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Research article

Nurses' self-regulated learning in clinical wards: Important insights for nurse educators from a multi-method research study

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ABSTRACT

Central in nurse education curricula stands the preparation of future nurses to work in quickly evolving, dynamic, clinical wards. Learning in the flow of work plays a pivotal role in initial nurse education, but also during continuous professional development. To drive their ongoing development, nurses need competency in self-regulation of learning (SRL). Despite the importance of SRL in the clinical workplace for all (future) healthcare professionals, research on self-regulated workplace learning (SRwpL) of nurses and future nurses in clinical wards is underdeveloped. This study aims to enhance the conceptual understanding of SRwpL strategies and practices in clinical nursing wards and to offer insights for designing effective educational interventions supporting the facilitation and development of (future) nurses' SRwpL in the clinical ward. A multi-actor, multi-method perspective was adopted to qualitatively investigate SRwpL strategies nurses engaged in. Nurses were observed and interviewed, but also professionals responsible for ongoing development in clinical wards (the ward's head nurses and learning counselors) were interviewed. The data collection took place before the COVID pandemic. Results reveal self-regulatory strategies conditional for SRwpL in addition to strategies initiating, progressing, and evaluating the learning process. Head nurses and learning counselors report a lack of these conditional strategies and little variation, and sporadic engagement in all other self-regulatory strategies. To enhance (future) nurses' SRwpL, we suggest that clinical supervisors from educational institutions could exert a lasting influence by not only educating student nurses, but also fostering further professional development of counselors and head nurses to scaffold the SRwpL processes of future nurses in clinical wards.

1. Introduction

A central aim in many nurse education programs is preparing future nurses to work in quickly evolving, dynamic healthcare environments (Kuiper and Pesut, 2004), for which workplace learning plays a pivotal role (Billett, 2016; Liljedal et al., 2019). As providing entrusted qualitative patient care and cure has priority (Billett, 2016; Liljedal et al., 2019), engagement in learning in the flow of work is challenging. To move beyond accumulation of practice, which in itself does not lead to learning (Ericsson, 2006), scholars argue that being competent in self-regulation of learning (SRL) in nursing is needed to overcome these challenges (Chen et al., 2019; Kuiper and Pesut, 2004).

SRL refers to the active engagement in cognitive, affective, behavioral, and metacognitive strategies whereby individual learners recognize their learning needs, set goals, engage in suitable strategies, monitor, and evaluate their progress towards the learning goal, and, if needed, make adaptations (Sitzmann and Ely, 2011; Zimmerman, 2002). SRL is socially situated and occurs in the dynamic interplay with meaningful others (Hadwin et al., 2018). In recent decades, in nurse education research, a lot of attention has been paid to how future nurses self-regulate (SRL; Chen et al., 2019; Kuiper and Pesut, 2004) or self-direct (SDL; Chakkaravarthy et al., 2020; Murad et al., 2010) their learning. Although both concepts share the idea of the learners' responsibility to engage in learning activities (Gandomkar and Sandars, 2018; Loyens et al., 2008), SRL offers a more grain-size perspective on the different strategies engaged in during the learning process (Cuyvers, 2019; Endedijk and Cuyvers, 2021; Loyens et al., 2008). Furthermore, research has mainly focused on nurses' SRL in education and training

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contexts where the environments are intentionally organized towards learning such as for example in academic settings, skillslab practices, and online learning (a.o. Chen et al., 2019). At the workplace however, learning opportunities are not explicitly pre-defined and organized, and the learner self needs to be very much in control of initiating, advancing, and evaluating the learning process (Cuyvers et al., 2021; Sitzmann and Ely, 2011).

Notwithstanding all this, research on (future) nurses' self-regulated workplace learning (SRwpL) in clinical wards is lacking to a great extent (Cuyvers et al., 2020). Due to its intertwinedness with daily work behavior, SRwpL is difficult to study, and nurses may even not be aware when they mobilize these strategies. To meet the theoretical, methodological, and practical challenges related to investigating SRwpL in the authentic clinical wards (Cuyvers et al., 2020; Cuyvers et al., 2022), we adopt a multi-actor, multi-method perspective in this study. In this way, we aim to answer the following research question: What SRwpL strategies do nurses engage in during their daily practice in the clinical ward?

2. Self-regulation of learning in the clinical environment

A systematic review of SRL in the clinical environment of medical students and residents (van Houten-Schat et al., 2018) showed that a sound theoretical framework for SRL in clinical practice is lacking. As a result, researchers fall back to theoretical frameworks stemming from research in classroom learning. In recent research among medical specialists, a model was developed showing the complex interrelatedness of self-regulatory strategies (See Fig. 1), thereby shaping the learning process evoked (and disrupted) by the challenges of daily practice (Cuyvers et al., 2021). The self-regulatory strategies are categorized on their different roles in the process: some of the strategies are conditional (readiness), and other strategies are initiating (agents), advancing (mechanisms), and evaluating (appraisals) the learning process (Cuyvers et al., 2021). Finally, as a metacognitive strategy related to all other self-regulatory strategies (indicated with dotted arrows in Fig. 1), reflection plays a crucial role in the self-regulated learning process in the clinical workplace (Cuyvers et al., 2021; Larsen et al., 2016; Mann et al., 2009). In this study reflection is defined as the *careful thinking about the work-related situation, task or case which could be triggering potential learning, as well as the careful thinking about all the different self-regulatory learning strategies*. Exemplary, reflection could be the careful thinking about the opportunity for learning enclosed in a work-related challenge, or careful thinking about which cognitive or affective perceptions one is experiencing, or careful thinking about how learning could be planned. To what extent and how these strategies are mobilized by nurses is unknown, resulting in a limited understanding of nurses' SRwpL practices. Insights in these practices is needed to better understand how nurse educators can support future nurses to be ready for continuous professional development.

