time" 26.76% of the time. Two example quotes are "[this intervention is] time consuming" and "This will take up time from two people. This time is not always available." "Dependent of others" (25.35%) and "not safe" (19.72%) were two other common disadvantages. For the former, one

respondent mentioned that “It all dependents on the skills of the instructor.” For the latter, one respondent asked “Will a nurse dare to approach a colleague with a question?”

Digital modeling. The most common advantage for DM was “just-in-time” (17.07%). The respondents claimed that “I would save them and watch them whenever I need to” and “I like this a lot because you can search for them when needed.” They also mentioned “modality” 15.24% of the time. One example quote is “It concerns a short video. I would rather watch this than read a text.” The third most common advantage for DM was “supporting the learning process” (14.02%). One respondent mentioned that “A video is educational for everybody.” Regarding disadvantages, the respondents mentioned “implementation and facilitation” 23.75% of the time. One respondent claimed that “It’s a lot of work to make good videos.” They also mentioned “applicability and accessibility” as another possible disadvantage (22.50%). One respondent asked, “Where can we find the videos when we need them? Will they be uploaded to a database?”

Analogue questioning and explaining. The most common advantage for AQE was “personal attention” (19.15%). One respondent claimed that “Face-to-face contact is always important.” Moreover, the possibility for the intervention to be “adaptive and personalized” was a significant advantage (12.06%). Two example quotes are “[with this intervention] you are looking at the strengths of the nurse/learner” and “The possibilities of your workplace, skills, weaknesses, and strengths are taken into account.” The respondents also mentioned “awareness” as a significant advantage (11.35%). The most common disadvantage was “time” (21.35%). Many reactions (20.22%) also related to the “implementation and facilitation” of the intervention. Respondents claimed that “It’s expensive” and “There also has to be time and space to have conversations with a coach.” The final disadvantage is that one has to be “dependent on others” with this intervention (16.85%). An example quote is: “The results are highly dependent on the skills of the coach.”

Digital hints, analogue hints, and digital questioning and explaining. These three interventions scored the lowest on the usefulness scale on average and were ranked as the least favorite. One common category of advantage for the DH (21.74%), AH (23.71%), and DQE (13.54%) interventions was “easy access.” Two example quotes are: “Via your smartphone, so quickly accessible” and “[The coasters] are ready to grab, so you don’t have to think too much about it.” This suggests that there was a consensus regarding how easily accessible these three interventions were. However, given the low ranking of these interventions, respondents noted several disadvantages. For DH, the three most common categories of disadvantages were “digital/digitally skilled” (26.44%), “no need/will not be used” and “time” (both 19.54%). An example quote for “digital/digitally skilled” is: “[You need a smartphone]… the senior employees don’t always have one or don’t know how to use it that well.” In the

category “no need/will not be used” a quote is: “I don’t think nurses will feel the need to do this on a regular basis, especially not via a smartphone app.” For the category “time” a fitting quote is: “We don’t always have enough time to think about what we have learned.”

For the AH intervention, the most common disadvantages were “not adaptive/personalized” (20.51%), “implementation and facilitation” (16,67%), and “modality” (15.38%). Respondents claimed that AH is “not adaptive/personalized”: “I think that the answers on the coasters will be very general and a personal learning question will need a more specific answer.” An example quote for “implementation and facilitation” is: “The coasters will have to be updated once in a while, otherwise they will become irrelevant.” In the category “modality” respondents mentioned: “[The coasters] will probably get lost.”

For the DQE intervention, the most common disadvantages were “digital/digitally skilled” (19.61%), “not adaptive/personalized” (16.67%), and “not personal/impersonal” (16.67%). An example quote for the disadvantage “digital/digitally skilled” is: “I would prefer a face to face talk, I find that communicating is easier that way.” In the category “not adaptive/personalized” a quote is: “This concern very general suggestions, that are not adapted to the specific situation.” For the category “not personal/impersonal” a fitting quote is: “Communication via an app tends to be a bit impersonal.”

