

The ‘Self-Regulated Learning Opportunities Questionnaire’: a Diagnostic Instrument for Teacher Educators’ Professional Development

E.M. Vrieling*^{ab}, T.J. Bastiaens^{bc}, S. Stijnen^b

^a*Iselinge University of applied sciences, Doetinchem, The Netherlands;* ^b*LOOK, Open University, Heerlen, the Netherlands;* ^c*Institut für Bildungswissenschaft und Medienforschung, FernUniversität in Hagen, Hagen, Germany*

*Corresponding author. PO Box 277, 7000 AG, Doetinchem, the Netherlands. E-Mail address: emmy.vrieling@ou.nl

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Abstract

Many recent studies have stressed the importance of students' self-regulated learning (SRL) skills for successful learning. Although primary teacher educators are aware of the importance of SRL for their students, they often find it difficult to implement SRL opportunities in their teaching. To support teacher professional development, an SRL model was described in a previous theoretical study. In the present article, this SRL model is elaborated towards the 'SRL Opportunities Questionnaire' (SRLOQ) that can be applied by primary teacher educators as a diagnostic instrument for classroom settings. A four-phase research design is applied consisting of scale development, score validation, further validation of the SRLOQ in primary teacher education, and a confirmatory factor analysis. Finally, a single case study is described that illustrates the usefulness of the SRLOQ in classroom practice.

Keywords

Diagnostic instrument; Higher education; Pre-service teacher learning; Professional development; Self-regulated learning; Vocational education

1. Introduction

This article describes the elaboration of a theoretical self-regulated learning (SRL) model (Vrieling et al. 2010) towards a diagnostic questionnaire ('SRL Opportunities Questionnaire' - SRLOQ) for primary teacher educators (i.e. teachers of prospective primary teachers). It also demonstrates the usefulness of the SRLOQ for primary teacher educators to assess student teachers' SRL opportunities in pre-service teacher education.

1.1 Primary Teacher Education and SRL

Teacher education is a field that has traditionally focused on teaching subject knowledge and training teaching skills (Kremer-Hayon and Tillema 1999). However, researchers and practitioners in teacher education are increasingly confronted with the lack of transfer from theory to practice (Korthagen et al. 2000). In other words, primary student teachers (i.e. prospective primary teachers) are often not able to apply the knowledge and skills they have learned in their teacher education programs in real classroom contexts.

In response to this problem, many teacher educators are now striving to increase student teachers' SRL opportunities throughout their initial training (Lunenberg and Korthagen 2003), because SRL has shown to foster students' deep and meaningful learning, resulting in significant gains in learning, problem solving, transfer and academic achievement in general (Nota et al. 2004; Sundre and Kitsantas 2004; Valle et al. 2003; VanderStoep et al. 1996). In such educational settings, teacher educators attempt to adjust their instructional behaviour, aimed at enhancing students' self-regulation of learning.

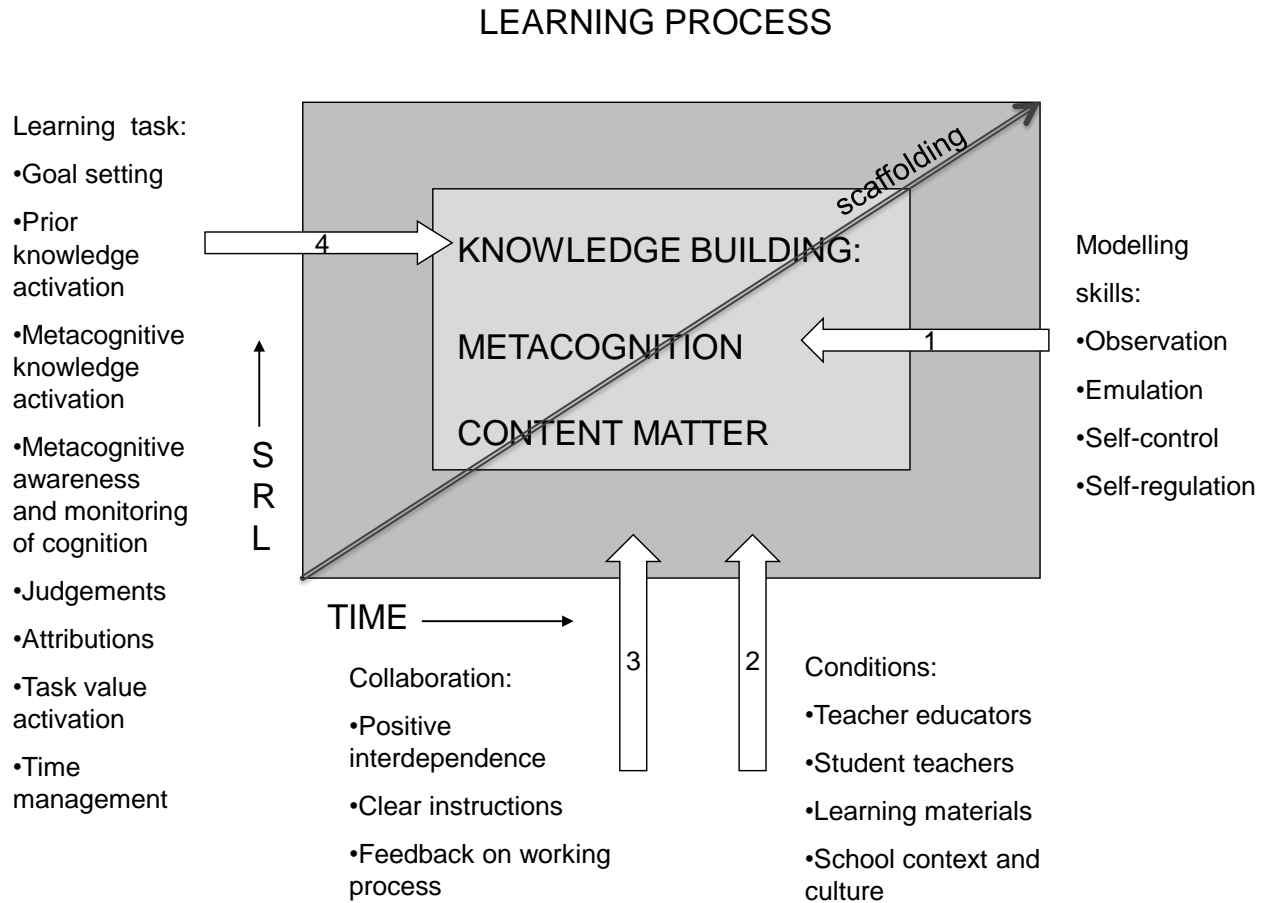
In general, SRL is defined as a goal-oriented process, proceeding from a forethought phase through self-monitoring and self-control to self-reflection (Pintrich 2000, 2004). The most