3. Methods

3.1. Context, design and participants

The study was conducted in a 400-bed teaching hospital in northwest Netherlands. To study SRwpL in depth as it is engaged in in the authentic context, a case-study design was chosen with multiple actors to provide insight through a multi-method approach (Yin, 2018). Twenty-eight nurses from 6 different wards – gastro-intestinal medicine, emergency, vascular surgery, pediatrics, maternity, and geriatrics- participated, the head nurses from the same wards, and all eight learning counselors of the learning academy of the hospital. Learning counselors are appointed by the hospital to support and facilitate the learning of all graduated and student nurses. The learning counselors act as nurse educators at the workplace in close collaboration with supervisors from the educational institutions they have an agreement with. The nurses were selected using convenience sampling: nurses working at the time of data-collection on each ward took part as participants. The sampling of nurses and head nurses across different disciplines, and learning counselors assigned to different disciplinary wards allow searching for commonalities that might provide evidence for findings not solely preserved for a particular group. As such the transferability of the findings could be foreseen (Guba, 1981).

All participants were informed about the research procedure and explained their right to withdraw at any time. Written informed consent

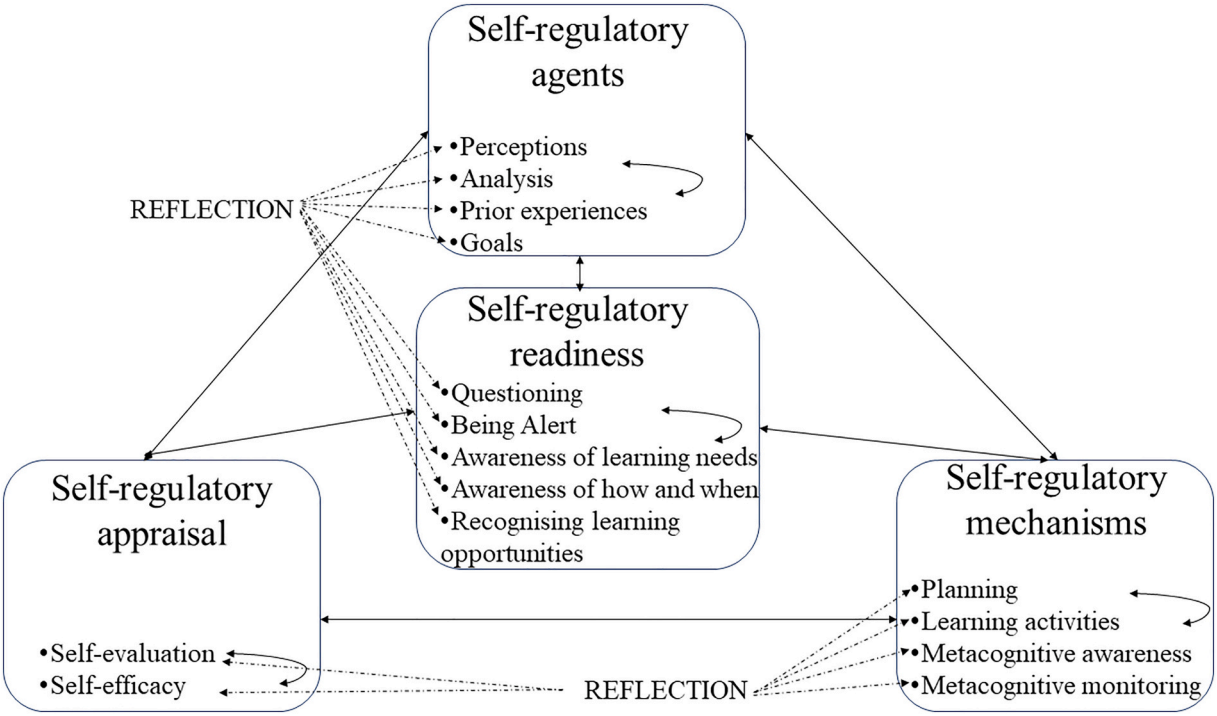

Fig. 1. Model of Self-Regulation of Professional Learning (based on Cuyvers et al., 2021).

was obtained from all the head nurses and learning counselors, oral consent from the participating nurses. Names and references were pseudonymized and anonymized. No personal data of nurses or patient data were collected. Nevertheless, patients were always asked for the permission to enter their room and observe the nurses.

