Preface

In order to understand the importance of investigating the relationship between Self-Regulated Learning (SRL) and Information and Communication Technology (ICT), it is worth looking at the picture of pedagogical developments in the past century. The need to move away from a vision of learning as a transmissive process, where the teacher plays the role of "sage on the stage", has been widely acknowledged. Both theoretical and applied research indicate educational paradigms like cognitivism, constructivism, and their social versions as stimulating and effective approaches, not only as concerns learners' development of content-related competence, but also regarding their overall cognitive and personal growth. According to these views, the role of teachers is to promote student-centered learning by designing learning environments which encourage motivation, self-efficacy and metacognitive awareness. On the other hand, learners are expected to become more active, reflective and responsible for their own learning, to different degrees and in different ways, according to their needs and potential, as well as the nature of learning objectives and content. The role of technology, in this process, can be of primary importance, because computers empower students by acting like amplifiers of their cognitive, social and creative abilities. As Marc Prensky[i] straightforwardly puts it, "technology's role – and its only role – should be to support students teaching themselves (with, of course, their teachers' guidance)".

Despite many years of investigation and field experiments, including the implementation of governments' polices addressing the introduction of ICT in schools, an effective combination of the above mentioned learning theories and the integration of ICT in schools is still far from being widely practiced, probably because it entails a compound and significant effort to create "student-centered", "problem-based", "personalisable" learning environments and to integrate their use in educational settings. In addition, to take advantage of such environments students need to become active and responsible in their approach to learning. Fostering learners' self-regulation is therefore a necessary step to actually implement promising pedagogical approaches and improve learning.

The pervasiveness of technology in all aspects of our life makes SRL even more necessary in view of a world where learning can no longer take place once and for all, and lifelong learning appears to be the only way to cope with a fast evolving society. Technology, however, also makes SRL skills more difficult to achieve, in that it adds extra variables that must be controlled at the cognitive, metacognitive, motivational and emotional levels. For example, having at one's disposal a variety of expressive media and information sources entails the ability to make choices that require a high degree of metacognitive awareness, while handling cognitive overload or dealing with the sense of isolation in distance learning entail a good deal of control on the motivational and emotional level. The need for the development of SRL skills is not limited to formal learning contexts, but is a real, compelling necessity also to exploit the opportunities, and cope with the challenges, of informal learning contexts, as well as of work and

life in the knowledge society. At the same time, technology-rich environments put their users quite naturally in an active position, therefore providing a suitable environment for practicing these skills. In conclusion, technology-rich environments both require and foster SRL, which makes the relationship between SRL and ICT quite complex.

This book deals with this relationship from several standpoints, addressing both theoretical and applicative issues, providing examples from a range of disciplinary fields and educational settings. It includes 24 chapters by a total of 57 authors from 28 different institutions in 13 countries. All together, they give a wide-angle view on the relationship between SRL and ICT, well representing the current state of the art. Moreover, they help to deepen an understanding of the nature of SRL, spotting a variety of relevant aspects, as well as of possible approaches to its study.

The book starts with a review that analyses the theoretical basis for understanding the possible relations among SRL and Technology-Enhanced Learning Environments (TELEs). Bernacki, Aguilar and Byrnes (Chapter 1) examine 55 empirical studies and interpret their findings to draw a picture of the current support to SRL in TELEs from the point of view of opportunities offered and learners' propensity to take advantage of them. These authors focus on several aspects, such as types of TELEs considered in the literature, learning entailed and influence of personal SRL tendencies. The picture that arises from this review substantiates the claim that TELEs can promote SRL but are also best used by self-regulated learners.

Among the aspects highlighted in this review, the importance of developing approaches to analyze learners' SRL attitude, as well as to evaluate or measure their SRL competence stands out as a critical one, because achievements in this field are a necessary condition to develop and test any SRL-improving approach. This is the focus of the following four chapters.

Barnard-Brak, Lan and Paton (Chapter 2) tackle the issue of measuring SRL behaviors in online learning environments. They analyze the problems entailed by several ways of measuring SRL currently in use, and propose to overcome them by profiling SRL behaviors. The five distinct SRL profiles that arise from their analysis are discussed in a social cognitive perspective and are related to metacognitive factors and academic achievement.

Assessing SRL behavior is the focus of De la Fuente and Lozano (Chapter 3), who describe and discuss an ICT-based assessment tool addressed to young children, designed according to a psychological model of SRL as well as a model for the design of Computer Assisted Assessment. They also point out the need for any kind of assessment tool to comply with ethical standards; these encompass elements such as competency, interpretation and use of computer-produced reports, characteristics of the person to be evaluated, confidentiality, as well as equivalence of paper-and-pencil and computer-supported versions of a same test. The assessment tool they propose appears to satisfy all these requirements.

