

Michelene (Micki) T. H. Chi
Curriculum Vitae [current]
July 23, 2020 (older)

PERSONAL DATA

Birth Place:	Chiang-Mai, Thailand	
Immigrant:	From Indonesia (naturalized U.S. citizen at age 16)	
<u>Home Address</u>	<u>Office Address</u>	<u>Email & Phone</u>
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EDUCATION

1970	B.Sc. in Mathematics, Carnegie-Mellon University
1975	Ph.D. in Psychology, Carnegie-Mellon University
	Thesis: <i>The Development of Short-term Memory Capacity</i>
	Committee: David Klahr, Patricia Carpenter, and Herbert Simon (Nobel Laureate in Economics)

RESEARCH AND TEACHING POSITIONS

1970-1974	NIE Trainee, supervised by Prof. David Klahr, Cognitive Developmental Group, Dept. of Psychology, Carnegie Mellon University.
1974-1975	Post-Doctoral Trainee, The Experimental Group, supervised by Profs. Mike Posner & Steve Keele, Department of Psychology, University of Oregon
1975-1977	Post-Doctoral Fellow, supervised by Prof. Robert Glaser, Learning Research and Development Center (LRDC), University of Pittsburgh
1977-2008	Research Associate to Senior Scientist LRDC, University of Pittsburgh
1982-1990	Assistant to Associate to Full Professor, Department of Psychology, University of Pittsburgh
1990-2008	Professor of Psychology, Department of Psychology, University of Pittsburgh
1994-1998	Cognitive Program Chair, Department of Psychology, University of Pittsburgh
1996-2001	Adjunct Faculty Member, Section of Medical Informatics, University of Pittsburgh Medical Center
2008-2010	Professor, Psychology in Education, Graduate School of Education, Arizona State University (ASU)
2010-2012	Professor, Dept. of Psychology, College of Liberal Arts and Sciences, ASU
2012-2013	Foundation Professor, MLF Teachers College, ASU
2013-2015	Director, Learning Sciences Institute, ASU
2015 - present	Dorothy Bray Endowed Professor of Science and Teaching
2018 - present	Regents' Professor, ASU

GRANTS COMPLETED in 2013 and 2014

Using a Cognitive Framework of Differentiated Overt Learning Activities (DOLA) for Designing Effective Classroom Instruction in Materials Science and Nanotechnology. **M.T.H. Chi (P.I.)** & S. Krause (co-P.I.) (Materials Science Engineering), NSF Engineering Education Program, Award No. 0935235, \$400,000.

Comprehension SEEDING: Comprehension through Self-Explanation, Enhanced Discussion, and Inquiry Generation. Rodney D. Nielsen (P.I.) (Boulder Language Technologies, CO) and **M.T.H. Chi (co-P.I.)**, Institute of Education Science (R305A110811). Budget for ASU sub-award to Chi, \$409,003. (Coeus Award No. 024969-001).

GRANTS COMPLETED in 2015 and 2016

Learning from Observing Learning with Dynamic Simulations. **M.T.H. Chi (P.I.)**, The Spencer Foundation Major Grant Program, Award No. 200800196, \$500,000.

The ICAP Module: Guidelines for Teachers to Increase Students' Engagement with Learning. **M.T.H. Chi (P.I.)**, & Roy Levy (co-P.I.), Institute of Education Science, (R305A110090), \$1,399,212. (Coeus Award No. 024405-001).

GRANT COMPLETED in 2017

2015-2017 *Learning from Dialog versus Monolog Videos.* **M.T.H. Chi (P.I.)**, & Sara Brownell (co-PI), National Science Foundation, \$249,995.

CURRENTLY ACTIVE GRANTS

2015 – 2020 *Developing and Revising Instructional Activities to Optimize Cognitive Engagement.* **M.T.H. Chi (P.I.)** & Joi Merritt (co-P.I.). Institute of Education Sciences, \$1,456,185.

2015 – 2021 *Teaching the Crosscutting Concept of Emergent Cause-and- Effect to Overcome Misconceptions.* **M.T.H. Chi (P.I.)** & Joi Merritt (co-P.I.). Institute of Education Sciences, \$1,456,431.

2019 – 2021 *Improving Online Learning from Tutorial Dialog Videos.* **M.T.H. Chi (P.I.)** & Yi-chun Hong (co-P.I.). NSF IUUSE Proposal 1915150. \$600,000.

