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Using Online Learning Networks to Promote Self-Regulated Learning in Primary Teacher Education

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Abstract: Many recent studies have stressed the importance of students' self-regulated learning (SRL) skills for successful learning. Consequently, teacher educators have begun to increase student teachers' SRL opportunities in educational pre-service programs. Although primary teacher educators are aware of the importance of SRL, they often find it difficult to implement opportunities in their teaching. To provide more insight into relevant SRL aspects and support implementation in pre-service teacher education, this study first explores the benefits of online SRL learning networks. The authors then present seven SRL design principles for primary teacher education, and show the results of implementing these principles in non-formal learning contexts. Finally, based on the positive results of the implementation process, the authors describe emerging trends for SRL learning networks to enhance further use in pre-service teacher learning programs. In such educational settings, the SRL design principles can be used as a holistic framework.

Primary Teacher Education and Self-Regulated Learning

Teacher education has traditionally focused on relaying subject knowledge and teaching skills (Kremer-Hayon & Tillema, 1999). However, researchers and practitioners in the field have noticed a consistent decline in transfer from theory to practice (Korthagen, Klaassen, & Russell, 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 primary teacher educators (teachers of prospective primary teachers) are now working to increase student teachers' self-regulated learning (SRL) opportunities throughout their initial training (Lunenberg & Korthagen, 2003). 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, Soresi, & Zimmerman, 2004; Sundre & Kitsantas, 2004; Valle et al., 2003; VanderStoep, Pintrich, & Fagerlin, 1996). To attain such an environment, teacher educators often must adjust their own instructional behavior so that they might enhance students' self-regulation.

In general, SRL is a goal-oriented process, proceeding from a forethought phase and continuing 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, Van Hout-Wolters, & Afflerbach, 2006; Zimmerman, 2001), an act commonly referred to as metacognition. By using metacognitive skills, student teachers can become aware of and monitor their progress towards their goals. As a result, students can improve their learning and comprehension, realizing any adaptive changes in their learning (Vermunt & Verloop, 1999).

Defining the Problem

Although primary teacher educators understand the importance of the concept of SRL (Kremer-Hayon & Tillema, 1999), they often find it difficult to actually foster it in educational pre-service programs (Korthagen et al., 2000). Since many practicing teacher educators do not have previous experience with SRL, they are still somewhat unprepared for the change and are often worried about their decreasing role as knowledge providers (Kremer-Hayon & Tillema, 1999). In order to improve the implementation of SRL in pre-service education programs, we must focus more attention on the professional development of teacher educators.

Based on the findings of a review study (Vrieling, Bastiaens, and Stijnen, 2010) and two empirical studies (Vrieling et al., 2011a, b), our analysis provides more insight into relevant SRL design principles and how to best implement them in pre-service teacher education. Our research questions are as follows:

1. What is the value of online learning networks for SRL implementation in primary teacher education?
2. Which SRL design principles are distinguished in research literature?
3. In what way are the SRL design principles useful for primary teacher educators?
4. What are emerging trends for online learning networks to support SRL implementation?

In the following sections, we will first outline the importance of online learning networks for SRL implementation in primary teacher education is introduced first. Then, seven SRL design principles for primary teacher education are outlined, followed by their application in non-formal empirical settings within primary teacher education. Finally, based on the findings of the empirical studies, recommendations to enhance SRL implementation through online learning networks are outlined.

The Value of Online Learning Networks for SRL Implementation in Primary Teacher Education

For successful implementation of an innovative design like SRL, teacher educators must be very explicit about the behaviors they expect from their students (Könings, Brand-Gruwel, & van Merriënboer, 2007). Since many teacher educators have little to no previous experience in such an instructional design, they are sometimes ill-prepared to fully implement it in their teaching (Könings et al., 2007). Hence, teacher educators play a crucial role in the interpretation of SRL design and its translation into educational practice.

Similarly, Vrieling et al. (2011a, b) noted that primary teacher educators' need informal SRL trajectories such as online interaction because learning networks are not limited by geography, space, or time. Rather, they can provide experiences for extending learning beyond the classroom walls that can be applied in classroom practice.

To fulfill this need, Laferrière, Lamon, and Chan (2006) indicate that learning networks can help qualitatively enhance lifelong learning for teacher educators. Redmond and Lock (2009) also report on similar online learning networks where student teachers, teacher educators, and practicing teachers discussed current issues such as SRL. Their research shows that the participants were involved in meaningful conversations that provided rich understanding of teaching practice by creating transfers between theories, experiences and realities of teaching in contemporary contexts. Thus, professional learning networks strongly influence teachers' professional roles, can lead to changes in their classroom activities, and consequently can have positive effects on students' learning progress (Lieberman & Wood, 2003).

