

YALE-LYNN HALL TEACHER ACTION RESEARCH

How a Self-regulation Learning Intervention Supports Students in a Project-based Learning Unit

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February 8, 2015

Abstract

This study examined whether a self-regulation learning intervention could improve students' self-efficacy and project artifact achievement in a PBL unit compared to the comparison group. This study examined two quantitative measures by conducting t-tests on the self-efficacy learning form (SELF) and project artifacts. The qualitative data were project artifact reflections. One key result was that the treatment (intervention) group had statistically significant differences between the comparison group in the SELF. The treatment group demonstrated higher scores in three of the four project artifacts, but not significant. Andre, a lower achieving student, showed in his reflections how the intervention improved his SELF and artifact scores. The key implication is the SRL intervention demonstrates a practical way for teachers to teach SRL skills to support PBL.

Introduction

Technological advancements have led to the world becoming an interconnected knowledge economy¹ where there is a need for all people to think and problem solve.² As a 7th grade Civics & Economics teacher, I teach project-based learning (PBL) as an instructional method that has students learn knowledge and skills through an inquiry-based process by creating a project.³ PBL fosters college and career readiness,⁴ higher student engagement,⁵ and an increase in content knowledge compared to traditional methods.⁶ However, my students were ill-equipped to tackle long-term projects because they lacked skills to manage complex tasks and work independently. Furthermore I could find no studies where a PBL unit incorporated a self-regulation learning (SRL) intervention.⁷ SRL is self-generated thoughts by students using metacognition, setting goals, and being active participants to direct their learning.⁸

¹ Friedman, T. (2007). *The World is Flat*. New York: NY: Farrar, Straus & Giroux.

² Wagner, T. (2008). *The Global Achievement Gap: Why Even Our Best Schools Don't Teach the Teach the New Survival Skills Our Children Need to Know and What We Can Do About It*. New York, NY: Basic Books.

³ Markham, T., Lamer, J., & Ravitz, J. (2003). *Project-based learning handbook: A guide to standards-focused project based learning for middle and high school teachers*. Novato, CA: Buck Institute for Learning.

⁴ Dickinson, G., & Summers, E. A Longitudinal Investigation of Project-based Instruction and Student Achievement in High School Social Studies. *Interdisciplinary Journal of Problem-based Learning*, 6(1), 82-103.

⁵ Gulbahar, Y. & Tinmaz, H. (2006). Implementing Project-Based Learning and E-Portfolio Assessment in an Undergraduate Course. *Journal of Research on Technology in Education*, 38(3), 309-327.

⁶ Boaler, J. (March, 1999). Mathematics for the moment, or the millennium? What a British study has to say about teaching methods. *Education Week*, 19(5), 30.

⁷ Boekaerts, M., & Corno, L. (2005). Self-regulation in the classroom: A perspective on assessment and intervention. *Applied Psychology: An International Review*, 54,199-231.

⁸ Zimmerman, B. J., & Schunk, D. H. (2001). *Self-regulated learning and academic achievement Theoretical perspectives* (2nd ed.). Mahwah, NJ: Erlbaum.

YALE-LYNN HALL TEACHER ACTION RESEARCH

I focused on City of University of New York's Professor Emeritus Barry Zimmerman's SRL model with Moylan (2009) (Appendix A). The questions I explored were

Q1. Do differences exist between students who receive a SRL intervention or not in a PBL unit regarding self-efficacy and project artifact achievement?

Q2. How can a SRL intervention support a lower achieving student in a PBL environment?

Method

To answer the research questions, 24 students in the treatment group received a SRL intervention and 28 students in the comparison group did not. Both 7th grade Civics & Economics groups were heterogeneous and had no major differences in grades and no previous SRL instruction.

Business project. The PBL unit was seven weeks and both groups received the same instruction about running a business by teaching them economic concepts through project artifacts. The Business project had the main characteristics of a PBL unit by the Buck Institute for Education: (1) the project was the curriculum, (2) utilize a driving question to focus student efforts and facilitate inquiry-based approach, (3) student-centered and realistic.⁹ The driving question for the unit was "What is necessary to run a successful business?"

Intervention. Before the Business project started, the treatment group received a four week intervention based on Zimmerman and Moylan's SRL model (Appendix B).^{10 11} For each

⁹ Thomas, J. W (2000). *A review of research on project-based learning*. San Rafael, CA: Autodesk Foundation. Retrieved from http://www.bie.org/index.php/site/RE/pbl_research/29

¹⁰ Cleary, T.J., Platten, P., & Nelson, A. (2008). Effectiveness of the self-regulation empowerment program with urban high school students. *Journal of Advanced Academics*, 20, 70-107.

¹¹ Stoeger, H. & Ziegler, A. (2008). Evaluation of a classroom based training to improve self-regulation in time management tasks during homework activities with fourth graders. *Metacognition Learning*, 3, 207-230.

phase of the three phase model (2009),¹² explicit teaching of the SRL processes and sharing strategy instruction were taught and practiced.¹³ Students in the Forethought phase were taught goal setting and planning strategies, in the Performance phase taught how to self-monitor those goals, help with self-control by using self-instruction and positive reinforcement (treats). In the Self-reflection phase, students were taught how to self-evaluate their work compared to the rubric and goals created. Research supports that explicitly teaching the SRL cyclical model and processes with opportunities to practice in learning settings is an effective approach to teaching SRL.¹⁴

Data Collection Instruments

Self-Efficacy for Learning Form (SELF).¹⁵ The SELF instrument was to understand students' self-efficacy beliefs in relation to their use of specific self-regulatory processes in different kinds of academic environments with student rated responses from 0% to 100%. It was given before the intervention and after the unit.

Project artifacts. The business artifacts students completed consisted of the business design (Artifact A), budget (Artifact B), advertisement (Artifact C). On Business Day, students

¹² Zimmerman B. J., Moylan A. R. (2009). Self-regulation: where metacognition and motivation intersect in *Handbook of Metacognition in Education*, eds Hacker D. J., Dunlosky J., Graesser A. C., editors. New York: Routledge, 299–315.

¹³ Paris, S.G., & Winograd, P. (1999). The role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. *Contextual teaching and learning: Preparing teachers to enhance student success in workplace and beyond*. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education; Washington, DC: ERIC Clearinghouse on Teaching and Teacher Education.

¹⁴ Zimmerman, B.J., Bonner, S., & Kovach, R. (1996). *Developing self-regulated learners: Beyond achievement to self-efficacy*. Washington DC: American Psychological Association.

¹⁵ Zimmerman, B. J., Kitsantas, A. y Campillo, M. (2005). Evaluación de la autoeficacia regulatoria: Una perspectiva social cognitiva. *Evaluar*, 5, 1-21.

presented and sold their products to elementary students and community members who served as the customers. Artifacts were graded by two other teachers.

Project artifact reflections. The project artifact reflections administered after each artifact was turned in except for Artifact D because it was a reflection. They helped to explain how students used SRL strategies in the PBL unit. I included an action plan question in the reflection to see what they would change.

Results

Two t-tests were conducted to determine whether statistically significant differences existed between the groups on the SELF and project artifacts. The results for question one demonstrated that the treatment group had a statistically significant difference found between baseline and post-intervention data for SELF scores ($p < .05$, $p = .02$). The treatment group received a pre score of 72.4 and a post score of 80.9 while the comparison group had a pre score of 71.9 and a post score of 76.3 (Appendix C). This is important because self-efficacy influences the amount of effort, persistence and strategies used.¹⁶ Although the project artifact scores were higher for three of the four artifacts for the treatment group, they were not statistically significant differences (Appendix C). Project Artifact D had a higher comparison score which could be attributed to the fact that it was a reflection completed in one day. A possible reason for no major differences is that the goals students create (to earn an A or C) impact their performance and self-reflection phases. The goal created in the Forethought phase directly influences the standards with which they assess their work and could have been established before the unit making achievement differences between the groups minimal.