SCHOLARLY IMPACT

1993 Chi, Feltovich & Glaser (1981), (Publication #15 in the reference list) was identified as a Citation Classic.

2000 Chi (1997) (Publication #65), was noted in the editorial of the *Journal of the Learning Sciences* (Kolodner, 2000, p. 2), as one of its "most cited papers" on

- methodology.
- 2000 Highlighted in “Reach for the Stars,” a basic research poster session that showcased the research careers of distinguished scholars, AERA.
- 2002 Chi (1978) (Publication #12) was voted as the 7th “Most Fascinating Studies in Child Psychology,” as surveyed by the Society for Research in Child Development, published in their Oct. newsletter.
- 2006 Two papers (#15 & #41) were ranked 1st and 7th most highly cited papers published in *Cognitive Science*, (from Goldstone’s 2006 Editor’s report).
- 2007 Noted by the journal *Auditing: A Journal of Practice and Theory*, as one of its most frequently cited authors.
- 2014 Menekse, Stump, Krause & Chi (#110) received the William Elgin Wickenden Award from the American Society for Engineering Education, recognizing it as representing “the highest standards of scholarly research in engineering education published in the *Journal of Engineering Education* in 2013.
- 2016 Selected by the American Educational Research Association (AERA) as a Knowledge Forum Scholar to give a talk on my ICAP research as part of their “Ed-Talk” video series. <https://www.youtube.com/watch?v=uC-9IViDGL0&feature=youtu.be>
- 2016 Cited as one of the top most influential scholars in education research in a Brookings Institution study. <https://www.brookings.edu/wp-content/uploads/2016/07/influence-in-research2.pdf>
- 2016 “Commonsense conceptions of emergent processes: Why some misconceptions are robust” (2005, #88) was listed as one of the most cited papers on science education in the Web of Science database, ranked first under the subcategory, “Student’s thinking about science”.
- 2017 Chi, M. T. H. (2009). Active-Constructive-Interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, 1, 73-105. (#100) was the #1 most downloaded paper from the publisher’s website, at 3521 times, as of Sept. 2017.
- 2018 Two blogs @ my work: One by Grainne Canole, the other by Adam Abdulla, both from Great Britain.
- 2018 ICAP paper (Chi & Wylie, 2014) has been translated and published in Chinese. Titled “Engagement Means Competence: A Summary of the Research and Value of the ICAP Framework” written by QunLi Sheng—a professor at Zhejiang University. The article is published on Open Education Research in Chinese, Volume 23, No. 2, April 2017.

2018 Publications #41, #47, #65, #70, #73, #88, #118, #121, are lead articles, and #107 & #123 are extended lead articles.

2019 Google Scholar Page: Total citations exceed 52,000, h-index 73
<http://scholar.google.com/citations?user=AIW99VQAAAAJ&hl=en>

HONORS (Post Ph.D.)

Fellow and Scholar (all elected or invited)

1986 Fellow, Division 7, APA

1992 Fellow, Association for Psychological Science

1996 – 1997 Resident Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, CA

2002-2005 Fellow, Center for Philosophy of Science, Univ. of Pittsburgh

2003 One of the 7 inaugural Fellows, Cognitive Science Society

2013 Fellow, AERA

2016 Education Research Knowledge Forum Scholar, one of 32 scholars selected by a crowdsourcing method to engage with policy leaders in a forum about educational research; initiated on AERA Centennial' year.

Awards and Recognition

1977-1982 Spencer Fellowship, awarded by the National Academy of Education, for promising research and professional development contributing to the theory and practice of education.

1982 Boyd R. McCandless Young Scientist Award, presented by Division 7 of APA, for distinguished theoretical contribution and programmatic research efforts in the field of developmental psychology

2001 Cited in Carnegie-Mellon University's Centennial Magazine as one of its 87 most successful undergraduates

2006 Chancellor's Distinguished Research Award, Senior Category, for "innovative research of landmark impact in several research areas", University of Pittsburgh

2010 Elected to the National Academy of Education

2013 Faculty Achievement Award, for excellence in defining edge research/creative activities, Professional Application, ASU

2013 Sylvia Scribner Award, AERA, Division 3. The award recognizes a program of work that has significantly influenced thinking and research in the field of learning and instruction.

2014 Wickenden Award, from the American Society for Engineering Education, for a paper that shows "the highest standards of scholarly research in engineering education published in the *Journal of Engineering Education*" in 2013.