In general, more focus is now being placed upon social aspects that influence learning and professional development (Brown & Duguid, 2001), as well as the spontaneous and informal learning processes in the development of social capital (Wenger, Trayner, & De Laat, 2011). Rapid technological developments enable this social knowledge construction in educational practice (Brown & Duguid, 2001; Lieberman & Wood, 2003). Technology can promote the building of learning networks, where people with common interests work and learn together although they may be separated by time and location (Shoffner, 2009). Technologies such as email, discussion boards, and weblogs provide opportunities for learning networks in which teacher educators can reflect on practice with colleagues, share expertise, and build a common understanding of new instructional SRL approaches for classroom practice.

Based on an international literature study, Villegas-Reimers (2003) concludes that network learning is an important way for teachers to professionalize, because it joins teachers with different classroom experiences and a common desire to work on challenges and questions in social learning settings. In the development of social learning, Wenger et al. (2011) distinguish "communities" from "networks." Communities (or learning teams) can be defined as "groups of people that work together cohesively toward a common goal" (Dechant, Marsick, & Kasl,

1991, p.1). In such communities, the learning partnership creates an identity around a common agenda or area for learning. The term “network” refers to a set of connections among people. Networks using information technology can optimize the connectivity among teachers. The extent and density of the network can be increased by strengthening existing connections, enabling new connections and getting a speedy response. The interplay between community and network processes thus enhances social learning.

Design Principles for a Successful Implementation of Self-Regulated Learning

To provide more insight into relevant SRL aspects during teaching, Vrieling, et al. (2010) formulated seven SRL design principles for primary teacher education that can play an important role in increasing student teachers’ SRL opportunities in educational pre-service programs.

The first principle suggests that teacher educators should create a sufficient knowledge base for their students. Teacher educators cannot expect their students to immediately regulate their learning all by themselves. As experts in the relevant subject-matter domain, the teacher educator must make this domain more accessible to student teachers (Bolhuis & Voeten, 2001).

To do this, teacher educators should integrate the necessary metacognitive skills and content matter into their teaching, comprising the second design principle. As part of the third principle, this integration should be modeled upon the following four regulatory skill levels (Schunk & Zimmerman, 2007):

- Level 1. Observation: Learners can induce the major features of the skill from watching someone model learning or performing.
- Level 2. Emulation: The learner, with assistance from the group, imitates the model’s performance.
- Level 3. Self-control: The learner independently performs under structured conditions.
- Level 4. Self-regulation: The learner shows an adaptive use of skills across changing personal and environmental conditions.

In the fourth principle, control of the learning processes should gradually transfer from teacher to student (“scaffolding”), To ensure successful knowledge building, teacher educators must provide considerable guidance to students (Kirschner, Sweller, & Clark, 2006). In this way, student teachers gain sufficient prior knowledge to be able to internally guide them. Only then should the teacher educator begin to decrease

The fifth principle moves past successful knowledge building to encompass knowledge of the conditional factors that can foster or hinder successful implementation. This ensures that teacher educators are adequately prepared for their job, that they use suitable (digital) learning materials to relay to their students a solid understanding of the significance of SRL and to create an appropriate school context and culture. Student teachers stress the importance for all teacher educators to use any learning materials (e.g. an electronic learning environment) in the same way (Vrieling et al., 2010). In line with the findings of Sim and Hew (2010) in higher education settings, for student teachers to adopt student teachers note that reflective learning in electronic environments requires clear technological instructions and sufficient time to be appreciated and adopted in student teachers’ learning.

The sixth principle stresses the engagement of student teachers in collaborative (digital) learning environments. Student collaboration facilitates the development of SRL (Wigfield, Hoa, & Klauda, 2007). When students have collaborative projects to complete, they make special effort contribute significantly to the group. Also, encouraging students to consult with peers can lead them to utilize their classmates as knowledge resources. To instill such an environment, teacher educators should 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 aspects of the learning task (i.e., assignments student teachers have to accomplish).

