# Chapter 26
# Longitudinal Case Study Research to Study Self-Regulation of Professional Learning: Combining Observations and Stimulated Recall Interviews Throughout Everyday Work

**Katrien Cuyvers, Piet Van den Bossche, and Vincent Donche**

**Abstract** Professional learning reflects critical processes of change whereby one modifies and extends prior competencies while performing one's job. Over the past two decades, the need has emerged and grown for insights on how employees take responsibility for their own learning and engage in self-regulation of professional learning. However, the process of measuring professional learning as well as self-regulation of professional learning during everyday work has raised difficult methodological problems for various reasons. The retrospective, cross-sectional, self-report measurement techniques often used, tend to de-contextualise learning from the complex environments in which professionals operate. Under such techniques, study participants are asked to make abstractions of this complexity to self-report regarding possibly implicit, multifaceted competencies and metacognitive strategy use as features of self-regulated learning. In this chapter, we offer an alternative

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approach via a longitudinal multiple case study design combining long-term observations with immediate consecutive stimulated recall interviews, towards building a more dynamic and situated understanding of professional learning through which to explore participants' self-regulation. Using both 'on-line' and 'off-line' measurement techniques, the proposed interactive approach was empirically applied to investigate self-regulation of professional learning in medical practice. Without pretentiously suggesting that this is the ultimate research solution, we aim to outline the approach, its opportunities and challenges, how to tackle these challenges, and how the approach's research insights could function to advance theory-building on professional learning in general—and self-regulation of professional learning in particular—in everyday work.

**Keywords** Professional learning · Self-regulated learning · Workplace learning · Longitudinal multiple case study · Long-term observations · Stimulated recall interviews

## 26.1   Introduction

Due to rapid changes in society and working lives, employers and employees have sought out strategies to ensure a certain level of competence at the job in the past few decades (Tynjälä, 2008). Besides traditional classroom training, forms of workplace learning ranging in their degree of integration with work offer abundant opportunities in this respect. The importance of integrating learning with the job has become a widespread belief and emerging practice among researchers, practitioners, and policymakers. In this chapter, 'professional learning' is defined as learning in the workplace which is entirely integrated with work (Cuyvers et al., 2021).

Supportive conditions are required to enable professional learning in the work environment (Ellström, 2001). Individual-related factors also play a vital role in professional learning (Tynjälä, 2013). For instance, researchers have assumed a professional's ability to self-regulate one's learning to be critical for ongoing improvements in performance and in the adoption of new ways of working (Cuyvers et al., 2021; Littlejohn et al., 2016).

Together with the increasing awareness on the importance of professional learning, interest has grown over the past two decades for insights on how employees go about shaping their learning process, or 'self-regulate professional learning'—for which hereafter we use the acronym 'SRpL' (Cuyvers et al., 2020). Measuring SRpL in real-time, ongoing professional experiences has become an important goal amid expanding on the work of those who have advocated for a dynamic and situated understanding of SRpL (Cuyvers et al., 2021; Endedijk & Cuyvers, 2021; Littlejohn et al., 2016). However, the process of measuring SRpL in all its complexity, as well as of grasping its role in improving workers' skills and other outcomes, has given rise to major methodological challenges and questions in empirical research (Cuyvers et al., 2020).

In this chapter, we first elaborate upon the concept of SRpL. We then describe challenges in prevalent methodological paths for SRpL. Finally, we propose an

alternative methodological approach to capture SRpL as an ongoing process in real-life work environments.

## 26.2   The Concept of Self-Regulation of Professional Learning

SRpL refers to professionals' ability to proactively, reactively, or implicitly engage in self-regulatory strategies to shape their learning process, elicited by the challenges in daily practice (Cuyvers et al., 2021). In SRpL in the workplace, self-regulatory strategies are behavioural, cognitive, metacognitive, and affective in nature (Cuyvers et al., 2021; Sitzmann & Ely, 2011), taking up different roles in the professionals' learning process. That is, some of the strategies engaged in are conditional for other strategies initiating, advancing, and evaluating the learning process (Cuyvers, 2019; Cuyvers et al., 2021). Interrelated self-regulatory strategies engaged in by the professional with feedback loops dynamically compose the unfolding learning process which can be evoked by a work challenge on the one hand, and interrupted by the work being performed on the other (Cuyvers et al., 2021). Given its highly implicit nature and intertwining with performance, professional learning and SRpL could be hard for observers and even learners to recognise or distinguish between. Based on empirical research on medical specialists in the clinical environment (Cuyvers, 2019; Cuyvers et al., 2021), Figure 26.1 depicts self-regulatory strategies engaged in, with arrows indicating the interrelatedness among strategies.
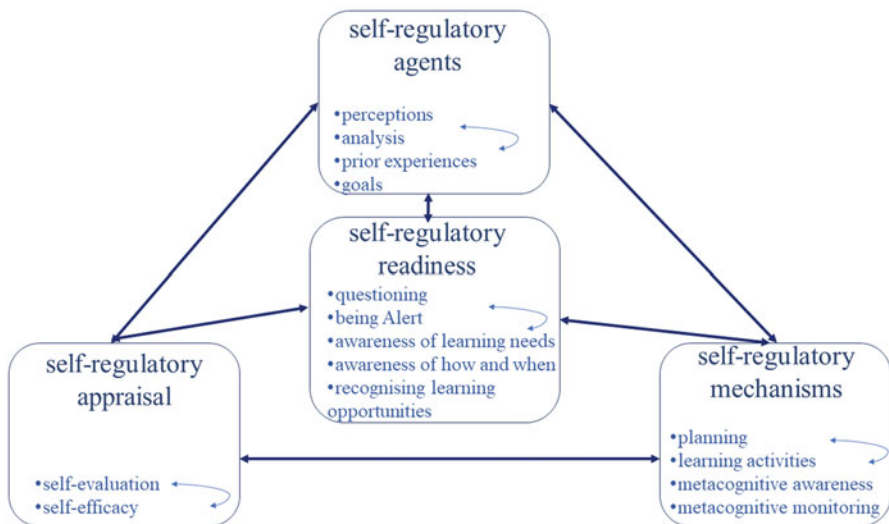