Discussion

The purpose of this study was to compare different SRL interventions to gain knowledge about the preferences that exist in the healthcare sector concerning SRL learning and how to support it. The main research question is as follows: *How do nurses and L&D specialists within the health care sector perceive different SRL interventions based on scaffolding techniques?* Different healthcare professionals filled in the online questionnaire. With the data they provided, we have found the answers to the following three sub-questions in order to form an answer to the main research question:

1. Do the interventions differ in usefulness from one another?
2. What is the relation between the perceived usefulness of the interventions and the respondents’ SRLR?
3. What advantages and disadvantages do the respondents mention when judging the interventions?

The following section provides answers to both these questions and the main research question.

Main findings

In general, all the interventions were perceived to be useful since all of the interventions scored higher than the scale average. Since the usefulness was scored on a 5 point Likert scale, the scale average is 3. The least useful interventions scored a 3.11. The proposed interventions were overall perceived useful and can therefore be considered a step into the right direction. The participants appeared to be open to these kinds of interventions.

Three intervention were perceived the highest. These highly perceived interventions are Analogue Modeling, Digital Modeling and Analogue Questioning and Explaining. These three interventions scored the highest on usefulness and were ranked as the most favorite (in order) by the participants. We can conclude that the two interventions (both digital and analogue) that focused on the scaffolding mean "modeling" scored the highest on the usefulness scale as compared with the other interventions. When comparing the interventions individually, we find that Analogue Modeling was significantly more useful than all the other interventions except for Digital Modeling. Digital Modeling itself was significantly more useful compared to Digital Hints, Analogue Hints, and Digital Questioning and Explaining. Given these results, modeling can be a useful mean for promoting SRL. One explanation for this is that modeling is an extremely old tradition within the healthcare sector. Traditional apprenticeships has always been the most significant means of learning (van der Zwet, et al., 2010). This technique has been used for centuries. It is not surprising that a method that has been used for that long is still considered relatively useful. The Analogue Questioning and Explaining intervention centered around personal coaching sessions focused on the scaffolding means "questioning" and "explaining" and is the third highly perceived intervention. This intervention scored relatively high on usefulness and was ranked as the third most favorite intervention. One explanation is that the implementation through the help of a mentor or coach has a beneficial impact on medical students' and residents' SRL processes (Van Houten-Schat et al., 2018), therefore a coach might also be useful for others who work in the medial environment. Another explanation to consider is the current circumstances of the worldwide COVID-19 outbreak, which might cause people to gravitate towards talking to a coach. The participants might think that coaching sessions are a useful form of support right now in particular since burnout, insomnia, depression and anxiety has become more common in healthcare workers (Tiete et al., 2020; de Vroege & van den Broek, 2021).

The interventions Digital Hints, Digital Questioning and Explaining, and Analogue Hints were scored as the least useful and ranked as the least favorite. However, these three interventions did still score higher than the scale average and can therefore still be considered rather useful than not useful. Note that two of the three digital interventions are in the bottom as well as both of the "hints" interventions. We thus conclude that the respondents do not prefer hints as supports for their learning process nor digital interventions over analogue ones. Respondents also did not think that hints or digital interventions were useful for them.

The second research question focuses on the relation between the six interventions and the self-regulated learning attitude SRLR. The most notable relationships across the entire dataset are the significant positive correlations between the respondents' SRLR and the usefulness scores for two of the

interventions. There is a positive correlation between SRLR and Digital Hints and SRLR and Analogue Modeling. In other words, when the respondent scores on SRLR increased, the intervention was rated as more useful. Similarly, when the SRLR scores decrease, the usefulness scores also decrease. Given the high scores of usefulness in this study, we can conclude that the participants with a high SRLR score are more open to these types of interventions and might see more value in using these interventions. Given the fact that we only found two significant relationships, the relation might we more complex than we initially thought. Possibly the relationship between SRLR and the perceived usefulness is a curvilinear relationship. Meaning that, the higher someone score on SRLR the higher they perceive the usefulness of the intervention, but only to a certain point. When that certain point (SRLR score) is reached, the perceived usefulness will only decrease (Li, 2018).