- 2014 MLF Teachers College Outstanding Research Achievement with Impact Award
- 2015 Dorothy Bray Endowed Professor of Science and Teaching
- 2015 Edward Lee Thorndike Career Achievement Award for Distinguished Contribution to Education, American Psychological Association, in recognition for original, scientific, and empirically-based research that contributes significantly to knowledge, theory, or practice in educational psychology.
- 2016 The AERA Career Award for Distinguished Contributions to Research in Education is the premier acknowledgment of outstanding achievement and success in education research. It is designed to publicize, motivate, encourage, and suggest models for education research at its best.
- 2016 Inducted into the American Academy of Arts and Sciences
- 2016 White House Meeting as a Knowledge Forum Scholar. February.
- 2018 Best Paper Published in *Journal of the Learning Sciences*: Awarded by the International Society of the Learning Sciences
- 2018 Recipient of the David E. Rumelhart Prize, from the Cognitive Science Society, for significant contribution to the theoretical foundations of human cognition funded by Robert J. Glushko and Pamela Samuelson Foundation.

Keynote or Plenary Speaker at Conferences (titles given below starting on p. 17)

- 1993 Keynote: The 10th International Conference on Machine Learning
- 1995 Keynote: The 17th Annual Conference of the Cognitive Science Society
- 1999 Keynote: Annual meeting of the American Society for Engineering Education, St. Louis, June.
- 2003 Keynote: The 10th European Association for Research on Learning and Instruction, Padova, Italy.
- 2006, 2007 Lead discussant on Transfer (2006) and Expertise (2007), at the National Science Foundation meetings, Oct. 2006, 2007.
- 2008 Keynote: The VI European Meeting in Conceptual Change, Turku, Finland
- 2010 Lead speaker: Communication Analysis Workshop, Tempe, AZ
- 2011 "Highlighted Session Speaker" at International Conference on Computers in Education, for the sub-conference track Computer-supported Collaborative Learning, Chiang-Mai, Thailand, Nov.
- 2012 Mastering Leadership Conference, sponsored by Pearson, Scottsdale, March.
- 2014 Sylvia Scribner Award Address, AERA, April.
- 2014 Plenary speaker on "Conceptual Change Across Domain: Science," for the Conceptual Change Sig on *Generic and Specific Issues in Conceptual Change in Science*, Bologna, Italy, August.
- 2015 Featured speaker at the "Rice Workshop on Personalized Learning," April.

- 2015 Award address: E.L. Thorndike Career Achievement Award, American Psychological Association, in recognition for original, scientific, and empirically-based research that contributes significantly to knowledge, theory, or practice in educational psychology, July.
- 2016 Public Scholarship Ed-Talk, presented at a Presidential Session on *Challenging Common Sense Conceptions of Learning*, Feb.
- 2016 Keynote speaker: “*Counter-intuitive Findings and Implications for Teaching from the Sciences of Learning.*” Snell Conference: Practicing the Art and Science of Teaching, Center for the Art and Science of Teaching, Oct.
- 2017 Invited as a featured scholar in the Wisconsin Ideas in Education Series (WIES) at the University of Wisconsin-Madison to present a talk titled: “*ICAP: A theoretical framework for how to engage students to promote deeper learning,*” Feb.
- 2017 Plenary speaker on “*Teaching Emergence: An Attempt at Differentiating Science Concepts of Processes*” at the National Association for Research in Science Teaching (NARST) conference for *Challenges in Learning Science Concepts*. April.
- 2017 Special presentation, at AERA Presidential Session on *Acquired Wisdom. Lessons Learned by Distinguished Researchers* with the session paper:
- 2017 Award address, presented at the Distinguished Contributions to Research in Education Award session: *Translating ICAP on Student Engagement into Practice*.
- 2017 Keynote at the TRUSE (Transforming Research in Undergraduate STEM Education) conference on STEM education hosted at St. Thomas University with the talk, “*ICAP: How to Promote Deeper Active Learning Engagement*”
- 2017 Keynote speaker at the National Conference on Technology-Enhanced Learning hosted by the National University of Singapore. Keynote titled, “*Implications of ICAP, a Theory of Student Engagement, for Technology-enhanced Practices*”.
- 2018 Keynote speaker, “*Conceptual change in understanding collective causality versus cumulative causalit,*” at the 2nd Interdisciplinary REASON Spring School hosted by the Munich Center of the Learning Sciences in Munich, Germany, March 2018.
- 2018 Workshop speaker, at the 2nd REASON Spring School hosted by the Munich Center of the Learning Sciences, Munich, Germany, March 2018.
- 2018 Keynote speaker, “*Teachers Translating a Theory of Cognitive Engagement into Practice,*” at the 11th Annual Subway Summit hosted by Columbia University, Teachers’ College, New York, NY, June 2018.

