

Misunderstandings of Teachers Applying ICAP Theory into Practice

Jesse Ha, Man Su, Michelene Chi, and Catherine Cullicott
jesseha@asu.edu, mansu@asu.edu, mtchi@asu.edu, ccullico@asu.edu
Arizona State University

Abstract: Interactive-constructive-active-passive (ICAP) is a theory of learning that differentiates students' engagement primarily on behavior. ICAP postulates that interactive engagement is superior for learning than constructive engagement. This paper discusses misconceptions of teachers during a 5-year project that attempted to translate ICAP into instruction. Teachers successfully implemented active mode but struggled to design appropriate constructive or interactive lessons.

Keywords: ICAP, Active learning, Constructive learning, Cognitive Engagement

Objective

This paper describes an analysis of modifications teachers made to lesson plans and classroom practice during a 5-year project that attempted to teach K-12 teachers via professional development (PD) about a theory of cognitive engagement called ICAP. ICAP stands for four cognitive engagement modes: Interactive, Constructive, Active, and Passive (Chi, 2009; Chi & Wylie, 2014).

This paper aims to use data from Chi et al. (2018) and take a more thorough approach by examining teachers' understanding of ICAP through analyzing teacher misunderstandings in 65 teacher lesson plans and materials as well as video recordings of all lesson implementations.

Theoretical framework

The ICAP theory was first introduced in Chi's (2009) study, in which the paper proposed three cognitive modes of engagement (active, constructive, and interactive), along with evidence in the literature in support of ICAP's predictions that interactive > constructive > active. ICAP was further extended in Chi & Wylie's (2014) study to include the passive mode because numerous laboratory and classroom studies in the body of literature contrasted the passive mode from active mode.

The four ICAP modes have a hierarchical relationship in that collaborative behavior requires that each student is individually generating with his/her partner's contributions; being generative often requires that students are physically manipulating, and physical manipulation requires that students pay attention to the content. In this way, one mode subsumes another mode in the following order: interactive subsumes constructive, which then subsumes active, which then subsumes passive, suggesting a hierarchical relationship in the order of learning outcomes, such that $I > C > A > P$.

Methods

Using lesson plans, lesson materials, and video recordings, we broke down each of the 65 lessons into activities (e.g. lecture with notes, lecture with guided worksheets, silent reading with questions). Then each activity was assigned an ICAP rating through an analysis of questions and problems posed in worksheets as well as implementation in videos. The criteria for assigning an ICAP rating was based on percentage of questions if a worksheet was used or percentage of time on each element of the activity. For example, popcorn reading in class may be considered active because some students are reading aloud; however, most of the class is passively listening as a percentage of each students' time on the activity. A worksheet that has nine recall questions with one generative question is classified as active since only 10% of the questions are constructive. We then gave a final ICAP rating to each lesson based on a majority criterion. For example, if a lesson had three constructive activities and two active activities, the lesson was rated as constructive.

Data sources

Chi et al. (2018) tested the effectiveness of the ICAP module in a K-12 charter school in the southwest. Thirteen teachers who completed ICAP module created either two or three sets of a pair of lessons designed to engage students in two different corresponding ICAP modes or "paired-lesson plans", except for one teacher designing a trio of lesson plans for one set of lessons. Six teachers created three sets of paired-lessons and seven teachers created two sets of paired-lessons. Thus, a total of 65 lesson plans were created for 32 topics. These lesson plans

were distributed across the ICAP modes in the following ways: 3 in the passive mode, 18 in the active mode, 21 in the constructive mode, and 23 in the interactive mode. Teachers then implemented each of the paired-lesson plans in two classes corresponding to the intentionally designed ICAP mode.

Results

Each lesson contained on average three activities excluding the pre- and post-test. Teachers had trouble designing their lessons to the intended ICAP mode, especially for constructive and interactive. Table 1 compares our ratings to teachers' intended mode, referred to as teacher self-ratings; the diagonal cells represent a match between the researcher and teacher ratings. There is a perfect match for active activities (18 out of 18), and almost perfect for passive activities (2 out of 3). That is, teachers were quite accurate at designing lower mode (passive and active) activities. On the other hand, Table 1 shows that teachers were far less accurate for designing higher mode activities. They were correct in only 8 out of 21 constructive activities and 9 out of 23 interactive activities. When teachers erred, they were most frequently biased toward the active mode. The teachers distributed their lesson plans across the three non-passive modes about equally (18, 21, 23). We rated 45 out of their 65 lessons to be in the active mode (see the Total column).

Table 1: ICAP Lesson Teacher Self-rating vs. Researcher Rating

	Teacher Self-Rating				
	Passive	Active	Constructive	Interactive	Total
Researcher Rating					
Passive	2				2
Active	1	18	13	13	45
Constructive			8	1	9
Interactive				9	9
Total	3	18	21	23	65

For intended interactive lessons, 16 out of 23 lessons, teachers incorrectly modified their lessons. Errors in lesson design included not ensuring the lesson was mainly constructive before adding interactive components and having students parallel process. Also, some teachers structured group work in a way so that students completed the lesson primarily individually. Analysis of the interactive lessons also found an interesting pattern. For 9 of the 23 interactive lessons, teachers incorrectly took an existing lesson and simply added group members without altering the instructional materials in any other way.

Scholarly significance

Results indicate that teachers have trouble using the ICAP framework for improving their lessons to either the constructive or interactive modes of engagement with fewer than half of lessons matching the intended mode. Furthermore, some teachers failed to change their lessons into the interactive mode correctly for two reasons including: (a) the lessons failed to engage students constructively; (b) collaborative work in lessons was not co-generative but rather parallel processing. In addition, some teachers incorrectly developed interactive lessons without making any changes to lessons other than just adding group members. Chi et al. (2018) also found that for intended constructive and interactive lessons, students work products contained mostly manipulative responses. Our results help explain why students may not have engaged commensurately.

References

- Chi, M. T. H. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, 1(1), 73–105. <https://doi.org/10.1111/j.1756-8765.2008.01005.x>
- Chi, M. T. H., Adams, J., Bogusch, E. B., Bruchok, C., Kang, S., Lancaster, M., ... Yaghmourian, D. L. (2018). Translating the ICAP theory of cognitive engagement into practice. *Cognitive Science*, 42(6), 1777–1832. <https://doi.org/10.1111/cogs.12626>
- Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49(4), 219–243. <https://doi.org/10.1080/00461520.2014.965823>

Acknowledgements

This research was funded by the Institute of Education Sciences (R305A150432).