To answer the final research sub-question, this study analyzes the two open-ended questions about advantages and disadvantages. This research question aims to gain insights on what aspects of the interventions were perceived positively and what aspects were perceived negative. First, the most common disadvantages for each intervention were from the categories "time," "highly dependent on learner," and "applicability and accessibility." The inclusion of the disadvantage time is not a surprising result. In the Netherlands, the high workload has long played a role in healthcare (SER, 2020). In addition, the current COVID-19 pandemic has caused an increase in this workload (Tiete et al., 2020; de Vroege & van den Broek, 2020). However, the facilitation or organization of time is one of the most important components for the facilitation of workplace learning. The factor time has a big impact in the learning potential within an organization (Tynjälä, 2008). In the category "highly dependent on learner" respondents commented on the need for a learner to be ready and open to SRL. Participants also reported that the success of the intervention depends on the learners' skills and knowledge levels (about SRL). All this can be related to the idea of scaffolding. When done correctly scaffolding is a technique to support every learner, no matter their current skill level (van de Pol et al., 2010). The given support is adaptive and personalized to individual learning needs and will fade away or take a different form over time (van de Pol et al., 2010). The fact that "highly dependent on learner" was a commonly mentioned disadvantage might tell us something about the current skill level within the healthcare sector. Moreover, about the concern the participants might have felt due to the fact that they or their colleagues will not be able to benefit from the interventions fully due to their current SRL skills. This aligns with previous research suggesting that the SRL capabilities of healthcare professionals can be improved (Cuyvers, 2020; Bloemendal, 2019). It should be noted that the disadvantages mentioned in the category "highly dependent on learner" account on average for less than 6% of the reactions for the whole dataset. The role of this category is considerably smaller than disadvantages from other categories despite its presence in

every intervention. The last category of disadvantages is “applicability and accessibility.” Like the disadvantage “time”, this disadvantage is too related to the facilitation of workplace learning. Making the interventions and other kinds of knowledge accessible to the employees is important in order for learning to take place (Li et al., 2009). Li et al. (2009) found that in order to increase learning organizational support is a key component. This is inline with one of the findings of Cuyvers (2019), were the importance of ‘Manager support and motivation’ is stressed and mentioned as a component of her SRpL model. The disadvantage “applicability and accessibility” was most relevant for the Digital Modeling (22.5%) and Digital Questioning and Explaining (14.61%) interventions. With the Digital Modeling intervention, participants were concerned that the videos would get ‘lost’ in their mail inbox since the vignette did not provide a database to store the videos and later search for them. The focus of Digital Questioning and Explaining lies more on whether the software will be able to provide applicable guidance in a lot of different situations. Is the Artificial Intelligence software smart enough to comprehend the questions asked by the medical professionals and will it provide adequate help?

Regarding the advantages, every intervention contains some outliers. For example, the outlier for Analogue Hints and Digital Hints is “easy access.” Moreover, Digital Hints is often associated with “awareness.” Previous research found similar benefits of using a smartphone app (King et al., 2013). In their research the smartphone application was associated with easy access and awareness (King et al., 2013). With Digital Modeling and Digital Questioning and Explaining, “just-in-time” is often associated with these interventions. With the Analogue Modeling intervention, the participants found “learning together” to be a major advantage. With Analogue Questioning and Explaining, participants often mentioned “personal contact” as an advantage. This implies that each intervention has its own advantages and strengths. It is also necessary to examine the goal that should be achieved with the intervention to ensure that the correct intervention is applied.