**Fig. 26.1**  Interrelated self-regulatory strategies in SRpL. (Cuyvers, 2019)

As Cuyvers et al. (2021) described, in medical practice, the process of SRpL starts when a medical specialist encounters a performance-related situation in which learning could take place. This calls for alertness on the part of the medical specialist (self-regulatory readiness, as depicted in the centre of Fig. 26.1) regarding the current situation: alertness both for the danger of routine in performance and for competencies being challenged. In this alertness, the medical specialist questions and reflects on their own performance and competencies required (self-regulatory readiness strategy). This questioning is engaged in, in relation to an activation of awareness (self-regulatory readiness) both of the competencies, and of the potential gaps at hand for the medical specialist. Hence, they can recognise the situation and patient as an opportunity for learning (self-regulatory readiness strategy). Amid these self-regulatory readiness strategies, the medical specialist could perceive the patient or situation in different manners (self-regulatory agents): for instance, as either tense or exciting (affective perception; self-regulatory agent) or as difficult (cognitive perception; self-regulatory agent) in relation to the questioning engaged in as self-regulatory readiness strategy.

Thus, the medical specialist could analyse the situation (self-regulatory agent) not only from the perspective of job performance, but also from that of learning in relation to identifying missing competencies, knowledge, or skills. Engagement in the self-regulatory strategies visualised in Fig. 26.1 evolves while the medical specialist pursues strategies related to other strategies. Given the complexity of the unfolding of SRpL over time as a process, its interrelated components, and its integration with work, important challenges for empirical research come to the fore, as outlined in the next section.

## 26.3 Measurement Challenges in Prevalent Methodological Paths

A recent systematic literature review showed that systematic efforts to measure SRpL began in the last decade (Cuyvers et al., 2020). The existing body of research revealed various challenges related to such measurement. To start with, most of the SRpL studies reviewed transferred measurement approaches to self-regulated learning (SRL) from educational to work settings (Cuyvers et al., 2020). Doing so, the de-contextualised, cross-sectional, self-report techniques used in such research have tended to isolate the phenomenon of interest from the complex environment in which professionals operate in, often measuring overall professional development activities on a more general level (Cuyvers et al., 2020).

Despite widespread evidence for the validity of instruments assessing SRL in educational contexts (Schunk & Greene, 2018), most of these instruments have not been developed to gauge less intentional, less planned professional learning in the workplace. Also, study participants are asked to make retrospective abstractions of the complexities in their work, to self-report on the behavioural, cognitive,

metacognitive, and affective self-regulatory strategies used. As such, the dynamic process of SRpL, with interrelated strategies also highly intertwined with performance, has tended to be measured as a relatively static aptitude, potentially biased by memory failure or the notion of socially-desirable answers (Cuyvers et al., 2020; Moorman & Podsakoff, 1992; Rausch, 2014; Veenman, 2011).

To tackle the issue of gauging its dynamics, research on SRL in educational contexts over the last decade has focused on capturing SRL during the task itself, as a process in the actual learning environment—referred to as 'on-line'—via trace data such as eye-tracking, log files, and physiological sensors (Spliethoff & Abele, 2022, Chap. 8; Azevedo et al., 2010, 2018; Jossberger, 2022, Chap. 21; Winne, 2010). As on-line event measures, trace data have often been collected from technology-enhanced learning environments (Bernacki, 2018). In measuring SRpL, the ability to use trace data depends on the presence and role of technology in the work of the professionals under investigation. Also, although online event measures such as traces are described as interesting to measure SRL, the value of other techniques such as think aloud, surveys, and interviews, especially when augmented, is still expressed by researchers in the field (Azevedo et al., 2010; Winne, 2010).

Moreover, in research on SRL in the workplace during internships, besides 'off-line', self-report questionnaires (Bransen et al., 2020; Brydges et al., 2020; Vrieling-Teunter et al., 2021), diaries or structured learning reports have been used as off-line event measures as well (Endedijk et al., 2016; Rausch et al., 2022, Chap. 3). But although it offers valuable insights on SRL situated in the workplace as a learning environment, this method is time-consuming and labour-intensive for professionals, and it does not allow for a more process-driven assessment of SRpL.

Finally, professional learning and regulatory strategies are often largely implicit as well as complex,—with its integration with work making it difficult to distinguish between learning and work for valid measurements. It requires a complex array of competences, thereby defying simple representations of what is being learned and how (Cuyvers et al., 2016; Furner & Steadman, 2004; Eraut, 2000, 2004; Rausch, 2014).

Thus, although the importance and research field of SRpL have grown considerably in the last decade, the prevalent measurement methods and instruments have hardly grasped the complexity of the process of SRpL in real-life contexts.

## 26.4  Proposing an Alternative Methodological Approach for SRpL Measurement

To meet the challenges we described, we introduce here an alternative interactive approach to measure SRpL. We propose a longitudinal multiple case study to explore SRpL as it actually unfolds in real-life professional learning environments. In this design, long-term direct observations as an on-line event measurement technique are combined with immediate stimulated recall interviews as a self-report

off-line event technique. While we do not mean to suggest that this is the only viable alternative, in triangulating multiple data collection techniques across time, the situated longitudinal methodological perspective does go beyond the well-trodden path of cross-sectional, off-line self-report questionnaires. It enables the reduction of the so-called 'mono-method bias' when measuring SRpL as it evolves over time, accounting for the conditions in real-life work environments.

In the next sections, we first discuss the methodology, followed by a brief illustration of a previously reported empirical application (Cuyvers et al., 2021). We then elaborate upon the method's opportunities and address some major challenges which have arisen in bridging the gap between the proposed on-line and off-line techniques used. Finally, we put forth suggestions for future research on SRpL.

