RESEARCH SUMMARY

Characteristics and context of Primary Years Programme (PYP) students' self-efficacy and self-regulatory development

Summary developed by the IB Research department based on a report prepared by
Anastasia Kitsantas and Angela D Miller
George Mason University

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Background

Self-efficacy is defined as the extent to which students believe they are capable of executing a learning task under specified conditions. Similarly, self-regulation refers to the degree to which students are metacognitively, motivationally and behaviourally proactive and responsible participants in their own learning process (Zimmerman, 2000). The purpose of this study was to investigate the self-efficacy and self-regulatory skills of students enrolled in the International Baccalaureate (IB) Primary Years Programme (PYP), particularly in relation to the study of mathematics. The study also explored the extent to which teacher practices encouraged self-regulation and impacted student efficacy beliefs.

Research design

This study was conducted in three phases. The focus of phase I was the exploration of PYP classrooms through observational and interview methods with the purpose of documenting and understanding students' self-regulation within the context of mathematics instruction. Three PYP elementary schools from the Washington DC metropolitan area participated in phase I. An observational tool, designed to capture classroom practices that enhance students' self-regulatory practices, was developed during this phase. This phase also provided interview data on teacher beliefs about motivation and self-regulation and how these beliefs influence their classroom practices.

The aims of phase II were: (i) to develop survey and observational measures to assess practices that lead to self-regulatory competency from both student (n = 355) and teacher (n = 64) perspectives; (ii) to examine the predictive power of these influences on students' self-efficacy for learning and the development of self-regulation. The measures used were contextualized in mathematics. The researchers obtained data from a large enough sample of students to begin to discern the patterns of self-regulation among students in grades 3 through 5 using the Elementary Plan, Practice and Reflect Scale (EPPRS) developed for this study.

Finally, in phase III, a qualitative case study was used to examine best practices from three teachers who were identified as fostering highly self-regulatory practices among their students. In this phase, the researchers interviewed these teachers and identified common themes in the interview data.

Findings

Phase I

Teachers

The interview and observation data revealed that teachers were aware of IB curriculum elements and thoroughly implemented them in their classrooms. One aspect of the IB curriculum that was discussed was inquiry-based learning. This form of learning was understood in terms of developing self-initiated learning. One teacher described this method of learning in terms of "tools" which students can use to further their own learning by pursuing topics that interest them.

Similarly, being a "risk-taker" was associated with student self-initiative. The application of the learner profile was also discussed in terms of developing student self-regulation. Teachers mentioned that the learner profile was used in goal setting, feedback and in the monitoring of progress.

Within the context of mathematics, some teachers discussed the utility of group work in the development of student efficacy beliefs. Math groups were also valued in terms of allowing students to teach each other, which if properly facilitated, can help to foster students' efficacy beliefs in that they can see how similar peers are able to understand and teach mathematical concepts to each other.

The IB practice of reflection was also discussed by a number of teachers. Some teachers encouraged this habit by creating reflection journals, which prompted students to reflect on their learning (for example, asking students "What did you learn? How did you learn this?"). One teacher also discussed the use of reflection packets which were sent home on the weekends with the hope that reflections would be shared with parents.

In addition teachers engaged in various self-regulatory processes with their students. Below, the researchers provide examples of processes during each phase of self-regulation: forethought, performance and self-reflection.

Forethought

- **The learning process:** One teacher discussed the importance of the "process of learning" in terms of helping her students become self-regulated learners. According to this teacher, not only should learning be discussed in terms of a process, but learning should also be discussed in terms of "working through the process". Both of these statements are consistent with the forethought process (strategic planning) that emphasizes breaking down learning into its components.
- **Goal setting:** Another forethought process discussed included the use of goal setting. One teacher highlighted the practice of student-led conferences where goals were set and reviewed. Another teacher indicated using parent conferences to discuss and set goals for students.

Performance

- **Monitoring:** The practice of monitoring was discussed by a number of teachers. This was explained as helping students to monitor themselves in terms of knowing when they don't understand something. The use of agendas and calendars were also identified as tools in helping students keep track of their performance. One teacher highlighted the use of coloured "tags" to help students indicate when they did or did not understand something.

Self-reflection

- **Student reflection:** One teacher viewed reflection as an attribute that well-rounded students possess demonstrated by the fact that these students know how they got their answer. Reflection helps students to see which areas they are strong in, which areas they need to work on and which areas they enjoy. Collectively, these findings provide valuable information to help teachers instil self-regulated learning in their students.

Students

Although the student sample size was small, the results of the investigation have important implications for teachers and generally support the findings of previous research conducted in this field. The findings indicated that the use of SRL microanalysis[1] can allow teachers to gather context-specific information about how students' forethought, performance and reflection are interconnected (Zimmerman, 2000). For example, students who set process-oriented goals demonstrate not only greater motivation to persist in tasks, but also greater use of stategy and adaptive reflections of their performance. In contrast, students who set outcome-oriented goals exhibit less motivation, demonstrate fewer strategies and make more maladaptive reflections of their performance (Cleary, Zimmerman 2001; Kitsantas, Zimmerman 2002). Teachers, therefore, should emphasize to their students the need to set process goals rather than outcome goals because process goals are crucial to the development of self-regulation in learning.