It is also interesting to analyze the benefits of the three highest-scoring interventions. As mentioned in the results section, Analogue Modeling’s greatest advantages are “learning together,” “supporting the learning process,” and “safe.” “Learning together” is related to social learning, which has been positively related to nurses’ SRL in other studies (Aagten, 2017; Berings, et al., 2008). The Digital Modeling intervention also shares the advantage of “supporting the learning process.” We can therefore conclude that medical professionals see interventions around the scaffolding mean “modeling” as supporting learning well. In addition, “modality” and “just-in-time” were also significant advantages for the Digital Modeling intervention. The third favorite intervention was Analogue Questioning Explaining. The greatest advantages of this intervention were “personal attention,” “adaptive and personalized,” and

"awareness." This intervention therefore had no overlap with Digital Modeling and Analogue Modeling. We can again conclude that each intervention had its own advantages and strengths.

This chapter provides one last observation regarding the most preferred and useful intervention: Analogue Modeling. Participants mentioned the "safe" category as both an advantage (10.16%) and disadvantage (19.72%) of this intervention. This relates to how the comments in these categories mainly refer to asking questions and asking for help. If the intervention stimulated questioning, it was seen as an advantage. However, many participants were concerned that not everyone dares to ask for help. This intervention therefore seems to be closely related to a safe learning environment. This must be considered when implementing an intervention such as this.

Implications and recommendations

Theoretical implications. The main theoretical implications of this research are the insights gained about designing meaningful interventions in the healthcare sector. This study both shows which interventions score high on usefulness and are most preferred by respondents. The highly perceived interventions are Analogue Modeling, Digital Modeling and Analogue Questioning and Explaining. We can conclude that interventions focused around the scaffolding technique 'modeling' are perceived useful. Previous research suggest that this might be due to the fact that modeling (master-apprenticeship) is an old tradition in the clinical context (van der Zwet, et al., 2010) and still plays a large role in educating healthcare professionals today (Mohammadi et al., 2020). This information can serve as the basis for developing new interventions. In addition, the information obtained from the stated advantages and disadvantages is also quite helpful. This is valuable information about what appeals to medical specialists and what does not appeal to them. This should be accounted for when designing interventions in the future. Another theoretical implication is about the relationship between SRLR and the perceived usefulness of the interventions. The results from this study give us reason to believe that the relationship is more complicated then we initially thought. The relationship might be a curvilinear relationship. This means that, the higher someone score on SRLR the higher they perceive the usefulness of the intervention, but only to a certain point. After that point (SRLR score) the perceived usefulness will not increase but decrease (Li, 2018).

Practical implications. A practical implication is that respondents perceived the top three interventions relatively positively. However, there is always room for improvement, and facilitators should take a critical look at the advantages and disadvantages identified by this study to improve the proposed interventions. The insights from this study can also be translated to other organizations outside the healthcare sector. The interventions were designed based on SRL and scaffolding principles that can be

applied in other work contexts. The specific videos/vignettes should, however, be altered to fit other occupations and organizations.

Recommendations. Based on these conclusions, a recommendation for practitioners is to further develop (one of) the top-rated interventions. With the information gathered in this study, adjustments and improvements can be made. For example, the categories of disadvantages "time," "highly dependent on learner," and "applicability and accessibility" were applicable to all of the six interventions. Recommended is to focus on improving these aspects first. Time is of course a difficult issue due to the high workload and staff shortage. However, time is a prerequisite for learning to take place. An intervention cannot be implemented successfully without the facilitation of time. As Tynjälä (2008) states, 'every now and then employees need time and space to reflect on and conceptualize their practices as well as update their professional knowledge and skills.' The other commonly mentioned disadvantage is "highly dependent on learner". This is related to the skill level of the learner and whether learners are open to self-regulated learning or the interventions which is a very important part of scaffolding (van de Pol et al., 2010). The literature about scaffolding also stated the importance of fading (van de Pol et al., 2010). Which in this case means that the interventions are adaptive and will be personalized to the learners skill level. The guidance giving by the intervention will look different for every individual using it, based on their use of the intervention and their progress. The last frequently mentioned disadvantage was the "applicability and accessibility" of the intervention. For some specific interventions this disadvantage might be easily solved. For example, with the DM intervention a good system or database is needed to store all the video's. This way videos on specific topics can be found easily when needed.

