Chapter 24
Integrated Use of Multiple Social Software Tools and Face-to-Face Activities to Support Self-Regulated Learning: A Case Study in a Higher Education Context

Jari Laru and Sanna Järvelä

Abstract Recently, researchers have started to explore how mobile devices, social media or personal learning environments can support or promote self-regulated learning. In continuation of these research efforts, we developed a pedagogical framework for seamless learning based on the levels of interactivity and self-regulation of learning that different tools and activities enable. With this pedagogical design, we bridge individual and collaborative activities as well as face-to-face and mobile social media activities. The aim is to activate the degree of interaction and sharing desired and required for engaged learning. In this chapter, we introduce the theoretical principles of the framework: self-regulated learning, cognitive tools and macro-scripts. We also illustrate the pedagogical principles with a case study in a higher education context as an example of designing the integrated use of multiple social software tools and face-to-face activities to support self-regulated learning.

Introduction

The latest developments in information and communication technologies are changing the ways in which people communicate, collaborate and learn in fundamental ways (Lewis et al. 2010). Personal, portable and wirelessly networked technologies are becoming more prevalent in the lives of learners, while the development of social media has simultaneously led to new ideas about what it means to participate in educational activities (Liu and Milrad 2010). Multisilta and Milrad (2009) coined the term 'mobile social media' to describe the integration and interplay between these two emergent technologies. In its simplest form, mobile social media makes possible access to and situated updating of one's weblog. In other words, the use of mobile social media converts the students' acts into artefacts

J. Laru (✉) • S. Järvelä
Learning & Educational Technology Research Unit (LET), Faculty of Education, University of Oulu, Oulu, Finland
e-mail: jari.laru@oulu.fi; sanna.jarvela@oulu.fi

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(Roschelle and Pea 2002). At its best, mobile social media tools can be used for creating personalised-to-social learning activity (Wong et al. 2010), where mobile devices are used as an integral part of pedagogical design that consists of individual, collaborative and collective learning activities (Laru et al. 2012).

New affordances provided by the combination of mobile devices and social software tools lead us into a new phase in the evolution of technology-enhanced learning, one that forges new learning spaces and continuity between the pedagogical phases of the instructional design (Alvarez et al. 2011; Laru et al. 2012). In practice, the increasing use of mobile social media in education is stitching together the formal and informal learning contexts of learners and bridging individual and social learning, which is leading towards seamless learning. However, as noted in the review by L.-H. Wong and Looi (2011), most of the studies in seamless learning tend to discuss or analyse personalised and social learning separately or only focus on one of these aspects. The interplay between Web 2.0 tools and mobile technologies as well as the interplay between individual and collective activities is setting new challenges for supporting collaborative learning as teachers have to integrate these new technologies into more or less traditional learning methods, curricula and the everyday life of their schools (Arvaja et al. 2009). On a more general level, a major challenge in the technology-enhanced learning field is the overemphasis on designing tools and instructional activities for sharing and communicating, while the potential role of tools and appropriate instructional design for guiding and supporting learning processes has been virtually ignored (Järvelä and Hadwin 2013).

More recently, researchers have started to explore how mobile devices, social media or personal learning environments can support or promote self-regulated learning (Dabbagh and Kitsantas 2011; Kitsantas and Dabbagh 2011). In continuation of these research efforts, we developed a pedagogical framework for seamless learning based on the levels of interactivity and self-regulation of learning that different tools and activities enable. With the pedagogical design, we bridge individual and collaborative activities as well as face-to-face and mobile social media activities. The aim is to activate the degree of interaction and sharing desired and required for engaged learning (Järvelä and Renniger 2014, in press). In this chapter, we introduce the theoretical principles of the framework: self-regulated learning, cognitive tools and macroscripts. We also illustrate the pedagogical principles with a case study in a higher education context as an example of designing the integrated use of multiple social software tools and face-to-face activities to support self-regulated learning.