important aspect of SRL is that students can monitor, control and regulate their own cognitive actions (Pintrich 2000; Veenman et al. 2006; Zimmerman 2001), which often is referred to as metacognition. By using such metacognitive skills, student teachers can become aware of and monitor their progress towards their goals. In this way, they can improve their learning and comprehension. As a result, students can realize any adaptive changes in their learning (Vermunt and Verloop 1999).

1.2 SRL Design Principles

Although primary teacher educators support the importance of the idea of SRL, they often find it difficult to actually foster it in educational pre-service programs (Korthagen et al. 2000). Many practising teacher educators have not been prepared for this changing role during their own education and are often worried about their decreasing role as knowledge providers (Kremer-Hayon and Tillema 1999). To provide more insight into relevant SRL aspects during teaching, Vrieling et al. (2010) formulated seven SRL design principles for primary teacher education, combined in an SRL model (Figure 1). These design principles are important to consider while increasing student teachers' SRL opportunities in educational pre-service programs.

Figure 1. SRL model for primary teacher education



In the SRL model, the learning process of student teachers is visualized. As can be seen in the centre of the SRL model ('knowledge building'), teacher educators are advised to create a sufficient knowledge base for student teachers in the domain (first SRL design principle).

Teacher educators cannot expect their students to regulate their learning all by themselves from scratch. As experts in the relevant subject-matter domain, it is the teachers' task to make this domain more accessible to student teachers (Bolhuis and Voeten 2001).

Teacher educators can play a key role in facilitating this knowledge building by integrating the necessary metacognitive skills and content matter during teaching (second SRL design principle). The importance of modelling these metacognitive skills (third SRL design principle) is drawn by arrow 1 (pointing at ‘metacognition’), representing four regulatory skill levels (Schunk and Zimmerman 2007). At the first level (observation), learners can induce the major features of the skill from watching someone model learning or performing. At the second level (emulation), the learner, with assistance from the group, imitates the model’s performance. At the third level (self-control), the learner independently performs under structured conditions. At the final level (self-regulation), the learner shows an adaptive use of skills across changing personal and environmental conditions.

Furthermore, in line with the first ‘knowledge building’ principle, a gradual development from teacher control to student control over learning processes (‘scaffolding’) is stressed (fourth SRL design principle). To ensure successful knowledge building, it is important for teacher educators to provide considerable guidance to students (Kirschner et al. 2006). In this way, student teachers gain sufficient prior knowledge to be able to internally guide them. Only then the guidance of the teacher educator can decrease. This gradual increase in SRL is displayed in Figure 1 by the diagonal arrow.

Besides the importance of successful knowledge building, awareness of the conditional factors that can hinder or foster SRL development is necessary (fifth SRL design principle). Arrow 2 shows the influence of these conditions on the learning process. It is emphasized to prepare teacher educators adequately for their job, to ensure the comprehension of the significance of SRL by student teachers, to use suitable learning materials for SRL and to create an appropriate school context and culture.

Also, the engagement of student teachers in collaborative learning environments is visualized in the model (sixth SRL design principle). Student collaboration plays a facilitative role in developing SRL (Wigfield et al. 2007). When students have collaborative projects to complete, they make special effort to ensure that they make a helpful contribution to the group. Also, encouraging students to consult with peers can lead to making the most of their classmates as knowledge resources. Arrow 3 indicates the influence of collaboration on the learning process. Three pieces of advice for teacher educators are described: ensure positive interdependence in the group, provide clear instructions to student teachers and provide adequate feedback on their working process.

Finally, the seventh SRL design principle explores the relevant SRL aspects of the learning task. This is visualized by arrow 4 (pointing at 'knowledge building'). The first SRL aspect concerns 'goal setting'. Academic goals are regarded as important variables for student teachers because goals can serve as self-defining reference points that determine the further processes of SRL, such as planning, executing and monitoring (Schunk and Ertmer 2000). Second, 'prior knowledge activation' enables student teachers to understand the task and its goals, to recognize the required knowledge for performing it and to distinguish the several characteristics and their prediction of performance (Eilam and Aharon 2003). Third, 'metacognitive knowledge activation' includes the activation of knowledge about cognitive tasks and cognitive strategies in the SRL forethought phase (Pintrich 2000, 2004).

The fourth SRL aspect of the learning task, 'metacognitive awareness and monitoring of cognition', is a core component within information processing models of self-regulation (e.g. Nietfeld et al. 2006). It is important for student teachers to develop thinking activities to decide

on learning contexts, to exert control over their processing and affective activities and to steer the course and outcomes of their learning (Vermunt and Verloop 1999).

In the SRL self-reflection phase, Pintrich (2000, 2004) distinguishes two cognitive key processes. The first process involves learners' 'judgements' and evaluations of their performance of the task (fifth SRL aspect of the learning task). Students can learn to make judgments about the way their work relates to the criteria. The second process of the SRL self-reflection phase concerns students' 'attributions' for performance (sixth SRL aspect of the learning task). Attributions are beliefs concerning the causes of outcomes (Butler 2002). Teacher educators can facilitate effective self-regulation by providing attribution feedback to students, which stresses factors students can control, such as effort and strategy use (Schunk 2007).