However, to truly study the effects of the interventions on SRL, the interventions should be implemented, tested and monitored in the work context. Further research is needed to determine these effects.

Limitations

Despite its strengths, the current study has some limitations. First, due to the Covid-19 pandemic, the workload in the healthcare sector has increased drastically. As a result, the sample size was smaller than what the author had originally intended. The participants from this study may also have been negatively affected by the pandemic. Due to the increased workload, learning at the workplace may not be seen as a priority. This may have influenced the answers given in this study. However, since the author selected participants based on a convenience sample, the participants who did participate were most likely enthusiastic about learning and development. This enthusiasm for learning might have influenced the answers in a positive manner. Another possible limitation is the length of the videos. They were quite

short, as all videos were around 60 seconds. This might not have provided enough time for the complete idea of the intervention to be properly conveyed.

Conclusion

This research aimed to determine the preferences of nurses and learning and developments specialists concerning proposed interventions, as well as assessing the perceived usefulness of these interventions. The following research question was formulated: Are there differences among the proposed SRL interventions, and if so, how can we explain these differences? Based on the quantitative and qualitative analysis of the interventions, it can be concluded that there are differences to be found between the interventions. The results indicate that based on the usefulness score and ranking a clear top three of the interventions can be made. Analogue Modeling, Digital Modeling and Analogue Questioning and Explaining are (in this specific order) the most useful and most favorite interventions based on the judgment of both the nurses and the L&D specialists. The goal of finding explanations for these differences was reached by looking at the correlations between the usefulness score of the interventions and the SRLR score of the participants, as well as analyzing the qualitative data. The significant positive correlations between Analogue Modeling and SRLR and Digital Hints and SRLR indicated that the usefulness score moves in the same direction as the SRLR score. This means that a higher SRLR score leads to a higher usefulness score on these specific interventions. With the analysis of the qualitative data it became clear that there is not one specific reason for why these interventions turned out to be the top three most preferred interventions. Both the modeling interventions (Analogue Modeling and Digital Modeling) have been linked a lot to the advantage “supporting the learning process.” Therefore modeling interventions have been found to be supportive of the learning process. No further overlap in advantages between the interventions was found. We can therefore conclude that each intervention has its own advantages and strengths and is scored useful and ranked in the top three most favorite interventions for reasons unique to the specific intervention.

As stated in the introduction of this study, not much is known about SRL and the support of it in the medical environment. In order for medical professional to become better self-regulated learners, they need adequate guidance. One way of helping them is by implementing meaningful interventions. However, the knowledge about these interventions was limited. This study provided an insight in what type of interventions are most preferred and rated most useful by healthcare professionals. It also provided an overview of the most referred to advantages and disadvantages per intervention. Therefore this study can be considered as one step towards meaningful SRL interventions for healthcare professionals.

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Appendix 1

Comparing the usefulness score of two interventions at a time for nurses and L&D Specialists.