### 26.4.1 Why a Longitudinal Multiple Case Study Design Matters in Exploring Self-Regulation of Professional Learning

Methodological literature in social sciences has often advocated for the use of case studies to research real-life phenomena (Yin, 2014). This approach allows for in-depth explorations of contextual characteristics and conditions in relation to the phenomenon under investigation (Yin, 2014). Multiple case study designs have been particularly known for facilitating the replication and pursuit of theoretical propositions, leading to the acquisition of more compelling and generalisable evidence (Yin, 1999, 2014). Since case study research relies on multiple sources of evidence, thereby triangulating data, it tends to increase the credibility of findings (Noble & Heale, 2019; Stake, 1995; Yin, 1999, 2014).

Gauging how SRpL unfolds requires an in-depth investigation of temporal and sequential features (Cuyvers et al., 2020; Endedijk & Cuyvers, 2021). The longitudinal tracing of how respondents and processes change over time could enable the achievement of this goal (Bernacki, 2018; Yin, 2014). As such, a longitudinal multiple case study design could address the demand to measure SRpL as a real-time, dynamic process situated in professionals' work environments. Using a multi-method approach in this way, with both on-line and off-line data collection, could successfully tackle challenges in measuring behavioural, cognitive, metacognitive, and affective self-regulatory strategies. In line with Yin (2014), we propose long-term direct observations as a key method in case study research, augmented with immediate, consecutive stimulated recall interviews.

Not only has theory proposed observations as an on-line measurement to assess actual ongoing behaviours (Veenman, 2007; Wolters et al., 2011), but also as a means to deliver rich evidence on what one is learning, and how, while performing one's job (Eraut et al., 1998; Eraut, 2000, 2004). Despite the value of direct observations in case study fieldwork, they do not allow for the simultaneous study

of engagement in covert cognitive and metacognitive regulatory strategies in SRpL. Indeed, researchers have yet to figure out how covert regulatory strategies are externalised into observable behaviours. Nevertheless, observations provide clues for the tracking down and recalling of covert and implicit learning which might have taken place (Furner & Steadman, 2004).

To address the shortcomings in observations, we propose the integration of stimulated recall interviews into the longitudinal case study design, as these clues can be used as prompts to mediate verbalisation and elicit participants' thoughts and strategies from a real-life activity (Henderson & Tallman, 2006; Wolters & Won, 2018). Previous research on metacognition recognised stimulated recall interviews as a useful means to capture metacognitive strategy use (Henderson & Tallman, 2006; Veenman, 2005; Veenman et al., 2006; Wolters et al., 2011). To establish validity, such literature recommended the use of a protocol with open-ended questions, including all relevant dimensions of the assessed construct (Henderson & Tallman, 2006; Wolters & Won, 2018). Notwithstanding the fact that only conscious thoughts and strategies can be reported, research indicated that stimulated recall was satisfactorily reliable when participants were prompted and questioned within the limits of a 48-h period (Henderson & Tallman, 2006).

To summarise, research aiming to map SRL at the workplace, including SRpL, and its process across time can benefit from applying longitudinal case study research designs. Especially when this is combined with long-term observations of verbal and non-verbal behaviours as prompts for immediate stimulated recall interviews to elicit the verbalisation of thoughts and embedded metacognitive strategies. The interactive approach using observation and self-report measures (via on-the-spot, workplace interviews) can offer important comprehensive insights into overt actions and behaviours, as well as into covert thoughts and metacognitive strategies.

We now turn to illustrating the application of the proposed methodology via an empirical study (Cuyvers et al., 2021), before detailing the method's opportunities and challenges, as well as how to tackle the latter.

## 26.4.2   How Medical Specialists Self-Regulate Their Learning: Illustration of the Research Approach

We employed the longitudinal case study design introduced above to investigate the SRpL process during medical specialists' daily practice in a clinical environment (Cuyvers et al., 2021). The study aimed to unravel the dynamic SRpL process by investigating (1) which overt and covert SRpL strategies medical specialists adopted in a real-life clinical environment (RQ1), and (2) how the process of SRpL evolved dynamically through time in relation to physicians' job performance (RQ2). Thirteen physicians from diverse specialties participated in this study: an endocrinologist, a cardiothoracic surgeon, a gynaecologist, a neurologist, a neurosurgeon, two

emergency physicians, three radiologists, an intensive care specialist, a pathologist, and a paediatric reconstructive urologist. All came from hospitals in Flanders (the Dutch-speaking part of Belgium).

To illustrate the research method, the upcoming section details the key measurement actions performed in the study. First, we describe which behaviours we decided to observe, and why ('behaviours under observation'). Second, we elaborate on the choices regarding the observations' time aspects. Third, we report on how we carried out the observations. Fourth, we describe how we conducted the stimulated recall interviews. Finally, we describe the process of data preparation, followed by its analysis (Cuyvers et al., 2021).

### 26.4.2.1  Behaviours Under Observation

As mentioned earlier, the existing body of research on SRL in various contexts has not yet determined which behaviours could be observed as externalisations of SRL strategies. Hence, for the purposes of this study, our observations focused on both the verbal and non-verbal behaviours of physicians. We followed the physicians around ("shadowing") while noting all conversations and discussions with colleagues of the same or other medical specialties or disciplines, and with patients and family (Cuyvers et al., 2016). We recorded each interaction in as much detail as possible—person, time, what was said—to glean a thorough perspective from the observations on how interactions could provide opportunities for SRpL. We also paid attention to and made notes on facial expressions, as a non-verbal behaviour, and on all behavioural indications of learning and potential SRpL strategy use. Making thick, rich descriptions which were accessible to others was an important goal in our fieldwork process, to allow for replication and/or verification and de-briefing, and help to minimise investigator bias and ensure the validity and reliability of data collection (Bakeman, 2000; Morse, 2018).