The seventh SRL aspect of the learning task, 'task value activation', includes perceptions of the relevance, utility and importance of the task (Pintrich 2000). Finally, 'time management' (eighth SRL aspect of the learning task) is an important component of SRL as well (Dembo and Eaton 2000). It involves making schedules for studying and allocating time for different activities.

1.3 Problem Definition

Although the SRL model provides more insight for primary teacher educators during SRL implementation in educational pre-service programs, an innovative design like SRL needs to be more explicit about the teaching behaviours expected from the teachers to really support teachers' professional development (Könings et al. 2007). Teacher educators play a crucial role in the interpretation of the SRL design and its translation to educational practice. It is a general concern of innovations such as SRL that educational developers create a powerful learning

design and teacher educators subsequently are not able to fully implement it in their teaching (Könings et al. 2007). Therefore, the SRL model must be further operationalized towards a tool that enables primary teacher educators to implement SRL opportunities in their teaching, gradually moving from teacher to student regulation of the learning process (Vrieling et al. 2010).

As a consequence, the present study further elaborates the principles of the SRL model to answer the following research question: Which tool can assess primary student teachers' SRL opportunities in educational pre-service programs? The article continues with a description of the incorporation and validation of the SRL design principles in a diagnostic instrument for classroom settings. Then, the usefulness of the instrument for primary teacher education is outlined and illustrated in the form of a single case study. Finally, the findings are discussed and indications for future research are formulated.

2. Development of the 'SRL Opportunities Questionnaire' as a Diagnostic Instrument

2.1 Introduction

In this chapter, the SRL principles are made objectives of instruction for teacher educators in the form of an instrument for classroom practice: the SRLOQ. This study followed a four-phase research design consisting of scale development, score validation, further validation of the instrument in a pilot study, and a confirmatory factor analysis (CFA) after a main study. The method and results of each phase are outlined.

2.2 Scale Development

In the scale development phase was first determined which principles of the SRL model needed

further elaboration towards a diagnostic instrument for classroom practice. The principles concerning collaboration (sixth SRL design principle) and the learning task (seventh SRL design principle) were selected for two reasons: (1) these recommendations are directly related to instructional designs for classroom practice, and (2) by incorporating these recommendations in the SRLOQ. The remaining set of 5 more generic SRL recommendations (knowledge building, integration of content matter and metacognitive skills, modelling skills, scaffolding, and conditions) are also put in practice by teacher educators in an indirect matter while applying the SRLOQ. This is further explained hereafter.

When the SRL aspects of the learning task (principle 7) are taken as a starting point, the first 4 SRL principles concerning knowledge building are incorporated as elementary rules. As a consequence to be able to perform the learning task in a self-regulating manner (e.g. Appendix 1, item 1.1.1 ‘Students describe personal learning goals for my course’), student teachers must possess sufficient knowledge (principle 1) about the course, containing both content matter as well as metacognitive skills (principle 2). In the case of metacognition, a more skilled tutor, such as the teacher, can be asked to model the necessary skills (principle 3). Similarly, sufficient knowledge building of student teachers in learning tasks can only be ensured by a gradual increase of their SRL opportunities (principle 4). Besides knowledge building also learning conditions (principle 5) have to be regarded as a basic assumption to ensure smooth performance of the learning task. If, for example, student teachers are not aware of the importance of describing their own goals, this can impede a fluent performance of the learning task.

In the second phase of the scale development, the recommendations concerning collaboration and the learning task were operationalized in potentially relevant items of the questionnaire. Based on the literature review of Vrieling et al. (2010) that aimed at formulating

SRL design principles for primary teacher education, all selected sources of the literature review concerning collaboration and the learning task were analyzed for the operationalization of the SRLOQ. This screening led to the first selection of items that were included in the SRLOQ in analogous versions for student teachers and teacher educators. In Table 1, an example of the items of the student teachers (third column) and teacher educators (fourth column) version is given for each SRL recommendation (second column). The teachers' and students' ratings for each SRLOQ subscale were expected to correlate.

Table 1: SRLOQ scales

Scale SRLOQ	Recommendation SRL model	Scale example version student teachers	Scale example version teacher educators	Number of items	Cronbach's α version student teachers	Cronbach's α version teacher educators
Planning	Goal setting	The teacher expects me to describe personal learning goals	Students describe personal learning goals for my course	17	$\alpha = 0.84/0.86$	$\alpha = 0.85$
	Metacognitive knowledge activation	The teacher expects me to divide big assignments into smaller parts	Students divide big assignments into smaller parts for my course			
	Task value activation	The teacher expects me to describe the value of my learning goals towards classroom practice	Students describe the value of their learning goals for my course towards classroom practice			
	Time management	The teacher expects me to make a time plan to master my learning goals	Students make a time plan to master the learning goals for my course			
Monitoring learning process	Metacognitive awareness and monitoring of cognition	The teacher expects me to point out in which areas I need feedback	Students point out in which areas they need feedback for my course	6	$\alpha = 0.81/0.85$	$\alpha = 0.74$
Zone of proximal development	Prior knowledge activation	The manual describes in what way I can prepare myself for the lessons	The manual describes the way students can prepare themselves for the lessons of my course	12	$\alpha = 0.84/0.78$	$\alpha = 0.77$
	Perceptions of task difficulty	The teacher expects me to describe why my learning activities are challenging	Students describe why their learning activities for my course are challenging			

Coaching and Judging	Metacognitive awareness and monitoring of cognition	The teacher provides feedback on my learning progress	I provide feedback to students' learning progress for my course	16	$\alpha = 0.86/0.91$	$\alpha = 0.81$
	Judgments	The grading of the assignments by the teacher is based on previously formulated judging criteria	I grade the assignments based on previously formulated judging criteria			
	Attributions	The teacher demonstrates that making mistakes is part of the learning process	I demonstrate that making mistakes is part of the learning process			
Collaboration	Collaboration	During collaboration, the teacher pays attention to specific collaboration skills such as dividing tasks and reporting to each other	During collaboration, I pay attention to specific collaboration skills such as dividing tasks and reporting to each other	5	$\alpha = 0.61/0.73$	$\alpha = 0.74$