3.2. Measures and data collection

In line with earlier research on SRpL in the clinical environment (Cuyvers et al., 2022), multiple methods were triangulated to assure the credibility (Yin, 2018). The data collection took place before the COVID pandemic. On-ward observations/shadowing of the nurses during their work were performed and offer rich evidence on overt SRwpL strategies. During the shadowing, observed behavior served as cues for immediate consecutive in-loco stimulated recall interviews in which covert strategies and the content of thoughts regarding the situation at hand were questioned (Cuyvers et al., 2022). During the observations, verbal and non-verbal communication, interactions, and observable behavior during a variety of accessible professional activities of the nurses, were registered as 'unstructured data'. A pre-developed protocol, tested in earlier research (Cuyvers et al., 2022) was used to facilitate the collection (Fig. 2). Also during the shadowing, cues for the stimulated recall interviews were registered.

During the immediate consecutive in-loco stimulated recall interviews, open-ended questions were selected from a pre-developed protocol, also used in earlier research (Cuyvers et al., 2021; Cuyvers et al., 2022) to elaborate on the observed behavior and detect different SRwpL strategies. Examples of questions to start the stimulated recall interview were: "Is see you do this… what were you thinking about? What was going on in your head? How did you experience this situation?". Depending on the answer of the nurses, other questions were selected from the protocol to invite the nurses to further elaborate on the content of their thoughts regarding potential SRwpL strategies in the particular situation. For example, when a nurse would say a situation was experienced as challenging, expressing a cognitive perception (self-regulatory agent), the researcher would ask about the reason why this situation was experienced as challenging. This question aimed to investigate whether there was an awareness of a potential underlying gap in competency, and a learning need (self-regulatory readiness). Subsequently, for example, underlying goals for the particular situation would be investigated (self-regulatory agent). The immediate consecutive in-loco stimulated recall interviews enhance credibility and dependability (Cuyvers et al., 2022; Henderson and Tallman, 2006). The first author observed approximately five hours on each ward,

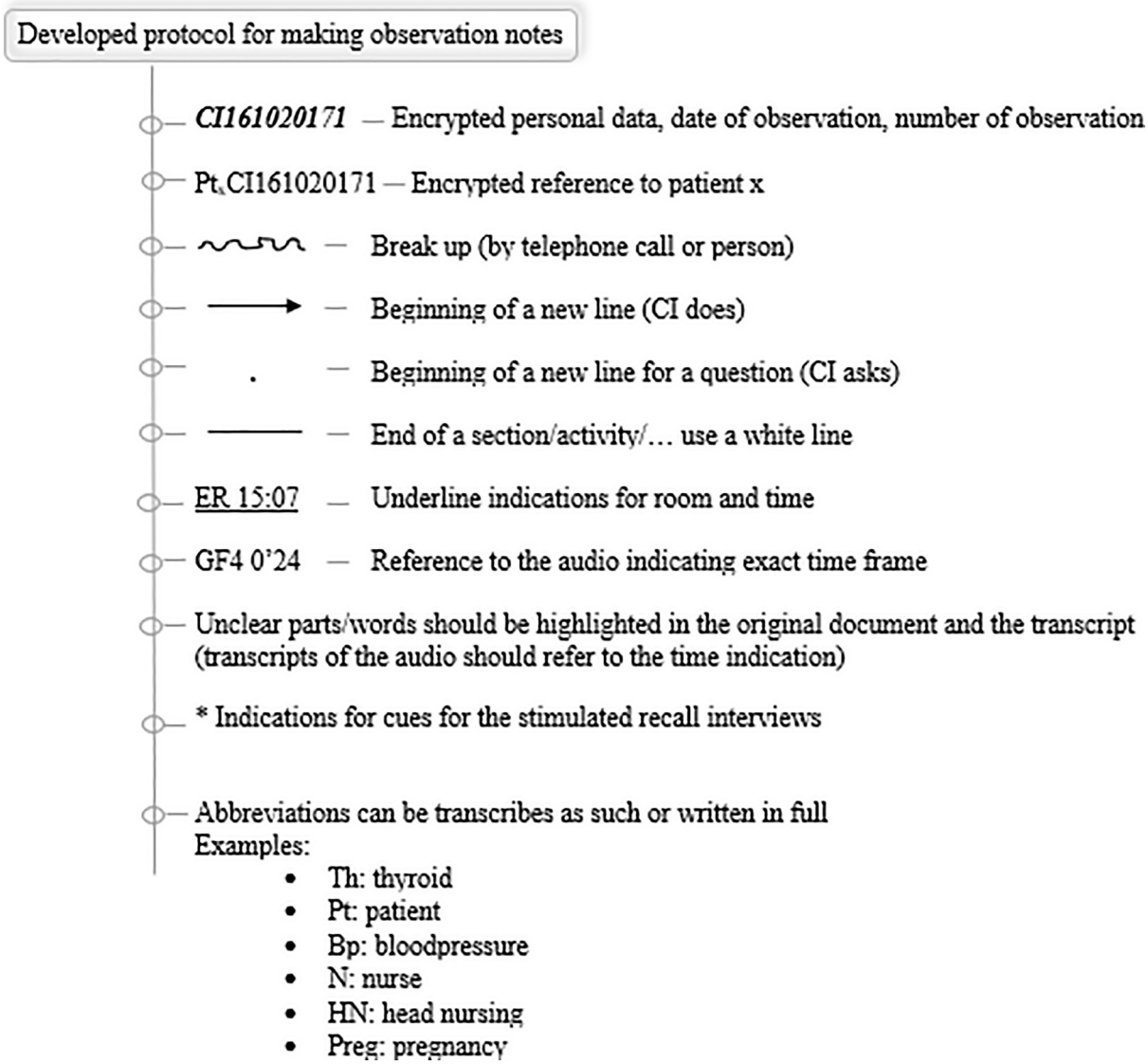

Fig. 2. Illustration of the protocol for observations in the clinical ward (Cuyvers et al., 2022).

respectively gastro-intestinal medicine, emergency, vascular surgery, pediatrics, maternity, and geriatrics.

