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Helping Primary School Students Engage in Collaborative Problem Solving of Real World Issues

Focusing on Low Progress Learners

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KEY IMPLICATIONS

- Low progress learners can be cognitively prepared for collaborative problem solving.
- Well-structured preparatory tasks lead to better collaboration and learning outcomes.
- Primary school students can learn about environmental issues and positively contribute to their communities.

BACKGROUND

Children can learn about environmental sustainability while also developing 21st century competencies such as creativity, critical thinking, and collaborating. Our project aimed to teach primary four students about preserving the environment through an instructional method called "Preparation for Future Collaboration" (PFC), whereby students solved open-ended problems specific to the environmental challenges in Singapore. Under PFC, students engaged in three phases of learning activity: (1) Preparation via individual generation of ideas and decisions, (2) Collaboration with a peer to discuss ideas/decisions, and (3) Receiving direct instruction from a teacher who consolidated the concepts in a whole-class lesson. Within the project we investigated the effects of two different preparation strategies on the process of collaboration and learning outcomes. The findings helped to inform the conditions under which students learn from collaboration.

FOCUS OF STUDY

Limited research has addressed both the process and learning outcomes of instructional methods that incorporate the three phases of PFC in the contexts of real classrooms. Using authentic environmental problems, we specifically examined how well- and ill-structured preparatory tasks affect student collaboration with a peer, learning after collaborating, and individual problem-solving performance post lesson. The project intended to meet three key goals. First, by conducting the work in low-banded classes, we hoped to inform how low progress learners could be better prepared to engage in authentic problem-solving in the 21st century. Second, we aimed to develop a constructivist instructional method whereby students could use their informal prior knowledge to generate ideas and collaborate with their peers before receiving direct instruction. Third, we hoped to contribute to the larger society to prepare a young generation to attend to issues of sustainability.

KEY FINDINGS

Our results showed a benefit of a well-structured preparatory task within the PFC instructional method. Compared to freely generating their own examples to problem prompts, students who prepared by selecting from a given list of solutions engaged in more effective collaborative behaviours, gained more knowledge after

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collaborating, and performed better on a post problem-solving task (Lam, 2017). Our work has shown that young students are able to engage in collaborative problem solving on complex issues, produce unique and practical solutions, use beneficial collaborative behaviors, and learn about environmental sustainability (Lam & Low, 2016).

SIGNIFICANCE OF FINDINGS

We recommend that teachers use pedagogies that involve delaying direct instruction, even in primary school. Our work shows the benefits of engaging students in a problem-solving task before explicitly teaching the concepts. This runs counter to traditional methods, where teachers first give step-by-step instructions and explicitly teach the concepts. They may afterward allow the students to engage in practice problems, if time allows. We note that our lessons were implemented during the school's normal curriculum hours and thus did not "add-on" to lesson time. It is possible to delay instruction and first allow students to explore concepts in the amount of time devoted to normal curricular hours.

Education policy could positively influence student learning and skill building by deemphasizing the importance of "exam content" and instead initiate policy that creates classroom time for students to explore the complexities of real world issues. Further research should be conducted to show the effects of instructional methods that take true constructivist approaches, allowing children to first use their own informal knowledge and experiences to engage in learning activities.

POPULATION

One school, 10 teachers and 160 students were involved in the study.

RESEARCH DESIGN

We used a quasi-experimental design, with random assignment of whole classes to one of two conditions during our preparation phase of PFC: (a) Select, where students chose problem solutions from a given list, or (b) Generate, where students freely generated examples to problem prompts. Afterward, students engaged in collaboration with peers in the same condition. In phase three, the students received the same teacher-guided instruction in the content. Time-on-task, topics of lessons, and teacher were all held constant across the two conditions. We analysed student conversations, artefacts from the preparation and collaboration phases, and post problem-solving solutions.

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