Colombo and Antonietti (Chapter 4) relate SRL strategies and cognitive styles in multimedia learning. They designed an experiment to investigate the interplay between a number of variables: topic's perceived complexity, students' learning strategies in multimedia and related metacognitive awareness and students' cognitive styles. Learning outcomes were assessed based on mere retention and on two types of problem solving tasks. The study suggests that participants tended to self-regulate their strategies according to topic complexity and that cognitive styles play a minor role in self-regulation but seem to influence metacognitive awareness of the strategies applied.

Egan and Zhou (Chapter 5) deal with learners' ability to correctly predict their performance in assessment tests. They propose the Trichotomous Calibration Model, which includes three forms of calibration: assessment calibration (i.e. learner's ability to predict the main features of an upcoming

assessment), strategic calibration (i.e. the match between perceived task difficulties and strategies chosen to tackle it) and internal calibration (i.e. the accuracy of learners' judgment of their achievement on a future assessment). Trichotomous Calibration can be measured by means of nStudy, a software tool that keeps track of students' choices while learning, without interfering with the learning process. This model sheds light on how students can improve their assessment predictions, so as to adjust their learning strategies accordingly. This is a nice example of how measuring some regulation aspects can influence SRL improvement.

Enhancing learners' self-regulation in TELEs is the unifying aim of all the other chapters, which show a wide variety of approaches and points of view: some analyze issues that are of concern in a variety of learning contexts, others focus on particular aspects in disciplinary fields; some make use of general-purpose technological tools and propose methods and strategies to create SRL-supportive learning environments, others make use of specific software tools which present favorable features or were expressly designed to foster SRL; some analyze experiences carried out within single courses, others tackle SRL improvement by acting on the organization of a whole school, institution or enterprise.

Let us start with four studies tackling relevant issues of broad applicability.

Pertinent to any academic level and subject, and regarding many kinds of TELEs, is the contribution of Ellis and Folley (Chapter 6), who point out that a focus on SRL in education should lead to a radical transformation of learning assessment approaches. They observe that learners are not fully in the position to take advantage of teachers' encouragements and support to self-regulate if learning assessment is not in line with learning objectives and strategies. In order to actually foster SRL, assessment should be redesigned, giving space to learners' choice as concerns a number of aspects: format, subject, criteria, timing and results. Technology offers a wide range of tools to support the realization of all these choices. Their proposal indeed appears as the ultimate step to take in order to make learners take responsibility for their own learning and growth.

Improving SRL in distance education, in particular in higher education and lifelong learning contexts, is the focus of Andrade and Bunker (Chapter 7), who discuss how SRL can help to narrow the gap between learner and instructor in online learning. Their aim is to identify how distance education contexts can support the development of SRL through course design, instructor feedback and institutional support. After reviewing the use of ICT in distance education, they present a model for course design aiming to help develop SRL in distance learners, and illustrate it with applications for key stakeholders.

Harris, Lindner and Piña (Chapter 8) concentrate on techniques that can be incorporated in online courses to promote student's use of self-regulated learning strategies. After discussing related issues, they present a number of strategies and techniques that appear successful for promoting SRL and can easily be incorporated in online courses. Their proposal is exemplified by means of a scenario where an intelligent tutoring component is used to support students' development of SRL strategies.

Delfino, Dettori and Persico (Chapter 9) discuss the possible influence of task nature on learners' self-regulation, analyzing the case of an online course based on a socio-constructivist approach. The aim of the study is to inform the design of online collaborative learning activities supportive of self-regulation. To this end, they apply interaction analysis to learners' messages in the discussion forums of four different tasks, looking for indicators of self-regulated learning behaviors. The outcomes of their study show that task influence does not concern the total amount of SRL indicators found in the messages, but rather their type. In addition, the way tasks are proposed and scaffolded appears to have an influence on how students self-regulate.

The following six chapters concentrate on specific disciplinary fields where self-regulation competence appears useful to help learners overcome what are usually considered intrinsic difficulties of the subjects. All of them use wide-application technology and give rise to SRL-supportive learning environments thanks to suitable set ups and methodologies.

Calabrese and Faiella (Chapter 10) deal with issues related to the design of online activities that effectively support SRL in language learning. Based on the most recent theoretical and methodological approaches to language learning, they argue that the very nature of this subject requires learners to be self-regulated in order to obtain any result. Hence, it is particularly important for language courses to be designed and structured so as to favor SRL. This becomes even more important for online courses, as they require a good degree of autonomy of the students. They point out the main aspects to be taken care of in online language course design, and illustrate their proposal with the example of on online English course at university level.