Furthermore, semi-structured interviews with the head nurses and learning counselors of the respective wards were performed to capture their perceptions of nurses' engagement in SRwpL activities. Again, a protocol was used to establish the credibility and dependability of the findings (Guba, 1981; Henderson and Tallman, 2006). Head nurses and learning counselors were asked to recall a recent situation in which nurses were seen or heard to be confronted with a gap in their competency followed by inquiring about the engagement in SRwpL strategies seen and heard. The semi-structured interviews took on average 45 min.

All fieldnotes and audiotaped interviews, together with stimulated recall interviews were transcribed and brought together in transcripts ranging between 3237 words and 11,833 words, with an average of 6805 words. Semi-structured interviews were also transcribed verbally.

3.3. Data analysis

Content analysis was performed by the first author with the support of Nvivo 12 software. Data were deductively analysed with a code tree based on recent SRpL insights in the clinical environment (see Table 1) (Cuyvers et al., 2021). Careful considerations and rigorous empirical thinking of the first author, with reflexivity enhanced the credibility of the findings (Creswell and Miller, 2000). Furthermore, member checks were held between the first and the third author, who are both experts in the field of SRpL, to critically discuss potential differences in interpretation and enhance the credibility of the findings (Creswell and Miller, 2000; Guba, 1981).

4. Results

To answer the research question, both the results concerning the engagement in the different SRwpL strategies as seen (observation) and heard (interviews) in the clinical wards, and perceptions of head nurses and learning counselors of different SRwpL strategies engaged in by nurses are summarized along with supporting quotations that represent the voice of the participants. Longer vignettes are displayed in tables to improve the flow of reading. Finally, results regarding reflection on the different SRwpL strategies engaged in, are reported. SRwpL strategies are consistently described as "seen or heard to be engaged in" aiming to report the findings rigorously.

4.1. Self-regulatory readiness

Regarding conditional strategies for SRwpL, all the readiness strategies were seen and heard during the observations and stimulated recall on the wards. However, head nurses and learning counselors reported self-regulatory readiness strategies to be absent to a great extent.

Being alert for challenges and the danger of routine, and not walking around thoughtless, was heard and seen among nurses on a few wards. Nurses refer to this strategy with 'seeing' what is coming, and 'seeing' that they are not routined in certain actions or procedures. Also, experiencing the daily workflow being broken through by for example a student nurse is expressed as not walking around thoughtless (see Vignette R1, Table 2). Although engagement in being alert as a strategy was observed, we also observed the opposite: routine work and performing on "automatic pilot". As one nurse indicated: *"well, I have been working here a while now, so for me, the patients in this room are on automatic pilot… this diabetes should be well regulated but other than that, it is just… it goes automatically"*.

Concerning ***awareness of learning needs***, this SRwpL strategy was seen and heard in most of the wards from several nurses, and concerning different procedures. For example, the dismissal procedure, the ABCDE-method for powerful priority setting, and new computer systems and approaches were referred to as is illustrated in vignette R2 (Table 2). Also, the need to learn how to make the nursing job fun for oneself and how to behave when changing to a new function on the ward, were mentioned. The head nurse of the respective ward confirmed engagement in this strategy but the majority of the learning counselors explicitly stated that they do not hear or see this.

Q***uestioning oneself, and one's competencies*** was only seen and

Table 1
Overview of the categorized SRwpL-strategies (Cuyvers et al., 2021).

Categories	SRwpL-strategies	Display in the data
Regulatory readiness	Being alert	Expressions of not walking around thoughtless and keeping your eyes and brain open for challenges and the danger of routine.
	Questioning	Expressions about questioning oneself, ones competences, and what others claim.
	Awareness of how & when	Expressions related to the awareness about situations in which learning could take place.
	Awareness of learning needs	Expressions about realizations on what one knows and can, and what not, which procedures and techniques one is able to perform, and which not.
	Recognizing affordances	Expressions about chances and invitations for learning seen in cases, tasks, or situations, and interacations.
Regulatory agents	Perceptions	Expressions regarding the cognitive experience and affective experience related to a case, task, or situation at hand potentially initiating SRwpL.
	Analysis	What is described to be known about the case, task, or situation at hand potentially initiating SRwpL.
	Prior experiences	Expressions of actively searching memory for recall regarding knowledge, skills and metacognitive strategies used in a former, often very similar experience and a possible gap.
	Goals	Expressions of learning goals, deliberate and tied to performance-goals, that initiate SRwpL in the clinical environment.
Regulatory mechanisms	Planning	Expressions regarding decision-making about a cognitive, or behavioral approach for learning. Expressions of thinking processes related to planning activities that could lead to deliberately or reactively undertaking learning strategies.
	Learning activities	All activities described by the physicians to be undertaken that serve the progression of SRwpL and reach the learning goals.
	Metacognitive awareness	Expressions related to the awareness of the expected efficacy of a way of learning. Descriptions of reasons why a chosen approach will help to reach the learning goals.
	Metacognitive monitoring	Expressions regarding the attention for progression towards the goals set. Descriptions of knowing if and how a chosen approach is serving the progression towards the learning goals.
Regulatory Appraisals	Self-evaluation judgments	Expressions regarding the assessment of progress towards learning goals set, or assessment of learning that took place. For learning goals tied to performance, expressions of self-evaluation of performance leading to according self-evaluation of learning.
	Self-efficacy judgment	Expressions regarding the beliefs about one's own capabilities.
Reflection related to all other self-regulatory strategies		The careful thinking about the work-related situation, task or case which could be triggering potential learning, as well as the careful thinking about all the different SRwpL strategies

Table 2
Vignettes for self-regulatory readiness strategies.

