Cultivating Students' Interest and Agency in Learning Social Studies: Knowledge Building and Concrete-Pictorial-Abstract Model

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The Asian Conference on Education 2025
Official Conference Proceedings

Abstract

The Singapore Social Studies curriculum often presents abstract and complex concepts, making it challenging to arouse and maintain students' interest, let alone exercise their sense of agency in learning. To address the challenges, this study integrates the Knowledge Building (KB) approach and the Concrete-Pictorial-Abstract (CPA) model, along with diverse technology-supported learning experiences at rotating stations. Findings indicate that this integrative approach enhanced students' interest in the subject, becoming active participants as they explored complex concepts through the various stations. Furthermore, the CPA model enhanced students' understanding by guiding them from concrete to a deeper comprehension of abstract concepts using concrete and visual representations. This comprehension, in turn, cultivated greater student agency, as students actively contributed their learning reflections and ideas, leading to a collaborative contribution of diverse ideas. Further consideration could build-on from this approach in helping students deepen their knowledge of the abstract concepts based on their initial contributions.

Keywords: social studies, knowledge building, e-pedagogy, Concrete-Pictorial-Abstract Model, station rotation model

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Introduction

The 2023 revised Singapore Social Studies syllabus advocates a shift away from traditional direct instruction toward more active and authentic approaches, enabling students to make sense of the content while enhancing their interest and understanding of abstract Social Studies concepts (MOE, 2023). This paradigm shift challenges educators to adopt innovative instructional strategies that engage learners more effectively. Research by Chiodo and Byford (2004) found that students often perceive Social Studies as "boring" when it is taught predominantly through expository instruction, which lacks active student involvement. This finding underscores the need for dynamic, participatory teaching methods that make learning meaningful and engaging for the students.

This paper examines the Knowledge Building (KB) approach integrated with innovative instructional models, particularly the Station Rotation and Concrete-Pictorial-Abstract (CPA) frameworks, further enhanced by the affordances of the Singapore Student Learning Space (SLS) platform. Together, these strategies aim to cultivate active and authentic learning environments that nurture students' interest and agency in learning Social Studies.

Review of the Models

Knowledge Building

Scardamalia and Bereiter (2014) articulated that KB involves students' creation and improvement of knowledge within a community through progressive discourse. This perspective aligns with the need for students to engage in collective inquiry and discourse, which is critical for building up students' comprehension of abstract Social Studies concepts. The KB approach positions students as active contributors to the knowledge creation process rather than recipients of information, fostering deeper engagement with the content. It guides teachers to facilitate an environment of collective inquiry with a set of unique KB principles.[1]

Station Rotation Model

The Station Rotation Model is a series of varied learning activities that students rotate through. Activities could include online (technology-enabled) offline, teacher-led stations. Key benefits of the model include encouraging communication and collaboration among students for purposeful building of community and collective knowledge and prioritising student agency (Tucker, 2021). By weaving Knowledge Building principles with the Station Rotation Model, educators can design a structured yet flexible learning environment that encourages student agency, collaborative knowledge building and deep understanding of what they are learning.

Concrete-Pictorial-Abstract Model

The Concrete-Pictorial-Abstract (CPA) Model is based on Bruner's (1966) conception of enactive, iconic, and symbolic modes of representation in learning concepts. Commonly used in Singapore's Mathematics curriculum, this approach extends beyond mathematical learning, positing any set of knowledge and concepts can be represented in three ways: 1. By actions or physical/external/experiential representations (Concrete), 2. Summary of images/visual representations (Pictorial), and 3. Language (words), symbolic representations (Abstract)

[1] Comprehensive list of Knowledge Building Principles: https://www.kbsingapore.org/12-principles-of-kb.

(Leong et al., 2015). The CPA model could enhance students' learning of Social Studies by scaffolding their understanding from concrete, tangible experiences to more complex abstract concepts. Guided by the KB principle of "Real Ideas, Authetic Problems", students would explore artefacts and real-world examples through various modes of representations. Finally, when students achieved better understanding, it would provide them the knowledge to become active contributors, paving the possibility for further synthesis of ideas and collective knowledge expansion.

