workshop 2
Self-Regulated Learning in Technological Learning Environment:


Effects of Technology-Based Simulations on Self-Regulated Learning/Teaching - A Longitudinal Study

Mary Gutman\textsuperscript{1} & Bracha Kramarski\textsuperscript{2}

\textsuperscript{1}. Efrata College, Israel
\textsuperscript{2}. Bar-Ilan University, Israel

We propose that SRL (self-regulated learner's perspective) and SRL in teaching (SRLT; teacher's perspective) should be taught to pre-service teachers at the pedagogical knowledge acquisition stage (Kramarski & Michalsky, 2009, 2010, in press; Michalsky & Kramarski, in press). The development of \textit{SRL}, \textit{SRLT}, \textit{lesson design} skills, and \textit{teaching practice} of pre-service teachers who were exposed to self-regulation training in a Technology-based Simulation (TBS) was compared to pre-service teachers who received the same self-regulation training and simulations in a traditional environment. The comparison focused on two perspectives in addressing pedagogical scenarios: \textit{dual} perspective (\textbf{2P}—involving explicitly the teacher's role in his learning and teaching) and \textit{single} perspective (\textbf{1P}—involving explicitly the teacher's role in teaching). Four learning conditions were established: \textbf{TBS +2P}; \textbf{TBS +1P}; \textbf{2P: 1P}.

\textbf{Participants/training program.} 191 first-year pre-service prospective teaching students were examined (28 h). Participants were divided randomly into four groups. Intervention focused on Learning-by-Teaching (LBT) and on SRL/SRLT theoretical framework oriented towards pedagogical scenarios with different perspectives (2P/1P). Scenarios were presented by virtual agents (teachers and students) in the TBS groups and on paper by traditional groups.

\textbf{Measures:} Mixed method analysis assessed pre-service teachers for: (a) Pre/post SRL and SRLT — self-perceived planning, monitoring, evaluation (Schraw & Denison, 1994) and regarding online indicators of informed decision making (seeking/using Help function) during solution process; (b) Pre/post lesson design (immediate effect) and
actual classroom teaching one year after course (long-term transfer effect for a focused group). Lesson analysis examined three criteria: tasks/goals; strategies, and students demands (Kohen & Kramarski, 2012; Shulman, 1986).

**Findings, discussion, conclusion:** Findings showed generally significant contribution of the dual perspective approach to the technology-based simulations (TBS +2P) compared with the single perspective (TBS +1P) and dual/single perspective traditional environment approaches (2P, 1P) in the areas examined: pre-service teachers' SRL and SRLT; ability to transfer processes (immediate effect) on lesson design with respect to the student demands criterion, and positive long-term effects of actual teaching on the tasks/goals and student demands criteria. The strategy criterion was not affected. Online SRLT process data showed that the TBS +2P group was more mindful when using in the system Help function, particularly in the monitoring phase. Assessment of participants' lesson design showed differential effects between the three groups (TBS +1P; 2P; 1P) favouring TBS +1P. No significant differences for SRLT and actual teaching were found between the three groups. Findings have significance for teacher education with technology.

**References:**


"E-learning in Chemistry Education: Self-Regulated Learning in a Semi-Virtual Classroom"

Rachel-Rosanne Eidelman & Yael Shwartz
Weizmann Institute of Science

Rationale

We face two major problems in chemistry education at the high-school level: (1) fewer students choose to study Chemistry as a major, and (2) declining numbers of chemistry teachers. A virtual Chemistry course was implemented in order to change that trend.

Research Purpose

Study purpose is to characterize and follow the development of students’ SRL skills in the process of learning Chemistry (virtually and traditionally), as well as measuring method efficiency and predicting the success rate per student, in the course.

This research focuses on:

a) Developing a virtual classroom for Chemistry by research-based design.

b) Comparing the self-regulated learning skills of students in both virtual and traditional environments.

The course design lays on the literature regarding Technological and Scientific Literacy (Kohler & Mishra, 2008, 2011; Shwartz, Ben-Zvi, & Hofstein, 2005), and on studies that investigated models for virtual teaching. Tallent-Runnels, Thomas, Lan and Cooper (2006), summarized 76 articles dealing with virtual courses. Four main categories were addressed: course environment, learners’ outcomes, learners’ characteristics and institutional and administrative factors. Flexibility of individual pacing, and the convenience and autonomy in their studies were preferred by students. E-learners were more successful in a well-designed course, but with no significant grade differences.
The study

Our study has two interrelated parts: (1) **Designed-Based Research** (DBR) of Technology-Enhanced Learning Environments (TELEs) which describes the process of development, investigation and refinement of virtual courses (Collins, et al., 2004). (2) **Self-Regulated Learning** (SRL) as are those who proactively seek out information when needed, and take the necessary steps to master it (Zimmerman, 1990, 2008). These learners are conceptualized as metacognitive, motivated, hold high self-efficacy, engage in self-attributions and have intrinsic task interest. They are behaviorally active participants in their learning processes. It is believed that a major requirement for learning in virtual environments is the ability to be a self-regulated learner (Tsai, 2011).

