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Title	Scripting collaborative learning with the Spiral Model of Collaborative Knowledge Improvement (SMCKI)
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# Scripting collaborative learning

## WITH THE SPIRAL MODEL OF COLLABORATIVE KNOWLEDGE IMPROVEMENT (SMCKI)



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Designing meaningful Technology-Enhanced Learning (TEL) experiences and environments have always been a challenge for in-service and pre-service teachers. With the rapid proliferation of Information Communication Technology (ICT) tools, teachers need to have good knowledge on the affordances of various ICT tools and consider how to take advantage of these affordances to enhance teaching and learning. Good teaching in technology-rich classrooms is not just about technology but the integration of content, pedagogy, and technology (Koehler & Mishra, 2005).

In the practices of designing and implementing computer-supported collaborative learning (CSCL) experiences and environments for NIE student teachers, we leverage on affordances (e.g., a shared space to make all the students' thinking visible, peer-rating/editing function to make students work and improve on the same documents) of the technologies such as Padlet, GoogleDoc, Popplet, and AppleTree to enhance students' CoL processes and outcomes. During the process, many challenges which affect effective collaborative learning (CoL) have been identified. The challenges include: students tend to do more cooperative learning ("divide and conquer" approach) than collaborative learning (interdependence among group members); students tend to put a lot of effort on the administrative aspects of CoL (e.g., role division in terms of group leader, time manager, scribe, etc) than the idea improvement and knowledge advancement as an individual, as a group, and as a class; there are free riders in the groups, especially in a classroom where there is big class size.

How to better design and implement meaningful CSCL activities in a big student size classroom? In this course titled "The use of ICT in Character and Citizenship Education and Chinese Language Learning" (QCZ50C), a pedagogical model "Spiral Model of Collaborative Knowledge Improvement" (SMCKI) developed by A/P Chen Wenli, was leveraged to script student teachers' collaborative lesson design (CLD). SMCKI is a 5-phase model (Figure 1) to guide the design and implementation of collaborative knowledge improvement in a classroom by strengthening the collaboration among individuals in groups, and among the groups in a class. 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 of the knowledge. The phase 1 to phase 3 represents the process of knowledge divergence (individual - group - class) whereas phase

3 to phase 5 is about knowledge convergence (class - group - individual). Table 1 describes the 5 phases in detail.

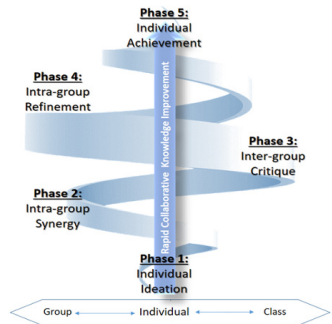


Figure 1. Spiral Model of Collaborative Knowledge Improvement (SMCKI) (Chen, et al, 2019)

Three SMCKI scripted CLD activities have been implemented. By scripting the collaborative learning process through SMCKI within a dynamic classroom setting, many issues and challenges faced by traditional CoL, e.g., freeloader member or group, lack of interdependence in the group, limited knowledge advancement, are addressed. Figure 2 shows the artefacts generated on the Padlet board by student teachers after 4 phases of SMCKI scripted CLD. Commencing from the first phase of individual ideation, each member populated their lesson design idea within the group board. Followed by a face-to-face discussion (Figure 3), an intra-group synergized idea was created and posted on the Padlet board ("Our Synergy" in Figure 2).



Figure 2. Student-generated artefacts on the Padlet Wall after 4 phases of SMCKI scripted CLD.

Table 1. Description of phases of SMCKI

SMCKI Phase	Description
Phase 1 Individual ideation	Within each group, participants generate ideas based on the requirement of the given task onto the designated online collaborative board. This is an individual process where no discussion should take place.
Phase 2 Intra-group synergy	Within each group, group members view the ideas of each group member. F2F discussions take place to synergize all ideas into one consolidated idea. The consolidated idea will be made explicit with the title "Our Synergy" on the online collaborative board.
Phase 3 Inter-group critique	Each member within each group is allocated one designated other group to view and critique. Upon completing their designated task, individuals are free to view other groups within the class.
Phase 4 Intra-group refinement	Members of each group return to their group to view the comments of other group members. An intra-group discussion takes place to decide if refinement needs to be made on the existing idea – either from comments or from ideas collected from the viewed groups.
Phase 5 Individual Achievement	Each individual reflects and/or completes their individual lesson design based on their collaborative work.