### 26.4.2.2  Time Aspects of the Observations

All physicians in our sample were observed during their daily medical practice. We selected the time slots based on the different professional activities of each specialist. This could mean that the researcher accompanied the physician during surgery on Monday morning, consultations on Wednesday, administrative duties on Thursday afternoon, and formal meetings on Friday. Hence, we could witness a variety of situations and co-occurring competencies for which learning could be necessary or beneficial, and access potential learning experiences.

Consultations, ward rounds, informal meetings, and surgery all provided valuable opportunities for observation. Moreover, writing requests for technical investigations, reading patient files and other reports, and consulting on radiographic images were examples of professional activities that could lead to learning, offering observable clues for ongoing SRpL. In this study, the medical specialists were 'shadowed',

which meant that the researcher sat by, stood by, and followed the physicians as they went about their duties, while using equipment to make written and audiotaped records of the activities and interactions (see detailed description Sects. 26.4.2.3 and 26.4.2.4).

Thorough considerations on time-related aspects led to intermittent shadowing of the medical specialists: on average, each physician was observed four times, for 4 h, so on average for a total of 16 h. We chose time intervals according to their schedules to, on the one hand, allow space for the investigation of possible dynamics in SRpL strategy use; and on the other, to reduce the risk of memory failure and reminiscence bias, and hence of invalid data (Yin, 2018). As such, we organised a maximum interval of five working days between two observation moments. If this rule could not be kept, for example due to a planned vacation, a telephone call was made by the researcher to the physician to follow up on data collection regarding SRpL strategies engaged in between the last visit of the researcher and the last day before the physician's break.

### 26.4.2.3   Performance of the Observations

Ethical considerations discourage video recordings in medical practice, and the complexity of the behaviours under observation hinders the adoption of a structured scheme to note a priori determined behaviours. The collection of unstructured data in the clinical environment can be considerably less complicated, if answers to open-ended questions during everyday work can be quickly registered. We used a clipboard, paper, and pencil for this purpose. To facilitate registration and later transcriptions, we employed a protocol pre-developed by the researcher for making observation notes, as illustrated in Fig. 26.2.

### 26.4.2.4   Process and Structure of the Stimulated Recall Interviews

All indications for potential SRpL we observed prompted in loco stimulated recall interviews on beliefs, thoughts, and intentions associated with specific overt behaviours and potential covert SRpL strategies. In our study, this sometimes took place during lunch or a short coffee break, but mainly in between two patient consultations or ward rounds, while going from one room to another, immediately before and after surgery, during the periods of surgery which allowed the physician to answer questions, and following emergency situations. Also, each new observation moment started with asking what had happened after the researcher had left an earlier observation moment. We used a stimulated recall protocol with open-ended questions to explore developed based on the insights of SRL and professional learning elements (Cuyvers et al., 2020) to explore, in a semi-structured manner, the nature and process of SRpL (see Fig. 26.3 for sample questions).
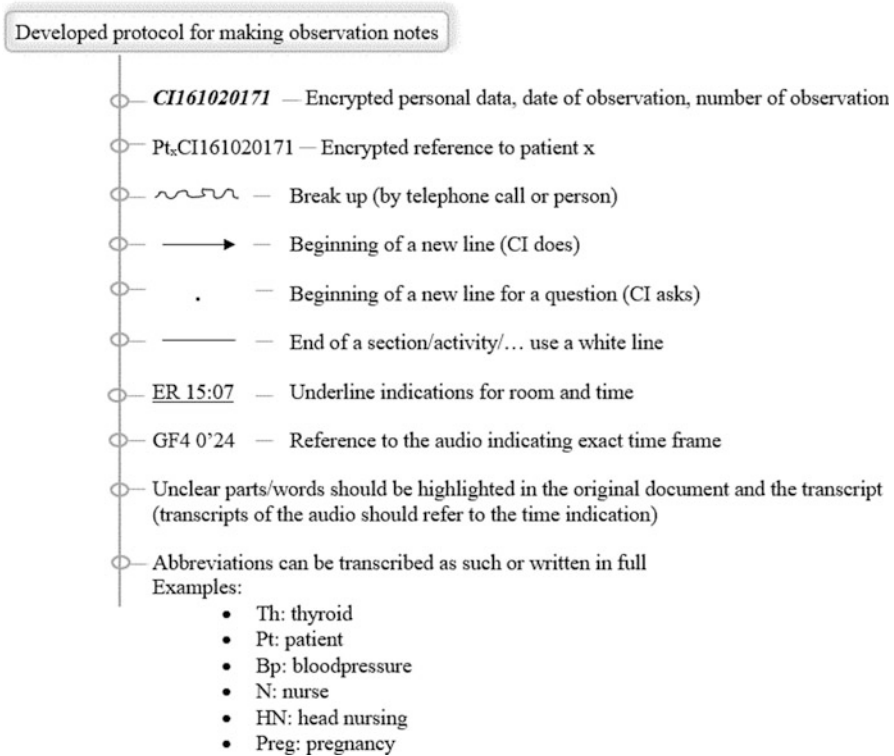
| | | |
|---|---|---|
| *CI161020171* | — | Encrypted personal data, date of observation, number of observation |
| Pt$_x$CI161020171 | — | Encrypted reference to patient x |
| ⁀⁀⁀⁀ | — | Break up (by telephone call or person) |
| ⟶ | — | Beginning of a new line (CI does) |
| . | — | Beginning of a new line for a question (CI asks) |
| ⎯⎯ | — | End of a section/activity/… use a white line |
| ER 15:07 | — | Underline indications for room and time |
| GF4 0'24 | — | Reference to the audio indicating exact time frame |

Unclear parts/words should be highlighted in the original document and the transcript (transcripts of the audio should refer to the time indication)

Abbreviations can be transcribed as such or written in full
Examples:
- Th: thyroid
- Pt: patient
- Bp: bloodpressure
- N: nurse
- HN: head nursing
- Preg: pregnancy

**Fig. 26.2** Illustration of the pre-developed protocol during observations

### 26.4.2.5 Data Preparation for Analysis

All stimulated recall interviews were audio-recorded and transcribed. Field notes were also transcribed. After collecting and transcribing the data, we had to prepare it for analysis.