The research questions are divided into these two research areas.

Tools

A modified and translated form of the Learning and Study Strategies Inventory (LASSI) questionnaire (Weinstein, Palmer, & Shulte, 2002) was used in order to measure the change in SRL skills over time.

It consists of 48 items related to six categories: attitude and interest; concentration and attention to academic tasks; motivation, diligence, self-discipline, and willingness to work hard; use of support techniques and materials; use of time management principles for academic tasks; test strategies and preparing for tests.

**Educational Data Mining** (EDM) methods were used in order to gain data for quantitative statistical purposes (Romero, Ventura, 2007; Chen et al, 2000; Castro et al, 2007).

Other tools that will be used are: performance tasks, internal and external chemistry tests and in-depth interviews.
Participants

Population includes the intervention group: students who enrolled in the virtual Chemistry classroom aged 15-18. Two other groups provide a base-line pre-group and a control group.

Principles of virtual course design

Attention was taken to the design principles for developing or adapting materials: Diagnostics, Diverse learning styles, Independence and responsibility, Peer learning. All lesson design is of identical form. Moodle 2.7 is the learning environment. Two science camps will be held during the school year.

Initial results regarding students' SRL skills are being collected, and will be reported in the fully paper.

References:


A Technology Enhanced Intervention for Self-Regulated Learning in Science

Tali Shapiro, Bat Sheva Eylon & Zahava Scherz

Department of Science Teaching, Weizmann Institute of Science, Rehovot, Israel

Abstract

This study describes a technology enhanced Self-Regulated Learning (SRL) intervention designed to foster self-regulating learning skills among students, and provides reports on research aimed to explore students’ self-regulating behaviors and considerations demonstrated in implementing the intervention in 7th grade science classes.

Self-regulated learning subsumes key aspects of the learning process such as cognitive strategies, metacognition and motivation in one coherent construct. Central to this construct is the responsibility of students to take charge of their own learning. The SRL intervention in our research included three components: (a) Assessment tasks of students’ content knowledge and learning skills; (b) Teacher and student reflection forms regarding students’ assessment tasks performances; (c) A technology enhanced SRL (Te-SRL) environment. The Te-SRL is a generic environment which enables the design of learning / assessment units.

In this study we developed two units in chemistry and one unit in biology. Each unit starts with a background story followed by four problems. Students choose one of three alternative paths for solving each problem: the autonomous path in which students solve the problem without any help; the hint path, and the guided path which offer different degrees of scaffolding. The scaffolding can be any of the following types: conceptual scaffolding, meta-cognitive scaffolding, procedural scaffolding, and strategic scaffolding. The problems in all three paths are identical as are the correct solutions.

Research was carried out during the 2014 school year in the context of 7th grade science curriculum that embedded the study of learning skills in science content
according to learning material that followed the current curriculum for middle schools in Israel. Three hundred and sixty-six (366) 7th grade students from four middle schools participated in this research. Data was collected from questionnaires, assessment tasks, think aloud protocols, and computerized tracing of students work in the Te-SRL. The qualitative data was coded according to a framework developed based on Pintrichs' (2000) theoretical framework for classifying and analysing different processes which play a part in self-regulated learning.

The results indicate that explicit reflection of student achievements is an important factor in developing student awareness of their abilities and knowledge, and making decisions about their process of learning. Additionally, scaffolding is important for students who experience high levels of anxiety associated with school, who have trouble monitoring their level of concentration, or have difficulty making information meaningful. Results also indicate that most students make efficient use of the learning environment and know how to make judgment calls regarding when and if they need guidance or scaffolding.

Encouraged by the results, we suggest that technology-based activities should be embedded in a setting which includes explicit reflection regarding students' performance and learning processes and should offer optional routes to learning and problem solving aimed at different learners.