Self-regulatory readiness	Nr.	Vignette
being alert	R1	Nurse 4:, *"I always find it very nice to take student nurses with me because this keeps me alert. It may have been a while since I have seen specific things, but then I think: oh, I need to dive into that and read about it to inform myself. So this is good for me."*
awareness of learning needs	R2	Nurse 3*: "I work on a variable basis and because of that I sometimes lack rhythm. Consequently, I always have to pay very good attention to ensure all the paperwork is in order, and check whether people still need prescriptions when they are being dismissed. This is very important. I want to acquire this rhythm in the dismission procedure, I find that important".*
Questioning oneself, and one's competencies	R3	Head nurse 1: *"…we had this situation recently where a patient had a heparin pump. This patient was going for surgery and the pump had to be stopped on a specific point of time before the operation. Then suddenly, I received a notification that something was wrong with this patient, and this is what happened: before going to surgery, this patient needed an extra examination, and the nurse simply detached the pump, removed the catheter, and transported the patient …just like that, far too long before the pump should have been stopped. So, I called this nurse with me, and I said, well I received this notification, this and this happened, why did you remove the heparin pump like you did? Do you know what this could have had as a consequence? Then the nurse said, yes, I know what the consequences can be. And I don't know why I did this… I didn't even think about it then, because it was busy on the ward, and I had a student nurse with me… And I know the protocol… I don't know".*
recognizing situations, tasks, and cases as affordances	R4	Nurse 1: *"… well, mainly about applying hypnosis… because we are just starting this as an approach, and we are trying to apply it… you need the right moment and the child that is open for it… so I was able to apply it one time on our ward, and for me each time is always a bit learning, because evidently it is different with each child".* Nurse 2: *"… obviously this patient shows neurological failure, and I don't think they are expecting it to come from the brain, but I think they are suspecting that it is an infectious disease, which of course is extremely instructive… Borrelia or Lyme's disease, I don't know much about that…".*

heard sporadically on one of the wards. As one nurse stated, *"Well, a small child was coming in yesterday for allergy testing on peanut butter, but then I thought: oh no, this child is small, less than one year, how can I dose it in such a way that this small child can have the peanut butter without overreacting?"*. Some of the head nurses and a learning counselor explicitly stated that this strategy is absent. In vignette R3 (Table 2) one head nurse indicated how a nurse did not question nor was alert consequently potentially leading to a dangerous situation.

Regarding ***recognizing situations, tasks, and cases as affordances*** for learning, this strategy was seen and heard on all the wards from various nurses. Different situations and tasks were seen as opportunities for nurses to develop technical and more generic skills (see Vignette R4, Table 2). Again, some of the head nurses and a learning counselor explicitly refer to this strategy as lacking.

4.2. Self-regulatory agents

For the SRwpL strategies initiating the learning process, different ***affective and cognitive perceptions*** related to cases, tasks, and situations experienced during job-performance were seen and heard from nurses on all the wards, especially on the geriatric ward. Exciting, pitiful, and very nice situations are examples of affectively perceived cases, tasks or situations that initiate learning. Also, cognitive triggers, such as interesting, intriguing, challenging, and worrying situations are mentioned (see Vignette A1 and A2, Table 3). One head nurse (see Vignette A3, Table 3) reported one situation indicated to be scary (a new procedure) causing 'unrest on the ward' related to not knowing how to deal with it.

Offering patient care comes to the fore in the goals nurses formulate, as could be heard on the wards. This is also indicated by the head nurses. However, also ***learning goals*** that are intertwined with work were reported to function as a self-regulatory agent. For example, one nurse challenges himself to improve in injecting drip. This challenge started as a joke, but certainly initiated subsequent learning: *"… I restarted to practicing injecting drips, for fun, as a joke…and I aimed for poking the needle right, eight times in a row… yeah, it's also just fun to challenge yourself…"*.

Analyzing situations, cases or tasks to understand the competence gap were not seen nor heard from nurses, head nurses, or learning counselors. Finally, we found some expressions of ***actively searching memory regarding knowledge, skills and metacognitive strategies used in former, often similar prior experiences*** as a regulatory agent, but also to avoid learning. For example, unsuccessfully placing a stomach pump in the past is mentioned as a negative prior experience. When a patient needs this pump, the nurse (nurse X in Vignette A4, Table 3) asks a colleague (nurse Y in Vignette A4, Table 3) to do this in her place (see Vignette A4, Table 3).