In the final phase of the scale development, the selected items were grouped into potentially relevant scales of the SRLOQ. The SRL recommendations concerning collaboration and the learning task (goal setting, prior knowledge activation, metacognitive knowledge activation, metacognitive awareness and monitoring of cognition, judgments, attributions, task value activation and time management) were incorporated in five scales of the SRLOQ. This can be seen in the first and second columns of Table 1. The SRLOQ distinguishes the following super ordinate scales: (1) planning (including goal setting, metacognitive knowledge activation, task value activation, and time management), (2) monitoring of the learning process (including metacognitive awareness and monitoring of cognition), (3) zone of proximal development (including prior knowledge activation, and perceptions of task difficulty), (4) coaching/judging (including metacognitive awareness and monitoring of cognition, judgments, and attributions), and (5) collaboration. Because the recommendation concerning ‘metacognitive awareness and monitoring of cognition’ includes both internal and external feedback, this recommendation was

incorporated in two different super ordinate scales, namely ‘monitoring of the learning process’ (internal feedback) and ‘coaching and judging’ (external feedback). Also, the importance of challenging goals (part of the ‘goal setting’ recommendation) was embedded in the super ordinate ‘zone of proximal development’ scale as ‘perceptions of task difficulty’.

2.3 Score Validation

2.3.1 Qualitative Analyses

To be able to empirically test the SRLOQ, depth interviews with 5 primary student teachers and 4 primary teacher educators were conducted first. Based on qualitative analyses of the interviews, the SRLOQ was adjusted. Besides minor textual adjustments to improve the readability of the questionnaire, analyses of the interviews resulted in two major changes in the questionnaire:

1. The 2 items concerning ‘successful experiences’ (‘The assignments of my course can result in successful experiences’ and ‘Students describe why their learning activities for my course resulted in successful experiences’) were too difficult to understand for student teachers and therefore removed from the questionnaire.
2. Most educational programs in primary teacher education only apply the portfolio as a tool to assess student teachers’ development in their working place and not to assess student teachers’ theoretical and practical development in general. Therefore, the words ‘in the portfolio’ were removed from all concerning items in the questionnaire.

Then, 62 primary student teachers and 29 primary teacher educators of one primary teacher education institute in the Netherlands completed the SRLOQ. Besides minor textual adjustments,

qualitative analyses (based on the remarks of the respondents) resulted in five major changes in the questionnaire:

1. In the introduction text was clarified that the aim of questionnaire is not to judge the teacher educator, but to assess student teachers' SRL opportunities in educational pre-service programs.
2. In most primary teacher education institutes, teacher educators perform different roles. They teach a subject course, but often also provide personal guidance to student teachers' academic development. Because the questionnaire aims at the assessment of student teachers' SRL opportunities in classroom practice, the word 'teacher' was changed into 'teacher of a course'.
3. Although several teacher educators do not make use of planned moments for appointments with student teachers, students often can meet the teacher whenever they have questions. As a result, the concerning item was re-formulated ('I make use of planned moments for students on which they can meet me to ask questions about their progress or students can always meet me when they have questions about their progress').
4. In the introduction section of the student teachers version of the questionnaire was explained that the word 'expect' (e.g. 'The teacher expects me to describe personal learning goals') means that the SRL activities are not only stimulated by teacher educators during the lessons, but really have to be accomplished by student teachers.
5. In the introduction section of the teacher educators version of the questionnaire was clarified that the aim of the questionnaire is not to provide teachers' opinion on SRL opportunities, but to describe the teaching situation as actually occurring.

2.3.2 *Quantitative Analyses*

The data of the score validation phase were quantitatively analysed by performing reliability analyses at the level of the scales of the instrument first. Based on these analyses, the item concerning peer feedback ('Students provide peer feedback to other students for my course') was removed from the 'monitoring' construct and added to the 'coaching/judging' construct. Table 1 outlines the number of items (fifth column) and Cronbach's Alpha's for the scales for the student teachers (first value of column 6) and teacher educators (column 7) version of the SRLOQ. Cronbach's Alpha's for the student teachers version were 0.84 (planning), 0.81 (monitoring of the learning process), 0.84 (zone of proximal development), 0.86 (coaching/judging) and 0.61 (collaboration). Cronbach's Alpha's for the teacher educator version were 0.85 (planning), 0.74 (monitoring of the learning process), 0.77 (zone of proximal development), 0.81 (coaching/judging) and 0.74 (collaboration). In general, these values imply reasonable reliability and homogeneity of items within the scales of the questionnaire.

Second, correlation analyses were performed on the level of the items within the scales of the questionnaire. In illustration of the results, the correlation matrix in Table 2 shows the correlations between the items of the 'goal setting' recommendation, which is part of the super ordinate scale 'planning'. The findings confirmed the results of the scale analyses. In addition, it was noticed that the items concerning the manual (e.g. 'The electronic learning environment/manual describes the learning goals for my course') scarcely correlate with other SRL items in the questionnaire. Table 2 illustrates this as well: the last two manual related items (Appendix 1, items 1.1.8 and 1.1.9) poorly correlate to the other 'goal setting' items. This indicated that most teacher educators do not apply the manual as a real tool in the guidance of

student teachers' SRL. However, the manual is an important tool in the SRL implementation process and the concerning items were therefore maintained.