Self-Regulated Learning as the Theoretical Framework for Pedagogical Design

Our pedagogical design to seamless learning is grounded in the socio-cognitive perspective on learning and self-regulated learning theory. Self-regulated learning theory is concerned with how learners develop learning skills and use learning skills effectively, and it is guided by the environmental conditions that promote individuals to adopt, develop and refine strategies and monitor, evaluate, set goals, plan, adopt and change belief processes (Zimmerman and Schunk 2001). Self-regulated learning theory extends the conceptions of learning beyond cognitive processes and outcomes, acknowledging the interactive roles that motivation, emotion, metacognition and strategic behaviour play in successful learning. There is much research evidence that self-regulated learners are active participants who effectively control their own learning experiences in many ways, including organising and rehearsing the information that is to be learned and holding positive beliefs about their capabilities, the value of learning and the factors that influence learning (e.g. Schunk and Zimmerman 2012).

Recently, researchers have considered self-regulation as a social and collaborative learning context, and they have extended the conceptual perspective to the social aspects of self-regulation (Hadwin et al. 2011). Self-regulation occurs in independent, cooperative or collaborative tasks and leads to changes in the knowledge, beliefs and strategies individuals carry forward to new task contexts and changes in the structures and conditions of their environment (person n in Fig. 24.1). The ultimate goal is independence or personal adaptation in regulatory activity. Co-regulation occurs when the individuals' regulatory activities are supported, assisted, shaped or constrained by and with others. Regulatory support

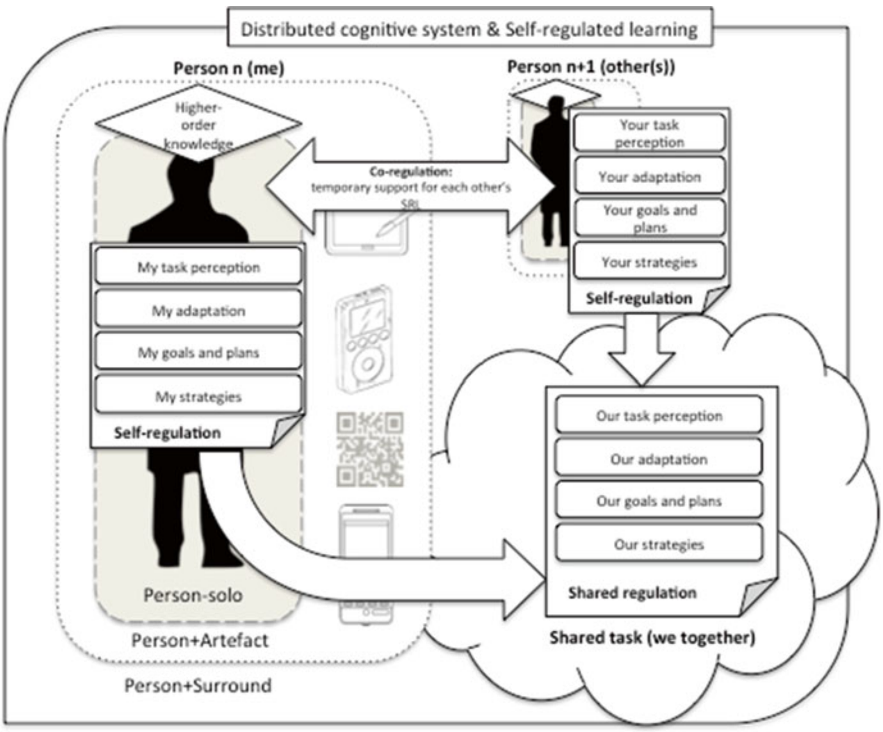

Fig. 24.1 Relationship between the distributed cognition system and self-regulated learning

