Mobile Learning to Support Self-Regulated Learning: A Theoretical Review

Martine Baars, Erasmus University, The Netherlands
Olga Viberg, KTH Royal Institute of Technology, Sweden*

ABSTRACT
This paper discusses the possibilities of using and designing mobile technology for learning purposes coupled with learning analytics to support self-regulated learning (SRL). Being able to self-regulate one’s own learning is important for academic success but is also challenging. Research has shown that without instructional support, students are often not able to effectively regulate their own learning. This is problematic for effective self-study and stands in the way of academic success. Providing instructional support for both metacognitive processes such as planning, monitoring, and reflection and cognitive processes such as learning strategies can help students to learn in a self-regulated way more optimally. Mobile learning provides opportunities to provide ‘just in time’ support for both cognitive and metacognitive processes. To provide insights into how mobile learning can support SRL, this theoretical review discusses selected studies that have used mobile learning to support SRL in different domains.

KEYWORDS
Cognition, Learning Analytics, Metacognition, Self-Study, Study Success, Support, Theoretical Review

INTRODUCTION
For many learners, self-studying learning materials provided by the teacher directly or originating from other sources is a critical part of their education and self-education. Self-study is defined as spending time and effort on gaining knowledge on a topic without direct guidance of the teacher. Self-study does not only happen within the setting of higher education (e.g., Biwer et al., 2021; Doumen et al., 2014; Rogan et al., 2021; Schmidt et al., 2010) but also plays a role in earlier levels of education, including secondary education (Dirkx et al., 2019) and also in lifelong learning activities (Sagitova, 2014).

Research has demonstrated mixed results on the relation between self-study and academic performance (Doumen et al., 2014; Stinebrickner & Stinebrickner, 2004). Next to spending time on self-study, it is crucial to perform the ‘right’ learning activities that meet the needs of the learner...
during self-study in order to make the most of it (Doumen et al., 2014; Dunlosky et al., 2013). That is, students need to effectively self-regulate their learning activities during self-study. For example, to succeed in their self-study they need to be able to plan their self-study, monitor the learning process and use effective learning strategies (Geller et al., 2018; Hartwig & Dunlosky, 2012), as well as to self-reflect on the performed learning activities (Zimmerman, 2000). This suggests that self-study and self-regulated learning (SRL) are closely interconnected.

In general, research has shown that learners have poor SRL skills such as planning, monitoring and reflection (Bjork et al., 2013; Stone, 2000). Further, learners are often not aware of effective learning strategies and how to use them (Blasiman et al., 2017; Cervin-Ellqvist et al., 2020; Dirkx et al., 2019; McCabe, 2011). Therefore, it is essential to know how we can best support learners during their self-study and help them to self-regulate their learning processes and use effective learning strategies (e.g., goal-setting, self-explaining and self-testing). In addition, providing this support at the ‘right’ time and ‘right’ place, easily accessible for learners across formal and informal learning environments, would be a promising way to move forward in the field of study success in higher education and beyond.

In this theoretical literature review, we argue that when developing support mechanisms for SRL, we should carefully consider the use of learners’ own mobile devices, coupled with the recent advances in the field of learning analytics (LA). The role of mobile technologies in this endeavour is still a topic for further explorations.

**SELF-REGULATED LEARNING**

Self-regulated learning (SRL) is the degree to which individuals are “metacognitively, and behaviourally active participants in their own learning process” (Zimmerman, 1989, p. 4). SRL comprises “the processes where students activate and sustain cognitions, affects, and behaviours that are systematically oriented toward the attainment of personal goals” (Zimmerman & Schunk, 2011, p.1). According to Zimmerman’s model of SRL (2000), there are three phases in SRL: forethought, performance and self-reflection. In the forethought phase, students plan a learning session, for example, by analysing the task, setting their goals and planning how to reach them. In the performance phase, students execute the task, while monitoring their learning progress and controlling their learning activities through the use of self-control strategies to keep them cognitively engaged and motivated to execute the learning task. In the self-reflection phase, students evaluate their performed learning session and reflect on it by making attributions about their success or failure. Hence, in this model of SRL, both cognitive and metacognitive processes take place. A positive relation between SRL and performance was found both in offline, more traditional settings (Richardson et al., 2012) and in online learning settings (Broadbent & Poon, 2015).