Table 2: Correlation matrix 'goal setting'

Goal setting	Item 1.1.1	Item 1.1.2	Item 1.1.3	Item 1.1.4	Item 1.1.5	Item 1.1.6	Item 1.1.7	Item 1.1.8	Item 1.1.9
Item 1.1.1	1,00	0,66*	0,73*	0,43*	0,35*	0,54*	0,54*	0,14	0,14
Item 1.1.2	0,66*	1,00	0,89*	0,67*	0,43*	0,54*	0,64*	0,23	0,03
Item 1.1.3	0,73*	0,89*	1,00	0,70*	0,42*	0,55*	0,60*	0,22	0,15
Item 1.1.4	0,43*	0,67*	0,70*	1,00	0,30**	0,58*	0,47*	0,29**	0,10
Item 1.1.5	0,35*	0,43*	0,42*	0,30**	1,00	0,60*	0,49*	-0,03	0,10
Item 1.1.6	0,54*	0,54*	0,55*	0,58*	0,60*	1,00	0,59*	0,25	0,13
Item 1.1.7	0,54*	0,64*	0,60*	0,47*	0,49*	0,59*	1,00	0,31**	0,26
Item 1.1.8	0,14	0,23	0,22	0,29**	-0,03	0,25	0,31**	1,00	-0,02
Item 1.1.9	0,14	0,03	0,15	0,10	0,10	0,13	0,26	-0,02	1,00

* significance: $p < 0.01$, two-tailed

** significance: $p < 0.05$, two-tailed

2.4. Further Validation of the SRLOQ in Classroom Practice

2.4.1 Introduction

The present section describes the further validation of the SRLOQ in classroom practice. In chronological order the procedure and findings are outlined, also including a general discussion of the data and their implications for the field of educational psychology.

2.4.2 Procedure

In the next validation phase, the scores for the 5 scales found in the former phase were cross-validated with a second set of student participant responses. From September 2009 until January 2010, the SRLOQ was applied in an empirical pilot study with 3 teacher educators and 136 first-year student teachers in 2 primary teacher education colleges in the Netherlands (Vrieling et al. 2012a). The research was conducted in courses about educational theory containing lectures, lessons and moments of guidance. Table 3 visualizes the research design of the intervention study. Student teachers' SRL opportunities were quantitatively measured by the SRLOQ.

Teacher educators and student teachers were qualitatively tracked by training courses (teacher educators), tutorial conversations (teacher educators) and retrospective interviews (teacher educators and student teachers).

Table 3: Research design intervention study

Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Lessons	x	x		x		x	x			x		x				x	x	x
SRLOQ (TEs and STs)				x						x								x
Course (TEs)					x													
Conversations (TEs)						x					x							
Interviews (TEs and STs)																		x

The pre-test (completing the SRLOQ) was performed at the end of the third lesson (week 4). At that time, teacher educators and student teachers were expected to be unaware of the treatments in the intervention-period. Both student teachers' judgments of a teachers' instruction behavior and teacher ratings of their own SRL instruction were compared to obtain better interpretable data. After the pre-test, two kinds of treatments were undertaken with teacher educators aimed at increasing student teachers' SRL opportunities in educational programs: (1) training courses after lesson 3 (week 5) and (2) individual tutorial conversations after lesson 4 (week 6). The content of the training courses and tutorial conversations is explained in Section 3.3.

The intermediate-test (completing the SRLOQ) was performed at the end of the sixth lesson (week 10). Based on analyses of the intermediate-test, tutorial conversations were conducted again after lesson 6 (week 11) aimed at a further increase of student teachers' SRL opportunities.

At the end of the last lesson (week 18), the post-test (completing the SRLOQ) was conducted. Within five days after the post-test (end of week 18), all teacher educators and a

sample of student teachers (two students per teacher educator) were interviewed retrospectively.

2.4.3 Findings

Reliability of the SRLOQ was assessed via estimates of the internal consistency of scores for each scale of the SRLOQ. The values of Cronbach's Alpha's of the student teachers version of the SRLOQ are reported in Table 1 (sixth column, second value). Cronbach's Alpha's were 0.86 (planning), 0.85 (monitoring of the learning process), 0.78 (zone of proximal development), 0.91 (coaching/judging) and 0.73 (collaboration). These results again provide evidence that the scores on the 5 scales are consistent.

The final version of the SRLOQ is a self-report instrument designed to assess student teachers' SRL opportunities in educational programs. It contains 56 items, divided in 5 final sales: planning (17 items), monitoring of the learning process (6 items), zone of proximal development (12 items), coaching/judging (16 items) and collaboration (5 items). Except for the items concerning the manual that ask for a yes or no reply, the items are scored on a five-point Likert scale. The instrument is designed for classroom practice and takes approximately 20 minutes to administer. In Appendix 1, all items of the teacher educator's version of the SRLOQ are presented.

Qualitative analyses indicated that teacher educators could distinguish and became more conscious of the five SRL scales in their teaching by using the SRLOQ. This instrument enabled them to assess student teachers' SRL opportunities in classroom practice on the five scales. However, effective appliance of the SRLOQ requires training. To be successful in the SRL implementation process, teacher educators are advised to attend training courses that explain the design principles of the SRL model and individual tutorial conversations, based on the measured

degree of SRL opportunities with the SRLOQ. In this way, in answer to the research question of the present study, the SRLOQ is a suitable diagnostic instrument for teacher educators to assess student teachers' SRL opportunities in primary teacher education.

In general, it was found that the educational programs of the participating primary teacher educators displayed a gap concerning SRL opportunities between the second and third year. In the first two years, the major phase, educational programs are mainly teacher centered. Then, from the start of the third year, student teachers are expected to self-regulate their' learning by applying all they learned in, for example, self-chosen specializations. By learning to use the SRLOQ, the instrument cannot only be applied as a diagnostic tool for individual teacher educators, but also for educational pre-service programs in general.

2.5 Confirmatory Factor Analysis

In the final validation phase, the dimensional structure of the SRLOQ was tested with a CFA using the data of a main study (Vrieling et al. 2012b). This main study was performed from January 2010 until June 2010 with 11 teacher educators and 257 second-year student teachers in 5 primary teacher education colleges in the Netherlands. Since the items concerning the manual correlated rather poor with the other items in the questionnaire, a CFA was applied on the SRLOQ as well as on the SRLOQ without the items related to the manual. The sample size was 485 since the data from the pre-test and the post-test of the main study were used for the CFA.

