
Title	Computer-supported collaborative argumentation in Singapore classrooms
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Computer-Supported Collaborative Argumentation in Singapore Classrooms

By *Chen Wenli*

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Introduction

Argumentation plays an important role in various aspects of inquiry-based learning. Much effective argumentation happens between multiple participants who engage in evaluation, reflection, reasoning, and decision making through arguments and counterarguments in relation to a specific topic. However, effective collaborative argumentation rarely takes place in inquiry-based learning classrooms. One of the critical issues is that teachers and students lack technological and pedagogical support in designing, implementing, evaluating and reflecting the argumentation.

Research Intervention

The research project has developed *AppleTree*, a web-based system to support students' collaborative

argumentation in classrooms (<https://appletree.sg>). *AppleTree* supports students' collaborative argumentation with graph-based representations of argumentation (See Figure 1 for the user interface). It incorporates mechanisms for scripting collaborative argumentation and supporting real-time formative (diagnostic) learning analytics and assessment that enhance the process and outcome of collaborative argumentation to improve students' learning and cultivate their 21st century competencies.

As shown in Figure 2, *AppleTree* embeds a pedagogical model called Spiral Model of Collaborative Knowledge Improvement (SMCKI) (Chen, Tan, Pi, 2021) to script the design and implementation of collaborative argumentation activities in classrooms. This 5-phase pedagogical model was developed to strengthen the connection between the individual and group. It provides the support for a smooth transition between work in solitude and collaborative learning within a class setting. Starting with a phase of individual ideation, the model leads to phases of intra-group and inter-group knowledge improvement and refinement through peer critique, which will lead

to the advancement the knowledge of students.

AppleTree provides real time learning analytics and assessment of students' collaborative argumentation. The real time assessment allows teachers and students to have a quick evaluation and reflection of their collaborative argumentation process and outcome from the aspects of social participation and cognitive quality (structure completeness). Figure 3 on the following page shows the visualisations of some automated learning analytics and

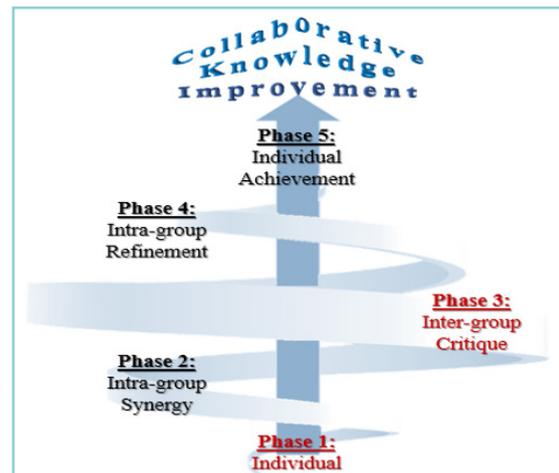


Figure 2. Spiral Model of Collaborative Knowledge Improvement (SMCKI).

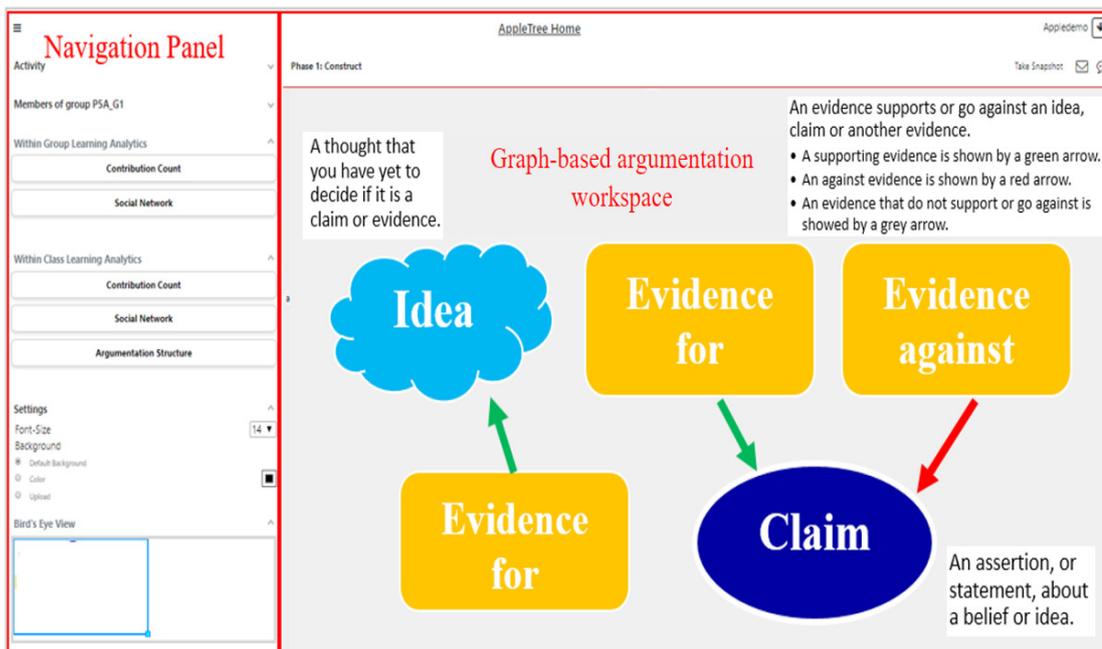


Figure 1. The screenshot of AppleTree system.