- 2018 Keynote speaker, “How to Promote Deeper Learning by Engaging Students Cognitively” at the College of Developmental and Educational psychology, Key Laboratory of Modern Teaching Technology, Ministry of Education Shaanxi Normal University in China
- 2018 Keynote speaker, “ICAP: How to Promote Deeper Learning by Engaging Students Cognitively,” at the 6th Computational Behavior Science Summit—Behavioral Data Analysis and Application in Wuhan, China
- 2018 Colloquium: “Why is it Important for Students to be *Constructive* While Learning?” presented to the Graduate College, Central China Normal University in Wuhan, China
- 2018 Colloquium: “ICAP: How to Promote Deeper Learning by Engaging Students Constructively.” Talk presented to the Tsinghua Institute of Education at Tsinghua University
- 2019 Plenary speaker, “ICAP: How to Promote Deeper Learning by Engaging Students Cognitively” at the Chicago Symposium Series on Excellence in Teaching Mathematics and Science at Northern Illinois University, Naperville, IL, Feb.
- 2019 Rumelhart Prize Address, “Translating the ICAP Theory of Cognitive Engagement into Practice” at the 41st Annual Conference of the Cognitive Science Society at Montreal, Canada July.
- 2019 Plenary speaker, “ICAP: How to Promote Deeper Learning by Engaging Students Constructively and Co-constructively” at the Annual Conference of the International Association for Medical Education in Vienna, Austria, August.
- 2019 Keynote speaker, “ICAP-A Framework for Active Learning,” presented at the curriculum retreat of Penn State Medical School, Hershey, PA, October.
- 2019 Simon Initiative Distinguished Lecture, “ICAP: How to Promote Deeper Learning by Engaging Students Cognitively,” Carnegie-Mellon University, Pittsburgh, November.

RESEARCH

Research Interests

I am basically a cognitive learning scientist interested in how students learn, and was trained originally as a cognitive developmental psychologist. My overarching interest is in understanding how students learn complex concepts in STEM (Science Technology Engineering and Mathematics) domains, as well as in ways to improve their learning. In short, my research on learning takes the perspective of the students, rather than the perspective of the instructors. Of course, understanding how students learn has direct implications for how instructors can teach to optimize students’ learning. I use both quantitative and qualitative methods. The qualitative coding methods are the ones that I have developed over the years for verbal explanations (see the first description of it in Publication #65 below).

I have several lines of active research. Three primary ones are briefly described here. First, I study ways of improving students' learning. In the past, this has included demonstrating how students can learn better by self-explaining (Publications #38, #41, #45, #46, #47, #58, #61, #69 #77, #79, #89, #104, #113, #115, #116, #117). Self-explaining is a constructive or generative activity, in which a student simply explains to herself while she is learning new materials, such as while reading.

This early work on self-explaining later developed into a theory of student engagement with instructional materials or instruction, such as a lecture. This theory, called ICAP, defines ways in which students engage cognitively with instructional materials by assessing their behaviors in terms of how they interact with instructional materials. ICAP defines four ways or modes that students can engage with instruction. They can behaviorally do nothing other than "pay attention" to instruction, such as listening. Paying attention is considered a *Passive* mode of engaging. They can be actively engaged by "manipulating" the instructional material without adding any new ideas or inferences, such as underlining text sentences or copying the solution steps of a problem. This is considered the *Active* mode. Students can also "generate" small pieces of knowledge or information that is beyond what was presented in the instructional materials, such as posing a question, self-explaining a sentence, compare-and-contrast two examples, and so forth. This is the *Constructive* mode, in that the students generated new information that was not originally presented in the instruction or instructional materials. For example, when they compare-and-contrast, they are generating similarities and differences not originally presented, or when they pose a question, the question was not originally presented in the materials. Finally, students can engage in the *Interactive* mode, which is to "collaborate" with another student, in a way that each partner is generative, moreover, they generate inferences and ideas by building upon each other's contributions.

Based on the hypothesized underlying cognitive processes, it is assumed that students' learning reflects the mode in which they cognitively engage with instruction, based on the behaviors they display that can be further confirmed by analyzing the products they generate. The prediction is that the *Interactive* mode is better for learning than the *Constructive* mode, which is better than the *Active* mode, with the *Passive* mode being the worst. Thus, students' learning decreases in this predicted direction: $I > C > A > P$. The predicted levels of student learning is borne out in hundreds of laboratory studies in the literature, that can be interpreted to map onto pairs of these modes. The predictions hold for all age group, all content domains, and all learning activities. For example, if a laboratory study compared how well students learn from making a concept map individual or collaboratively, the findings show that they learned more from doing it collaboratively. We describe next another example from a toddler study.