In addition to the chi-square (χ^2) statistic, which is an 'exact fit index', the overall fit of both versions of the SRLOQ was evaluated by examining three other types of fit indices as suggested by Hu and Bentler (1999). The Root Mean Square Error of Approximation (RMSEA) represents the 'approximate fit indices'. The Tucker-Lewis Index (TLI) and the Comparative Fit

Index (CFI) represent the ‘incremental fit indices’, and the Standardized Root Mean Square Residual (SRMR) represents the ‘residual based fit indices’. The results are outlined in Table 4.

Table 4: Model fit indices

Model	χ^2	df	RMSEA	TLI	CFI	SRMR
SRLOQ	4878,49*	1474	0,070	0,95	0,95	0,072
SRLOQ without items related to the manual	3571,57*	892	0,080	0,95	0,96	0,073

* significance: $p < 0.01$

Because the chi-square (χ^2) test is highly susceptible to the impact of the sample size (Russell 2002), the χ^2 ratio to its degrees of freedom (df) was evaluated instead. Values below 5 for the χ^2 /df (Kline 2005) and values below .08 for RMSEA indicate an acceptable fit (Marsh et al. 2004). Values for the TLI and CFI above .90 indicate a good fit (Russell 2002), while a SRMR below .10 indicate a good fit (Kline 2005).

The results for the SRLOQ were χ^2 /df = 3.31, RMSEA = 0.070, TLI = 0.95, CFI = 0.95, and SRMR = 0.072, which indicates at least an acceptable fit. The results for the SRLOQ without the items related to the manual were χ^2 /df = 4.00, RMSEA = 0.080, TLI = 0.95, CFI = 0.96, and SRMR = 0.073, which indicates an acceptable fit as well, but slightly inferior to the results for the SRLOQ. In general, the results of the CFA confirmed the five dimensional structure of the SRLOQ to be acceptable.

3. The Usefulness of the ‘SRL Opportunities Questionnaire’ in Classroom Practice: a Case study

3.1 Introduction

To illustrate the usefulness of the SRLOQ for classroom practice, a single case study (one of the 11 participating teacher educators of the main study) is outlined in this chapter. First, the context

of the study is explored, followed by a description of the design and the findings of the case study. Finally, recommendations for smooth SRL implementation are outlined.

3.2 Context

This preservice case study was conducted in a college of primary teacher education, which predominantly serves schools in a rural area in the east of the Netherlands. This is an independent, relatively small institution totalling approximately 500 students per academic year. Most students enter its program after graduating from the middle level of general secondary education and the highest level of secondary vocational education.

The female teacher educator that is described in the case study (Anne) taught 10 lessons to 4 separate groups of fulltime second-year regular student teachers in the research period. She volunteered to cooperate. At the time of measurement, she had 8 years of working experience.

3.3 Design

The research design of the main study was similar to the pilot study that is described in Section 2.4.2. Two treatments were accomplished in the research period: training courses and individual consulting conversations.

The aims of the training courses were to increase teacher educators' SRL knowledge and skills, to focus on the consulting conversations, and to make a first planning on increasing student teachers' SRL opportunities in the learning program. After getting acquainted, teacher educators were firstly trained in applying the first set of five design principles of the SRL model (knowledge building, integration of content matter and metacognitive skills, modelling skills, scaffolding, and conditions). For example, the four phases of modelling metacognitive skills

(observation, emulation, self-control, self-regulation) were practiced. Then, the elaboration of the sixth (collaboration) and the seventh (learning task) design principles towards the SRLOQ was explained and practiced. Finally, teacher educators were asked to make a planning for their individual classrooms in which at least 3 of the 5 SRLOQ scales were implemented.

The two cycles of tutorial conversations were based on both teacher educators' SRL planning and analyses of respectively the pre-, and intermediate-test. The SRLOQ scales were the leading themes of the conversations. The intentions of the teacher educators and analyses of the measured SRL degree as viewed by teacher educators and student teachers, were compared. In the end, this comparison resulted in an adjusted planning for SRL implementation in classroom practice, aiming at a further increase of student teachers' SRL opportunities in the learning program.

Finally, teacher educators and student teachers were questioned in semi-structured interviews about their experiences with student teachers' increased SRL opportunities in educational programs. The scales of the SRLOQ were used as starting points for the topics of the interviews.

3.4 Findings

In general, Anne wished to diminish the consuming role of student teachers that she frequently observed in her lessons. To achieve this shift, Anne planned to work on four super ordinate scales of the SRLOQ: 'planning', 'zone of proximal development', 'coaching/judging' and 'collaboration'. In the case of 'planning', she aimed at the sub scale 'goal setting', more specifically item 1.1.5 (Appendix 1: 'Students determine which learning activities they attend to master the learning goals for my course.'). At the end of lesson 2, Anne divided the theory of her

course in 8 subjects and provided opportunities for her students to select one of the topics that interested them. Then, the students worked on their subjects during the lessons 3 till 6. Anne also provided criteria for the students concerning the presentations of the subjects that were incorporated in the lessons 7 till 9. In the final 10th lesson, students had opportunities to ask questions about uncertainties in the topics.

In this way, Anne also aimed at improving the ‘prior knowledge activation’ aspect of the ‘zone of proximal development’ scale, representing items 3.1.4, 3.1.5, and 3.1.6 (Appendix 1: ‘My assignments connect well to students’ prior knowledge’, ‘My lessons appeal to students’ prior knowledge’, ‘The content of my lessons connects well to students’ prior knowledge’).

In the presentation lessons, student teachers were asked to provide feedback to their peers, based on the criteria as provided by Anne (Appendix 1, item 4.1.1 ‘Students provide peer feedback to other students for my course’). In this way, Anne worked on the aspect ‘metacognitive awareness and monitoring of cognition’ within the super ordinate scale ‘coaching/judging’ as well.

The final scale that Anne worked on was the ‘collaboration’ scale (Appendix 1, item 5.1.1 ‘Students collaborate with peers for my course’, item 5.1.2 ‘Students describe the way they collaborate with peers for my course’, 5.1.4 ‘During collaboration, I pay attention to specific collaboration skills such as dividing tasks and reporting to each other’).