Compared interventions	Group	Mean Rank	*N*	*Z*	*P*
AH – DH	Nurses	2.18 – 2.39	31	-1.366	.172
	L&D	2.38 – 3.26	25	-2.209	,027
	Both	2.27 – 2.78	56	-2.500	.012
DM -DH	Nurses	4.52 – 2.39	31	-4,364	.000*
	L&D	4.46 – 3.26	25	-2,161	.031
	Both	4.49 – 2.78	56	-4.872	.000*
AM – DH	Nurses	4.95 - 2.39	31	-4.577	.000*
	L&D	4.98 - 3.26	25	-3.731	.000*
	Both	4.96 – 2.78	56	-5.550	.000*
DQE – DH	Nurses	2.58 - 2.39	31	-.687	.492
	L&D	1.90 - 3.26	25	-2.999	.003*
	Both	2.28 – 2.78	56	-1.987	.047
AQE - DH	Nurses	4.39 - 2.39	31	-4.468	.000*
	L&D	4.02 - 3.26	25	-1.951	.051
	Both	4.22 – 2.78	56	-4.560	.000*
DM – AH	Nurses	4.52 - 2.18	31	-4.669	.000*
	L&D	4.46 - 2.38	25	-3.805	.000*
	Both	4.49 – 2.27	56	-5.914	.000*
AM – AH	Nurses	4.95 - 2.18	31	-4.872	.000*
	L&D	4.95 - 2.38	25	-4.289	.000*
	Both	4.96 – 2.27	56	-6.132	.000*
DQE – AH	Nurses	2.58 - 2.18	31	-1.451	.147
	L&D	1.90 - 2.38	25	-.137	.891
	Both	2.28 – 2.27	56	-.928	.353
AQE - AH	Nurses	4.39 - 2.18	31	-4.685	.000*
	L&D	4.02 - 2.38	25	-3.560	.000*
	Both	4.22 – 2.27	56	-5.616	.000*

AM – DM	Nurses	4.95 - 4.52	31	-2.094	.036
	L&D	4.98 - 4.46	25	-1.396	.163
	Both	4.96 – 4.49	56	-2.455	.014
DQE – DM	Nurses	2.58 - 4.52	31	-4.285	.000*
	L&D	1.90 - 4.46	25	-4.170	.000*
	Both	2.28 – 4.49	56	-5.979	.000*
AQE - DM	Nurses	4.39 - 4.52	31	-.444	.657
	L&D	4.02 - 4.46	25	-1.029	.303
	Both	4.22 – 4.49	56	-.974	.330
DQE - AM	Nurses	2.58 - 4.95	31	-4.314	.000*
	L&D	1.90 - 4.98	25	-4.289	.000*
	Both	2.28 – 4.96	56	-6.134	.000*
AQE – AM	Nurses	4.39 - 4.95	31	-2.642	.008
	L&D	4.02 - 4.98	25	-2.488	.013
	Both	4.22 – 4.96	56	-3.484	.000*
AQE - DQE	Nurses	4.39 – 2.58	31	-3.830	.000*
	L&D	4.02 – 1.90	25	-4.104	.000*
	Both	4.22 – 2.28	56	-5.654	.000*

Note. * is significant at .003 level

Appendix 2

Final code tree with an explanation of the type of code included per category

	Category	**Explanation**
Disadvantages	Dependent on others	The dependence of others and their skills or time. The fact that you need another person and cannot do it individually.
	Digital/ digitally skilled	It is a digital or software driven intervention. The user needs to be digitally skilled in order to use it.
	Highly dependent on learner	A successful implementation is highly dependent on the individual learner and their personal characteristics.
	No need of/ will not be used	There is no need to implement this intervention. It will not be used by a lot of people.
	Implementation/ Facilitation	Concerns about the implementation of the intervention (e.g., the costs) and the facilitation of the intervention (e.g., keeping it up to date).
	Mean does not fit the goal	This intervention will not support the learner in the intended way.
	Less interaction	There is no possibility to interact with colleagues or the intervention prevents interaction from taking place.
	Miscellaneous	Codes that are considered to be disadvantages but are only mentioned a few times and don't belong to any other category.
	Not adaptive/ personalized	The intervention is to general (or either not specific enough). It is not adaptive and will therefore not offer personalized learning.
	Not safe	This concerns a feeling of the intervention not being private and therefore not safe. It also concerns the fear of asking for help.

