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# Enhancing Maths Curriculum Through Team-Based Learning

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## KEY IMPLICATIONS

- Team-based learning (TBL) is promising in potentially exceeding traditional teaching methods in improving math performance.
- TBL is best enacted in an existing culture of student-centred learning among students and teachers.

## BACKGROUND

TBL is a contemporary instructional method originally developed by Michaelsen, Watson, Cragin, and Fink (1982). Characterised as teamwork-based learning, TBL requires students to participate in pre-class preparatory work and then apply the knowledge learned during in-class sessions. TBL has been shown to produce a variety of learning gains over traditional lecture-based pedagogies including increased mastery of course content, higher academic outcomes, and higher student satisfaction (Darling-Hammond, 2008; Zgheib, Dimassi, Akl, Badr, & Sabra, 2010; Koles, Stolfi, Borges, Nelson, & Parmelee, 2010; Abdelkhalek, Hussein, Gibbs, & Hamdy, 2010; Redwanski, 2012).

## FOCUS OF STUDY

Sustenance Secondary School (SSS) is a specialised school for Normal (Technical) students who are predominantly weak in maths and have a very low intrinsic interest in solving maths problems. The student profile of SSS includes a high proportion of "low progress learners" who are academically challenged, low on self-confidence, and lack motivation. As a specialised school, one of SSS's goals is to create innovative pedagogies to meet the learning needs of a diverse profile of students and to share those pedagogies and resources with other schools and teachers in Singapore.

## KEY FINDINGS

An ANCOVA revealed that there was a statistically significant difference in post-test scores between the TBL and non-TBL group, when adjusted for the pre-test score, $p < .05$. Pairwise comparisons showed that there was a significant difference between TBL post-test score ($M = 6.661$) and non-TBL post-test score ($M = 9.550$), $p < .05$.

Secondary Two data from Sustenance Secondary and Neverland Secondary were analysed together as both schools completed the same research package for Secondary Two level on linear equations.

An ANCOVA revealed that there was a statistically significant difference in post-test scores between Sustenance's TBL and non-TBL group, as well as Neverland's TBL group, when adjusted for the pre-test score, $p < .01$. Pairwise comparisons showed that Sustenance's TBL post score ($M = 10.553$) is significantly different from Neverland's TBL post score ($M = 6.657$), $p < .01$. Numerically, Sustenance's TBL group improved the most ($M = 8.381$), followed by Neverland's TBL group ($M = 4.044$). Further data analyses suggested that Sustenance's TBL group improved significantly more than Neverland's TBL group.

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## SIGNIFICANCE OF FINDINGS

Analysis of pre- and post-tests revealed that overall, TBL improved math performance for Secondary Two and Three students. Results from Secondary Two students suggested that TBL is as effective as non-TBL instruction in improving math performance. Feedback from surveys and focus group discussion further highlighted the effectiveness of TBL in improving students' learning experience, such as engaging students better, making lessons fun and enjoyable, increasing critical-thinking, problem-solving and collaborative skills among students, as well as creating a positive learning environment for students.

More importantly, TBL steers away from teacher-directed teaching to encourage student-centred learning, which allows for the teacher to provide more individual attention to weaker students. Taking the limitations of the study into account, TBL holds on to its promises in enhancing student learning outcome, even for low progress learners.

## PARTICIPANTS

A total of 56 lower secondary students from three schools, and 28 upper secondary students from one school participated. A total of 22 teachers from the three schools underwent professional development conducted by Co-PI Leong Swee Ling, who is a Master Teacher at the Academy of Singapore Teachers.

## RESEARCH DESIGN

Students were divided into two groups, a TBL group and non-TBL group. Students in the TBL group went through lessons that followed the TBL procedure, while students in the non-TBL group went through lessons that followed the teacher's usual teaching style which does not follow the structured procedures involved in TBL lessons.

Prior to research lessons, all students completed a pre-test to find out their baseline levels before conducting the research lessons. Post research lessons, all students completed the same test as a post-test to find out their performance after completion of the research lessons. The pre- and post-test was analysed for between and within group differences.

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