may be distributed among group members, but the outcome of co-regulation is that each individual's regulatory activity is changed because of interactions with another (Volet et al. 2009) (person n + 1 in Fig. 24.1). Shared regulation occurs when groups regulate together as a collective, such as when they construct shared task perceptions or shared goals. When groups co-construct plans or align monitoring perceptions to establish a shared evaluation of progress, they are engaged in shared regulation. Therefore, socially shared regulation of learning refers to processes by which group members regulate their collective activity (shared task in Fig. 24.1). This type of regulation involves interdependent or collectively shared regulatory processes, beliefs and knowledge (e.g. strategies, monitoring, evaluation, goal setting, motivation, metacognitive decision making) orchestrated in the service of a co-constructed or shared outcome (Järvelä and Hadwin 2013).

Although the concept of seamless learning has been used to describe how technology can be used to stitch together the formal and informal learning contexts of the learners or bridge individual and social learning activities, it can be also used as the framework to bridge self-, co- or shared regulation with meaningful pedagogical activities. This chapter includes a full activity design, as suggested by L.-H. Wong and Looi (2011), with multiple phases (see Fig. 24.2); the mobile-mediated conceptualisation activity was just one phase of the instructional design. Products created in that phase can be characterised as artefacts that were used as a mediating tool for reflections, elaborations, reviews and knowledge building (Wong and Looi 2011).

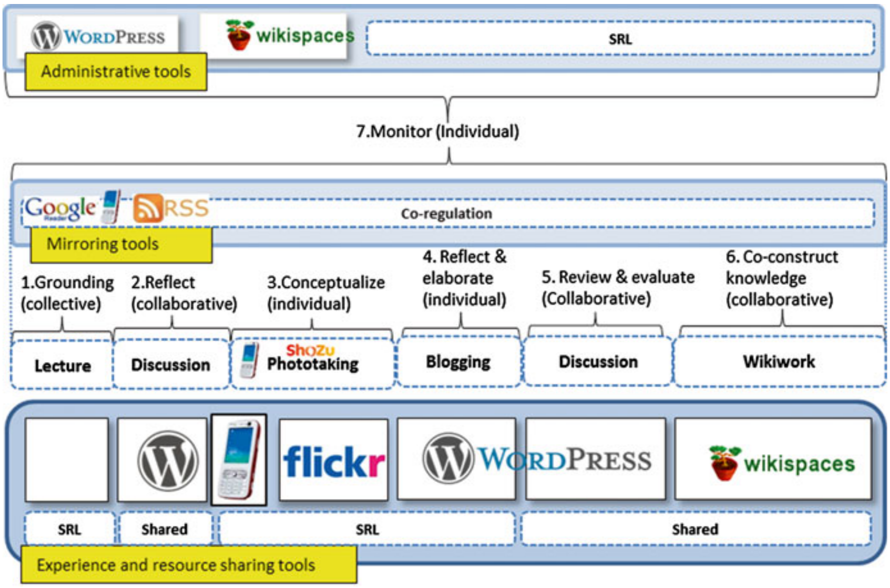

Fig. 24.2 Socio-technical design of the seamless learning case study

Technological Artefacts as Cognitive Tools for Supporting Self-Regulated Learning

The theoretical framework of this chapter is also based on the ideas of distributed cognition and cognitive tools. We build on the idea of distributed cognitive system (Perkins 1993) in which routine cognitive tasks are performed by tools (technological artefacts) and more complex communications and tasks are the core intellectual capabilities of people. By cognitive tools, we mean the 'smart tools' that we are using to mediate activities and augment our thinking processes (e.g. measuring or calculating) (Norman 1993; Pea 1993).

Until now, mobile devices have almost always been seen as merely devices for person-to-person communication (Nyiri 2002) or platforms for the dissemination of knowledge (Herrington et al. 2009). However, the newest mobile devices (e.g. smartphones, PDAs) have become versatile cognitive tools with rich educational possibilities (Laru 2012).