A classic finding in emergent literacy shows that toddlers whose parents not only read to them, but also engage them in "non-immediate talk," is related to children's later performance on measures of vocabulary, story comprehension, and definitions. "Non-immediate talk" was defined in a way that connotes generative/*Constructive* engagement: it is talk that "goes beyond the information contained in text or illustrations to make predictions; to make connections to the child's past experiences, other books, or the real world; to draw inferences, analyze information, or discuss the meaning of words..." (De Temple & Snow, 2003, p. 19). Thus, the benefit of parents reading to a toddler and engaging in non-immediate talk can be easily understood from the ICAP's perspective when focusing on the toddlers' participation: Toddlers engaged in non-immediate talk were being generative/*Constructive* whereas toddlers who were just read-to were being attentive/*Passive*, supporting the $C > P$ part of the $I > C > A > P$ hypothesis. Note that the mapping of interventions in published results to ICAP modes often requires that we transfer the focus of an intervention in terms of what the *learners* did (the toddlers in this case), rather than what the instructors/experimenters did (the parents in this case). So in the toddler study, the mapping is based on what the toddlers did, and not based on what the mothers did.

IES has funded and continues to fund our ICAP project because we are attempting to translate ICAP into practice, by developing a module for professional development (PD). Our first project has resulted in some very interesting findings, challenges, and lessons learned. This translation work is described in paper #123 in the publication list below. ICAP is also described in publications #100, #110, #113, #118.

A second line of work tries to understand why many science concepts or processes, taught in school curricula, such as diffusion, heat transfer, natural selection, and electrical current flow, are so difficult to learn with deep understanding. These are core concepts that students have to understand and are assessed on the Next Generation Science Standards. Instead, students typically hold robust misconceptions. I have developed a theoretical explanation for their difficulty and how to achieve conceptual change. See Publications #37, #42, #48, #50, #51, #56, #57, #59, #60, #63, #67, #70, #74, #76, #81, #88, #90, #98, #99, #106, #107, #108, #112, #120. The gist of the idea is that children grow up in environments in which their daily encounters with events, narrative stories, and other phenomena, enable them to understand these events, stories and phenomena as sequential, linearly causal events. Perhaps children have an innate predisposition to understand linear causality. Regardless of the underlying causes, they fail to understand emergent causality, a causality that arises from the interactions of multiple agents simultaneously. I am currently testing this theory by designing and developing an online module that teaches students this idea of emergence, then seeing whether knowing about emergence might enable students to better understand non-linear processes that they have to learn in school, such as concepts of diffusion and natural selection. This work is funded by IES.

A third line of work has been my interest in seeking optimal instructional methods and understand why they work. For example, I have explored why tutoring is an effective instructional method, from the students' perspective (Publications #66, #73, #84, #85, #95, #96, #97, #102, #114). More recently, I have proposed a new method of learning, by observing and overhearing human tutorial dialogs in videos instead of listening to didactic lecture-style monolog-videos. Such human tutorial dialogs can be easily captured in video files and delivered online. Basically, we found that students watching the dialog videos can learn as well as the tutees in the video files (Publication #96, #101, #111; #114, #121), and much better than learning from didactic monolog videos. This suggests that we can easily and cheaply scale up the advantages of human tutoring without the need for directly interacting with a tutor. Moreover, this method of learning is particularly beneficial for low performing students. Although we don't yet have a satisfactory explanation for why dialog-videos enhance learning more so than monolog-videos, we surmise that it may have to do with the social and motivational benefits of watching a peer (the tutee) struggling to learn, with the observing students sharing the same level of understanding as the tutee in the dialog videos in a college biology class. We just completed an NSF-funded project in which we compared students' learning from dialog versus monolog videos. Although we did not get the results we expected, we learned many lessons about carrying out interventions in authentic classrooms. This work has implications for a variety of application contexts, the most obvious one is optimizing ways of delivering online learning materials instead of a talking head. Papers relevant to this work are: #94, #96, #101, #111, #114, #121, #122.

Aside from these three lines of work, many of my research projects explore the benefit of collaboration. That is, we seek to understand what causes the benefits of collaboration (#64, #71, #78, #86, #94, #100, #110, #117, #118), and not just for learning but also for innovation. My current approach is to explore collaboration in the context of dialogic interactions, in terms of trying to capture two people co-constructing together. By co-constructing, we do not mean one person's ideas converging with another person's ideas (the predominant view in the literature on co-construction, see Publication #94), but we mean that in interacting, there is the potential of creating something new to both partners. We have empirically captured such innovations of new ideas in two separate studies, but because the frequency of creating ideas is low (about 10-15%), we have not tried to publish them. However, if novel

ideas and products can be co-constructed even in 5% of the times peers collaborate, that's an exciting outcome. In short, although difficult to capture, I believe co-constructing is an empirically tractable question, but a very difficult one. I am interested in pursuing this research area more actively in the future.