It is much more fun for me to work like this, because students are active in stead of consumptive and my role is more guiding instead of directing. I now am really looking forward to the lessons.

Student teachers were in favor of their active role during the course. Nevertheless, they also stressed the importance for teacher educators to provide an adequate knowledge base to avoid uncertainty. Student teachers stressed the importance for Anne to add the necessary information to the student-presentations. Student teachers also appreciated the final lesson in which Anne provided opportunities to elaborate on the content of her course to better prepare student teachers for the test.

It is very pleasant to be activated and work like this; however we must know for sure that we possess all the required knowledge for the test.

Furthermore, it appeared difficult for student teachers to provide peer feedback in a suitable manner. This indicates student teachers' need for explicit metacognitive strategy instruction. Although Anne provided criteria for feedback, the modelling of peer feedback was not practiced in the classroom.

Student teachers appreciated the collaborative tasks. By discussion, argumentation, and reflection upon the task at hand, deeper processing of the information and richer and more meaningful learning was achieved. Nevertheless, student teachers also stressed the importance for all individual members of the group to actively cooperate. When this was not the case, the advantages of the joined effort were decreased and student teachers gave privilege to working alone.

Less active students see their peers working: explaining the theory and thinking of ways to illustrate the theory during the presentation; by working in groups, all members are forced to actively cooperate.

In general, Anne observed many possibilities to further enhance student teachers' SRL opportunities in her lessons on the longer term. She stressed the need to improve the learning task by utilizing real-life problems that require the integrated use of knowledge, skills, and attitudes. She also observed that the electronic learning environment was an undervalued aspect of the learning program. It was not applied as a real tool in the guidance of the self-regulation of primary student teachers. However, to make such an innovation a successful one, the implementation of SRL opportunities must not be an individual journey, but a joined enterprise of teacher educators, student teachers, and a supportive school context and culture.

Finally, Anne remarked that the five SRL scales are closely connected. Although Anne planned to increase SRL opportunities on a selected number of SRL constructs, student teachers' general SRL opportunities increased significantly during the research period.

By becoming more conscious of the 5 SRL scales, the instrument helps me to observe my course, the manual, the electronic learning environment, and so on, from a different perspective.

In sum, Anne managed to distinguish the five SRL scales in her teaching and was also able to increase student teachers' SRL opportunities on the separate scales and in general. Through working with the SRLOQ, her consciousness of the SRL scales was trained, resulting in SRL ideas to implement in classroom practice on the short, but also on the longer term. In addition,

Anne not only noticed the advantages of SRL for student teachers' academic success, but also became aware of the importance to 'scaffold' SRL opportunities in pre-service teacher education to avoid disadvantages such as student teachers' uncertainty.

3.5 Recommendations for successful SRL implementation

As can be learned from the case of Anne, primary teacher educators are advised to focus on knowledge building in the domain by creating a gradual transfer from teacher control to student control ('scaffolding'). Teachers are experts in the relevant subject-matter domain, and it is their task to make this domain more accessible to students.

To enable SRL, this knowledge construction not only includes content knowledge, but also metacognitive knowledge. To develop and enhance student teachers' metacognitive learning skills, primary teacher educators are obliged to explicitly link that skill development to the way they teach. This means that the teaching procedures challenge students' thinking and their thinking about thinking. To achieve this goal, the four phases of Zimmerman's model (observation, emulation, self-control and self-regulation) can be incorporated in primary student teachers' education and training.

To facilitate student teachers' reasoning and sustain their interest and engagement in collaborative projects, teacher educators have to guide peer interactions by insuring positive interdependence in the group, giving clear instructions on how to co-operate and providing adequate feedback on the co-operating process (Bolhuis and Voeten 2001). In addition, the transaction costs (communication and coordination within the group) should be kept to a minimum to ensure positive interdependence (Kirschner et al. 2009). When viewed as a

metacognitive skill, student teachers need practice and guidance in performing adequate collaborative skills.

To increase student teachers' SRL opportunities in learning tasks, the four-component instructional design (4c-id) model (Van Merriënboer and Kirschner 2007) can be applied. In the 4c-id model, student teachers start with relative simple but realistic situations that contain all essential aspects of the complex task, and then gradually receive more complex authentic assignments characteristic for their professional situation. This improves the transfer between theory and practice. The SRL recommendations concerning the learning task (Figure 1) can be embedded in the 4c-id model.

Finally, successful SRL implementation asks for a joined venture of all participants within primary teacher education. Primary teacher educators that perceived their schools as being more supportive were more motivated and persistent towards SRL implementation.

4. Discussion

Because of the promising results of SRL for students' academic success, teacher educators are increasingly confronted with the necessity of increasing student teachers' SRL opportunities in their learning programs. Although teacher educators support the idea of SRL, they often find it difficult to implement SRL opportunities for student teachers in their teaching. Therefore, a theoretical SRL model was developed in a former study (Vrieling et al. 2010).

However, implementation of SRL in curricula asks for more explicit instructions about the teaching behaviors expected from teacher educators. Many researchers (e.g. Elwood and Klenowski 2002) indicate formative assessment (i.e. assessment whose purpose it is to enable students, through effective feedback, to fully understand their own learning and the goals they

are aiming for) as a promising element to improve learning and the quality of teaching. For that reason, to support teacher educators' professionalism, the SRL model was further elaborated in the present study towards an assessment instrument for classroom settings: the 'SRL Opportunities Questionnaire' (SRLOQ). The SRLOQ was shown to provide a good grip for primary teacher educators in the SRL implementation process as it can support primary teacher educators in assessing student teachers' SRL opportunities in educational pre-service programs. Combined with teacher training, the instrument is not only applicable in individual classroom settings, but also to assess educational programs in general.

A major misunderstanding about SRL concerns the idea that student teachers can work more independent, and teacher educators are allowed to invest less time in the guidance of student teachers. This is a false assumption. Student teachers' SRL development demands adequate guidance by teacher educators. SRL implementation asks for a thorough preparation. Teacher educators have to think about ways to provoke goal setting, planning, monitoring, control and reflection by student teachers themselves.