The online module of a blended English course for higher education is also the focus of Hirata (Chapter 11), who seeks to improve students' autonomy so as to help them exploit the wealth of language-related resources available on the Internet. This issue is particularly critical in Japan because traditional cultural factors discourage learners to act in a self-directed or self-regulated way. She experimented two different approaches to web-based, self-directed language learning (i.e. data-driven language activities and website critical evaluation). The outcomes of both experiences were positive, and showed that students' own planning, monitoring and evaluation helped them to take advantage of, and appreciate, the two proposed activities, as well as to develop a positive and responsible attitude with regards to learning.

Mathematics problem solving is instead the concern of Tung and Chin (Chapter 12), who use video as a feedback tool to stimulate learners' self-regulation, within an Activity System Theory perspective. Students are asked to reason aloud and are videotaped while solving mathematical problems. The video becomes an opportunity for self-observation, helping the students to reflect on their own problem solving behaviors. This helps them to understand the reasons for failures and figure out possible ways to overcome them, thanks also to the assistance of a tutor who prompts them with suitable questions when necessary. The application of this approach with secondary school students produced positive outcomes and led the authors to draw a set of guidelines to assist educators in the development of similar learning activities.

Helping learners to overcome failure in mathematics problem solving by improving their self-regulation is also the aim of Mariotti and Maffei (Chapter 13), who worked out an approach to effectively use the feedback provided by a computer-algebra system in remedial activities. Their detailed analysis of the case of some high school students highlights the effectiveness of their proposal and how improvement in algebraic problem solving took place in parallel with the acquisition of SRL competence.

Yet another way to use feedback as a support to self-regulation in mathematics problem solving is proposed by Kramarski (Chapter 14). Here students work collaboratively in virtual communities, sharing problems and solutions and explaining their thinking and solution approaches. Critically examining each other's reasoning, with the support of metacognitive prompts, leads the learners to become aware of and monitor their own thinking, which has a positive influence on mathematical reasoning. The author describes an experience in which two different metacognitive teaching methods were applied, showing that these had different influences on the outcomes of the learning process.

SRL prompts are used by Olakanmi, Blake and Scanlon (Chapter 15) to improve the academic performance of high school students learning science in a computer-based simulation environment. The outcomes show that such prompts effectively supported the learning process, helping the students to take control of their activity through critical thinking, and to obtain better academic achievements than

a control group working in the same environment without SRL-prompts. This study aims to provide a platform to help understand how a teaching approach based on SRL-prompts is applicable and effective in different kinds of TELEs on different topics.

While the previous group of studies rely on methodological approaches to create supportive environments with wide-application technological tools, the following four chapters take advantage of specific software tools including features which appear particularly supportive of SRL.

Vighnarajah, Wong and Abu Bakar (Chapter 16) describe how a group of high school students exercised self-regulation in a blended course in physics, thanks to the use of an online environment especially designed to enhance the practice of SRL. Measurements of students' SRL competence with the MSLQ questionnaire and statistical analysis of the gathered data testify that this online environment actually proved to be a valid support to SRL.

An environment developed to promote self-monitoring and regulation is used by McMahon (Chapter 17) to help university students improve their capacity to read critically, apply reading concepts to solve problems and develop higher order conceptual understanding. This environment provides a range of tools, such as annotations and discussion facilities, to assist learners in monitoring their reading comprehension. Application of this environment in an undergraduate class highlighted its actual usefulness to support individuals who lack effective strategies of reading comprehension.

Two online tools developed specifically to stimulate student's self-regulation are described and analyzed by Sanz de Acedo Lizarraga, Ardaiz and Sanz de Acedo Baquedano (Chapter 18). One of these tools is a wiki designed to support group regulation during the collaborative generation, analysis and assessment of ideas, while the other tool supports the creation of small working groups within large classes by helping to detect affinities among ideas individuals have proposed, by supporting goal setting as well as generation and evaluation of ideas. A pilot study carried out with university students working on tasks requiring creativity and innovation encouraged the application of these tools to support group self-regulation in creative tasks.

Proske, Narciss and Körndle (Chapter 19) focus on a platform designed to scaffold students' self regulation by means of a number of tools addressing different aspects and phases of SRL. An interesting feature of this platform is that teachers who use it to set up a learning environment can choose which tools to include, hence tailoring the learning environment on the SRL aspects they wish to support most. In the study described in this chapter, the focus is on the use of a learning plan tool by the students of a university course, which positively affected students' actively working on the achievement of their learning goals.

Is it practical that a large organization, like a university, or a specialization school, or an enterprise, leave the development of learners' self-regulation to the initiative of single individuals or single courses? A synergy within the whole organization would likely result more economical and give rise to better results in that, even though some self-regulation skills are context-dependent, many others can be advantageously applied across fields, such as the development of a self-reflective attitude, or the habit to make goal-driven plans and monitor their development. This motivates the need to foster a SRL culture at organizational level. This is the focus of the following three chapters.