- *Goal setting*: Academic goals are important variables for student teachers because they serve as self-defining reference points that determine the next processes of SRL, such as planning, executing, and monitoring (Schunk & Ertmer, 2000).
- *Prior knowledge activation*: This 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 & Aharon, 2003).
- *Metacognitive knowledge activation*: This includes the activation of knowledge about cognitive tasks and cognitive strategies in the SRL forethought phase (Pintrich, 2000, 2004).
- *Metacognitive awareness and monitoring of cognition*: As a core component within information processing models of self-regulation (e.g. Nietfeld, Cao, & Osborne, 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 & Verloop, 1999).
- In the SRL self-reflection phase, Pintrich (2000, 2004) distinguishes two distinct cognitive key processes.
 - The first process involves learners' "*judgments*" and *evaluations of their performance of the task*. Students can learn to make judgments about the way their work relates to the criteria.
 - The second concerns students' "*attributions*" for performance. Attributions are beliefs concerning the causes of outcomes (Butler, 2002). Teacher educators can facilitate effective self-regulation by providing attribution feedback to students that indicates factors students can control, such as effort and strategy use (Schunk, 2007).
 - *Task value activation*: This process encompasses perceptions of the relevance, utility and importance of the task (Pintrich, 2000).
 - *Time management*: This important component of SRL (Dembo & Eaton, 2000) may involve making schedules for studying and allocating time for different activities.

Application of the SRL Design Principles in Primary Teacher Education

Vrieling et al. (2011a, b) successfully applied the SRL design principles in non-formal teacher education learning settings. In such settings, there is an explicit learning intention, but the participants do not receive a formal certificate after completion of the course of learning. Vrieling et al. (2011a, b) measured the dynamics of student teachers' use of metacognitive learning strategies and motivation for learning in environments with increased SRL opportunities. The research was conducted in educational theory courses containing lectures and moments of guidance. In total, 14 teacher educators and 387 first- and second-year student teachers of seven primary teacher education institutes in the Netherlands participated. During one semester, teacher educators participated in training courses and tutorial conversations aimed at increasing student teachers' SRL opportunities in the curriculum.

The researchers in these empirical studies used a mixed methods pre- and post-test design. They developed a questionnaire to collect quantitative data regarding student teachers' motivation for learning and use of metacognitive learning strategies. They used semi-structured interviews and tutorial conversations to track qualitative data on teacher educators and student teachers.

Their results demonstrated that the SRL design principles provide more insight for primary teacher educators into relevant SRL aspects and can help guide further implementation. Furthermore, the studies showed that student teachers' use of metacognitive learning strategies increased significantly during one semester in learning environments with increased SRL opportunities. This indicates that teacher educators can play a major role in developing student teachers' use of metacognitive learning strategies by increasing student teachers' SRL opportunities. In addition, qualitative analyses identified student teachers' need for more explicit metacognitive strategy instruction. These findings corresponded with the recommendations of Veenman et al. (2006) and Vrieling et al. (2010), indicating the necessity for primary teacher educators to explicitly model metacognitive learning strategies to student teachers.

Although student teachers' motivation for learning correlated significantly positive with SRL opportunities and SRL was shown to be a significant positive predictor of the motivation score, the increase of student teachers' motivation for learning appeared not to be significant during that one semester. One potential reason for the absence of motivation may be that the temporal interval was too brief for the effects to be detected. However, the increase of student teachers' expectancy, a component within the motivation scale, was shown to be significant. The expectancy scale includes control belief and self-efficacy for learning and performance (e.g. "I think that I will get good grades for this course.") Student teachers indicated appreciation of the increased SRL opportunities in the curriculum. Nevertheless, they also stressed the importance for teacher educators to provide an adequate knowledge base to avoid uncertainty. For example, student teachers like to know the criteria for judging their work in advance. Therefore, teacher educators are advised to focus on knowledge building in the domain, including both metacognitive skills and content matter (Vrieling et al., 2010).

In general, Vrieling et al. (2011a, b) revealed that the level of SRL opportunities in pre-service teacher learning environments is a strong predictor of primary student teachers' use of metacognitive learning strategies and enhances student teachers' motivation for learning, both important for their academic career.

Exploring SRL design principles in Online Learning Networks

Networked learning is increasingly considered as a powerful way to stimulate and facilitate teachers' professional development in educational settings (Lieberman & Wood, 2003). In such learning and knowledge-building communities, teachers interact with peers, students, information and resources by studying authentic problems (Laferrière et al., 2006). However, informal learning networks only result in innovative communities of practice if they are successfully facilitated. To enhance networked learning in the start-up phase, Hanraets, Hulsebosch, and de Laat (2011) distinguish five recommendations that are very similar to those of the SRL design principles:

- Facilitators must demonstrate a facilitating role instead of a directing role.
- Participants must feel responsible for their network activity (i.e. shared ownership).
- Participants must possess sufficient networking skills.
- Face-to-face and online interactions need to be combined.
- Support from management and direct supervisors is necessary.

Zooming in on the third recommendation concerning networking skills, Laferrière et al. (2006) illustrated that internet-based technologies support teachers' opportunities for reflective and collaborative learning. However, teachers and school managers are often not trained to develop competencies for networked learning such as reflective dialogues. Moreover, the culture in educational settings is often not conducive to learning networks. Since the effects of online learning vary depending on the self-regulation of learning by participating teacher educators (Laferrière et al., 2006), participants must be coached intensively, for example, in the use of technology. Thus, in line with the recommendations of the SRL design principles, the transition from guided learning to SRL should be a gradual process (scaffolding) in web-supported learning networks for professional development.

In such networks, teacher educators can gain more practice modeling metacognitive skills to their student because explicit training of metacognitive learning strategies tends to be rare in primary student teachers' classrooms (Vrieling et al., 2011a, b). These findings echo the results of Kistner et al. (2010), who conclude that a great amount of strategy teaching occurs in an implicit way because teacher educators often find it difficult to serve as a role model. Teacher educators are absolutely willing to invest effort in the instruction of metacognition within their lessons, but they need the "tools" for implementing metacognition as an integral part of their lessons and for making students aware of their metacognitive activities and the usefulness of those activities (Veenman et al., 2006).

The empirical studies of Vrieling et al. (2011a, b) also showed that teacher educators can improve their students' learning tasks (the seventh SRL design principle) by utilizing real-life problems that require the integrated use of knowledge, skills, and attitudes. The four-component instructional design (4c-id) model (Van Merriënboer & Kirschner, 2007) can be applied during this exercise in learning networks. 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 gradual shift in control over learning processes from teacher to student (or "scaffolding"), as stressed by Vrieling et al. (2010), offers a final example for further exploration of SRL design principles in online learning networks. In most primary teacher education programs, there exists a gap between SRL opportunities in the second and the third years (Vrieling et al., 2011a, b). In the first two years--the major phase--educational programs are mainly teacher centered. From the start of the third year, student teachers are often asked to self-regulate their learning by applying all they learned in self-chosen specializations, resulting in their graduation paper. In learning networks, the SRL design principles can be further utilized to enable primary teacher educators to implement SRL opportunities in their teaching, gradually moving from teacher to student regulation of the learning process.

In summary, qualitative analyses of the empirical studies showed teacher educators' need to further develop the SRL design principles for application in classroom practice. By creating online learning networks, teacher educators can be better equipped to elaborate the SRL principles. In addition, in line with the "knowledge building" and "scaffolding" principles, online learning networks should be gradually and collectively developed.

Discussion

Successful SRL implementation requires that teacher educators do more than follow the initial seven process-oriented design principles; they must provide more explicit instructions about the behaviors they expect of their students. Teacher educators sometimes labor under the false assumption that they can invest less time in the guidance of their students, mistakenly expecting them to work more independently than they may be able. Proper SRL development demands adequate guidance and thorough preparation by teacher educators, and they must always consider new ways to elicit goal setting, planning, monitoring, control and reflection by student teachers themselves.

Teacher educators also have to pay attention to individual differences between students, and must provide each student with specific guidance and feedback. They should be flexible enough to share control with their students. Actively involving students in preparing lesson plans, for example, can lead to prior knowledge activation. Overall, the key is to find out what students already know and what they want to learn.

In fact, perhaps the increase of student teachers' SRL opportunities demands even more effort and attention of teacher educators than the regular approach. As noted earlier, the use of informal trajectories such as online learning networks can help support teacher educators' long-term professional development and enhance lifelong learning. As stated by Laferrière et al. (2006), formal training courses in which experts transmit de-contextualized knowledge do not provide deep learning for teachers; effective learning is situated and needs to be grounded in teachers' own practice, experience, and community.

Within their own cultural contexts, teacher educators can create online learning networks where they interact with colleagues, student teachers, information, and resources as they tackle real-life challenges. After proper training in the SRL principles, teacher educators can better utilize these networks to adequately transfer knowledge and ensure it can be put into practice by student teachers. In this way, teacher educators can continue learning within their organizations, an important step towards lifelong learning.

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