Teacher educators also have to pay attention to individual differences between student teachers. Every student needs specific guidance and feedback. So, SRL implementation asks for flexible teacher educators who share the control with their student teachers. Prior knowledge activation, for example, can be realized by active involvement of student teachers in the preparation of the lessons. What do student teachers want to learn and what do they already know?

Maybe, the increase of student teachers' SRL opportunities in the learning program even demands more effort and attention of teacher educators than the regular approach. However, if SRL implementation is done right, it probably results in more academic success for student

teachers. By applying the SRL model in teacher training courses and the SRLOQ as a diagnostic tool for teacher educators and program developers, a better awareness of important instructional SRL principles for primary teacher education can be achieved.

Future research would benefit from developing a shorter version of the SRLOQ that takes less than 20 minutes to administer. Furthermore, the SRLOQ can be calibrated in a representative sample to provide norms for the SRLOQ. Finally, developing on-line measurement methods to obtain behavioral SRL measures during task performance can enrich appliance of the SRLOQ as a self-assessment instrument.

Appendix 1. SRLOQ, version teacher educators

Scales SRLOQ	Recommendation SRL model	Scale items of the original SRLOQ
1. planning	1.1 goal setting	1.1.1 Students describe personal learning goals for my course.
		1.1.2 Students describe SMART (specific, measurable, acceptable, realistic and time processing) learning goals for my course.
		1.1.3 Students describe short-term learning goals to master their long-term personal learning goals for my course.
		1.1.4 Students describe how their personal learning goals and the learning goals of my course are harmonized.
		1.1.5 Students determine which learning activities they attend to master the learning goals for my course.
		1.1.6 Students describe how their learning activities contribute to mastering the learning goals for my course.
		1.1.7 Students describe SMART (specific, measurable, acceptable, realistic and time processing) learning activities for my course.
		1.1.8 The electronic learning environment/manual describes how my course can support students in their development towards primary teachers.
		1.1.9 The electronic learning environment/manual describes the learning goals for my course.
		1.2.1 Students divide big assignments into smaller parts for my course.
		1.2.2 The electronic learning environment/manual describes how students can divide big assignments into smaller parts for my course.
		1.3.1 Students describe the value of their learning goals for my course towards classroom practice.
		1.3.2 The electronic learning environment/manual describes the importance of the learning goals for my course towards classroom practice.
	1.4.1 Students make a time plan to master the learning goals for my course.	
	1.4.2 The electronic learning environment/manual describes when the	

		assignments for my course have to be finished.
		1.4.3 The electronic learning environment/manual describes how much time students need in general to accomplish the assignments for my course.
		1.4.4 The electronic learning environment/manual describes the subject matter that has to be studied for my course.
2. monitoring of the learning process	2.1 metacognitive awareness and monitoring of cognition	2.1.1 Students describe their progress for my course.
		2.1.2 Students describe their progress for my course based on obvious criteria.
		2.1.3 Students point out in which areas they need feedback for my course.
		2.1.4 Students describe the adjustments of their work after getting feedback for my course.
		2.1.5 Students describe the adjustments of their working routine based on their success and failure experiences for my course.
		2.1.6 The electronic learning environment/manual describes how students can describe their progress for my course.
3. zone of proximal development	3.1 prior knowledge activation	3.1.1 Students describe their prior knowledge for my course.
		3.1.2 Students describe how their thinking and acting have changed due to the obtained new knowledge and skills for my course.
		3.1.3 Students can point out which subjects should be part of the lessons for my course.
		3.1.4 My assignments connect well to students' prior knowledge.
		3.1.5 My lessons appeal to students' prior knowledge.
		3.1.6 The content of my lessons connects well to students' prior knowledge.
		3.1.7 A few days before the lessons start, students have access to relevant documents for my course (e.g. through the electronic learning environment).
		3.1.8 The program of my course provides opportunities for making choices in the subject matter.
		3.1.9 The electronic learning environment/manual describes students' opportunities for making choices in the subject matter of my course.
		3.1.10 The electronic learning environment/manual describes the way students can prepare themselves for the lessons of my course.
	3.2 perceptions of task difficulty	3.2.1 Students describe why their learning activities for my course are challenging.
		3.2.2 The assignments of my course challenge students.
4. coaching/ judging	4.1 metacognitive awareness and monitoring of cognition	4.1.1 Students provide peer feedback to other students for my course.
		4.1.2 I provide feedback to students' learning progress for my course.
		4.1.3 I provide feedback to students' assignments and tests for my course.
		4.1.4 My feedback is based on previously formulated criteria.
		4.1.5 I provide feedback to short-term products.
		4.1.6 I provide opportunities for handing over the assignments after adjustments.
		4.1.7 I provide feedback in the electronic learning environment.
		4.1.8 I make use of planned moments for students on which they can

		meet me to ask questions about their progress or students can always meet me when they have questions about their progress.
	4.2 judgments	4.2.1 Students describe judging criteria to grade their progress for my course.
		4.2.2 Students describe judging criteria to grade their work for my course.
		4.2.3 Students describe strong and weak points in their work for my course based on judging criteria.
		4.2.4 I grade the assignments based on previously formulated judging criteria.
		4.2.5 The electronic learning environment/manual describes how students can grade their progress for my course.
		4.2.6 The electronic learning environment/manual describes the judging criteria of the assignments for my course.
	4.3 attributions	4.3.1 I stress students' strong qualities.
		4.3.2 I demonstrate that making mistakes is part of the learning process.
5. collaboration	5.1 Collaboration	5.1.1 Students collaborate with peers for my course.
		5.1.2 Students describe the way they collaborate with peers for my course.
		5.1.3 Students describe the way they collaborate with peers in the electronic learning environment for my course.
		5.1.4 During collaboration, I pay attention to specific collaboration skills such as dividing tasks and reporting to each other.
		5.1.5 During collaboration, I pay attention to general social and communicative skills such as good listening and respecting other opinions.

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