Yet, research has exhibited that our self-monitoring and use of SRL strategies are often far from accurate, especially for more complex learning tasks such as learning from text or solving problems (e.g., Baars et al., 2018; Bjork et al., 2013; Rhodes & Tauber, 2011). Often the accuracy of monitoring judgment is poor for both language tasks (e.g., De Bruin et al., 2011; Dunlosky & Lipko, 2007) and problem-solving tasks (Baars et al., 2014; Metcalfe, 1986; Metcalfe & Wiebe, 1987) if no additional instructional support is offered to help learners continuously monitor their cognitive activities. The fact that metacognitive monitoring is frequently inaccurate causes a major problem in the whole process of SRL. That is, metacognitive monitoring processes inform subsequent processes of controlling and regulating the learning process. This means that if monitoring is not accurate, regulation of learning, and learning performance may be harmed (Dunlosky & Rawson, 2012). Hence, it is crucial to support students’ metacognitive and cognitive processes in order to help them effectively self-monitor and self-regulate their learning process during self-study.

Dent and Koenka (2016) demonstrated that cognitive strategies and SRL processes are significantly correlated with academic performance. Similarly, earlier research has found that
prompting both cognitive and metacognitive strategies is effective to support SRL (Devolder et al., 2012). Further, metacognitive interventions to support SRL processes, like metacognitive reflection (Dignath & Buttner, 2008) and planning strategies (Dignath et al., 2008), were found to be effective for students in secondary education and beyond. Further, Nückles et al. (2020) confirmed the benefits of combining cognitive and metacognitive prompts when supporting students’ SRL.

When looking at how to support students’ SRL in online environments, in which students’ ability to self-regulate their learning activities is even more critical than in face-to-face learning settings (Broadbent et al., 2015), a similar picture emerges. In a review by Wong et al. (2019a) on supporting SRL in online learning settings, it was found that most studies have used prompts to support SRL, followed by feedback, integrated support system, and other approaches. One of the conclusions was that supporting aspects of SRL (e.g., planning, goal specification) did in fact improve SRL behaviours. Yet, it might not be enough to support SRL activities from only one SRL phase (forethought, performance or reflection) as these phases are connected and influence each other in a cyclical manner (Viberg et al., 2020b; Wong et al., 2019a; Zimmerman, 2000). That is, learners need continuous support in terms of just-in-time prompting across different SRL phases during their learning process. Further, although Schumacher and Ifenthaler (2020) investigated the use of prompts to improve SRL and found small effects of SRL prompts on performance, an interesting conclusion from their work is that prompts should be adapted to the learner in order to optimally support SRL processes during online learning.

To summarise, it is promising to support students’ SRL by designing effective scaffolds in which both metacognitive (e.g., planning, monitoring and reflection) and cognitive strategies (e.g., learning strategies such as summarizing or self-testing) are elicited (e.g., Nückles et al., 2020). Also, the connectedness of the different SRL phases should be taken into account when designing relevant support mechanisms in order to underpin the cyclical SRL process (e.g., Viberg et al., 2020a; Viberg et al., 2020b; Wong et al., 2019a).