Contemporary smartphones, tablets and other mobile devices resemble the idea of Wireless Internet Learning Devices (Roschelle and Pea 2002), which are powerful, small and personal networked mobile devices. We are approaching the landscape of ubiquitous computing (Weiser 1991) where computers are embedded in our everyday activities, so that we unconsciously and effortlessly harness their digital abilities as effort-saving strategies for achieving the benefits of distributed intelligence (Pea and Maldonado 2006). With more generalised mobile devices with integrated functions, cognitive tools for doing things, like mapping concepts, running simulations, gathering data and structuring discussions, are appearing with novel technological affordances introduced by rapid technological advancements (Laru 2012). In sum, mobile devices have technological attributes that provide unique technological, social and pedagogical affordances (Kirschner et al. 2004).

In order to fit the role of mobile devices and applications into today's world of distributed cognition, an appropriate framework is needed. One approach for this is a distributed view of thinking and learning, as suggested originally by Perkins (1993). In his *person-plus-surround* conception, Perkins adopts a systemic view on cognition that goes beyond the individual actor: a system engaging in cognition usually consists of an individual (person-solo) and his immediate physical (person + artefact) and social (person + surround) surround. This surround (environment) might include tools, such as paper, personal computers and mobile devices (person + artefact), as well as other persons (person + surround) (see Fig. 24.1). This surround participates in cognition, not just as a source of input and as a receiver of output but also as a vehicle of thought. Nevertheless, the person-solo is the central actor in this model because transference of knowledge to an external tool (person+) is adequate if the tool only performs routine tasks that cost too much to internalise (e.g. some mathematical calculations). Higher-order knowledge (e.g. metacognitive knowledge), as opposed to knowledge about routine tasks, should reside in the person-solo or between multiple person-solos (or be internalised by the person-solo).

Figure 24.1 represents distributed cognitive systems where the learners' knowledge about regulatory processes is explicitly shown. In this figure, the learners' have personal or shared knowledge about how to monitor and control thinking, beliefs and strategies to reach a goal. Within the distributed cognitive system, cognitive tools act as a dynamic mediator of interaction between learners, their environment, other tools and information (Koole 2009). From the perspective of self-regulated learning, cognitive tools offer benefits for promoting socially shared regulation of learning by helping collaborators search for and organise information on their own and collaboratively and by prompting learners to metacognitively consider the features of their work across levels of self-, co- and shared regulation (Hadwin et al. 2011).

Adequate Scaffolds to Support Seamless Learning Activities

Generic cognitive tools, such as social software tools and mobile software, are building blocks of seamless learning designs. Such tools are progressively being used in educational contexts, but they are not usually specifically designed to help students engage in and gain skills in processes like problem solving, collaborative knowledge construction or inquiry learning. These tools rarely offer support with specific instructional guidance concerning collaboration and argumentation. Instead, generic cognitive tools (Kim and Reeves 2007) typically provide rather open problem spaces, where learners are left to their own devices. In such spaces, learners are free to choose (a) what activities to engage in with respect to the problem at hand and (b) how they want to perform those activities (Kollar et al. 2007).

Open learning spaces are an example of minimally structured learning environments where students may struggle to become engaged in productive collaborative interactions, such as questioning, explaining and justifying opinions and reasoning, elaborating and reflecting upon their knowledge (Kobbe et al. 2007). With respect to challenges in collaborative learning, Kollar et al. (2006) have distinguished two classes of scaffolds: (a) scaffolds that emphasise the activities of individuals by providing a higher degree of scaffolding using sentence openers, question prompts or detailed descriptions that may gradually be faded out as the learners become more competent and (b) scaffolds that set up conditions in which favourable activities and productive interaction should occur but leave the detailed aspects of interaction unconstrained. Especially in research on computer-supported collaborative learning (CSCL), such scaffolds have been called 'collaboration scripts' (the former have been referred to as 'micro-scripts' and the latter as 'macro-scripts') (Kobbe et al. 2007) which, in short, are structuring and orchestration tools for enhancing the probability that productive interactions occur in a group (Hämäläinen and Vähäsantanen 2011; Laru 2012).