Findings showed that high achievers engage in more strategic thinking before, during and after mathematical problem-solving tasks than average and low achievers. Therefore, teachers should provide guidance for when and how to use strategies. For example, teachers can advise students to set goals before doing math homework and to think about strategies beforehand (strategic planning). In preparing students for doing math homework and studying for math tests, teachers should help students to develop a repertoire of self-regulated strategies. Furthermore, teachers should instruct students to set new goals after getting back a math test. This form of self-reflection is important because it allows students to evaluate their performance.

Phase II

Preliminary data from phase II across approximately 22 classrooms has provided evidence of the relationships between constructs of mathematics self-efficacy and self-regulation among elementary level students. The results indicated that students with higher levels of math self-efficacy were more likely to report the usage of planning and action self-regulation strategies. Because of the dearth of information on these constructs at the elementary level, the contributions of this study to the literature are significant. Replicating previous studies that were completed on an international scale (Joet, Bressoux, Usher 2011), this study found that mastery experience (meaning an emphasis

[1] This part of the study used student SRL microanalytic interviews. Microanalytic interviews are event measures that assess students' engagement in self-regulated learning while working on a relevant task.

on learning, improvement and the mastering of skills over time) is the best predictor of mathematics self-efficacy. In this sample, the researchers also found that social persuasion (meaning direct encouragement or verbal persuasion that one possesses the capabilities necessary to master a given task) was a strong predictor of efficacy, which the authors attribute to the collaborative nature of the typical PYP classroom.

Phase III

Best practices

During this phase, four exemplary teachers discussed their experiences and practices in developing self-regulatory practices and self-efficacy among their students. They identified the following best practices from their experiences. Many of these findings reinforce findings from previous phases of the study.

Planning

- **Goal setting:** Three teachers discussed the need for students to set goals and also to reflect on the goals they set. Furthermore, these teachers stressed the importance of students setting obtainable goals that are focused on more than simple achievement, but are centered around the process of learning.
- **Enhancing motivation:** Three of the teachers discussed the desire and necessity to increase student motivation for math. Motivation is important both for its intrinsic value and also because when motivation increases, achievement may also increase. Additionally, all four teachers described how math instruction needed to focus on real-life application in order to improve motivation and achievement and that this connection to real life can help students become "really reflective on where you use math and why it's important."

Performance

- **Collaborative learning:** All of the teachers stressed the value of collaboration between students for math instruction through partner and group work. Teachers tended to believe that such collaborative work supports learning and can also foster motivation and engagement.
- **Conceptual understanding:** Another topic that all teachers mentioned consistently throughout their interviews was the need for students to understand math conceptually. All teachers described the need for students to show their work, examine mistakes and determine how to correctly redo problems. Teachers indicated that it was more important for students to understand the process than to arrive at the correct answer.
- **Curriculum:** Although all of the teachers taught from different mathematics texts and resources, each described how beneficial the IB curriculum guides were to the success of their math instruction.

Reflection

- **Self-evaluation:** Teachers indicated that reflection is critical for both learning and teaching, as students learn a great deal from reflection and it also helps teachers to refine their instructional practices.
- **Celebrating growth:** All teachers described the need to focus on growth/progress in relation to math achievement, as a way to combat students' negative feelings or anxiety about math. As one teacher explained, this process of celebrating growth is "reassuring and confidence building, it's fun, it's like a pat on the back".

Recommendations

Based on the findings of the study, the researchers recommend seven principles of elementary education that encourage the development of highly effective students who self-regulate their learning.

1. **Create learning environments that allow students to experience ownership of their learning.** Students take responsibility for their own learning and learn to chart their progress and evaluate their own learning strategies.
2. **Provide opportunities for reflection.** Effective classrooms show evidence of reflection, asking students to think about what went well in the lesson, things that could be improved and what the students would do in the next lesson.
3. **Organize classrooms for collaboration and cooperation among students and teachers.** All of the teachers we interviewed and observed frequently used collaborative learning with their students and spoke of their belief in allowing students to learn from each other.
4. **Use authentic tasks and problems.** Teachers used authentic tasks to attract student attention and make concepts relevant to their everyday lives.
5. **Provide opportunities to practise ways of thinking and learning.** Ways of thinking in terms of the practice "how do we know" was a particular strength of the PYP classroom.
6. **Provide scaffolding to support student learning.** Scaffolding (an instructional approach that provides differing degrees of support to help students reach progressively higher levels of learning than they would be able to reach without assistance) was

observed during math instruction as the teacher used small group instruction to provide varying levels of math problems to different groups of students. While observing the small group instruction, teachers provided instruction and had students attempt the problem, while observing students who continued to have difficulties. The teacher would then point to how other students solved the problem, and often had the students show each other how they solved the problem.

7. **Create a culture of learning and respect for others.** This principle was a routine in the classrooms observed. An instance of this was observed when one teacher had students cheer whenever a student was called upon and answered a problem or question correctly. As a result, this norm, set up by the teacher, became part of the classroom culture.

References

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This summary was developed by the IB Research department. A copy of the full report is available at http://ibo.org/en/about-the-ib/research/. For more information on this study or other IB research, please email research@ibo.org.

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