The Role of Learning Analytics

Using trace data from an online application, or any other educational software used by the learner, could add another opportunity to examine and support learners’ SRL activities over time. That is, based on data traces left by learners, SRL support could be designed to be adaptive (Schumacher & Ifenthaler, 2020). This form of learning analytics has the potential of providing a more personalised and individualised continuous learner support across learning settings. The development of relevant support mechanisms, based on the examination of students’ trace data from various online learning technologies (e.g., learning management systems or mobile applications) refers to the field of learning analytics (LA). LA is defined as “the measurement, collection, analysis and reporting of data about learners and their context, for purposes of understanding and optimising learning and the environments in which it occurs (Long & Siemens, 2011, p.34). Research on LA to optimise SRL in online learning environments is an increasingly emerging research area, which has hitherto largely focused on the measurement and visualisation of different SRL aspects – based on the availability of student trace data - rather than on the development of instructional support of students’ SRL (Viberg et al., 2020c).

Potentially, mobile learning could make adaptive SRL support using LA available for learners anytime and anywhere. That is, almost every student has a smartphone and with this mobile device, instructional support for effective self-study can be brought closer to the students’ learning activities, adapted to their individual characteristics (e.g., in terms of their level of self-regulation (Viberg & Andersson, 2019)), and the context in which learning occurs. Yet, there has only been limited and small-scale research about the use of mobile devices to support students’ SRL processes (for overview, see Palalas & Wark, 2020; Baars et al., 2022a; Baars et al., 2022b).

Mobile Learning to Support SRL

Mobile learning (m-learning) can be formal, informal or in a combination (Viberg et al., 2018). It is associated with study success in educational, non-educational as well as informal learning settings
(e.g., Crompton & Burke, 2018; Shadiev et al., 2020; Wu et al., 2012). However, m-learning has been criticised for its lack of emphasis on the analysis of educational problems that “would improve learning and achieve learning goals” and its frequent focus on the examination of the use of mobile devices (Grant, 2019, p. 362). This can be explained by several reasons, including the fact that overall, m-learning studies have so far rarely been grounded in and explicitly analysed through an underlying theoretical lens (Grant, 2019). Also, m-learning studies were found to focus only to a limited degree, on the development and fostering of learners’ transferable SRL strategies and skills. Even though most of the tools designed to support students’ SRL have hitherto been developed in a form of web-based solutions (e.g., web apps and intelligent tutoring systems) for a computer use (Pérez-Álvarez et al., 2018), there are empirical studies about m-learning.

In a review of the relationship between m-learning and SRL, Palalas and Wark (2020) examined 38 papers and found that more than in three quarters of the reviewed studies, m-learning enhanced SRL, and the other way around. Also, it was found that m-learning and SRL enhanced other learning factors (e.g., curriculum development). They also stress that “due to the ubiquity, flexibility, and portability of mobile technologies, [m-learning environments] were particularly conducive to learners exercising their agency and using mobile devices as cognitive and metacognitive tools” (Palalas & Wark 2020, p.163).

Several m-learning studies aimed at assisting learners in their foreign and second language acquisition. Chen et al. (2018) introduced an English vocabulary app with an SRL mechanism, focusing on the development of goal-setting skills when learning new words, to improve learning performance and motivation in a m-learning setting. Goal-setting can be seen as a part of the forethought phase of SRL during which the learner can use metacognitive strategies such as goal-setting as the start of the learning process (Panadero, 2017). The experimental results demonstrated that the learners who used the tool with the SRL support exhibited significantly greater performance and motivation than those who employed the app without the SRL support. In another study, Viberg et al. (2020a), presented and evaluated a prototype of a mobile application (ATLAS app) – theoretically grounded in Zimmerman’s model of SRL (2000) – aiming to aid second language learners in developing their SRL skills, with a special emphasis on the development and evaluation of their affective SRL strategies when acquiring the target language. That is, in the reflection phase of SRL, learners look back at their learning process and can provide a reaction to it in terms of their satisfaction with learning or their feelings about the learning process. This so-called ‘self-reaction’ can inform the subsequent learning episodes as the SRL model by Zimmerman (2000) is iterative. The results showed that the participants expressed positive attitudes towards the use of affective learning components in the ATLAS app to increase their awareness of their individual self-regulated language learning at each step of the SRL process.

