21st Century Main Competence: Self-Regulated Learning from Kindergarten to Higher Education

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Constant improvement of knowledge and competences through education has become unavoidable. In both higher education and work in a demanding environment there are situations where individuals must learn and work independently and have to handle complex demands. To prepare students to deal well with those challenges, the ability to successfully self-regulate one's own thoughts, motivations, cognition and behaviour has become highly important. For this reason, self-regulated learning (SRL) is now an important topic in education and in educational research, and SRL is seen as a necessary requirement for successful life-long learning in the 21st century. However, what is SRL, and what is it for?

SRL helps to explain how students approach tasks, solve problems and adapt to changing contexts. Several different theoretical perspectives have been put forward for SRL. They all have in common that SRL is seen as an active and individual process that varies among task and learning environments. Overall, SRL is viewed as an important competence that is highly relevant for individual performance in different domains (e.g. writing, mathematics, science). To broadly describe SRL, it might be helpful to use an integrative meta-model that combines different perspectives (**see Figure 1**). The WWW meta model of SRL has three main dimensions: what, when, and which. The **what** dimension focuses on the three main aspects that need to be regulated: self, process and information. The *self* aspect of SRL means that learners have to regulate their own behaviour, actions, thoughts, emotions and motivation. The *process* aspect indicates that

learners also have to regulate their learning process. And the *information* aspect means that learners have to regulate their processing of information, so that new subjects can be successfully learned and retrieved. The **when** dimension takes into account that SRL is a complex and recursive process that can be divided into three phases. In the *pre-action phase*, learners have to evaluate the task characteristics and requirements in order to plan and set goals (target status) for the following action phase; learners also evaluate their resources (e.g. motivation, emotion, self-efficacy beliefs) and consider if they are willing to engage. In the *action phase*, learners' intentions come into play, and strategies are used to solve the task and process information. The *post-action phase* contains self-judgement, self-reflection and evaluation procedures. In dependency on the deviation between current learning status and targeted status, students adapt their earlier goals and future approach. The **which** dimension highlights the competences that are required for successful SRL. There are three main competences areas, subsumed under cognition, metacognition and resources. *Cognitively*, self-regulated learners have to be able to activate previous knowledge and transform and integrate new information by using different cognitive strategies (e.g. elaboration, transformation, rehearsal). Further, self-regulated learners have to show *metacognitive competences*, such as applying metacognitive knowledge about when and why to apply specific strategies and regulation skills (e.g. monitoring, evaluating). Thus, the metacognitive component focuses on the higher-order processes of SRL in order to monitor and evaluate the use of cognitive
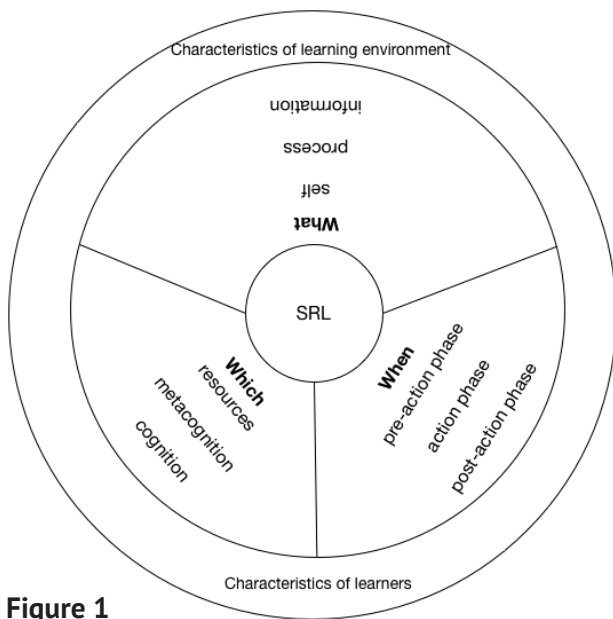
Figure 1