¹⁶ Bandura, A. (2004). Swimming against the mainstream: the early years from chilly tributary to transformative mainstream. *Behaviour Research and Therapy*, 42, 613-630.

YALE-LYNN HALL TEACHER ACTION RESEARCH

The second question examined how the SRL intervention helped one student. Due to limited space, Andre will be analyzed to see what helped him and some of his classmates improve their student achievement while some others did not. Before the intervention, Andre, a 13 year old student of more than one ethnic group, did not believe he was capable of following through on a task, maintaining his concentration and improving academically (Appendix E). He wanted to do well, but lacked SRL skills. Research states that there is rarely any instruction on SRL skills and many students do not learn these on their own.¹⁷ In Artifact Reflections A and B (Appendix D), Andre established goals and provided a few strategies, but was not receiving the desired outcome. For example, “didn’t use a planner but I did half of it per day” and “...used a strategic planner”. He only focused on completing the task and rewarding himself for finishing the task by either going onto the Internet or watching anime. In the Self-reflection phase, he mentioned that he met his goal, but it did not work out the way he wanted it to. One possible reason could be he was not self-evaluating his work, which he states in Artifact reflection A, “...didn’t read the rubric that much” (Appendix D).

Andre benefited from the SRL intervention because he was able to identify what he needed to change in Artifact C. Andre exhibited a SRL strategy saying, “...managing my time w/a list of things to do. These strategies made me meet my goal at the end.” In the Performance phase, Andre referred to his checklist/agenda to manage his time and self-reflects on his specific strategy use by stating he did achieve his goal and used his time properly. Andre used his previous reflections to make explicit changes to his approach to Artifact C by self-monitoring his progress and using a checklist to earn his highest grade on an Artifact (85 compared to the

¹⁷ Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41, 64-70.

scores of 65, 70 and 80). His SELF score went from a 49 before the intervention to 76. The students that showed little improvement did not incorporate SRL in all phases.

Discussion

The implications for this research is project-based learning has become a very popular instructional method.¹⁸ However, two leading organizations in the PBL movement do not mention student management in their ‘7 Essentials for PBL’ and ‘10 topics to include for PBL workshops’.^{19 20} This project demonstrated how a SRL intervention demonstrates a practical way for teachers to teach Zimmerman and Moylan’s model and have students utilize SRL strategies to improve learning in a PBL unit.

A second implication is that students similar to Andre who initially lacked SRL skills, could greatly benefit from a SRL intervention. The intervention provided Andre a way to set goals to improve his commitment to finishing the task which increased his self-efficacy perceptions when reflecting on his work.

A possible change in policy is that SRL instruction should be taught throughout K – 12 to help students manage their own learning. Students rarely receive instruction on SRL and many do not learn it on their own.²¹ Fortunately, self-regulation is teachable and is learned through explicit instruction and students’ own designs.²² By using Zimmerman’s feedback loop, teachers

¹⁸ Markham, T., Lamer, J., & Ravitz, J. (2003). *Project-based learning handbook: A guide to standards-focused project based learning for middle and high school teachers*. Novato, CA: Buck Institute for Learning.

¹⁹ Larmer, J. & Mergendoller, J.R. (2010). 7 Essentials for Project-Based Learning. *Educational Leadership*, 68(1), 52-55.

²⁰ Edutopia. Project-Based Learning Workshop Activities. (2011, August 17). Retrieved from <http://www.edutopia.org/project-based-learning-guide-activities>

²¹ Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41, 64-70.

²² Paris, S.G. & Paris, A.H. (2001). Classroom Application of Research on Self-Regulated Learning. *Educational Psychologist*, 36(2), 89-101.

YALE-LYNN HALL TEACHER ACTION RESEARCH

can incorporate any PBL unit because SRL focuses on procedural knowledge (e.g. learning the steps in the SRL cyclical model) and conditional knowledge (e.g. using the SRL strategy during a task) so they can be infused into any curriculum.²³ This is especially important as the demand for higher level thinking skills and preparing students to be college and career ready is required in this knowledge economy.