Because SRpL is a process, and we propose measurements to enable its capture, the final set of data analysed should reflect such a process. Therefore, we chronologically integrated all data into a longitudinal database for each case. In matching the type of data collected to the process, we distinguished between self-report data and observational data to clearly classify the description of what was overtly seen and heard and what was covert but made explicit via the stimulated recall interviews, respectively. We used different colours to indicate the different types of data in our analysis, but underlining the data from the observations while italicising that from the stimulated recall interviews is also possible, as illustrated in Fig. 26.4. This longitudinal database excerpt relates to a cardiothoracic surgery in which Henry is about to perform an anastomosis with four coronary bypass grafts.

The time indications of the stimulated recall interviews in the field notes allowed us to integrate the stimulated recall data into the observational data as closely as
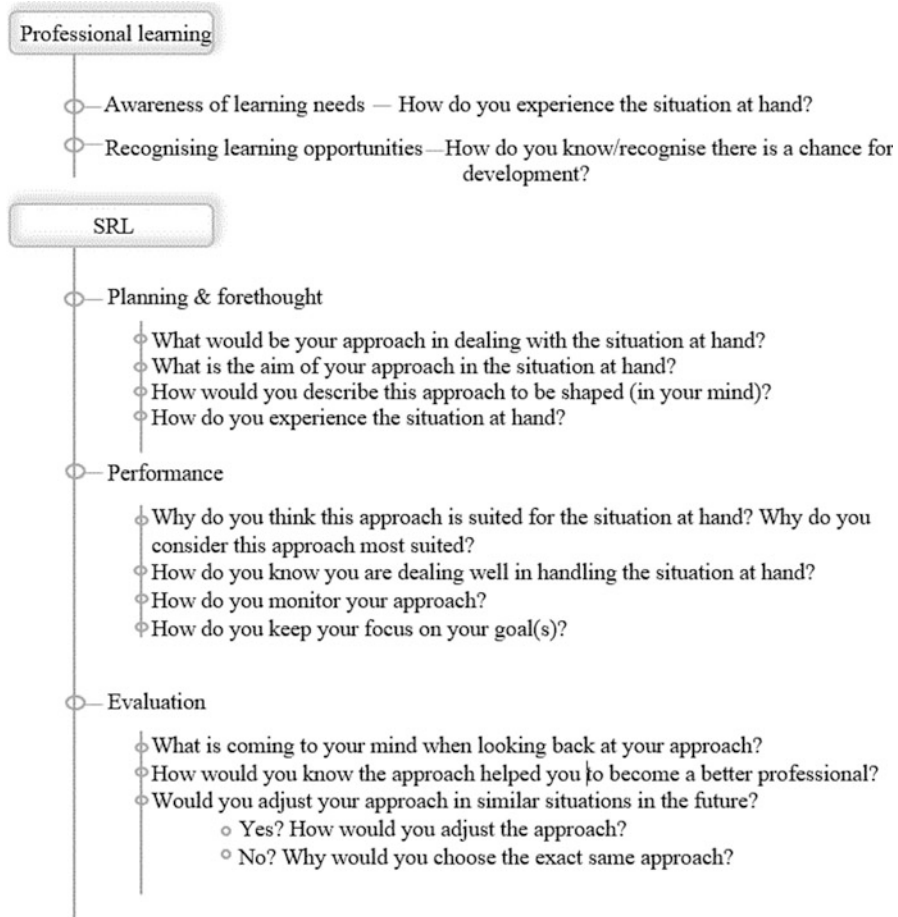
Professional learning

○—Awareness of learning needs — How do you experience the situation at hand?

○—Recognising learning opportunities—How do you know/recognise there is a chance for development?

SRL

○— Planning & forethought

　　○ What would be your approach in dealing with the situation at hand?
　　○ What is the aim of your approach in the situation at hand?
　　○ How would you describe this approach to be shaped (in your mind)?
　　○ How do you experience the situation at hand?

○— Performance

　　○ Why do you think this approach is suited for the situation at hand? Why do you consider this approach most suited?
　　○ How do you know you are dealing well in handling the situation at hand?
　　○ How do you monitor your approach?
　　○ How do you keep your focus on your goal(s)?

○— Evaluation

　　○ What is coming to your mind when looking back at your approach?
　　○ How would you know the approach helped you to become a better professional?
　　○ Would you adjust your approach in similar situations in the future?
　　　　○ Yes? How would you adjust the approach?
　　　　○ No? Why would you choose the exact same approach?

**Fig. 26.3** Sample questions in the SRpL stimulated recall protocol

possible to the actual thoughts and potential covert strategies engaged in. The longitudinal databases for each participant yielded the data to be analysed.

### 26.4.2.6   Analysis and Main Results

In our study (Cuyvers et al., 2021), we selected three cases from the entire sample and archived the longitudinal datasets in the Nvivo 12 software, which supports qualitative data analysis. To answer the first research question, we performed qualitative content analysis via a code tree based on the mainstream SRL theories, interpreted and expanded on with first insights on SRL strategies potentially important for SRpL (Cuyvers et al., 2020, 2021; Cuyvers, 2019). We conducted a deductive, vertical, within-case analysis, assigning codes to parts of the transcripts

**"H24042018**

**8.05:** *At the ICU... ...*

**Audiorecording n°6: 00.00** (on the way from the ICU to the operating room)

Henry says that the challenge is to perform the procedure correct but also to not make steps unnecessary for the individual patient... Henry says this latter is difficult...He says he is alert for the danger of making mistakes. He says that people make mistakes, people doubt themselves from time to time... Henry says he is still searching for his own way, without forgetting things, skipping steps, or not performing all the necessary steps thoroughly... Henry says that he is lefthanded which means he has to do things differently...

...