4.3. Self-regulatory mechanisms

Concerning SRwpL strategies advancing the learning process, ***planning*** a learning approach was not found in our observations and interviews. On the contrary, ***learning activities*** to advance the learning process were both seen and heard in the wards, and reported in interviews. Examples found are learning in interaction with others, learning by giving feedback to physicians, learning by doing things together with student nurses, observing others, and looking up things (see Vignettes M1 and M2, Table 4). Nurses also report awareness of the need to engage in learning activities (see 4.1.), but then subsequently not doing this (see Vignette M3, Table 4).

Metacognitive strategies that advance a potential learning process

Table 3
Vignettes for self-regulatory agents.

Self-regulatory agents	Nr.	Vignette
Affective and cognitive perceptions	A1	Nurse 5: *"… I am 60 and I really wanted to come to the hospital to work. I have spent most of my working career in elderly care. So, I come from care, and now I am very much into cure. Doing an intake for me is exciting and intriguing"*
	A2	Nurse 6*: "… I find it inconvenient… because she is asking for an answer to her question… and normally… with infection rates, we answer rather generically, and this is very specific…."*
	A3	Head nurse 2: *"well, for example, something new is introduced on the ward, and then everybody finds this a bit scary and is wondering how to deal with that… that is, we have a patient who will get parenteral nutrition, so intravenously. This is new on our ward and then the unrest on the ward can be felt. This patient and how to deal with this is often mentioned and questioned by the nurses."*
Prior experiences	A4	*"… nurse X is briefing nurse Y, who has not performed this procedure for many years. Nurse X says to nurse Y: 'but I have never succeeded before'… in the meantime the daughter of the patient comes telling both nurses that her father is throwing up a brown flowing substance… nurse Y says that if nurse X instructs her, she will then try to place the pump…".*

Table 4
Vignettes for self-regulatory mechanisms.

Self-regulatory mechanisms	Nr.	Vignette
Learning activities	M1	Nurse 7: *"we had a notification of a patient coming in. So I saw on the computer that radiculitus was mentioned, and then I failed to remember what that was, so I looked it up"*
	M2	Nurse 8*: "well, the male patient of bed n° three was very ill last night. The attending physician came to see him many times and now he seems to be reviving a little bit… I find this… not interesting but instructional… you have to keep an extra eye on a patient like this, do extra checkups, and then give feedback to the physician about the patients' status. I draw a lot from that"*
	M3	Nurse 9: *"Yes, well, I know I should dive into this, but then it doesn't happen. That's it…I would need someone to sit next to me instruct me on how and what… but it is always like, here you go, that's it… We help each other, but with this we actually gather a bit of what is needed here and a bit there… and that's it"*
Metacognitive awareness	M4	Nurse 10*: "I ask nurse Z because she is far more experienced than me"*.
Metacognitive monitoring	M5	Nurse 11: *"I notice in the moment that I am still thinking a lot about how to perform this procedure, and that there is no routine yet."*
	M6	Nurse 12: *"I will notice when I get better…"*.

Table 5
Vignettes for self-regulatory appraisals.

Self-regulatory appraisals	Nr.	Vignette
Self-evaluation judgments	Ap1	Nurse 13: *"It may sound silly, but daily, when I am working… I always have, I mean, it comes spontaneously that I reflect… One can reflect on a shift or action… with me it comes spontaneously… when I end my shift… you see I come to work by bike, and then when I bike home, or when I change my clothes to go home, it doesn't have to take long… then I think about how my day went, and what I possibly could do better in certain situations… So I do this automatically."*
	Ap2	Nurse 14*: "like with this ABCDE-method… physicians often refer to this, and that is still very hard for me… what exactly is A, what exactly is B, and so on… and so I always learn on this method…"*
	Ap3	Nurse 10: *"… well today I learned to recognize when an anaphylactic reaction is taking place… I had never seen this so closeby, and react on it… so this is what this day brought to me…"*.
	Ap4	Head nurse 3: *"… He is someone who waves it away… it happened but no harm is done, so …but as a head nurse, this is not the quality I want to provide on my ward… If this were me, and I would have made such a mistake, I would not sleep so to say, I would feel guilty towards this patient for having done something wrong… I find it so difficult when it is just waved away…"*.

Table 6
Vignettes for reflection.

Reflection	Nr.	Vignette
	Re1	Nurse 9: *"I will be honest with you, I am older, so for me that is just a thing. I find it difficult because there is so much to it when a patient is discharged from the hospital. You have to fax this, email that, ask the physician for that, a medical letter… all those things…"*.
	Re2	Nurse 15*: "I am almost 62…I was thinking lately, I used to work in pediatric daycare. I was very much into pediatric oncology, children being at home in the terminal phase… it is still so much in my heart… I find it… if I would have to do everything over, I would have… life goes as it goes, but I might have worked much more in pediatric oncology"*.

are occasionally seen and heard in the wards. For ***metacognitive awareness*** (the expected efficacy of learning activities to be undertaken) students and colleagues are consulted because their new or greater experience is considered effective for their learning (see Vignette M4, Table 4). ***Metacognitive monitorin***g (knowing if and how a chosen learning approach supports progression towards the learning goals) is mainly taking place intuitively: nurses report that they notice in the moment that there is a progression (see Vignettes M5 and M6, Table 4). The head nurses and learning counselors do not report back these metacognitive strategies.