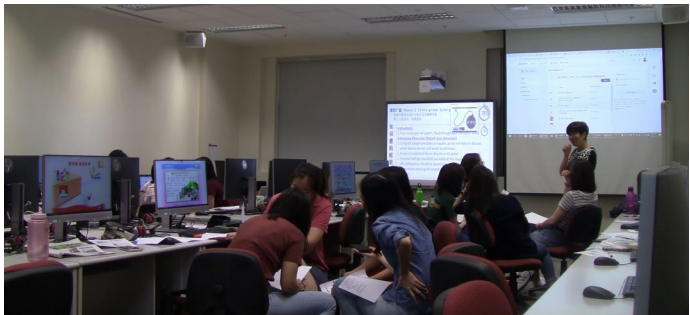


Figure 3. Students' face-to-face discussion in phase 2 (intra-group synergizing)

Collaborative knowledge improvement was further elevated through phase 3 inter-group critique. The participants posted their comments on the Padlet page of each group's synergised idea. In the 4th Phase, intra-group discussions took place to consider whether the comments from other groups were constructive and how to further refine the Phase 2 idea. A final refined idea was then generated after refinements were made (Latest Synergy in Figure 1).

To examine the effectiveness of the SMCKI-scripted CLD, the quality of student teachers' lesson design in phase 1, 2 and 4 was measured by TPACK (Technological, Pedagogical and Content Knowledge) coding framework (adapted from Zhang, Liu & Cai, 2019). Figure 4 shows the student teachers' improved quality lesson ideas from Phase 1 to Phase 3 (through intra-group synergizing), and from phase 3 to phase 4 (through inter-group critique). The gradual increasing trend from phase 1 to phase 4 shows participants' knowledge improvement over the SMCKI phases 1, 2 and 4.

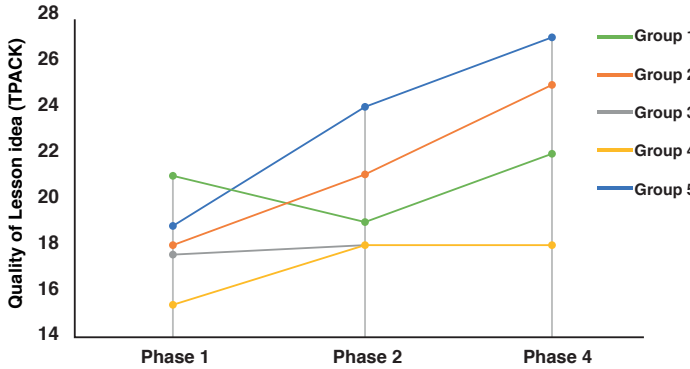


Figure 4. Students' lesson idea improvement across phase 1, 2 and 4

The SMCKI-scripted CLD lessons were well received by the student teachers. 95% of student teachers in the class agreed or strongly agreed that the CLD approach helped them to become better lesson designers. 87% student teachers agreed or strongly agreed that the SMCKI script was helpful for fruitful CoL.

In our teaching practices in fostering student teachers' 21st century competencies, in specific, communication and collaboration, SMCKI pedagogical approach was employed to script CoL in different online environments, and even learning environments without ICT tools where only paper and pencil were used. Figure 5 shows an example of student teachers' SMCKI-scripted CLD without ICT tools. The A3 sized paper was the Phase 2 synergized idea of one of the groups. The coloured sticky-notes are the comments from other groups, with each group represented by one colour. Figure 6 shows a snapshot of student teachers walking around the class viewing other groups' synergized group idea. Intra-group discussions took place and comments on sticky-notes were posted on the synergized A3 sized paper.

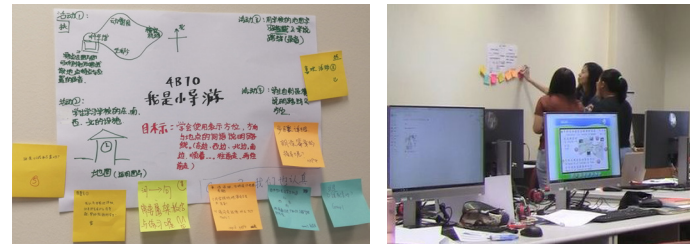


Figure 5 (left). An example of one group' SMCKI-scripted CLD without ICT tools - Phase 2 and phase 3  
Figure 6 (Right). student teachers walking around the class viewing other groups' synergized group idea

This attempt in using the SMCKI to script student teachers' CoL has been fruitful in both 1) improving their knowledge and competencies in lesson design, and 2) developing their 21st century competencies in communication and collaboration, creative and inventive thinking.

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