In addition to language learning, several studies have investigated using mobile applications to support SRL processes using a more general approach in higher education. A study by Tabuenca et al. (2015) demonstrated that using mobile devices with graduate students to track time during the learning process had a positive effect on time management. As time management is an important part of the performance phase in SRL, this also supports the idea that using mobile applications to support SRL is promising (Tabuenca et al., 2015). Also, a study by Broadbent et al. (2020) used a domain-independent online SRL training module and a mobile app in which university students wrote short diary entries. The results demonstrated positive effects in terms of resource management (i.e., time and space), metacognitive and cognitive strategies. In this study, the online training provided students with information about the three phases of Zimmerman’s SRL model (2000) across 21 days. Next, on each of those days, students were prompted via the mobile app about whether they were planning to study that day and if so, what SRL strategies they were going to use and how they felt (positive or negative affect). After studying, students were also prompted to report the strategies they had used and report on their affect. The mobile app in this particular study supported students with self-monitoring, an important part of the performance phase of SRL. The findings demonstrated
that the combination of the online SRL training module with the mobile app benefited the students’ use of SRL strategies the most. Yet, the daily diaries captured via the mobile app without the online SRL training did not seem to improve students’ SRL strategies compared to a control condition. If students do not know how to self-regulate their learning, self-monitoring via a daily diary only may not be enough to support SRL.

Exploring a way to scaffold both cognitive (i.e., study strategies) and metacognitive processes (i.e., planning and reflection) using a mobile app to improve SRL by students, the Ace your self-study app was developed (Baars et al., 2022b). To support metacognitive processes, the phases of the SRL model by Zimmerman (2000) were used to structure guidance for self-study sessions in the app. When using the app for a self-study session, students were prompted on several aspects of the forethought, performance and reflection phase in order to support their SRL activities. Next, to support cognitive processes, 20 evidence-based study strategies were offered with a short description and a video on how to use them. Results from a study in which first year students were invited to use the app for their self-study sessions, have shown students were satisfied with the app in general, and it increased students’ self-reported SRL skills and motivation across a five-week course (Baars et al., 2022a). Possibly, the students who were inclined to use the app were also the ones that were eager to develop their SRL skills. Also, students might overestimate their SRL abilities (Bjork et al., 2013) or find it hard to judge the quality of their self-study efforts.

To conclude, m-learning is argued to be a promising avenue for supporting SRL processes. In this section we highlighted studies that used m-learning to support parts of the forethought phase i.e., goal setting (Chen et al., 2018), the performance phase (Broadbent et al., 2020; Tabuenca et al., 2015), the reflection phase (Viberg et al., 2020a) and a combination of all three phases (Baars et al., 2022b) in SRL (Zimmerman, 2000). Hence, although research is still scarce, there are a few studies from the domain of language learning (e.g., Viberg et al., 2020a; Chen et al., 2018; Viberg & Kukulska-Hulme, 2021) and on self-study in general (Baars et al., 2022a; Broadbent et al., 2020; Tabuenca et al., 2015) that provide promising results in terms of supporting SRL using m-learning.

**CHALLENGES AND FUTURE TRENDS**

Overall, the results from research about the development of just-in-time m-learning support to foster learners’ SRL during their self-study seems promising (Baars et al., 2022b; Broadbent et al., 2020; Chen et al., 2018; Lai et al., 2022; Viberg et al., 2020a; Tabuenca et al., 2015) and provide us with several future directions of research and practice. At the same time, they also present several challenges that we need to carefully consider in the design process and future research on how to support students’ SRL processes over time.