*Henry continues his preparation to perform the operation, looks at his watch... He disinfects his hands asking the assisting nurse to check a certain machine because it is very noisy."*

**Fig. 26.4** Illustration of the integration of observational and stimulated recall data in a longitudinal database, with an excerpt of the data of cardiothoracic surgeon Henry, from a 23-page document
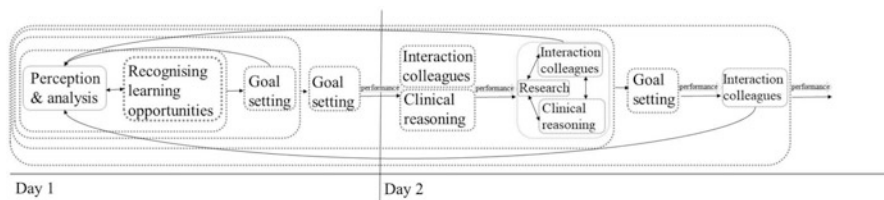


**Fig. 26.5** SRpL trajectory composed by relations between SRpL strategies in which physicians engaged

which we interpreted as referring to SRpL strategies. We sought commonalities and differences among the data within each case, thereby creating internally homogeneous and externally heterogeneous codes and categories (Graneheim & Lundman, 2004).

We followed this within-case analysis with a cross-case analysis, comparing textual interpretations, their commonalities and differences across cases, to obtain more compelling evidence regarding the SRpL strategies found. Principles of the grounded theory approach were applied to identify SRpL strategies inductively and further build up the theory on SRpL. The first author analysed the longitudinal data independently. Evidently, data were coded and categorised, and constantly compared, thereby carefully scrutinising differences and similarities in the data. Tentative categories and potential differences in interpretations were critically discussed and assessed with the other authors in several peer debriefing sessions to increase the credibility of the findings (Graneheim & Lundman, 2004).

We engaged in a sequential intrapersonal investigation of each longitudinal dataset independently, as part of the within-case approach addressing the second research questions. For this purpose, we indicated with arrows all the relationships we identified between SRpL strategies used by the medical specialists. Figure 26.5 illustrates this by depicting a specific SRpL event across a two-day time span.

Several SRpL activities took place and connected with each other then. More specifically, within a selected learning event, we noted the physicians' apparent SRpL strategies, drawing arrows between them to indicate their relationship. We had arrows lead back to the SRpL strategies referred to more than once. Feedback loops originated in that way. The combinations of the earlier and newer SRpL strategies were framed, composing the ongoing process, as seen in Fig. 26.5. As such a so called SRpL trajectory across time emerged from the data, along with the dynamics of the process. We sought meaningful patterns for these trajectories within and across cases. We ensured the trustworthiness of the SRpL trajectories by further discussing the results in several peer debriefings (Graneheim & Lundman, 2004).

Based on these analyses of the data collected (Cuyvers et al., 2021), we found SRpL in the clinical environment to be shaped by a broad variety of SRpL strategies initiating, advancing, and evaluating the process of SRpL. Alongside the existing frameworks, we identified and classified as 'readiness strategies' the SRpL strategies without which SRpL could not take place. We also found SRpL to be an interrelated, dynamic process, unfolding over time with feedback loops among strategies and therefore constantly being adapted. Lastly, we concluded that physicians' work performance was a key driver of SRpL (Cuyvers et al., 2021).

### 26.4.3   Opportunities and Challenges of the Proposed Methodology

This case study design involves both on-line and (self-report) off-line data collection. As the next sections will show, the combination of these two techniques brought valuable opportunities for our empirical research, but also major challenges when applied to the case of SRpL of physicians (Cuyvers et al., 2021).

#### 26.4.3.1   Opportunities and Challenges in Data Collection

One major opportunity the proposed interactive approach provided was a *comprehensive insight* on overt actions and behaviours as well as on covert thoughts and strategies. However, it was difficult to arrive at a *precise definition of the behaviours of interest*. Observations tend to be tied to judgments referring to the process of selection, filtering, discriminating, and sorting (Bratich, 2018; Gobo & Marciniak, 2011). Therefore, a clear and precise definition of the concept under investigation, informed by theoretical insights, is a prerequisite for making systematic and replicable observations (Bakeman, 2000). Since the existing literature has failed to clearly determine the aspects of observable behaviour that could point to SRpL, researchers must resort to collecting 'unstructured' data during fieldwork. Moreover, although *ecological validity* may constitute a great opportunity when investigating contextual factors along with covert strategy use and overt learning behaviours

(Wolters et al., 2011), not everything can be registered during observations in the field. Hence, using our protocol led to important choices in structuring data collection and ensuring the quality of the observations, as we chronicle below.

First, we studied both verbal and non-verbal communication. Our detailed recording of conversations and discussions via our tailored protocol allowed for the collection of trustworthy and credible data on how interactions could facilitate opportunities of SRpL. Second, our focus on a variety of accessible professional activities yielded rich descriptions of professionals' on-the-job performance and how it integrated SRpL. Third, our registration of time—to structure our field notes according to the course of the day—proved important to validly incorporating the transcribed stimulated recall interviews into the longitudinal dataset. Fourth, we found our registration of clues indicating prompts for the consecutive stimulated recall interviews, and providing references to the audio recordings, to be key to the reconstruction of the flow of reality in subsequent analysis. Lastly, although it lacked sophistication, our use of a clipboard, paper, and pencil proved to be well-suited for data collection which followed the pace of work, and for the successive transcriptions for analysis.

Despite the difficulties we faced in precisely defining the behaviours to look for, our *interactive approach* provided major opportunities for the required *elicitation of covert cognitive and metacognitive strategy use*. The verbalisation of the observed behaviours, interactions, and facial expressions helped the professional to recall and reveal thoughts and metacognitive processes that occurred at the time of the activity, as also indicated by Henderson and Tallman (2006). By re-engaging with the event, the subject provided clues enabling the acquisition of insights on non-observable strategy use. This also prompted conversations regarding events which the researcher would otherwise possibly not have witnessed. In relation to the *most appropriate questions* to elicit covert strategy use in everyday work, the stimulated recall protocol based on theoretical insights demonstrated the capture of SRpL. Thus, the reliability of the findings was enhanced (Yin, 2014).