Designing Self-Regulated Learning Activities by Using Macro-scripted Approach

According to Hämäläinen and Vähäsantanen (2010), research on scripting CSCL has concentrated on reviewing the connection between micro-scripts and individual learning (Weinberger et al. 2007), whereas much less is known about the effects of macro-scripts on collaboration within groups in authentic learning contexts. This chapter focuses on macro-scripts as a pedagogical method to facilitate group collaboration in authentic settings. In general, macro-scripts take a more pedagogical and top-down approach to collaboration (Kobbe et al. 2007). According to Häkkinen et al. (2010) and Dillenbourg and Tchounikine (2007), this approach to scripting collaboration is based on coarse-grained scripts that set up conditions under which desired activities and productive interactions between students should occur while leaving the details of the interaction unconstrained.

Macro-scripts are not restricted to either computer-based activities or collaborative activities in small groups; they can also include individual reflection (e.g. writing a personal weblog), which is required in order to transform experience into learning, and collective activities (e.g. conclusive discussion at class level), which are important phases for structuring the informal knowledge that emerges in individual or collective phases (Dillenbourg and Hong 2008). Dillenbourg and Hong have termed these scripts, which are neither purely computerised nor purely collaboratively, as 'integrated scripts'. Such scripts integrate several activities (e.g. read, summarise) across multiple places (classroom, field trip) and social planes (individual, collaborative, collective) within a single workflow (Dillenbourg and Hong 2008).

However, activities (e.g. argumentation) alone do not automatically produce high-level learning. Rather, learning is affected by the ability to build new and novel knowledge and the quality of the shared processes (Hämäläinen and Vähäsantanen 2010). While collaborative learning is often defined as a process of constructing and maintaining a shared understanding, the effects of group learning are more dependent on the effort exerted to develop a shared understanding despite differences among the group members.

According to Dillenbourg and Hong, macro-scripts are aimed at engineering and fine-tuning the frequency and quality of explanation, argumentation and mutual regulation that are necessary for students to develop a shared understanding. In other words, the design of a macro-script succeeds when it disturbs collaborative systems in such a way that interactions are necessary between participants in order to maintain or restore collaborative actions to gain the desired learning outcomes. Building on the ideas of macro-scripts and following the ideas of seamless learning, we have integrated the social mobile media and pedagogical design in terms of the level of interaction and collaboration and the level of self-, co- and shared regulation with meaningful pedagogical activities (See Table 24.1). For an indication of the different phases of instructional design for the case study (S1–S7), level of interaction (collective, collaborative or individual), the level of self-, co- or shared regulation and regulation activity are represented in Table 24.1.

Table 24.1 The pedagogical design principles for the case study

Phase	Interaction level	Learning activity	Regulation level (activity)
1	Collective	*Grounding [lecture] (weeks 1–3 and 6–8):* Each of the six, 1-week working periods started with a lecture in which students were grounded in main theoretical concepts. The specific themes were presented in the following order: (1) learning infrastructure, (2) learning communities, (3) metacognition, (4) self-regulated learning, (5) learning design and (6) social Web as a learning environment	*Self-regulated learning (planning and goal-setting)*
2	Collaborative	*Reflect [discussion] (weeks 1–3 and 6–8):* The purpose of this collaborative phase was to reflect on the lecture topic in groups and to formulate a problem to be solved based on the group members' shared interests during the following solo learning phases. The groups were advised to set their own learning objectives based on the topic and to write down these objectives in their personal blogs for further reflection	*Shared regulation (Reflection)*
3	Individual	*Conceptualise [photo-taking (or other visual representation)] (weeks 1–3 and 6–8):* In this solo phase, individual students were required to conceptualise their group members' shared interests (i.e. shared problem). In order to do so, they were required to identify and capture situated pictorial metaphors describing their shared interests. In practice, their tasks were to explore their everyday working and living environments and take photos with a camera phone	*Self-regulated learning (active learning and strategic activity)*
4	Individual	*Reflect and elaborate [blogging] (weeks 1–3 and 6–8):* The task of this phase was to further reflect and elaborate on photos in the students' personal blogs. First, they were required to analyse collected visual representations in order to discard ideas that were not relevant to their groups' shared learning objectives. Second, they were required to write blog entries about chosen photos in which they further elaborated upon the associations between the photos, the group-level objectives and the students' everyday situated practices. (Note: the students were able to see photos taken and blog entries written by other students and in other groups by monitoring their activities with an RSS reader)	*Self-regulated learning (evaluation and revising strategies)*