Sung et al. (2016) suggest that more instructional design developments are needed “to more thoroughly exploit the educational benefits possible by utilizing mobile devices” (p. 265). The authors propose to: 1. leverage the pedagogical effects of mobile devices through elaborate designs of learning/teaching scenarios, 2. enhance the quality of the experimental design for mobile intervention for example through longer intervention durations, closer integration of technology and the curriculum, and assessment of higher-level skills (e.g., SRL), and 3. empower educators through the orchestration of mobile devices, software, and pedagogical design. Moreover, in developing effective mobile-assisted support for SRL, we need to carefully consider participatory design approaches, which directly involve key stakeholders, i.e., students and teachers in the design process. This is in line with the recent developments in the field of LA that suggest that participatory design and co-design can be effective ways to improve technological innovation and to incorporate users’ needs in the development of LA (Sarmiento & Wise, 2022).

Importantly, using a mobile tool as a device to support learning activities may have its limitations. Results from a meta-analysis have, for example, shown an advantage of paper over digital reading (Delgado et al., 2018). That is, participants who read from a computer had a more pronounced
overconfidence and lower performance, which is called screen inferiority. Using mobile technology to support SRL might also suffer from negative side-effects caused by using a (small) screen to convey instructional support and/or learning materials. Yet, as the SRL support could be created as guidance next to the self-study activities that students are performing, students are not necessarily presented with the content of the learning task on their mobile phone. The content (e.g., a text or assignment) could be presented separately from the mobile device in a book, another learning environment or on another device. For example, Baars et al. (2022b) presented the mobile application to support SRL, which was designed to use next to the learning materials needed for the self-study activity. Moreover, many studies on the screen inferiority effect have focused on reading (e.g., Delgado et al., 2018), and it is an open question if the effect would be similar for other types of tasks or domains, such as vocabulary learning or writing.

Adapting to the students’ needs is an interesting challenge the field faces right now. Schumacher and Ifenthaler (2020) concluded that for SRL supports to really improve SRL and subsequent learning performance, they should be adapted to the learners’ needs. Research has also demonstrated that learner characteristics such as motivation, current SRL skills and needs in multifaceted learning settings are important to consider when developing effective m-learning support (Sha et al., 2012; Viberg & Andersson, 2019). However, it can be a challenging task to address since such characteristics may differ considerably across learners, and also, they may change during the learning process. Possible ways to consider learners’ characteristics, skills and needs in the design process can be seen in terms of customized or learner-tailored solutions (e.g., Jivet, 2021). Yet, as in the learning process, the learner can involve the use of multiple devices such as a computers, tablets, books or mobile phones. Another challenge would be to find suitable ways of combining and understanding data from different devices to create these customized solutions (i.e., data interoperability, e.g., Samuelsen et al., 2019).

Another challenge relates to having a solid theoretical basis which is crucial to operationalise what activities and learning tasks in m-learning constitute what type of SRL strategies, skills or behaviours, and what that means in terms of providing adaptive support for it using LA. We suggest that both instructional design and the interpretation of trace data should be carefully aligned with the activities in the SRL phases (i.e., plan, monitor, and reflect; Zimmerman, 2000). For example, researchers have recently offered a conceptual framework for mobile-assisted language learning called Mobile Assisted Language Learning through Learning Analytics for Self-regulated learning (MALLAS), aimed at learning designers and teachers. This framework was developed to inform research about supporting second language learners’ SRL through the use of m-learning and LA across learning settings (Viberg et al., 2020b). It is an analytical tool that can be used to operationalise the support of mobile-assisted language learning (MALL). MALLAS captures the different dimensions of SRL (i.e., the three SRL phases, (Zimmerman, 2000)) and the use of LA that are required to support MALL. LA for SRL as suggested by Winne (2017) consists of a description of learners’ SRL activities, grounded in the examination of traces of actions performed during study (i.e., measurement) and a recommendation, i.e., what should be changed about how learning activities are carried out and instructions on how to alter them to be able to achieve learning goals (for an overview of LA research for SRL in online learning settings, see Viberg et al., 2020c). Hence, when using LA about SRL activities in a mobile app to support SRL, there would be opportunities to offer adaptive support, tailored to individual differences in terms of learner characteristics, needs and preferences, as well as adapted to other contextual information. According to Lincke (2020), contextualisation aims to use sensors, sensing technologies and information processing techniques to understand the current contextual situation of learners to be able to address their specific needs. Contextual information takes the environmental context, device context and personal context into account (Lincke, 2020). All this can make it more attractive for students to use mobile apps to support their SRL as the adaptivity might mean it would be better suited to their needs.