Another direction of this fourth line of research is a focus on how to enhance collaboration when students work in dyads. More specifically, we need to figure out how to help teachers understand that good collaboration requires that students engage in certain type of dialog pattern, not just having the appropriate conditions for collaborative work. Moreover, we have not figured out how to overcome the challenge of how to help teachers monitor and scaffold students to have productive collaboration. My interest in this challenging problem is addressed in this paper: #119.

I continue to write many papers on expertise (see Publications #2, #14, #15, #18, #19, #22, #23, #24, #29, #32, #35, #39, #44, #49, #52, #53, #54, #55, #82, #91, #93, #103, #105, #109).

PUBLICATIONS [The 20 most cited publications are indicated with their Google counts. Postdocs and students' names are underlined.]

Edited Books

1. Chi, M. T. H. (Ed.). (1983). *Trends in memory development research*. (Vol. 9). Basel: NY: S. Karger.
2. Chi, M. T. H., Glaser, R., & Farr, M. (Eds.). (1988). *The nature of expertise*. Hillsdale, NJ: Erlbaum. **[Google citations: 3,391]**
3. Durso, F. T., Nickerson, R. S., Schvaneveldt, R. W., Dumais, S. T., Lindsay, D. S., Chi, M. T. H. (Eds.) (1999). *Handbook of Applied Cognition*. England: John Wiley & Sons.

Papers

4. Chi, M. T. H., & Chase, W. G. (1972). Effects of modality and similarity on context recall. *Journal of Experimental Psychology*, 96, 219-222.
5. Chi, M. T. H., & Klahr, D. (1975). Span and rate of apprehension in children and adults. *Journal of Experimental Child Psychology*, 19, 434-439.
6. Chi, M. T. H. (1975). *The development of short-term memory capacity*. Doctoral dissertation, Carnegie-Mellon University, Pittsburgh, PA.
7. Chi, M. T. H. (1976). The representation of knowledge. *Contemporary Psychology*, 21, 784-785. (Review of Norman and Rumelhart's *Exploration in cognition*.)
8. Chi, M. T. H. (1976). Short-term memory limitations in children: Capacity or processing deficits? *Memory & Cognition*, 4, 559-572.
9. Chi, M. T. H. (1977). Age differences in memory span. *Journal of Experimental Child Psychology*, 23, 266-281.

10. Kail, R. V., Chi, M. T. H., Ingram, A. L., & Danner, F. W. (1977). Constructive aspects of children's reading comprehension. *Child Development*, *48*, 684-688.
11. Chi, M. T. H. (1977). Age differences in the speed of processing: A critique. *Developmental Psychology*, *13*, 543-544.
12. Chi, M. T. H. (1978). Knowledge structures and memory development. In R. Siegler (Ed.), *Children's Thinking: What Develops?* (pp. 73-96). Hillsdale, NJ: Erlbaum.
Reprinted in: (1993) *Worlds of Childhood Reader*, Wozniak R (ed.), 232-239. **[Google citations: 1,444]**
13. Chi, M. T. H. (1979). The growth and development of knowledge. *Contemporary Psychology*, *24*, 760-761. (Review of P. Ornstein (Ed.), *Memory Development in Children*.)
14. Chi, M. T. H., & Glaser, R. (1980). The measurement of expertise: Analysis of the development of knowledge and skill as a basis for assessing achievement. In E. L. Baker & E. L. Quellmalz (Eds.), *Design, Analysis, and Policy in Testing and Evaluation* (pp. 37-48). Beverly Hills, CA: Sage Publications.
(Abstract also published in *Evaluation Comment*, 1978, 5, 9.)
15. Chi, M. T. H., Feltovich, P., & Glaser, R. (1981). Categorization and representation of physics problems by experts and novices. *Cognitive Science*, *5*, 121-152. (a citation classic) **[Google citations: 7,103]**
16. Chi, M. T. H. (1981). Sources of memory development. *Proceedings of the North American Society for the Psychology of Sport and Physical Activity Annual Conference*.
17. Chi, M. T. H. (1981). Knowledge development and memory performance. In M. Friedman, J. P. Das, & N. O'Conner (Eds.), *Intelligence and Learning* (pp. 221-230). New York, NY: Plenum Press.
18. Chase, W. G., & Chi, M. T. H. (1981). Cognitive skill: Implications for spatial skill in large-scale environments. In J. Harvey (Ed.), *Cognition, Social Behaviors, and the Environment* (pp. 111-136). Hillsdale, NJ: Erlbaum.
19. Chi, M. T. H., Glaser, R. & Rees, E. (1982). Expertise in problem solving. In R. Sternberg (Ed.), *Advances in the Psychology of Human Intelligence* (Vol. 1, pp. 7-76). Hillsdale, NJ: Erlbaum.
[Google citations: 3,009]
20. Chi, M. T. H., & Gallagher, J. D. (1982). Speed of processing: A developmental source of limitation. Special Issue, H. Lee Swanson (Ed.), *Topics in Learning and Learning Disabilities*, *2*, 23-32.
21. Chi, M. T. H. (1983). The role of knowledge on problem solving and consumer choice behavior. In R. P. Bagozzi & A. M. Tybout (Eds.), *Advances in Consumer Research* (Vol. X).
22. Chi, M. T. H. (1983). Knowledge-derived categorization in young children. In D. R. Rogers & J. A. Sloboda (Eds.), *The acquisition of symbolic skills* (pp. 327-334). New York, NY: Plenum Press.