**Keywords:** self-regulated learning, scaffolding, technology enhanced learning environments.
References:


Expanding the Boundaries of Kindergarteners' E-book Reading: SRL Guidance for E-book Support among Young Children at Risk for Learning Disabilities

Adina Shamir

Bar-Ilan University

The contemporary book market has undergone dramatic change, with different forms of electronic books (e-books) now widely available. This uptake is true for adults but also for children with diverse academic needs (Rainie, Zickuhr, Purcell, Madden, & Brenner, 2012). In response to the finding that many of today's young children appear to enjoy listening to or reading stories on the computer or other electronic devices, a new body of research has emerged that examines the e-book's potential for supporting children’s literacy and learning (e.g., Shamir, Korat, & Fellah, 2012; Smeets & Bus, 2012). And yet, research on whether, how and under which conditions e-books fulfill their educational potential among young children with special needs is progressing rather slowly, with long-term research needed to deepen available findings.

In this spirit, the proposed chapter will focus on an investigation of the benefits of embedding guidance for self-regulated learning (SRL) in an e-book meant to foster e-book reading among kindergarteners at risk for learning disabilities (ALD). As far as we know, no such study has been conducted so far.

The said study investigated the effect of a learning-promoting activity with two versions of an educational e-book, one with and one without embedded SRL guidance, on the emergent literacy of ALD kindergartners. Participants (aged 4.5-7.0 years) were randomly divided into three groups: the first experienced the activity with an educational e-book embedded with SRL guidance (n=26), the second experienced the activity with the version lacking SRL guidance (n=26), whereas the third group (control) participated in the regular kindergarten program (n=26). The children’s verbal and nonverbal
cognitive levels, vocabulary and phonological awareness were measured pre-intervention. Vocabulary and phonological awareness levels were also re-evaluated post-intervention. The research findings indicated a significant improvement in these two variables among the two groups that worked with the two versions of the same e-book when compared to the control group. The greatest improvement in phonological awareness was found in the group exposed to the version with embedded SRL guidance.

Phonological awareness is a basic skill, needed for reading acquisition; many ALD children lag behind in this ability. The findings of the current study are therefore significant for their contribution to our knowledge on e-book use among ALD children in general and the impact of embedded SRL guidance in particular. Current findings and future challenges will be discussed.

References:
Self-Regulated Learning in Robotics-Based Learning Environment

Nareman Mara`e and Orit Hazzan

Department of Education in Science and Technology
Technion - Israel Institute of Technology

Self-regulated learning (SRL) is an active constructive process whereby learners set goals for their learning and monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features of the environment.

Numerous studies support the importance of SRL skills on school success. SRL skills facilitate students’ effective performance in academic settings and motivation. The importance of SRL leads the educational research to examine different learning environments that should promote SRL skills among students. Robotics-based learning environment assumed to have a potential environment to support these skills due to its characteristics and the opportunities to use it in informal contexts that should better support SRL.

The purpose of the presented study is to understand SRL processes in robotics-based environment and to explore common problem-solving strategies pupils use to achieve learning goals. In addition, it aims to investigate the contribution of robotics-based learning environment on motivating SRL processes. Therefore, the research attempts to answer the following research questions: **What are robotics-based learning environment characteristics motivating pupils to self-regulate their learning, and which strategies do they use to solve problems?**

The subjects were eighth-grade pupils, where 16 of them participated in internal Project for Excellent in Robotics, and they worked in pairs. Another 12 ones worked as one group in the frame of a national competition. The robotics activity took place over 6 sessions, generally once per week. Each session lasted approximately 1.5 hours using one of two robotics kits LEGO Mindstorms and K^NEX.
Data collection was performed mostly using qualitative instruments: participant observation, interviews and questionnaire for students. The collected data consisted of four observations for each pair/group of students that were documented via video camera and software for recording computer screen.

The results indicate that this environment provides valuable opportunities for pupils to self-regulate their learning. Through collaborative learning, student gets explicit examples of how to perform a task, how to reflect on his experience. Interaction with learners has a central role in stimulating SRL because of the multi-facet feedback that is an integral part in each phase of SRL, especially in the monitoring phase. Procedural programming allows breaking down problems to sub-problems and facilitates program debugging. Experiential leaning plays also a significant role in developing SRL skills as it is based and directed by learner's reflection that resembles monitoring process in SRL models.

Debugging and result testing, evaluation of progress toward goals, setting goals and hypothesizing are the most used strategies for problem solving and self-regulating the cognitive aspect of learning.

The study promotes the understanding of SRL in educational contexts in general and in robotics-based environment at particular, due to the use of qualitative instruments that allow deep analysis of online SRL processes among participants. In addition, it provides significant information about SRL among middle school pupils that have been little studied in this area. This study may help also in enhancing the development of learning environments to support SRL, taking into the consideration the most effective characteristics identified in the presented study.
References:


