
Title	Core 3 research programme findings on inquiry-based teaching and learning and implications for classroom practice
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Core 3 Research Programme Findings on Inquiry-Based Teaching and Learning and Implications for Classroom Practice



By *Dennis Kwek*

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Introduction

The CORE Research Programme (CORE) began in 2004 and has since spanned 17 years of tireless data collection, research and analysis. CORE is primarily about the investigation into the nature of teaching and learning in Singapore schools on a large scale. It surfaces answers to the questions of “How do our Singapore teachers teach?”, “Why do they teach the way they do?” and “How do Singapore students learn?”.

Through the use of a multitude of research methods to triangulate the research data—from classroom observations to surveys to interviews—the programme aims to ascertain what really is happening in schools. Importantly, CORE is based on everyday classroom pedagogies, and we have been studying how teaching and learning has evolved over time as a result of policy initiatives, curriculum reforms and pedagogical innovations.

As a result, our work involves working closely with partners from the Singapore Ministry of Education (MOE) to support policy development and thinking so that our findings on actual classroom practices can result in improvements for the system, teachers and students.

The Instructional Core Framework

Embedded within CORE is the principle of Instructional Core—a simple framework with an underlying complex idea that says that learning occurs whenever we have *teachers* (or knowledgeable others) interacting with *learners* in the presence of *content*.

The key lies not only in teachers, learner and content, but also in the relationship between the three cornerstones in this framework: the enactment of teacher-student interactions and relationships; the design and delivery of content to students; and students’ engagement and learning of that content.

Progression of CORE

CORE has gone through three waves of data collection and research refinement, and is now heading towards the 4th iteration in 2022–2023. Since its first 3 iterations (CORE 1 to 3), it has seen an increase in MOE’s involvement to

enhance utility, rapid expansion on curriculum areas and grade levels as well as improvements to the timely reporting of findings to the ministry.

The sampled classroom lessons have increased from 600 to over 3,000 lessons at the end of CORE 3. Refinements were also made to the instruments used whilst looking at the nature of knowledge, interactions, classroom talk, assessment for learning and visible learning strategies. CORE 3 comprehensively explored all school subjects, which allowed us to design subject-specific pedagogical indicators to capture what teachers in the various subjects do in classrooms.

From the big picture perspective, we aim to talk about the following two research questions:

1. What have we found out about how classroom pedagogies have changed since 2004?
2. What have we found out about inquiry-based pedagogies in CORE 3, drawing from the SkillsFuture for Educators’ Inquiry-based Learning Areas of Practice?

Our data collection focuses mainly at the Primary 5 and Secondary 3 levels, although we have ventured into Secondary 1 for some subjects. Primary

5 and Secondary 3 were intentionally chosen because we recognised that while these are close to high-stake years in primary and secondary schooling, they are important levels for productive reforms to impact on.

Findings of CORE 1 to 3

Through a comparison of CORE 1 to 3 data sets, it is clear that teachers have become good at emphasising in terms of knowledge focus, drawing from the revised Bloom's Taxonomy model. Our teachers emphasise factual and procedural knowledge almost all the time in their teaching. This forms the basis of content acquisition and manipulation, important building blocks for further knowledge work.

Importantly, what has improved significantly is the emphasis on conceptual knowledge, from 2004 to the present, a clear evidence that our teachers have shifted from a traditional "banking" model that Paulo Freire (Freire, 1972) has talked about, to more higher-order and conceptually deep approaches.

Inquiry-Based Learning

The emphasis on metacognitive knowledge has also seen an increase, although not as much. The improved emphasis on conceptual, and to some extent, metacognitive knowledge is thus laying the groundwork for inquiry-based learning (IBL).

The pedagogical changes that have occurred with the increase in conceptual knowledge have arguably paved the way for the blending of other knowledge types, an expansion in the repertoires of

interaction structures and classroom talk as well as contributed to greater student voice and agency overall. We do observe a tighter coupling between conceptual and metacognitive knowledge as well, and a shift towards more varied forms of teacher feedback as a means of assessment for learning.

In our observations, we have noted that teachers tend to use whole-class lectures and quick triadic interactions in which the teacher initiates a question, the student(s) respond, and the teacher evaluates the response(s). This is known in literature on classroom talk as IRE sequences.

While these are staples of our Singaporean teacher's pedagogical toolbox, we also saw increases in the use of pair work and group work, and whole-class discussions. The use of whole-class dialogic discussions allow for the development of conceptual and disciplinary understanding, and provide generative opportunities for student voice and the surfacing of their thinking to the teacher and their peers.

Assessment for Learning

Teachers were also observed to use Assessment for Learning (AfL) strategies in their classroom teaching. We adapted John Hattie and Helen Timperley's types of feedback (Hattie & Timperley, 2007) to analyse our video-recorded lessons and found teachers increasing the use of task-level and process-level feedback, although we would have liked to see more self-regulation feedback in our lessons.

Peer and self-assessment strategies were deployed less often in the lessons observed. At the same time, Hattie's

Visible Learning strategies (Hattie, 2009) were observed to be enacted by teachers who communicated learning goals and, to a lesser extent, recapitulating their lessons.

Varying Readiness for IBL Practices

Using our comprehensive coding instrument, we mapped relevant practices to the SkillsFuture for Educators' (SFEd) 5 IBL Areas of Practices—selecting relevant inquiry; teacher reflections on beliefs/values/assumptions; planning meaningful and relevant AfLs; applying appropriate instructional strategies; and gathering, selecting and evaluating data. Bearing in mind the presentation's findings are exploratory in nature, we note positive but varying evidence of the use of IBL in our classrooms across a range of subjects.

Broadly, our findings show that teachers in some subjects are engaging students in specific IBL practices more so than in other subjects. This variation can be seen as an indication of the degree of readiness for certain subjects to embark on IBL practices.

For example, teachers in Primary 5 and Secondary 3 Mathematics tend to select relevant types of inquiry strategies in about 7 out of 10 lessons through connecting problem-solving and disciplinary understanding to everyday contexts. Likewise, Secondary 1 and 3 Literature teachers tend to select relevant types of inquiry in about 8 out of 10 lessons, especially through connecting authentic contexts with other school subjects.



In the selection of appropriate instructional strategies, a greater consistency is seen across the different subjects. Through strategies such as open questions, discussions, visible learning strategies, peer critiquing and reflection, teachers are able to engage students in IBL especially in subjects such as English, Mathematics, Science and Literature.

Teachers were also observed gathering and using information about student learning to reflect on their own teaching and make decisions about student learning. This is done through teachers using explicit and implicit assessment information in at least 7 out of 10 lessons across all subjects we observed.

Challenges of IBL

IBL is not without its challenges and constraints, despite the improvements over time on pedagogical practices and increasing opportunities for IBL practices. Drawing from our CORE 3 studies and a synthesis report on inquiry-based pedagogies (Kwek et al, 2019), we recognised that there are challenges such as:

- » time constraints;
- » the need to prepare for examinations;
- » curriculum coverage;
- » perceived student readiness to do IBL;
- » teacher readiness to conduct IBL;
- » classroom management issues;
- » varying degrees of teacher resistance to IBL;
- » students' negative perceptions towards IBL;
- » parents' negative beliefs towards IBL.

As Hattie points out, IBL is a powerful approach for developing deep learning and strong conceptual and disciplinary understanding. We believe that many of these challenges can be addressed through professional development to help teachers transform their practices.

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