4.4. Self-regulatory appraisals

Concerning SRwpL strategies evaluating the learning process, ***self-evaluation judgments*** (assessment of the progress towards the set learning goals or outcomes) were hardly heard or seen spontaneously in the wards. One single time, one nurse indicated to reflect and self-evaluate her performance and learning (see Vignette Ap1, Table 5). Further, self-evaluation judgments are often very broad: *"of course, one can always become better as a nurse…"*. When explicitly asking about deliverables, some engagement in self-evaluation judgments on learning is heard (see Vignettes Ap2 and Ap3, Table 5). One head nurse also indicated self-evaluation judgments to be waved away (see Vignette Ap4, Table 5). ***Self-efficacy judgments*** were not observed or reported.

4.5. Reflection

Engagement in ***reflection*** as an overall metacognitive strategy is heard regarding triggering events: situations, cases, or tasks perceived as challenging or complex (see Vignette Re1, Table 6). No other reflections shaping the learning process were heard on the ward, only on their work: nurses indicate to look back on performing their job and reflect on what went well or was hard to do. The course of the work being messy and chaotic is perceived as hindering learning at work. Nevertheless, we did find one nurse reflecting on choices made regarding her overall development (see Vignette Re2, Table 6). The learning counselors and head nurses indicated to find nurses' reflection on work and potential learning very important as well as the promotion hereof. If and how nurses themselves are perceived to reflect on triggering events for learning and on the engagement in SRwpL strategies did not emerge from the interviews.

5. Discussion

5.1. Main findings and discussion

Our analysis of nurses' engagement in SRwpL from different actor perspectives showed that nurses use a diversity of self-regulatory strategies conditional for SRwpL. Furthermore, a variety in self-regulatory strategies initiating, progressing, and evaluating their learning process in the clinical ward while at the same time offering patient care and cure, are found. As such, for example challenging situations, tasks and cases (regulatory agents) are reported and indicated to be recognized as opportunities for learning (regulatory readiness). However, notwithstanding this diversity, many of the SRwpL strategies, are only found to be engaged in occasionally. Also, head nurses and learning counselors report a lack of these conditional strategies, and little variation, and sporadic engagement in all other self-regulatory strategies. These results raise concerns about how effectively the clinical ward is used as a daily learning environment (Eraut, 2004; Rich, 2017). Only if the learning potential of situations, cases, and tasks, and the according cognitive and affective perceptions are genuinely recognized, and SRwpL strategies are actively and deliberatively engaged in, can nurses continuously develop themselves. Then awareness of learning needs (regulatory readiness) could initiate analysis of these challenging situations, tasks and cases (regulatory agent) to gain a deeper understanding of what is hindering competent clinical performance and what skills or knowledge need to be developed. Relating to prior knowledge (regulatory agent),

formulating a targeted learning goal (regulatory agent), and expressing the will to close this competency gap can then further initiate effective and efficient learning. Only then, learning activities (regulatory mechanisms) as also described in former research (Berings et al., 2005) could be planned (regulatory mechanism) and monitored (regulatory mechanism) after which self-evaluation judgments can be made (regulatory appraisal). Questions arise to what extent engagement in these strategies is competing over delivering high quality patient care (as time is limited), or whether a way can be found that they mutually reinforce each other. Currently, learning in the wards seems exclusively reactive and serendipitous, rather than deliberately and with conscious intent. Further research is needed and conscious action to support nurses' SRwpL intertwined with the development of their other activities on the ward.

The diversity of strategies found, support the applicability of the framework that was originally for medical specialists (Cuyvers et al., 2021). Also the more recently added self-regulatory readiness category (Cuyvers et al., 2021) was observed in the data. Awareness of learning needs and the recognition of learning affordances were indeed found as self-regulatory strategies and conditional for other self-regulatory strategies to be engaged in (Cuyvers et al., 2021; Schulz and Stamov Rossnagel, 2010). In line with Cuyvers et al. (2021), deliberate metacognitive self-regulatory mechanisms were hard to differentiate. Also, reflection on the overall learning process (Cuyvers et al., 2021; Mann et al., 2009) that goes beyond looking back on what one did was lacking, although deemed important by head nurses and counselors. In future studies, we advise to use additional research methods to find out if this is really lacking or needs to be studied in a different manner.