strategies, for example. The *resources* competence involves regulation and use of internal resources (e.g. motivational and emotional regulation, regulation of attention) and external resources (e.g. help-seeking, peer learning). All three dimensions in the WWW meta model of SRL are influenced by learners' characteristics and the learning environment. Learners' characteristics (e.g. IQ, socio-economic status, beliefs) point out that individual preconditions influence how individuals approach a task and what previous experience they have in SRL. Characteristics of the learning environment (e.g. task, teacher support, time) draw attention to the fact that SRL is influenced by the context in which it takes place. In sum, the integrative WWW meta model of SRL shows that SRL is a highly complex process that can be differentiated into three phases (pre-action, action, post-action) in which students need different competences (cognitive, metacognitive and resources) to regulate the different aspects needed (self, process, information) in order to overcome challenges and reach the desired goal.

In our research studies, we focus on different school levels and analyse various dimensions of SRL. At the kindergarten level, we look at the complex interplay of self-regulated cognitions like ability self-concepts or mindsets and their

relation to different aspects of SRL. We are interested in what activities children choose in a scenario-based open learning environment, what they do when they encounter difficulties, and what affective-motivational reactions they show. At the upper secondary school level (grammar school), we examine how students master the whole SRL process when writing a lengthy essay. We want to learn more about how students approach a task of that kind, how well and how diversely they apply strategies, and what approaches lead to excellent work. In higher education, we are interested in how students self-regulate their learning in different academic learning situations, and we aim to analyse what SRL competences are relevant for high academic performance.

Self-Regulated Learning in Kindergarten

Children's self-regulatory abilities in kindergarten are key predictors of successful adaption to school, academic achievement and social competences. In a constantly changing environment, we want children to become competent self-regulated learners who embrace challenges, are interested in mastering new things, and persist in the face of difficulties to become lifelong motivated learners. The development of self-regulation during early childhood can be described as finding a balance between emotion and cognition to engage in goal-directed actions by regulating behavioural impulses, emotion, cognition and metacognition. However, how and where can the development of self-regulation be fostered as early as in kindergarten? Open learning situations, where children may choose where and what they want to play and what to do if they encounter difficulties are common in kindergarten and seem to be optimal for learning self-regulation competences (**see Figure 2**). Children have to plan, initiate, monitor and evaluate their activities, stay focused and motivated, and manage the environment. For example, children who attended a Montessori school, with student-chosen activities carried out with minimal instructions from teachers, performed better on self-regulation

Figure 2

tasks than children in non-Montessori schools. But not all children choose challenging activities or use difficulties as a learning opportunity. Some children just engage in the same activities most of the time, withdraw after setbacks, show maladaptive affective and motivational reactions, show a lower ability self-concept, or easily lose interest in the topic. We know that self-regulatory cognitions like ability self-concepts, self-efficacy beliefs or interest influence behaviour. A potential self-regulatory cognition is a child's mindset concerning whether human attributes (e.g. intelligence, abilities) are either fixed or malleable. Research with older children on up to university students showed that if they assume that interests and abilities are fixed (fixed mindset), like a set of pre-determined strengths and weaknesses (e.g. "I'm a math person"), they choose situations where they can show what they're good at and avoid tasks where they could fail. However, if they believe that abilities and interest are learnable and malleable (growth mindset), they embrace challenging tasks, show persistence and try new things, even if their ability self-concept or interest is low.

Previous research has found that children in kindergarten are usually overoptimistic and think that with enough effort they can master anything. The development of abilities and interests before kindergarten is closely tied to the context in which children grow up and thus plays an important role in social inequality. Wouldn't it be disastrous for children to assume that they have a set of pre-determined strengths and weaknesses?

Among other relevant teacher behaviours, subtle linguistic messages can influence children's mindsets. Research with school-age children shows that teachers can effectively support children's growth mindset through providing feedback focused on effort and strategies and not on the person. If feedback focuses on the person or the ability, it fosters a fixed theory (e.g. "Great, you did it right the first time. You have a real talent for numbers."), and the goal becomes a completed task that can be solved easily. But if feedback focuses on effort or strategies, it fosters a growth mindset, and children show persistence and choose difficult tasks that provide better learning opportunities; this is an important