Bergamin, Bettoni, Ziska and Eggs (Chapter 20) look at the relationship between SRL and ICT from the point of view of a university which aims to embed ICT in educational activities in a collaborative way, supporting and improving the quality of teaching and learning. The solution proposed is based on the concept of a "university-wide media culture", that the authors try to develop by means of a collaborative "Reference Course Model". This approach specifies principles, structures and procedures to be

applied in course organization and provides a collaborative framework to encourage both the individual learners and the whole community to gradually take control of their own learning.

Edirippulige and Marasinghe (Chapter 21) focus on SRL in the context of eHealth, that is, the delivery of healthcare through ICT communication tools. Becoming active in this field requires physicians not only to learn new knowledge and skills, but also to transform their attitudes and behaviors so as to start a new way of practicing. This entails designing eHealth educational programs fostering learners' self-regulation, by promoting meta-cognition, supporting strategic action, developing ability to monitor one's own thinking and actions and sustaining motivation. In order to meet these needs, a global SRL approach has been applied so that courses contribute to encourage individual goal setting and self-monitoring, provide opportunities for self-reflection, motivate learners by means of suitable feedback, stimulate them to make important decisions about their learning process and release them from highly structured, traditional assessment tasks.

Veen, van Staalduinen and Hennis (Chapter 22) propose the Networked Learning Model for developing and managing knowledge in a self-regulated way within complex working settings. The networked system Yuno, which is based on this model, was successfully tested in the real context of a large, knowledge-intensive company. The model and system incorporate various principles of SRL and are inspired by the way young generations share and develop new knowledge through digital, social networks. According to these authors, Networked Learners are self-motivated, strategic thinkers with a high degree of self-awareness. Their strength lies in their natural attitude towards networked activity, which will hopefully allow them to solve complex problems by reducing their complexity, thanks to competence sharing within the communities of practice they belong to.

The book is concluded by two chapters that reflect on the comparison of several exploratory studies, which allows their authors to draw suggestions to support different aspects of self-regulation in technology-rich learning environments.

De Marco, Businaro, Farina and Albanese (Chapter 23) explore three different ways to foster learning competence of first year university students. Their focus is on the interaction between collaborative learning in Technology Enhanced Learning contexts and the development of SRL competencies.

Pilling-Cormick (Chapter 24) reflects on the central role that control plays when learning takes place in technology-rich environments and on how self-regulated and self-directed learning are integrally related to it. Without some form of learner control, it is extremely difficult for both learners and educators to be truly successful in learning with technology. Recognizing that technology does not always allow full learner control, it becomes vital to discover ways to operate within the constraints of the environment to improve such situation. The analysis of three pilot studies developed in different contexts and with different technological tools is her starting point to share recommendations for designing instruction in TELEs with a focus on learner control.

All these chapters, together, provide a rich and compound picture of the state of the art on SRL in TELEs and the several directions in which the field is developing. Many software tools, technology-rich environments, subjects, educational levels and approaches are dealt with. Among them, online learning environments are, by far, the most often considered. This is not surprising, since this kind of TELE is increasingly used to develop the most diverse activities, not only in formal learning, but also to support non-traditional or informal learning situations. Online learning environments, however, do not constitute the only focus of this book, as a variety of other settings are also considered and most of the SRL-supportive methodological approaches proposed throughout the chapters are not strictly dependent on a particular kind of learning environment. In all cases, the studies presented witness a strong possible

synergy between SRL and ICT, provided a sound methodology (e.g. metacognitive support, teaching strategies, prompts of different kinds, task structuring, scaffolding, etc.) is applied to exploit the environments' potential. University appears to be the educational context most frequently addressed. This is not surprising, again, since university represents the last formative step before entering into productive life and starting to cope autonomously with life-long-learning. Hence, at this level, it is mandatory that students consolidate their ability to self-regulate their learning. Many other age ranges, however, are also considered, from young children in Chapter 3 up to the working context in Chapter 22. Several chapters are strictly focused on improving learning in some specific subject where SRL skills appear particularly critical. Most insight that can be gained from the studies in this book, however, is not strictly dependent on a particular age range or disciplinary field and can be applied to broader contexts. All this makes this collection of scholarly papers a precious source of educational reflections of large applicability.

The logical sequence adopted to organize the book's Table of contents is not the only one possible, as a wide variety of aspects intertwine in SRL and many connections among the chapters emerge when reading their content. For instance, the radical and stimulating suggestions of Chapter 6 concerning student choice in assessment are echoed in Chapter 21, which mentions release from highly structured assessment tasks among the measures undertaken to foster participants' SRL, hence showing in a practical case that student-centered assessment is actually viable and profitable. We will leave to the readers the pleasure of discovering so many connections, in the hope that this book may help them to appreciate the considered topic and discover ever new and interesting facets of fostering SRL with ICT.

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ENDNOTE

[i] Prensky, M. (2008). The Role of Technology in teaching and the classroom. Educational Technology, 48(6), 64.