	Not personal/ impersonal	The intervention feel impersonal, there is no personal contact.
	Time	This interventions will take up to much time and add workload. There is no time for this intervention during working hours.
	Applicability/ accessibility	This intervention is not applicable and/or accessible to/in a variety of situations and will not always have the desired outcome.
	Modality	Disadvantages concerning the way the intervention was presented.
Advantages	Activating	An external motivator that works activating
	Adaptive/ personalized	This intervention will serve specific needs and is adaptive. Therefore it will offer personalized learning.
	Autonomy	This triggers internal motivation and will stimulate the learners' autonomy.
	Just-in-time	An individual intervention that will be available when and where you need it.
	Awareness	Providing insights and an overview, it will make the learner aware of learning/ their learning process.
	Easy Access	The intervention is accessible in an easy manner.
	Learning goals	A focus on setting learning goals and achieving them.
	Miscellaneous	Codes that are considered to be advantages but are only mentioned a few times and don't belong to any other category.
	Supporting the learning process	This intervention explicitly supports the learning process, is educational and will provide confirmation.
	Personal attention	A focus on personal attention and face to face contact.

	Reflecting	Provides an opportunity to reflect and evaluate on actions.
	Learning together	The intervention stimulates learning and working together with colleagues (e.g., learning from their experiences)
	Time	It concerns a short intervention that will fit into working hours.
	Safe	The intervention is private and therefore feel safe. It stimulates a safe learning environment were asking questions is permitted.
	Example available	Provides the learners with an concrete and complete example.
	Modality	Advantages concerning the way the intervention was presented.
	Content	Specific advantages about the explicit content included in the intervention
	No Advantages	This intervention has no advantages
	No disadvantages	This intervention has no disadvantages

Appendix 3

Overview of qualitative analysis.

		DH				AH				DM				AM				DQE				AQE			
	Category	**Nurses**	**L&D**	**Total**	**%**	**Nurses**	**L&D**	**Total**	**%**	**Nurses**	**L&D**	**Total**	**%**	**Nurses**	**L&D**	**Total**	**%**	**Nurses**	**L&D**	**Total**	**%**	**Nurses**	**L&D**	**Total**	**%**
Disadvantages	Dependent on others	0	0	0	0,00	0	0	0	0,00	0	1	1	1,25	9	9	18	25,35	0	0	0	0,00	4	11	15	16,85
	Digital/ digitally skilled	14	9	23	26,44	0	0	0	0,00	2	0	2	2,50	0	0	0	0,00	8	12	20	19,61	0	0	0	0,00
	Highly dependent on learner	1	4	5	5,75	2	2	4	5,13	0	2	2	2,50	3	0	3	4,23	2	3	5	4,90	4	1	5	5,62
	No need of/ will not be used	14	3	17	19,54	8	3	11	14,10	4	2	6	7,50	0	0	0	0,00	6	5	11	10,78	7	0	7	7,87
	Implementation/ Facilitation	0	0	0	0,00	5	8	13	16,67	12	7	19	23,75	3	1	4	5,63	0	1	1	0,98	9	9	18	20,22
	Mean does not fit the goal	0	0	0	0,00	0	0	0	0,00	2	3	5	6,25	0	2	2	2,82	4	3	7	6,86	0	0	0	0,00
	Less interaction	4	3	7	8,05	0	0	0	0,00	2	4	6	7,50	0	0	0	0,00	1	1	2	1,96	0	0	0	0,00
	Miscellaneous	0	1	1	1,15	1	5	6	7,69	1	7	8	10,00	0	1	1	1,41	3	0	3	2,94	1	2	3	3,37
	Not adaptive/ personalized	5	5	10	11,49	7	9	16	20,51	3	4	7	8,75	0	1	1	1,41	9	8	17	16,67	0	0	0	0,00
	Not safe	0	1	1	1,15	1	1	2	2,56	1	2	3	3,75	8	6	14	19,72	1	3	4	3,92	5	2	7	7,87
	Not personal/ impersonal	2	0	2	2,30	1	0	1	1,28	0	0	0	0,00	0	0	0	0,00	9	8	17	16,67	1	0	1	1,12