phase in the self-regulation process. The concept of the growth mindset has gained a foothold in many schools in the United States, with teachers emphasizing that abilities can be encouraged and developed. Having a growth mindset protects children from the negative influence of a low ability self-concept, and this is a chance to overcome social inequality. Research studies with older children show that their ability self-concepts and their mindsets influence self-regulation. In light of previous research showing that children in kindergarten are overoptimistic and think that they can master anything with sufficient effort, it remains unclear whether fixed and growth mindsets can already be distinguished as early as in kindergarten. The goal of our research is to investigate the interplay between self-regulated cognitions like ability self-concepts and mindsets and to find out if these cognitions are related to self-regulated learning and achievement in kindergarten. We hope that the results of our empirical research will generate new insights into the complex interplay between self-regulated cognitions and self-regulated learning in kindergarten and support kindergarten teachers in helping children to become self-regulated learners.

Self-Regulated Learning in Grammar School – Does the *Matura* Thesis Foster SRL Competences?

The Swiss grammar school (upper secondary level) diploma is a general higher education entrance qualification. Specifically, it allows pupils to study at most Swiss universities without having to pass an entrance exam. The *Matura* thesis is an independently written or commented project that pupils write over a longer period and present at the end of their grammar school education. Both the writing and presentation of the thesis require a set of high SRL competences. At the start, in the pre-action phase, pupils have to motivate themselves, develop a research question and draw up a plan and a timetable. In the action phase, they have to acquire knowledge and constantly monitor

whether they are still on the track. Additionally, their ability to stay motivated and prevent negative emotions is crucial so that they do not constantly postpone tedious steps. After completion of the thesis, in the post-action phase, pupils have to think about whether the strategies used were adequate and effective and whether they would do things differently next time. This helps them use their experience to master future tasks and/or to adapt and optimize certain regulation strategies. As up to now almost no studies were available on SRL in conjunction with the *Matura* thesis, our aim in this study is to explore SRL in the context of that task. We seek answers to the following questions: How do pupils generally approach writing a thesis? How often, how well, and how diversely do they apply self-regulatory strategies? What approaches and SRL competences lead to excellent theses, and what approaches prove to be not particularly successful?

To answer these questions, approximately 1,200 students at 14 grammar schools in the German-speaking part of Switzerland are completing a questionnaire during different phases of the *Matura* thesis task. The students keep a learning journal to document their work and learning process. From this data, it is possible to obtain in-depth knowledge about students' working and learning processes. SRL is thus assessed longitudinally based on a real grammar school task (**see Figure 3**). The findings will uncover students' strengths and weaknesses in writing a *Matura* thesis. As a result, it will then be possible to optimize school-internal support and thereby optimize students' preparation for writing theses as well as preparation to study at the university level. Some initial findings are set out in the sections below.