Methods

Participants

The student participants (N = 33) were from one secondary 4 (grade 10) class in a government-aided school in Singapore. The class was an express class taking the Social Studies subject at the GCE O-level standards and were considered middle to low achievers. The lesson took place in April 2024 and the duration was one hour. It was the first time that the students were exposed to the KB approach and experienced such an integrative lesson, whereas other lessons were designed based on more direct instruction or structural discussions.

Lesson Design and Technology Environment

In designing the lesson, a few other key KB principles like "Epistemic Agency", "Idea Diversity" and "Democratising Knowledge", guided the design and selection of learning activities at each station while integrating CPA model. Guided by the principle of "Real Ideas, Authentic Problems", driving forces that contribute to Globalisation were determined as an authentic topic because it is relatable to students given Singapore's position as an open economy reliant on trade and movement of people. In the current syllabus, students are required to understand the meaning of Globalisation and the roles of the driving forces – 1. Technological advancements in transportation, 2. Technological advancements in digital technology and 3. Growth of Multinational Corporations.

The Student Learning Space (SLS) was selected as the main technology platform given students' familiarity with the platform. It is a core technology platform used by Singapore schools for teaching and learning (MOE, 2024). It allows students to engage with visual representations of abstract concepts either in the form of embedded images, videos or other interactive tools. A key component of the SLS platform – the Interactive Thinking Tool (ITT), allows students to contribute their initial ideas or theories for all to view – promoting idea diversity with the potential of synthesising various ideas, leading to a more comprehensive understanding of the abstract. Lastly, we considered the Key Applications of Technology (KAT)[2] in designing the learning activities to help enhance the integration of the models with KB. Table 1 provides a summary of integrating the KB approach with the station rotation and CPA model, considering the KATs to enhance the learning experiences:

[2] Key Applications of Technology (KAT) are design guidelines on how learning processes are enhanced with the affordances of technology. There are eight KATs (Learning Together, Metacognition, Motivation, Personalisation, Scaffolding, Assessment for Learning, Conceptual Change, Differentiation) teachers could consider when designing and enhancing their lesson activities with the use of technology (ETD, 2024).

Table 1
Summary of the Lesson Design

<table>
<tr><th colspan="3">Topic: What are the factors that contribute to Globalisation?</th></tr>
<tr><td colspan="3">Key Concepts: Globalisation, Technological advancements in transportation, Technological advancements in digital technology, Growth of Multinational Corporations (MNCs)</td></tr>
<tr><th>KB Principle</th><th colspan="2">How the principle guides the lesson design</th></tr>
<tr><td>"Epistemic Agency"</td><td colspan="2">Student agency is encouraged when they take ownership to decide on the station to participate, own pace of learning at each station and be active contributors of their reflections and ideas as they learn as a community. Teacher act as a facilitator of their learning, supporting students to overcome any difficulties encountered during the lesson.
KAT: Technology allows for Differentiation and Personalisation as SLS allows content to be integrated and embedded using different media forms. Students access the content based on their readiness level and interests, at their own pacing, enhancing student agency.</td></tr>
<tr><td>"Idea Diversity"

"Democratising Knowledge"</td><td colspan="2">Students' idea contributions on the Interactive Thinking Tool (ITT) are displayed for all to view. This provide a platform of idea diversity where all are empowered to create and recognise as valid contributors of the community.