5.2. Implications for practice

Notwithstanding the need for further research, insights in nurses' SRwpL, and perceptions of head nurses and learning counselors who take up an important role as nurse educators in the workplace, allow to make suggestions to (further) strengthen the preparation for practice of future nurses by all educators involved. *First*, this study found that although nurses indicate an awareness of learning needs, and recognize learning affordances, subsequent deliberative engagement in other SRwpL strategies that initiate, progress and evaluate the learning processes is missing to a great extent. All nurse educators involved – supervisors from the educational institution, head nurses, learning counselors- but also colleagues, could support this by creating awareness on the importance of deliberate SRwpL in clinical wards. When students become aware that they themselves are in control to deliberately self-regulate their learning, it makes their learning less dependent on coincidental cases, tasks, or situations, or educators and colleagues. *Second*, this study found that the engagement in metacognitive SRwpL strategies such as reflection, metacognitive monitoring, or self-evaluation judgments, was rather limited. Although nurse education programs have been investing in the development of reflective skills, graduated nurses do not indicate to use these skills to reflect on their learning processes and SRwpL strategy-use. Teachers in nursing schools should be aware of the danger of creating "reflective zombies" (De la Croix and Veen, 2018) and an utilitaristic approach of reflection (Fragkos, 2016). *Third*, based on the findings that head nurses and learning counselors, contrary to the researchers, only sparsely perceive SRwpL strategies to be engaged in, we can question to what extent they fully recognize these strategies to be used by nurses. Although more research is needed to validate the potential explanation for this finding, it holds important implications for what is needed for nurse educators at the workplace, to facilitate interns' SRwpL. To design and implement (educational) interventions that effectively support and develop the engagement in SRwpL strategies, adequate conceptual knowledge shared by all the actors involved in learning and development in organizations, and health profession education is essential (Bell et al., 2017; Brydges et al., 2022). All actors involved in learning and development in organizations should develop a shared understanding of which competencies, including the ability for SRwpL, need to be learned (Conway et al., 2022). Further, the professional development of all actors involved in student nurses' SRwpL should be supported by educational experts and supervisors from educational institutions, and human resource developers from the organization, so that student nurses' SRwpL competency can develop in a triadic relationship between the student nurse, the educators at the workplace, and the supervisors from the educational institution. Future studies should inform the design and development of interventions that promote the development of SRwpL, for example by developing co-regulation practices (Hadwin et al., 2018). Co-regulation of learning refers to the dynamic metacognitive processes through which self-regulation of cognition, behavior, motivation, and emotions are adaptively and flexibly supported and scaffolded, and regulatory ownership is transitionally shifted to an individual (Hadwin et al., 2018; Rich, 2017). Although there is a growing awareness of the importance of co-regulation of learning and co-regulation interventions supporting the development of SRwpL, research hereon during internships and beyond graduation is needed (Brydges et al., 2020; Cuyvers, 2019; Rich, 2017; Van Houten-Schat et al., 2018).

5.3. Study's strengths and limitations

This study contributes empirically to the theory of SRwpL, specifically in nursing. The multi-actor perspective allowed for learning counselors, head nurses, and a researcher acquainted with the concept of SRwpL and the healthcare context to reveal different viewpoints on engagement in SRwpL and how it is perceived. A qualitative approach was used by triangulating multiple methods to offer credible findings. The methodology was applied in earlier research (Cuyvers et al., 2021; Cuyvers et al., 2022) and proved appropriate for an in-depth investigation of engagement in SRwpL in the clinical ward (Cuyvers et al., 2022). By capturing potential learning events during observations and interviews on a large variety of wards we could provide insights in which SRwpL strategies nurses engaged in with high ecological validity.

At the same time, research showed that the use of interviews to recall SRwpL strategies engaged in by learners during job-performance is worrying concerning the validity (Cuyvers et al., 2020). Knowing this, it is not unthinkable that for novices to the concept such as head nurses and learning counselors, the recall of cognitive, metacognitive, affective, and behavioral strategies seen and heard to be engaged in was biased by memory failure. To overcome this, SRwpL strategies perceived to be engaged in in recent situations were questioned, instead of reflections on longer periods of time. A downside of this approach could be that we only focused on a sub-set of the activities perceived to be engaged in and that other research techniques are needed to investigate the perceptions of SRwpL strategies and demonstrate a larger variety of SRwpL strategies perceived to be engaged in.

6. Conclusion

This study investigated SRwpL engaged in by nurses in the clinical ward during patient care and cure, and how SRwpL is perceived to be engaged in by learning counselors and head nurses, which was previously a neglected area in the field of nurse educational research. Results reveal self-regulatory strategies conditional for SRwpL in addition to strategies initiating, progressing, and evaluating the learning process which are well-known from existing SRL-models. The self-regulatory strategies conditional for the learning process are categorized as self-regulatory readiness strategies, and include 'questioning', 'being alert', 'awareness of learning needs', 'awareness of how and when', and 'recognizing learning opportunities'. Head nurses and learning counselors report a lack of these conditional strategies and little variation, and sporadic engagement in all other self-regulatory strategies. Although a variety in SRwpL strategies was found to be engaged in, and 'awareness of learning needs', and 'recognizing learning affordances' as

self-regulatory readiness strategies were found to be engaged in, subsequent deliberate engagement in other self-regulatory strategies in the workplace is missing to a great extent. This study offers valuable insights and makes essential suggestions to develop the education and guidance of student nurses in the clinical wards, with supervisors from educational institutions taking up an important role not only in the education of student nurses but also in fostering further professional development of all others involved in scaffolding SRwpL processes of future nurses in clinical wards.

Ethical considerations

The hospital management commissioned the research and gave consent before the research, including the local research advisory committee. All participants were informed about the research procedure and explained their right to withdraw at any time. Written informed consent was obtained from all the head nurses and learning counselors, oral consent from the participating nurses. Names and references were pseudonymized and anonymized. No personal data of nurses or patient data were collected. Nevertheless, patients were always asked for the permission to enter their room and observe the nurses.

CRediT authorship contribution statement

Katrien Cuyvers: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Catharina Van Oostveen:** Writing – review & editing, Resources, Methodology, Funding acquisition, Conceptualization. **Maaike D. Endedijk:** Writing – review & editing, Visualization, Validation, Methodology, Funding acquisition, Conceptualization. **Veerle Struben:** Writing – review & editing, Resources, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

No conflict of interest.

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