The first questionnaire survey focused on students' individual prerequisites. Results showed that two thirds of the students already find possible thesis topics before the official start of the thesis task. Moreover, on average students felt well prepared to write a *Matura*
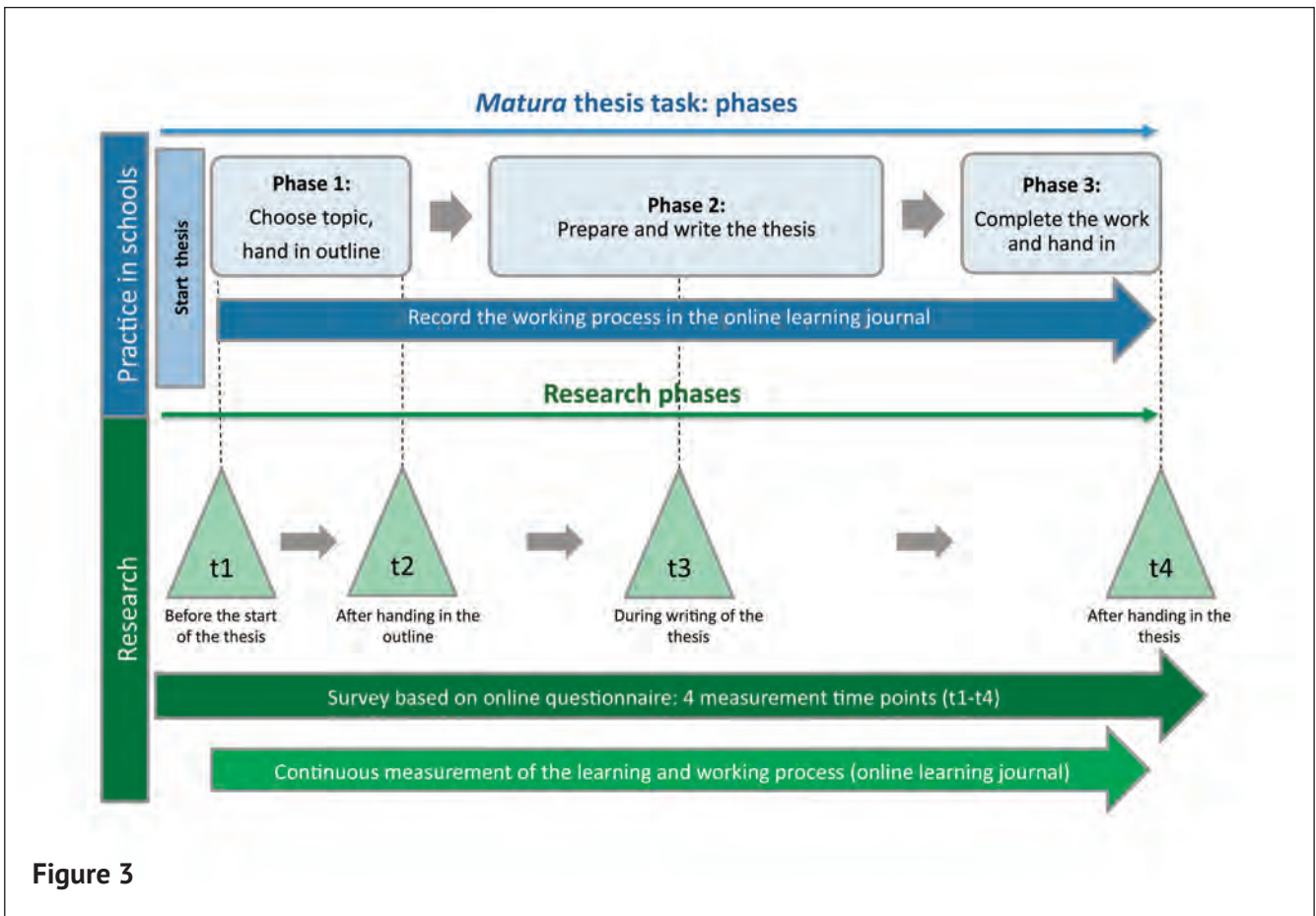
Figure 3

thesis and were convinced that they would master the challenges and perform well. Initial motivation to work on the thesis was found to be personal interest and determination to achieve high marks.

The second questionnaire survey, which was conducted after pupils had handed in their topic and an outline, mainly investigated supervision and support processes. The findings show that 63% of the students were assigned the supervisor that they wished for and 96% of the students felt that the support that they received was rather-to-very useful. The questionnaire also contained questions on students' concerns about the thesis and on their self-efficacy. Although on average the students reported that they worried about meeting expectations, they also believed that they could write a good thesis provided they put enough effort into the task. Overall, a number of findings paint a positive picture. We are eager to find out if this positive balance will be confirmed by the third and fourth questionnaire surveys and if there will be any significant differences between the four measurement time points.

Self-Regulated Learning in Higher Education, or What Makes a Good Student?

At university, it is expected that students acquire new knowledge mainly independently, as higher education is characterized by great autonomy with respect to learning organization, learning materials and learning procedures. Moreover, university students have rather few opportunities to benefit from teachers' feedback as compared to students in high schools. Universities offer both opportunities and a strong necessity for students to self-regulate their own learning. Therefore, it is not surprising that SRL competences are important prerequisites of academic achievement. Research has found positive relationships between SRL competences

and academic outcomes in traditional learning settings and also in online learning environments in higher education. However, little is known about which of the SRL competences students need in higher education so as to cope effectively with challenges in different learning situations (i.e. writing academic papers, preparing for exams, attending lectures). Our research on "Self-regulated learning and academic success: S&S" aimed to develop new instruments to measure different components of SRL in higher education and to identify successful strategic behaviour for different learning situations at university.