Future research is needed to see if a SRL intervention could support project achievement and content knowledge in a PBL unit with a range of settings, needs, and ages. Andre is one example of how explicitly teaching SRL had a direct impact on achievement.

²³ Zimmerman, B.J., Bonner, S., & Kovach, R. (1996). *Developing self-regulated learners: Beyond achievement to self-efficacy*. Washington DC: American Psychological Association.

Appendix A:

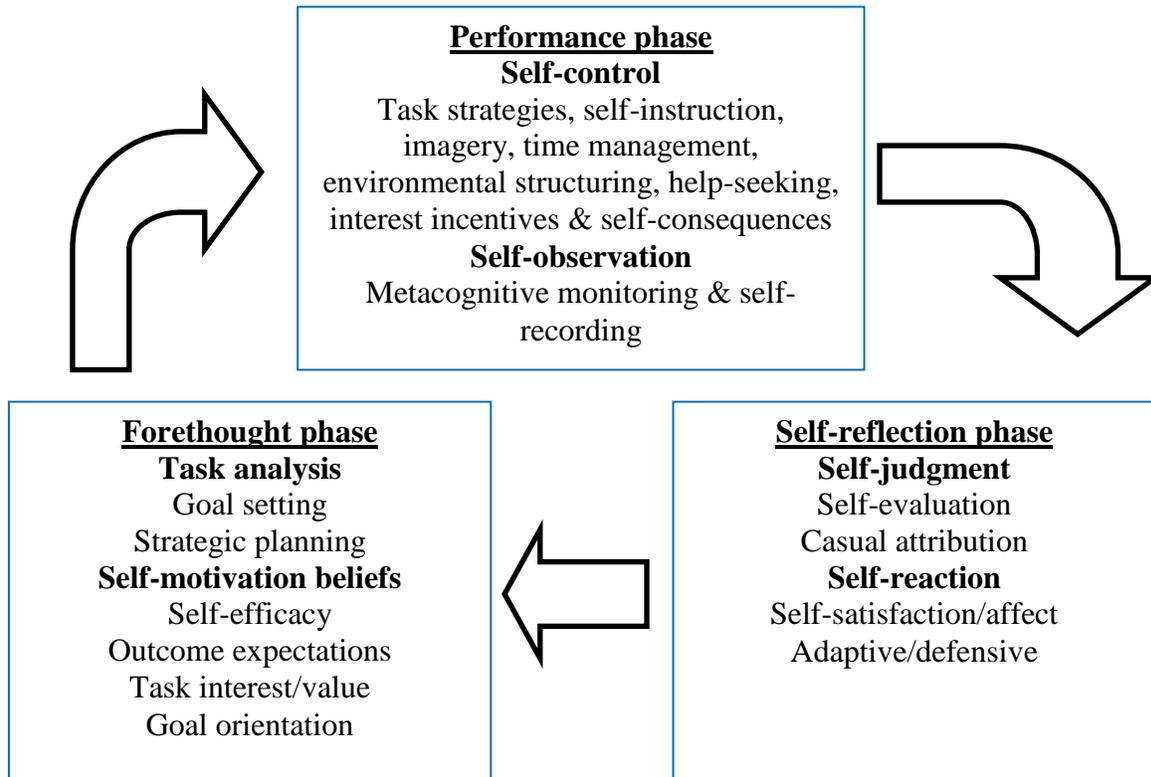


Figure 1. SRL diagram adapted from Zimmerman and Moylan (2009) © Routledge

Appendix B:

Table 1	
<i>SRL Intervention</i>	
Structure of Intervention	Research Supported Practices
<p>*Classes 1 – 3</p> <p>The teacher explicitly teaches Zimmerman and Moylan’s model (2009) and SRL strategies to students.</p>	<p>Teaching and sharing specific strategy instruction – the when, how, and why to apply strategies is necessary for SRL (Paris & Winograd, 1999).</p> <p>Students should be explicitly taught the SRL cyclical model and processes (Zimmerman et al, 1996).</p> <p>Initially direct instruction has shown to be the most successful strategy for encouraging students to be self-regulative (Levy, 1996).</p> <p>Direct instruction means explicitly explaining and show the strategies and how they are used – it involves modeling and demonstrating (Zimmerman, 2008).</p> <p>When teachers model their thought process, students are more likely to begin to use those same processes (Boekaerts & Corno, 2005).</p>
<p>*Classes 4 & 5</p> <p>Students apply the strategies to a classroom task and receive feedback from teacher and peers.</p>	<p>Successful interventions provide students a “tool box” of various strategies they can employ on academic tasks (Paris & Winograd, 1999).</p> <p>Students need to have multiple SMART goals to monitor their actions and make continuous improvement which allows for students to see success or failure based not on one goal (Ford, 1995).</p> <p>Guided practice is an important for helping students take more responsibility and it can help improve SRL and motivation (Lee et al., 2010).</p>
<p>*Classes 6 – 10</p> <p>Students apply new strategies in a small project-based learning unit and reflect and receive feedback.</p>	<p>Students need to practice SRL strategies in an authentic environment to find value and know how to utilize strategies (Paris & Winograd, 1999; Zimmerman et al., 1996). Knowing how a strategy works is not enough (Paris & Paris, 2001).</p> <p>Students must have time to practice strategies independently, reflect and internalize them (Zimmerman, 1998).</p>

***Classes = 90 minute block**

Appendix C:

Table 2

Treatment and Comparison Group SELF and Project Artifact scores

	Treatment		Comparison		Sig.
	Pre	Post	Pre	Post	
SELF	72.4 (14.8)	80.9 (9.9)	71.9 (12.3)	76.3 (10.0)	.02
Artifact A		80.6 (10.2)		77.1 (10.8)	.17
Artifact B		85.4 (9.3)		81.1 (10.8)	.07
Artifact C		80.9 (8.7)		80.8 (8.4)	.95
Artifact D		82.1 (9.7)		83.8 (6.5)	.42

Appendix D:

Table 3

SRL strategies used by Andre

	Forethought	Performance	Self-Reflection	Action Plan
Project Artifact A	This time I didn't use a planner but I did half of it per day. I think I didn't do that well on it such as the neatness and creativity part of it.	I went away from distractions and I said to myself that [I] can go to the internet if I finish a good part of my project.	Yes I did complete my goal because I finished it but it didn't workout well. Next time, I would ask help with the neatness & creativity.	I will ask help so the person could give me advice. I didn't read the rubric that much.
Project Artifact B	I thought that this part was going to be easy so I had high confidence. I used a strategic planner.	I said to myself, that if I figure out the prices and figured out the calculations I can watch one episode of an anime.	I achieved my goal but it didn't turn out the way I wanted to. Next time I should seek help from others such as a teacher or parents.	I will plan out what the finished product first & Review the rubric.
Project Artifact C	The strategies that worked out well for me is to get away from distractions & managing my time w/a list of things to do. These strategies made me meet my goal at the end.	I moved away from distractions & used a checklist/agenda to manage my time properly.	I did manage to complete my goal, I used my time properly but I think I still need to ask someone such as a friend to look over it so I can improve on it.	I will ask someone to revise it (or give tips) and make it look more creative.

Appendix E:

Table 4

Andre's scores from selected questions on the SELF Scale

	Pre	Post
2. When a lecture is especially boring, can you motivate yourself to keep good notes?	20	70
3. When you had trouble understanding your instructor's lecture, can you clarify the confusion before the next class meeting by comparing notes with a classmate?	5	85
7. When you feel moody or restless during studying, can you focus your attention well enough to finish your assigned work?	20	85
9. When you have to take a test in a school subject you dislike, can you find a way to motivate yourself to earn a good grade?	50	75
10. When your last test results were poor, can you figure out potential questions before the next test that will improve your score greatly?	50	80

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YALE-LYNN HALL TEACHER ACTION RESEARCH

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YALE-LYNN HALL TEACHER ACTION RESEARCH

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