The *interactive approach* proposed in this chapter revealed the possibility of measuring SRpL dynamically, by *taking time into account*. This offered a major advantage over cross-sectional measurements. However, prior research lacked parameters on *when and how long* to observe, *how many* observation moments there should be, and *how much time between* observations would be needed to capture SRpL as it unfolded in time. Moreover, given the concerns regarding the validity of retrospective self-report measurements (Veenman, 2007), we still must ponder the *best timing* to conduct stimulated recall interviews.

As mentioned earlier, important considerations guided our choices regarding the time-related aspects in our empirical study. We used on average four observation moments for each physicians, with an average duration of 4 h each. This duration was seen as sufficient time in the field and at the same time not too long, reducing the risk that researcher fatigue would influence the validity of the observation. We synchronised the variation in time slots with our study subjects' different professional activities and set a maximum five-day interval between two observation moments. This intermittent replication logic proved well-suited to ensuring more

external validity and transferability (Yin, 2014; Morse, 2018). Regarding the timing for stimulated recall interviews, the literature has shown that retrospective reconstruction may lead to invalid interpretations of metacognitive skills, rather than correct recollections from memory (Veenman, 2007). To mitigate memory shortcomings, we used mostly non-directive prompts to elicit immediate consecutive recall, as close as possible to the actual event, which helped to ensure the reliability and validity of the data (Henderson & Tallman, 2006; Veenman, 2007).

Our research addresses an obvious plea for alternative valid measurements of SRpL through multi-method approaches (Cuyvers et al., 2020), such as in our combining on-line and off-line techniques with long-term observations and stimulated recall interviews. However, *obtrusiveness* of the researcher is a challenge when collecting data in the field (Angrosino & Rosenberg, 2011) and using verbalisation of observations as clues for stimulated recall interviews. Addressing this as an ethical issue (Angrosino & Rosenberg, 2011; Bratich, 2018; Roulet et al., 2017) requires the approval of the ethics committees and consent of all subjects concerned. Yet harder to overcome is the related validity challenge at the heart of our proposed interactive approach. As stated earlier, generating an 'ecologically valid' understanding of actual events appeared as a great opportunity. Not only did this approach discourage participants from painting an invalid 'ideal picture' when reality is being observed (as indicated by Furner & Steadman, 2004), but it also allowed for metacognitive strategies to be triggered remarkably close to the time of the actual event. However, such triggering (for instance in an interview situation) could also be viewed as an unintended intervention, which could push the degree of obtrusiveness and thus potentially influencing the validity of the findings (Roulet et al., 2017). Indeed, although inquiring into metacognitive strategy use during interviews is required in this approach, external regulation of the learning process could take place (via the interviewer asking questions), leading to intervention bias and perhaps even confirmation bias (Roulet et al., 2017). On the one hand, inviting professionals to think and speak about metacognitive strategy use during their practice (e.g. monitoring and reflection) could influence and perhaps lead to certain answers; on the other hand, long-term field observations enable researchers to ascertain whether a systematic tendency towards this externally-regulated metacognitive strategy use is at work.

Another related challenge recognised in the literature on methodologies (Ericsson & Simon, 1993; Henderson & Tallman, 2006) was subjects' potentially limited ability to *articulate* complex metacognitive strategies; in our study, they had to have the vocabulary to reflect, for example, metacognitive awareness and monitoring. Asking the right questions is key for this purpose, and paraphrasing subjects' answers could offer further solutions in this matter, but again, the latter could increase obtrusiveness and lead to bias. Another danger (Henderson & Tallman, 2006) is that habituation may supplant conscious strategy use, with only strategies in participants' consciousness being reported. Also, metacognitive strategy use could be absent, and inquiring into unconscious or absent strategies could cause bias.

The existing literature offered us no clear-cut solutions for these challenges. However, some suggestions can be made, which will be described in the next section.

### 26.4.3.2   Opportunities and Challenges in Data Analysis

The longitudinal case study design based on direct observations and stimulated recall interviews yielded *a lot of rich* empirical data. Such a rich dataset can leave researchers 'in a fog' for quite some time, unsure of what to *analyse* (Yin, 2018) or of the appropriate unit of analysis to choose. Evidently, this choice depends on the research questions posed. Investigating the concept of SRpL and its constituting self-regulatory strategies requires a grain size *unit of analysis*. When investigating the dynamic nature of SRpL, the unit of analysis is brought to the relations and sequences between self-regulatory strategies engaged in by professionals. The *selection of the learning events* related to professionals' engagement in SRpL can be another challenge in this sense, which calls for the researcher to address the question of what constitutes a learning event and how it can be identified. In sum, although the unit of analysis in research on SRpL is this concept occurring in close relation to work, its distinctive key characteristics designate this concept and lead to its different characteristics as relevant for the actual research question and necessary units of analysis.

A final challenge to be noted concerns the *interpretation of the SRpL data collected*, particularly in reference to the *distinction between strategies that regulate learning and those that regulate performance*. Careful consideration and rigorous empirical thinking, with reflexivity on the part of the researcher, are thus necessary, and a conscious sensitivity in a (repeated) cyclic analytic approach will help the researcher in this matter (Cresswell & Miller, 2000; Yin, 2018). We urge the researcher to always keep in mind during the analytic process, whether the data clearly demonstrates if or how the self-regulatory strategies observed explicitly served the purposes of work, learning, or both. Our engagement in peer-debriefing sessions proved critical to data interpretation convergence and to ascertaining the validity of findings (Cresswell & Miller, 2000; Lincoln & Guba, 1985).

## 26.4.4   Suggestions for Future Research

In relation to the opportunities and challenges mentioned above, we make further suggestions which may inform the decision-making process for future research on SRpL and/or professional learning.