The results of our studies show that we successfully developed three new achievement tests to assess students' metacognitive knowledge for different learning situations: regulation of their academic writing process, regulation of their attention while attending a lecture, and regulation of their motivation while preparing for an exam. Further, we found that students' metacognitive knowledge is an important prerequisite in all three different learning situations. The results also show that students have different approaches to preparing for a larger exam. Students who reported high self-regulation competences achieved higher marks on the exam at the end of the term than students with lower self-regulation competences. Especially metacognitive and motivational regulation competences played a significant role in students' academic performance. Finally, new scales were developed to assess students' implicit theories of academic writing and SRL. Implicit theories of both academic writing and SRL were related to students' strategic behaviour. Students who think that an ability can be learned showed higher self-regulation competences than students who think that academic writing and SRL cannot be learned and therefore just reflect a person's inherent gift. Overall, the results of our studies emphasize the importance of SRL competences and students' implicit beliefs for successful academic learning in different situations.

Outlook

All of our studies contribute significantly to the field of SRL by focusing on different groups, domains and aspects of SRL. Even though SRL has become an important topic in education, more research is needed to understand the relationship between self-regulation and external regulation, to expand existing SRL models by explicitly including beliefs about human attributes, and to get a clearer picture of the relevant SRL competences that students need in different learning situations or for larger and complex tasks. At the same time, the results of empirical research need to be discussed with teachers and principals in order to support teachers in effectively preparing students to overcome demands and difficulties in the 21st century.

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Elements of success in the Swiss education systems

In a speech at an International Congress, President Johann N. Schneider-Ammann, Head of the Department of Economic Affairs, Education and Research, outlines the importance of vocational and professional education and training...

Vocational and Professional Education and Training – or VPET – is a matter of considerable importance to the Swiss government and to me, in particular, as President of the Confederation and Education Minister.

There are 3 main reasons for this: VPET ensures an income, it imparts knowledge and, it creates jobs.

"From skills to prosperity – sharing elements of success" – The motto of this year's congress puts it in a nutshell. It also raises 2 important questions:

Firstly, what skills are needed if we are to be successful and create prosperity? Secondly, how can we use the skills acquired to best effect?

The motto also suggests how to address these questions. Not by retreating to an ivory tower and trying to solve problems all by ourselves, but by going out and exchanging ideas in the workplace, between the workplace and school, within our own country and with our neighbours beyond our borders.

Allow me to say a few words about my country, Switzerland.

As you know, we now have one of the highest per capita GDPs in the world, one of the highest labour force participation rates (at 84%, 13 percentage points above the OECD average) and one of the lowest unemployment rates in Europe, and, indeed, the world.

That was not always the case. Switzerland used to be a poor country. 200 years ago, at the beginning of the 19th century, the people here in the canton of Zurich did not have enough to eat. As a small, landlocked country at the centre of Europe, with no raw materials worth mentioning, Switzerland had no choice but to develop into an innovative knowledge society, and to constantly invest, expand and diversify in it. One of our country's greatest strengths is our mixed education system, which allows us to recognise both practical and academic talent and to invest in each accordingly.

"In times of great change, no-one can afford to stand still. Let's take a look into the future. There are two major forces of change in the world today."

This is a major contributor to our innovativeness and competitive strength. It also means that we can continue to develop our education system, making it fit to respond to the needs of the future, both of the country's economy and of the individual. Please don't misunderstand me: the last thing I want to do is suggest that other countries should adopt our education system. Each country has its own historical, economic and socio-economic context. A country's education policy should take account of this background and reconcile what is desirable with what is feasible.

But I would like to reveal to you briefly what I believe are the Elements of Success in the Swiss education system:

1. Duality and work based learning

The dual vocational education and training system, in which apprentices spend time in both a host company and in vocational school, is a key element of success and the main VET model in Switzerland.