	Time	12	5	17	19,54	8	2	10	12,82	2	1	3	3,75	12	7	19	26,76	1	2	3	2,94	5	14	19	21,35
	Applicability/ accessibility	2	2	4	4,60	1	2	3	3,85	3	15	18	22,50	1	3	4	5,63	3	5	8	7,84	5	8	13	14,61
	Modality	0	0	0	0,00	7	5	12	15,38	0	0	0	0,00	1	4	5	7,04	3	1	4	3,92	1	0	1	1,12
Advantages	Activating	2	2	4	4,35	5	1	6	6,19	0	0	0	0,00	0	0	0	0,00	3	3	6	6,25	1	1	2	1,42
	Adaptive/ personalized	2	4	6	6,52	3	1	4	4,12	5	9	14	8,54	1	4	5	3,91	2	5	7	7,29	9	8	17	12,06
	Autonomy	0	2	2	2,17	4	0	4	4,12	5	7	12	7,32	0	1	1	0,78	2	1	3	3,13	2	1	3	2,13
	Just-in-time	2	1	3	3,26	5	3	8	8,25	12	16	28	17,07	4	4	8	6,25	15	11	26	27,08	4	1	5	3,55
	Awareness	15	5	20	21,74	3	2	5	5,15	2	0	2	1,22	1	1	2	1,56	0	1	1	1,04	10	6	16	11,35
	Easy Access	9	11	20	21,74	11	12	23	23,71	4	7	11	6,71	3	3	6	4,69	9	4	13	13,54	1	0	1	0,71
	Learning goals	0	0	0	0,00	0	0	0	0,00	1	0	1	0,61	0	0	0	0,00	2	0	2	2,08	8	6	14	9,93
	Miscellaneous	2	2	4	4,35	2	1	3	3,09	10	5	15	9,15	1	5	6	4,69	6	1	7	7,29	5	2	7	4,96
	Supporting the learning process	4	3	7	7,61	0	1	1	1,03	16	7	23	14,02	17	8	25	19,53	3	3	6	6,25	3	6	9	6,38
	Personal attention	1	1	2	2,17	0	0	0	0,00	0	1	1	0,61	3	1	4	3,13	1	0	1	1,04	16	11	27	19,15
	Reflecting	4	5	9	9,78	0	0	0	0,00	1	1	2	1,22	1	0	1	0,78	0	0	0	0,00	1	3	4	2,84
	Learning together	3	2	5	5,43	7	4	11	11,34	6	2	8	4,88	26	11	37	28,91	0	0	0	0,00	8	5	13	9,22
	Time	0	2	2	2,17	3	2	5	5,15	5	6	11	6,71	0	3	3	2,34	7	7	14	14,58	2	3	5	3,55
	Safe	0	2	2	2,17	3	1	4	4,12	0	1	1	0,61	9	4	13	10,16	3	1	4	4,17	10	2	12	8,51
	Example available	1	0	1	1,09	0	0	0	0,00	5	2	7	4,27	7	2	9	7,03	0	0	0	0,00	0	0	0	0,00
	Modality	1	3	4	4,35	10	8	18	18,56	15	10	25	15,24	4	2	6	4,69	1	0	1	1,04	1	1	2	1,42

	Content	1	0	1	1,09	2	3	5	5,15	2	1	3	1,83	2	0	2	1,56	3	2	5	5,21	3	1	4	2,84
	No Advantages	1	3	4	-	2	3	5	-	5	1	6	-	9	5	14	-	3	1	4	-	2	4	6	-
	No disadvantages	2	2	4	-	3	4	7	-	1	1	2	-	0	1	1	-	2	3	5	-	0	1	1	-