A final challenge that has to be addressed pertains to the protection of learners’ privacy, information security, and ethics. The use of learners’ own mobile technologies in research can allow
access to multichannel process data. Such process data – that can be used to enrich the examination and understanding of the SRL activities and improve students’ conditions for self-study – consists of log files (including contextual data), sensor data, and can be aggregated with students’ personal (e.g., preferences), demographic (e.g., gender), and learning device (e.g., type of smartphone) data. All this creates risks to students’ privacy and security. This requires a more responsible approach to the use of this data (Viberg et al. 2020b). A good start is to follow the existing national and international frameworks, e.g., the General Data Protection Regulation (GDPR, in Europe; European Union, n.d.) and the Family Educational Rights and Privacy Act (in the United States of America; U.S. Department of Education, 2018). However, they can be challenging to operationalise in practice. As highlighted by the European Union Agency for Network and Information Security (ENISA, 2017), “in the area of mobile apps and privacy there is still a serious gap between legal requirements and the translation of these requirements into practical solutions” (p.55). This implies that there is a need for specific institutional policies and practical actions in this regard. One such action can be to develop a taxonomy of data privacy metrics to be used: 1. in the design process of mobile technology-assisted SRL support tools, i.e., further guidance on what the developers are required to do and how they will be able to meet these requirements, and 2. in the examination of the existing tools to measure to what extent they are effective for complying with GDPR principles of data minimization, purpose limitation, and confidentiality and integrity. Also, there are the recommendations for privacy and data protection in mobile applications offered by ENISA (2017) and mobile security characteristics offered by Goode (2016), including: 1. focus on the user, 2. agile multi-factor authentication, 3. mobile single-sign-on, and 4. simplified unified security. In sum, we also need to remember that the protection of students’ privacy is not only a legal obligation, but also a moral one.

Implications for Research and Practice

Future research should combine insights from different disciplines on designing and using mobile applications to support SRL to offer theoretically grounded mobile applications which are in line with theories on instructional design and supporting SRL, as well as m-learning design characteristics (Grant, 2019). For example, research on supporting SRL across multiple domains (i.e., domain-general support), could consider the results found in domain-specific approaches such as in the domain of language learning (e.g., Chen et al., 2018; Viberg et al., 2020a). Furthermore, studies in the field of educational psychology on supporting SRL in general (e.g., Baars et al., 2018; Nückles et al., 2020; Roelle et al., 2017), provide valuable insights on how to combine metacognitive and cognitive supports which can be applicable in the field of m-learning. Moreover, in general, valuable insights and recent developments from the computer science field (in terms of developing adaptive learning solutions (e.g., Viberg et al., 2020b) and the human-computer interaction discipline, as well as research into ensuring stakeholders’ privacy and information security (see e.g., ENISA, 2017) during the development and application of mobile information systems, should be carefully considered.

Using, for example, the MALLAS framework (Viberg et al., 2020b) or the examples of the recent research efforts focusing on the use of multichannel student data to study SRL (e.g., Azevedo et al., 2022; Fan et al., 2022), future research could shed light on how to use multichannel trace data to better understand learners’ evolving SRL process and its related activities in m-learning. It is crucial to know more about what type of learner activities would warrant what type of support in order to improve SRL processes during learning (Wong et al., 2019b). Also, such data can be used to inform the design of relevant visualizations (e.g., learning dashboards) aimed at students, teachers, and researchers to raise their awareness of the SRL processes, consequently enabling an even more active approach to fostering SRL.