About two thirds of all young people in Switzerland take up an apprenticeship when they are about 15. There are about 230 nationally recognised and regulated apprenticeships to choose from.

This dual system is based on a very simple idea: learning by doing. Young people are able to

learn the skills that businesses require. Their job prospects are therefore excellent.

2. Permeability

The next Element of Success is permeability, which occurs in 2 directions: laterally, between the academic and vocational education paths, and bottom-up, with opportunities for life-long learning and promotion.

Whichever path a person takes, it offers the potential for a successful career.

I can give you a good example of this. A colleague of mine recently spoke to a woman who had done an apprenticeship as a hairdresser. Having obtained advanced qualifications in her trade, she successfully ran her own business for 20 years. She then obtained the baccalaureate qualification

and went on to university to study social sciences. Today she runs her own consulting company. The point I'd like to make is: no qualification leads to a dead-end. As we say in German: kein Abschluss ohne Anschluss! With a qualification under your belt, doors will open to you.

3. Private-sector involvement

Another success factor in Swiss VPET I would like to highlight is the role and involvement of businesses, which makes for a system attuned to the needs of the labour market.

Small to medium-sized businesses make up over 99% of the Swiss economy. So it is especially important for these small companies to be involved in training young people. Indeed, about 40% of companies in a position to offer apprenticeships do so. They do this on a voluntary basis – there is no obligation. This private-sector involvement and cooperation with trade associations is hugely important in Switzerland. It is the trade associations that define the apprenticeship curricula. This means that young people acquire the skills that are required in the labour market. At the first VPET congress in 2014, we looked at why companies take the trouble to train apprentices.

Studies show that businesses benefit from offering training. I used to be the CEO of a construction machine manufacturing company that trained apprentices. And I can assure you that the benefits of employing apprentices can usually be felt even before they complete their training: after a time, their productive work more than compensates for their employment and training costs.

Furthermore, to train apprentices is an investment in the future skills available to the company: the

company can then save indirectly on the costs of recruiting and training new employees.

In times of great change, no-one can afford to stand still. Let's take a look into the future. There are 2 major forces of change in the world today.

Firstly, the effects of global competition are being felt in many countries. Traditional economies are affected by a gradual process of deindustrialisation.

This threatens the jobs of many. In Switzerland, where about a fifth of economic output is still generated by the industrial sector, there are 2 principal factors ensuring that industrial production remains efficient – a liberal labour market and a skilled workforce.

The second big change in society is digitalisation. This offers huge opportunities both in our private lives and at work. Take today's congress. As I stand here before you, you may well be tweeting to each other about our congress – under "#VPET16".

So I have to compete with Twitter and your mobile phones for your attention. Of course, I am not really being serious – but the digitalisation of our society does become a serious threat when employees are in fear of losing their jobs. Certain occupations will no doubt disappear.

But here again, our flexible and permeable labour market opens up new opportunities. New jobs will be created and new training programmes developed. Life long learning applies not only to individuals, but to our education and training system too. A system that is to be successful long term must continue to develop and adapt to external circumstances.

To quote the physicist and Nobel Prize winner Stephen Hawking: "Intelligence is the ability to adapt to change." I am convinced that the dual

education and training system can adapt quickly to technological change.

When the public and private sectors work closely together, young people can acquire exactly the skills they need for the labour market of tomorrow.

In order to be able to cope with challenges and change, we need to think and to act collectively. Truly viable solutions don't come from isolated thinkers, locked in isolated rooms, but develop from networks and discussions.

"This dual system is based on a very simple idea: learning by doing. Young people are able to learn the skills that businesses require. Their job prospects are therefore excellent."

The time has come to learn from one another and to share our countries' experiences. All of us are attending this congress because we believe in the importance of vocational and professional education and training, we are convinced of its place in the future of our countries and so we wish to see it promoted.

My country, Switzerland, is honoured to be acting as a platform for the exchange of ideas, experiences and good practices.

President Johann N. Schneider-Ammann
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Education and Research WBF
https://www.wbf.admin.ch/wbf/en/home.html
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