KAT: The SLS Interactive Thinking Tool (ITT) facilitates the process of Learning Together, and allows students to contribute, improve and build-on one another's ideas (ETD, 2024).</td></tr>
<tr><td>"Real Ideas, Authentic Problems"</td><td colspan="2">At each learning station, based on CPA model, students are given concrete "real" and/or visual manipulatives to help them learn the abstract concepts. There are four learning stations (Station Rotation Model) for four key concepts with a fifth station assessing their learning of the topics. Summary of each station as below:
<table>
<tr><td>Station one: Globalisation</td><td>CPA: Use of the game Jenga as a concrete manipulative, providing students with a concrete understanding on how countries are interconnected and interdependent to each other like Jenga blocks.</td></tr>
<tr><td>Station two: Transportation</td><td>CPA: A visual manipulative of animation of movements of all container ships around the world to illustrate visual representation on how transportation has developed and facilitates increased movement of people and goods, driving Globalisation.
KAT: Using videos to bring about Conceptual Change.</td></tr>
<tr><td>Station three: Digital Technology</td><td>CPA: Use of the old Nokia Phone 3310 model as concrete manipulatives. Comparison of older technology of communication (Nokia Phones) with smart devices (iPad) to provide students a concrete understanding of advancement in technologies, bringing about more connections and communications across the world.</td></tr>
<tr><td>Station four: MNC</td><td>CPA: Using the EdTech tool called Blooket, students are tested on their general knowledge of popular MNCs through a gamified approach with each Booklet question showcasing visual representations of MNCs. The enactive activity can help students understand the growth of MNCs as they recognise these international corporations in their everyday lives.
KAT: Increase Motivation through a gamified platform that can bring about understanding the role of MNCs.</td></tr>
<tr><td>Station five: Consolidation</td><td>In words (abstract), students at this station will state the three driving forces that they've learned on the SLS Interactive Thinking Tool as part of the consolidation.</td></tr>
</table></td></tr>
</table>

Research Questions

To evaluate the effectiveness of the design in cultivating students' interest and agency in learning Social Studies, two research questions would guide this study:

1. How does the Knowledge Building approach with Station Rotation and the Concrete-Pictorial-Abstract (CPA) models, enhanced with Key Applications of Technology, cultivate students' interest towards learning Social Studies?
2. To what extent does the Knowledge Building approach with Station Rotation and the Concrete-Pictorial-Abstract (CPA) models, enhanced by the Key Applications of Technology, cultivate student agency in learning Social Studies?

To address the first question, a post-survey with two items ("Do you prefer today's lesson over your other lessons? Provide an explanation". "Would you want to see more of such station-led lessons in the future?") was administered to capture students' perceptions of their interest in

learning during the Social Studies lesson. The first question required students to provide a yes or no response and relevant explanations. The second question was on a Five Point Likert Scale, asking students to rate "strongly disagree" to "strongly agree". The data would provide insights into how the integrative approach cultivated interest among students towards Social Studies.

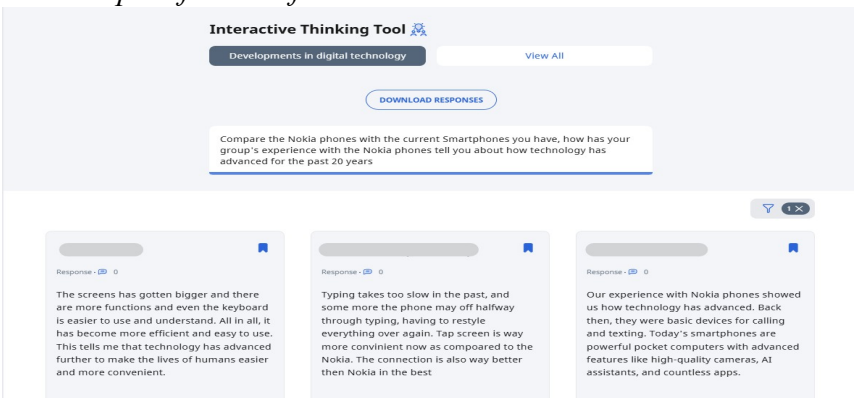
For the second question, calculating the number of contributions on the ITT at each stations would provide evidence of students taking active, autonomous roles in deciding and moving to each station, participate in the station's activity at their own pace and reflecting on their learning on ITT, all accomplished with limited to zero involvement from the teacher. Another measurable data point could examine the number of attempts made on embedded interactive activities on SLS, specifically at station 4 on the attempts made at the Blooket activity.