23. Chi, M. T. H., & Koeske, R. (1983). Network representation of a child's dinosaur knowledge. *Developmental Psychology, 19*, 29-39. **[Google citations: 600]**
24. Chi, M. T. H. & Rees, E. (1983). A learning framework for development. In M. T. H. Chi (Ed.), *Trends in memory development research* (Vol. 9, pp. 71-107), Basel, New York, NY: S. Karger.
25. Chi, M. T. H. (1984). Representing knowledge and metaknowledge: Implications for interpreting metamemory research. In F. E. Weinert & R. Kluwe (Eds.), *Learning by thinking* (pp. 239-266). Stuttgart, West Germany: Kohlhammer.
(Also reprinted in F. E. Weinert & R. H. Kluwe (Eds.) (1987). *Metacognition, motivation and understanding* (pp. 211-232). Hillsdale, NJ: Erlbaum.)
26. Chi, M. T. H. (1985). Changing conception of sources of memory development. *Human Development, 28*, 50-56.
27. Chi, M. T. H. (1985). Interactive roles of knowledge and strategies in the development of organized sorting and recall. In S. Chipman, J. Segal, & R. Glaser (Eds.), *Thinking and Learning Skills: Current Research and Open Questions* (Vol. 2, pp. 457-485). Hillsdale, NJ: Erlbaum.
(Abstract reprinted in the Franklin Institute Press, December 1980.)
28. Chi, M. T. H., & Glaser, R. (1985). Problem solving ability. In R. Sternberg (Ed.), *Human Abilities: An Information-processing Approach* (pp. 227-257). San Francisco, CA: W. H. Freeman & Co. **(Google citations: 485)**
29. Gobbo, C., & Chi, M. T. H. (1986). How knowledge is structured and used by expert and novice children. *Cognitive Development, 1*, 221-237.
30. Mitchell, A. A., & Chi, M. T. H. (1986). Measuring knowledge within a domain. In P. Nagy (Ed.), *The Representation of Cognitive Structures* (pp. 85-116). Toronto: Ontario Institute for Studies in Education.
31. Rabinowitz, M. & Chi, M. T. H. (1986). An interactive model of strategic processing. In S. J. Ceci (Ed.), *Handbook of the Cognitive, Social, and Neuropsychological Aspects of Learning Disabilities* (pp. 83-102). Hillsdale, NJ: Erlbaum.
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Invited Colloquia, Tutorials, Symposia, and Workshops since 1990 (this section includes the titles of the keynote addresses, which are listed on p. 5-6, but excludes conference talks, except for the most recent two years: 2017 & 2018.)

1990

Colloquium on *The Nature of Self-Explanations*, University of Colorado, January.

Workshop speaker on *Learning and Problem Solving in Students*. The Pittsburgh Area Independent School Teachers Association Annual Conference, Sewickley Academy, Pittsburgh, October.

1991

Workshop speaker on *Construction and revision of mental models during learning*. The Third Biannual Workshop on Cognition and Instruction, Pittsburgh, PA.

1992

Chi, M. T. H., de Leeuw, N., Chiu, M. H., & LaVancher, C. "Self-explanations improve learning." Poster presented at the NATO Advance Study Institute on Psychological and Educational Foundations of Technology-Based Learning Environments. Orthodox Academy, Kalymbari, Greece, July, 1992.