In practice, for students engaging in self-study and for teachers stimulating their students to do so, m-learning support for SRL (apps and services) should be considered as a means that can provide improved conditions for studying and learning. It is important to highlight that SRL cannot be designed as a one-size-fits-all solution. It is critical to consider SRL activities in relation to the
offered learning tasks, i.e., whether they should be of a more general character or whether they should be more closely connected to the targeted subject (e.g., math or language learning), or whether they should be balanced in some way or another.

CONCLUSION

In this theoretical literature review the use of mobile learning (i.e., m-learning) to support metacognitive and cognitive processes in self-regulated learning (SRL) was reviewed and discussed in order to provide insights into opportunities for mobile-supported SRL, and formulate challenges and future trends for research and practice. SRL entails “the processes where students activate and sustain cognitions, affects, and behaviours that are systematically oriented toward the attainment of personal goals” (Zimmerman & Schunk, 2011, p.1). Thereby, SRL can help students to effectively take control of their own learning processes in order to increase academic success, especially in more widespread online learning settings (e.g., Broadbent & Poon, 2015; Richardson et al., 2012; Thiede et al., 2003). Although m-learning studies have only focused to a limited degree on the development and fostering of transferable SRL strategies, there are some examples of studies showing positive evidence in this regard and its further potential of using mobile applications in supporting SRL. For example, in the domain of language learning it has been shown that goal-setting (Chen et al., 2018) and supporting affective components of SRL (Viberg et al., 2020a) can benefit learners’ SRL. Moreover, there are some studies that investigated the use of mobile applications to support SRL in a domain-general way. For example, using mobile applications to support students in their time management (Tabuenca et al., 2015). Or supporting self-study using the SRL phases from the Zimmerman model (2000) and providing study strategies to work with (Baars et al., 2022a).

In order to advance our understanding of how to design and use m-learning to support SRL, there are some important suggestions to take into account in future research on, and the development of mobile applications or services to support, SRL. First, the instructional design of m-learning applications and its theoretical groundings are crucial when developing and investigating a mobile application to support SRL. In this paper, we advocate using both metacognitive and cognitive support (cf. Dent & Koenka, 2016; Roelle et al., 2017) and support the whole cycle of SRL (cf. Viberg et al., 2020a, b; Wong et al., 2019a). Second, as individual learners differ in their SRL activities and have different preferences and needs, using learning analytics in m-learning to create adaptive SRL support which can fade according to the learners’ needs, seems a promising direction (cf. Azevedo & Hadwin, 2005; Schumacher & Ifentahler, 2020). Third, using data traces in m-learning poses serious risks in terms of privacy and security. Therefore, we are calling for a more responsible approach—that would enhance learner agency—to student data when performing mobile learning analytics practice and research. A possibility to ameliorate these risks is to develop a taxonomy of data security metrics in relation to the national and international frameworks available for data protection.

Overall, mobile learning, underpinned by the theoretical lenses of SRL and coupled with learning analytics, provides appealing opportunities to support SRL. Yet, the use of mobile learning in the setting of fostering SRL also poses many questions and challenges which ask for further research and debate.

CONFLICT OF INTEREST

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Martine Baars, PhD, is an associate professor professor at the Department of Psychology, Education and Child Studies. Her research concerns instructional strategies to improve self-monitoring and self-regulation of learning in primary, secondary and higher education. She focuses on several aspects of self-regulated learning such as self-monitoring accuracy, motivation, learning strategies and cognitive load during learning in both offline and online learning environments (e.g., MOOCs) for individuals and groups. The role of mobile technology and how it can enhance (self-regulated) learning is part of her research interests.

Olga Viberg is associate professor in Media Technology with specialization in Technology-Enhanced Learning at the School of Electrical Engineering and Computer Science at KTH Royal Institute of Technology. Viberg’s research includes a focus on the learning analytics in higher education, the application of mobile technology in education, mobile learning analytics, integration of formal and informal learning environments, design for learning, self-regulated learning, computer-assisted collaborative learning, cross-cultural research and responsible use of student data in education, focusing on the issues of privacy and trust.