Findings

Out of the 33 student participants, 24 responded to the post-survey. For the first post-survey question regarding whether they preferred the lesson over other lessons, 100% responded "Yes". Analysis of their explanation to the question provided further insights, with 66.7% of the respondents indicating the lesson was "fun" or "less boring", suggesting such lessons provided students with a positive learning experience, nurturing a joy of learning. In addition, words like "hands on" and "interactive" were indicated by 9 respondents, while other explanations pertained to enjoying the Jenga or Nokia Phone concrete experiences. For the second post-survey question, 87.5% of the respondents indicated "strongly agree" (62.5%) or "agree" (25%) that they wanted to see more such lesson designs. In all, the findings suggested the benefits of integrative design in helping students to be interested and better engage with the Social Studies content they were learning.

In examining the second research question, the ITT facilitated the KAT of learning together, empowering students to be active contributors at each station. Figure 1 shows an example of the ITT for the third station:

Figure 1
An Example of an ITT for the Third Station



The number of contributions by students at each stations' ITT were as follows: station one – 32, station two – 28, station three – 26, station four - 27 and station five – 29. The data suggested active student agency where most took active, autonomous roles in deciding their choice and participation at each station, leading to contribution of their learning reflections and ideas at each station's ITT. Rather than being passive or reactive towards teacher's direct instructions, students were engaged in self-directed exploration. In addition, statistics from the Blooket

activity at the MNC station showed a total of 42 active participants, which is nine more than the number of actual participants. This further highlighted increased student agency where a few students made a deliberate choice to repeat the station (Blooket) activity, based on their interest in the content and/or activity.

Reflection and Conclusion

Reflecting on the findings, it was evident that this approach effectively cultivated student interest and agency in learning Social Studies. However, despite students' contributions leading to ideas diversity as observed at each stations' ITTs, the SLS tool was limited in function and was not suitable in encouraging students to further build-on, make improvements or engage in KB discourse. This observation aligned with Scardamalia and Bereiter's (2012) perspective that the progression of understanding of concepts in Social Studies, such as Globalisation, often does not emerge from sudden insights or "a-ha" moments typical in scientific inquiry. This meant that the process of build-on idea improvement in Social Studies does not come naturally for students. Instead, these ideas evolved through gradual increases in perceived complexity. Hence, this underscored the importance of intentional scaffolding in the KB process, particularly for abstract Social Studies concepts that require deeper engagement over time. To enhance the advancement of conceptual understanding, educators may consider implementing additional KB scaffolds, such as idea improvement prompts, reflective questioning, and iterative dialogue tools that encourage students to re-examine and refine their ideas continuously. By reinforcing these supports, future iterations of this approach may better facilitate students' ability to develop a nuanced understanding of complex Social Studies concepts, ultimately contributing to a more robust, enduring comprehension and student-driven learning of the concepts.

Furthermore, educators could consider designing a second lesson and build-on from this lesson, intentionally guided by the other KB principles of "Improvable Ideas", "Rise Above" and "Symmetric Knowledge Advancement", which could lead students to deepen their knowledge of the abstract concepts from their initial contributions from the first lesson. The affordance of technologies would enrich the advancement of conceptual understanding when educators consider KATs in implementing scaffolding and conceptual change on the platform they're using. Knowledge Forum (KF) might be a better platform for KB given the availability of theory-building scaffolds that can help guide students in contributing, build-on and improving each other's ideas through KB discourse (Scardamalia & Bereiter, 2014).

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors declare that no AI or AI-assisted technologies have been used to generate, refine, or correct the content in the manuscript. The ideas, design, procedures, findings, analyses, and discussion are originally written and derived from careful and systematic conduct of the research.

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