One notable innovation in our design and method was the time aspect. The choices we made led to reliable findings on the components of SRpL in medical practice and on its dynamic evolution through time (Cuyvers et al., 2021). We reiterate here some important reflections and offer suggestions. That is, spending enough time in the field, with long-term observations is needed to access sufficient potential learning experiences that ensure more possible variation of behaviour and regulatory strategy-use. Moreover, intermittent observation moments are needed to allow for measurements of the dynamic aspects of SRpL. To define the appropriate

time interval, insights on how and when change presumably reveals itself are necessary (Yin, 2014). Prior studies had been inconclusive regarding the ideal time frame for this: research on learning in the workplace relied upon visits of 1 or 2 days (Eraut, 2004; Furner & Steadman, 2004), while research on student teachers' SRL used six weekly learning reports (Endedijk et al., 2016). For future measurements of SRpL, we propose four observation moments, with an average duration of 4 h each, which proved to yield rich and credible findings in our empirical study (Cuyvers et al., 2021).

To address the challenge of researcher obtrusiveness, we first urge continuous critical scrutiny and reflection on the part of the researcher, as indicated by Guillemin and Gillam (2004), to assure the rigour and validity of the research. Second, we find it necessary for researchers to reflect on their own role in the observation context, making an explicit description of how this position could impact the data collection process (Bratich, 2018; Gobo & Marciniak, 2011). Researchers must take seriously the notion of a reflexive process in which their dynamics with subjects and the related contexts are an integral part of the research (Ezzy, 2013; Guillemin & Gillam, 2004; Gobo & Marciniak, 2011), to be critically reported on. Close and continual monitoring of the researcher's own interactions, reactions, roles, and biases, and related discussions with co-researchers, will support the objectivity of the research (Ezzy, 2013; Lincoln & Guba, 1985). Third, awareness for verbal and non-verbal signals in the participants' answers which might indicate bias, and alertness for signals regarding false interpretations, are necessary to ensure the validity and reliability of the data. Registration of, and reflection on, such signals should inform the analytic process.

Besides difficulties in interpreting SRpL data, we have noted challenges in identifying learning events during which professionals engage in SRpL. Indeed, the question, what counts for a learning event and how can they be identified, needs to be addressed by the researcher. Evidently, we first suggest gleaning professionals' indications of learning experiences from the existing literature (a.o. Cuyvers et al., 2016; Eraut, 2007; Eraut et al., 1998; Van Eekelen et al., 2005). Further, a clear definition of the situations that can account for learning events in which SRpL takes place is needed. To get a clearer picture of what constitutes SRpL during daily work, we recommend looking beyond the critical incidents professionals characterise as learning experiences. We suggest to define a 'learning event' as each on-the-job situation which a professional (1) explicitly relates to learning and development, (2) characterises as putting their competencies to the test, or (3) describes as an experience leading to the desire or need to perform better. We also suggest including in the definition situations in which others point out gaps in the professional's competencies, thereby offering a chance for SRpL. These clear parameters can play a key role in facilitating stimulated recall interviews; if researchers can identify situations as potential learning events based on subjects' verbal and non-verbal communication and cues, they can pose stimulated recall questions on the spot to elicit thoughts and potential SRpL strategy use.

## 26.5   Conclusion

It seems obvious that the de-contextualised, cross-sectional, self-report measurements often used to investigate professional learning and SRpL abate the complexity of on-the-job learning. We thus proposed a longitudinal multiple case study design as an alternative, using direct observations in everyday practice, along with stimulated recall interviews to acquire insights into metacognitive strategy use. Intermittent field observations offered us valuable cues to aurally prompt metacognitive strategy use during the stimulated recall interviews on the spot.

This interactive approach offers major opportunities to better understand the situated and dynamic nature of professional learning and the process of SRpL. However, bridging the gap between on-line and off-line techniques also comes with important challenges, such as the danger of researcher obtrusiveness and elicitation of certain metacognitive strategies. We chose medical practice as our case study (Cuyvers et al., 2021) to test the proposed approach to investigating SRpL. Research addressing other professional communities and environments could benefit from our findings and recommendations. Our approach could be used to research various aspects of professional development, especially when development over time should be taken into account, in authentic contexts and investigating observable and non-observable behaviours, thoughts, and affective, cognitive, and metacognitive processes. Examples would include the research topics of professionals' practical and generic skill development, identity formation, sustainment of occupational capacities, adaptability in ever-changing contexts, and personal, social, and contextual factors influencing developmental processes.

Furthermore, adding on-line, technology-supported data collection techniques to the proposed approach could greatly benefit the further exploration of SRpL, including many of the methods developed for research on SRL in educational settings (Schunk & Greene, 2018). 'Could', because contrary to educational settings, professional work environments are not designed for learning per se, which impacts these methods' applicability to workplace contexts. In terms of medical practice, another challenge is that in contrast with other work environments, it is highly socially interactive and dynamic, making it difficult for researchers to use particular on-line measurements. While video observations could facilitate observations during surgeries, during consultations, or situations where physicians run from here to there, they could be difficult to realise due to ethical concerns (e.g., obtaining patients' consent and honouring the confidentiality of medical information). Thus, due to the context-specificity of SRpL, these techniques clearly need further customisation, which could be done via experimentation with additional methods in the proposed design, in combining on-line and off-line techniques and in triangulating data sources to gauge these methods' ability to measure SRpL.

Overall, the proposed longitudinal case study design applied in Cuyvers et al. (2021) enabled us to disentangle the complex interdependence of work and learning. It represented a profound and systematic attempt to make implicit processes explicit and investigate SRpL contextually and in depth. The illustrated research approach

yielded valuable research insights for future theory development in various fields of inquiry; it may become an important avenue for future research on workplace learning and professional learning and development. Future studies in the field of SRpL (or beyond) might therefore benefit from using this research approach, and from further developing the triangulation of on-line and off-line methods (such as direct observations and immediate stimulated recall interviews) to fine-tune the approach.

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