(continued)

Table 24.1 (continued)

Phase	Interaction level	Learning activity	Regulation level (activity)
5	Collaborative	*Review and evaluate [discussion] (weeks 4 and 9)*: The first task of this collaborative face-to-face activity was to review the group members' weblogs from the previous 3-week period. The second activity was to evaluate the usefulness of blog entries in the context of their shared learning objectives and to discard irrelevant ideas. The outcome of this phase was used as material for co-construction of knowledge in the groups' wikis	*Shared regulation (evaluation and revising)*
6	Collaborative	*Co-construct knowledge [wiki work] (weeks 4–12):* The task in this collaborative assignment was focused on integrating each group's chosen blog entries and visual representations into a cohesive and comprehensive product of all the course topics. In other words, the given goal was to formulate what they had learnt 'in their own words' and to produce it as uniform material that could be put to authentic use	*Shared regulation (active learning and strategic activity)*
7	Individual	*Monitor peer students' contributions [monitor]* (whole course): This was not an assignment per se, but it enabled the students to obtain different perspectives by seeing what others were doing with social software tools, and it helped students assimilate and accommodate their thinking. In practice, the monitoring activities were done by using cloud-based syndication tools (RSS)	*Co-regulation (evaluation)*

Case Study: Integrated Use of Multiple Social Software Tools and Face-to-Face Activities in a Higher Education Course

In order to illustrate the pedagogical design of seamless learning, a case study of small groups of learners (4–5 students in each group) was conducted using multiple social software tools and face-to-face activities in the context of higher education. The participants were 21 undergraduate students in a 5-year teacher education programme in Finland. All of the students were enrolled in a 12-week course entitled *Future Scenarios and Technologies in Learning* during the spring semester of 2009. The 21 participants included 16 females (76 %) and 5 males (24 %). The mobile phone-mediated activities in this course are an example of course-related activities outside of the normal class hours, such as artefact creation in daily life (largely incidental encounters or improvisations), which is another subtype of formal learning in informal settings.

The learners' core task was to integrate selected individual blog reflections and visual representations into coherent and a comprehensive wiki (see Table 24.1), which was also the main outcome of the learning activity.

The same content was elaborated upon multiple times when students encountered multiple representations of each of the six content topics using different analogues, examples and metaphors. In other words, the instructional design required students to revisit the same material, at different times, in rearranged contexts, for different purposes and from different conceptual perspectives (Spiro et al. 1991).

The socio-technical design of the case study consisted of recurrent individual and collective phases where students used multiple administrative, mirroring and experience and resource sharing tools to perform designed tasks and enable self-regulated learning activities (See Fig. 24.2) (Laru et al. 2009, 2012).

