Ang Mo Kio Secondary School

Mrs Eunice Chan Baofen from Ang Mo Kio Secondary School shares her experiences in incorporating Cooperative Learning (CL) into the Science curriculum.

Why CL?

My experiences with CL have led me to see the advantages of being competent in a range of CL techniques and structures. When used skillfully and effectively, CL can facilitate teambuilding and promote mastery, thinking, information sharing, and communication skills in the classroom. Students gain confidence when they learn from and help one another. Depending on the structures used, CL helps to promote higher order thinking skills as well.

Having attended a five-day workshop on CL at Kagan’s Summer Academy in the US in 2009, I was eager to incorporate the structures I had learnt into my lessons. When my school came on-board TLLM (Ignite!3), I felt that a great opportunity had presented itself. We worked as a team to investigate if the use of CL in Science lessons promoted higher order thinking skills, raised achievement scores, and increased levels of engagement in students.

In conducting our research, we took special note of the four basic principles developed by Spencer Kagan (2009), which should be implemented in CL groups. 'Positive interdependence' takes place when each member succeeds only if all members succeed. 'Individual accountability' is important to ensure all

Students draw on each other's knowledge and insights.
Designing and implementing the SCI

Prior to designing our SCI, we attended the PETALS™ workshops during which we learnt more about educational theories and were introduced to various pedagogical approaches and assessment criteria to help us craft our SCI. Apart from examining the literature on CL, we also learnt the nuts and bolts of action research from crafting our research questions to conducting our research and analysing the results. Learning together as a team and drawing on each other’s knowledge and insights reaffirmed our belief in the benefits of cooperative learning.

We used the PETALS™ Framework to design the flow of our SCI. Our research involved a project group and a control group. As we chose topics related to Physics, the Physics teachers prepared Powerpoint slides, accompanying notes and activities relevant to the topics. Being in charge of the CL component, I incorporated Kagan’s (2009) CL structures into the lessons meant for the project group. I adopted structures such as ‘Jot Thoughts’, ‘Team-Pair-Solo’, and the ‘Q-matrix’.

‘Jot Thoughts’ requires students to each think of as many ideas as possible on a single sheet of paper. It is ideal for reviewing content. In ‘Team-Pair-Solo’, students solve problems first as a team, then with a partner, and finally on their own. It is designed to motivate students to tackle and succeed in problem-solving which are initially beyond their ability. The ‘Q-matrix’ allows students to sharpen their knowledge by asking and answering higher level thinking questions.

The use of CL for the project class was implemented over four weeks, with five forty-minute periods per week. The control group continued to be taught solely through direct instruction. After the lessons, both groups developed questions to be used for a game they later created using the Mission Maker software, a three-dimensional game authoring platform that allows students to create their own Science game as a performance task, without the need to learn any programming language.

We used a set of rubrics to assess the students on the quality of questions they generated, as well as on their content knowledge through a pen-and-paper test. We then used their scores for a quantitative analysis. We also required them to write periodic reflections, and evaluate their own and their peers’ work which was used as part of our qualitative analysis.

Impact of Cooperative Learning on Students

Our findings showed that the mean number of Levels 2 (understanding), and 3 (application) questions generated by the project class was approximately twice more than students in the regular class. This showed that the CL strategies did indeed help students generate more higher order thinking questions.

The results from the quantitative analysis showed that CL had a small effect on achievement scores.

However, the effect size for structured questions was slightly higher and this could be due to students’ greater exposure to CL with a focus on higher order thinking skills. This could have helped the students in the project class to do better in structured questions, which consisted of higher order thinking questions, than the regular class which did not go through CL. There was no effect of the intervention on answering multiple choice questions for the project class.

Findings from the PEI Questionnaire also showed encouraging results as students had indicated that they enjoyed the revised Science lessons. Through their responses during the focused group discussions and their narratives in the online survey, they not only showed that they were engaged affectively, behaviourally and cognitively, they were also aware that they had developed skills in communication with others and other technical skills to work with the Mission Maker software. They recommended that the school should continue with this revised package the following year.