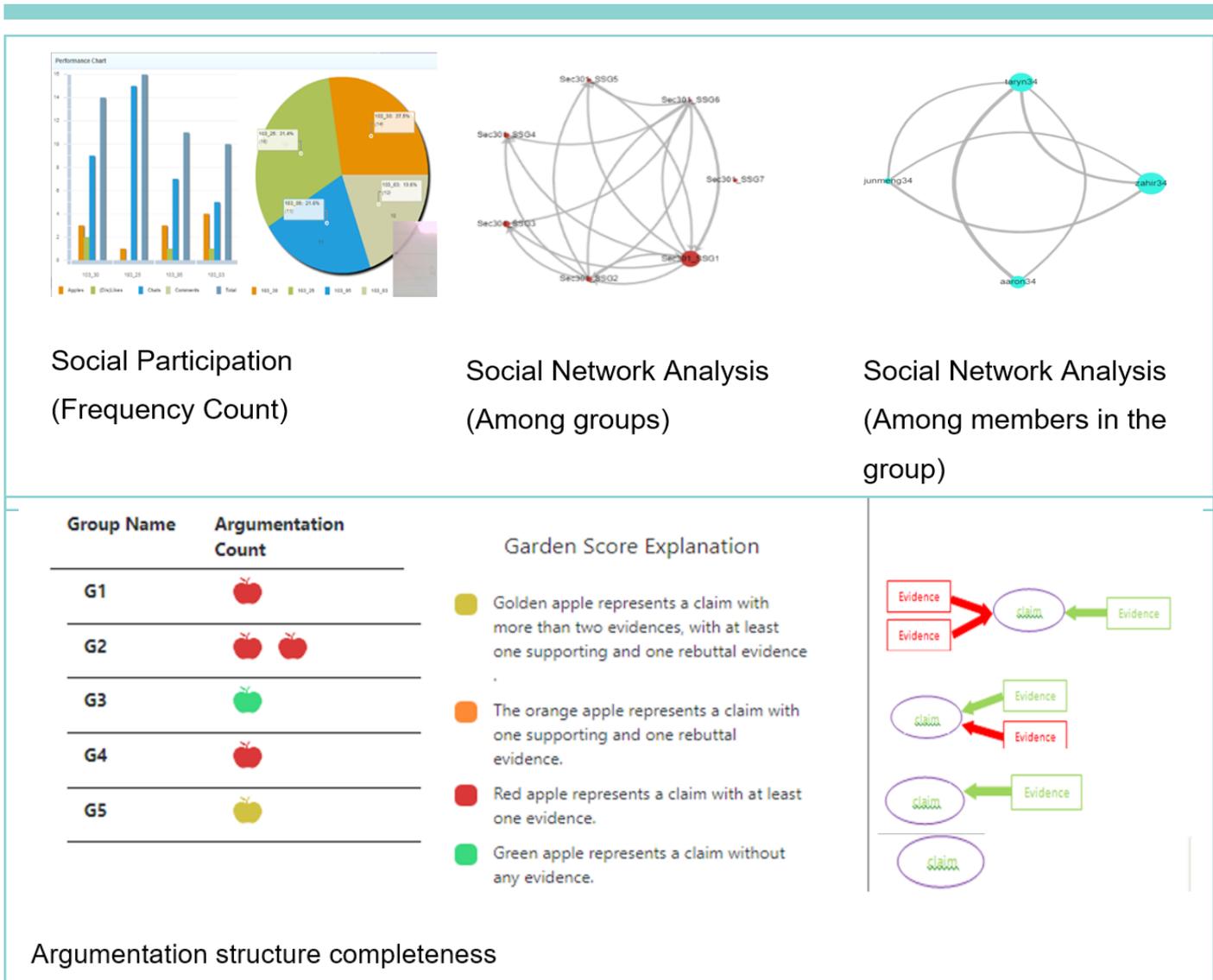


Figure 3. Visualisations of some automated learning analytics and assessment.

Science, Social Study, English and Mother Tongue. About 20 teachers and 400 students participated in at least 3 cycles of design-based research.

Key Findings

Pre- and post-tests were conducted for each cycle of all classes that participated in the research. The Wilcoxon signed-rank test results show that scripted collaborative argumentation with automated assessment improved students content knowledge (Zhang, Chen, Wen, & Looi, et al. 2019). Content analysis was employed to analyse the quality of the student groups' artefacts at five phases of SMCKI. The results show that the quality of students' collaborative argumentation artefacts in later phases were significantly higher than the artefacts in former phases. The

survey and interview analyses results show that students had improved their attitudes towards content learning and their 21st century competencies such as communication, collaboration and information skills.

Significance of Findings

Technology-enhanced learning, learning analytics, automated assessment and Artificial Intelligence for education are important research areas. They have implications on transforming teaching practices into argument-based inquiry learning. Engaging students in scripted computer-supported collaborative argumentation practices not only helps them learn the content knowledge deeper, but also develop their 21st century competencies.

References

Chen, W., Tan, J. S. H., & Pi, Z. (2021). The spiral model of collaborative knowledge improvement: an exploratory study of a networked collaborative classroom. *International Journal of Computer-Supported Collaborative Learning*, 16, 7–35.

Zhang, S., Chen, W., Wen, Y., Looi, C. K., Chai, A., & Ang, J. L. (2019). Collaboration script appropriation in a Science class. In 13th International Conference on Computer Supported Collaborative Learning (pp. 561–564). Lyon, Singapore: École Normal Supérieure de Lyon.

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