Firstly, a course blog and wiki were the administrative tools used in this study, which aimed to support the students' self-monitoring and self-evaluation efforts (Kitsantas and Dabbagh 2011). Secondly, a simple syndicate (RSS) tools, FeedBlendr and FeedBurner, were used to create individual, group and class-level feeds from students' Flickr, WordPress and Wikispaces accounts. These activity streams were available for all students via Google Reader and visible as RSS widgets in a sidebar of the respective blog or wiki. This enabled the students to bind social software tools together and they may be seen as additional collaborative tools that facilitated the relationships between different task phases, the students, the content they produced and the tools they used in this study (Lee et al. 2008). From the perspective of self-regulated learning, RSS syndication was used as a co-regulated learning tool because it enabled the students to monitor the individual, group and class-level activities of other students. It targeted group awareness, such as what other students were doing in their individual and shared learning tools (experience and resource sharing tools in the Fig. 24.2) (e.g. Leinonen et al. 2005).

Thirdly, multiple experience and resource sharing tools, as well as face-to-face phases, were used to support individual and shared self-regulated learning activities (Järvelä et al. 2007; Kitsantas and Dabbagh 2011; Laru et al. 2012). In the discussion phase immediately after the lecture, small groups of students regulated as collective when they had constructed shared task perceptions and shared task goals for the next phase (see conceptualisation, Phase 3). In the third phase, students used a personal mobile multimedia computer, which was integrated with features including a 3.2 megapixel digital camera, 3G connectivity and an Internet browser in order to identify and capture the situated pictorial metaphors describing their group's shared interests. The task of the fourth phase was to further reflect and elaborate on photos taken by using a Wordpress weblog, which captured the student's reflections chronologically, enabling self-monitoring and self-reflection. Both of these individual phases were designed so that each group member in the small groups of students had to take responsibility for setting individual goals and standards for his/her own contribution to the team (Järvelä and Hadwin 2013). In the fifth phase, blog articles and pictorial representations were discussed when the student groups collectively constructed their shared task perceptions by evaluating the usefulness of the blog entries in the context of their shared learning objectives. The outcome of this phase was used as material for co-construction of knowledge in the groups' wikis. In the sixth phase, wiki was used as a vehicle for integrating and elaborating upon individual blog entries, which has been seen as an important task strategy for self-regulated learning (Hazari et al. 2009).

Conclusions

Pedagogically grounded instructional design is needed in order to effectively use emergent technologies. The employment of mobile devices, including mobile phones and tablets, is a growing trend in education. This practice has been widely technology driven and often justified simply by the importance of using new technology in the classroom. Since we are currently living between the stages of mobile social learning and a ubiquitous future, the role of mobile technologies in different learning contexts is still a challenge for researchers and practitioners. Our claim is that seamless learning can be one productive way for schools and other educational institutions to promote learning skills, namely, self-regulated learning and collaboration, and to prepare people for the twenty-first century learning society. To advance research on self-regulated seamless learning, we propose a few design guidelines for self-regulated seamless learning.

We share the constructivist belief that students should learn in environments that deal with *'fuzzy', ill-structured problems*. Designing challenging collaborative learning tasks provides students with an opportunity for engaging in multiple strategic activities and opportunities for self-regulation and the shared regulation of learning. There should not be one right way to reach a conclusion, and each solution should bring a new set of problems. These complex problems and challenging learning tasks should be embedded in authentic tasks and activities, the kinds of situations that students would face as they apply what they are learning to the real world (Needles and Knapp 1994). Challenging learning tasks need scaffolds and support. For example, Belland (2011) has suggested the following guidelines for the creation of appropriate scaffolds: (a) support problem reformulation through qualitative problem modelling, (b) do not give specific end goals, (c) enable students to make comparisons between cases, and (d) enable students to work collaboratively.

As suggested by Spiro et al. (1991), the same content can be *elaborated multiple times*. In practice, this means that students encounter multiple representations of content using different analogues, examples and metaphors, for example, by using mobile tools or social software. Towards that end, the required instructional design is one that enables the students to revisit the same material, at different times, in rearranged contexts, for different purposes and from different conceptual perspectives. The same content can be also elaborated upon with multiple individual and collaborative phases before the collective activity allowing students the opportunities for self-, co- and shared regulatory processes (Järvelä and Hadwin 2013).

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