Chair/Discussant of the session on *Capturing and Modeling the Process of Conceptual Change in the Physical Sciences*. At the NATO Advance Study Institute on Psychological and Educational Foundations of Technology-Based Learning Environments. Orthodox Academy, Kalymbari, Greece, July, 1992.

1993

Colloquium speaker: "Self-explanations improve understanding: But do they promote conceptual change?" Presented at the Department of Psychology, Princeton University, Princeton, February.

Colloquium speaker: "Can misconceptions in science be removed?" Graduate Institute of Science Education, National Taiwan Normal University, Taipei, Taiwan, March.

Lecturer: "Self-explanations improve learning." At the Research Center of Cognitive Studies, National Chung Cheng University's conference on math education, Chia-yi, Taiwan, March.

Exhibit: "Constructing knowledge: How talking to yourself may improve learning." Carnegie Science Center, Pittsburgh, May 2-15.

Panel Discussant: "Conceptual change and the acquisition of expertise." *The Third International Workshop on Human and Machine Cognition*, Seaside, Florida, May. (I was the panel member invited to

represent the cognitive science view. Other members represented views from A.I., anthropology, situated cognition, and so forth.)

Paper Presenter: "Barriers to conceptual change in learning science concepts: A Theoretical Conjecture." *Cognitive Science Conference*, Boulder, June.

Symposium presenter: "Cascade and self-explanations." For the symposium *Cognitive models of problem solving*, Cognitive Science Conference, Boulder, June.

Keynote speaker: "The role of self-explanations as a form of knowledge construction." At the *Tenth International Conference on Machine Learning*, Amherst, June. (The Machine Learning conference invites a keynote speaker each year from an outside discipline. Other cognitive psychologists invited in the past were Doug Medin, Mike Posner, and so forth.)

Workshop participant and speaker: "Teaching for understanding." *Harvard Project Zero*, Boston, October.

1994

Invited Speaker: "What is learned in context?". Naturalistic Decision Making Conference, Dayton, Ohio, June.

Symposium speaker: "Stolen knowledge: Knowledge acquired through practice". Third Practical Aspects of Memory Workshop. University of Maryland, College Park, MD, August.

Colloquium speaker. "Self-explaining: An effective general learning skill?" New Mexico State University. Las Cruces, NM, December.

1995

Invited speaker: "Acquisition of concepts of processes." Creative Concepts Conference, Texas A & M University, College Station, Texas, May.

Speaker on "Creating Schools that Develop Expertise in Students." Workshop on The Gifted School. Hosted by OERI and Council for Exceptional Children. Tyson's Corner, Virginia, June.

Keynote speaker: "Revising a mental model as one learns." *The Seventeenth Annual Conference of the Cognitive Science Society*. University of Pittsburgh, Pittsburgh, PA, July.

Keynote speaker: "Self-explaining is the construction of a mental model" at the University of Memphis Conference on Reasoning, Memphis, Tennessee, September.

Invited speaker: "Learning from text by self-explaining." Clarion University, Clarion, PA, Nov.

1996

Workshop participant at Sage Foundation on *Literacy*, New York, April.

1997

Colloquium speaker, "How to Learn More Effectively", presented at Center for Advanced Study in the Behavioral Sciences, February.

Colloquium speaker, "Self-Explaining: A Domain-General Learning Activity". presented to the Education in Math, Science, and Technology group, U.C. Berkeley, March.

Colloquium speaker, "Self-Explaining: A Domain-General Learning Activity". presented to the

Center for Research in Mathematics and Science Education, San Diego State University, April.

Colloquium speaker, "Learning Compatible vs Incompatible Concepts: Incrementally versus Conceptual Change", presented to the Department of Psychology, Stanford University, April.

Guest Lecturer, Symbolic Systems, School of Education, Stanford University, June.

Colloquium speaker, "Conceptual Change in Learning Complex Concepts", presented to the Cognitive Science Program, Georgia Tech, November.

1998

Workshop speaker, "Current Research in Medical Education", presented at the Workshop on Formalizing the Informal: A Rationale for the Clinical Teaching of Medical Students and Residents. University of Pittsburgh Medical Center, Center for Continuing Education in the Health Sciences, March.

Presenter, "Learning Concepts of Equilibration Processes", at the Conference on Designing for Science, Learning Research and Development Center, April.

Tutorial speaker: "Discourse in Contexts of Learning", *Twentieth Annual Conference of the Cognitive Science Society*, Madison, WI, August.

Conference speaker, "Misrepresenting Complex Dynamic Systems as Events: A barrier to Learning Science", *EARLI Second European Symposium on Conceptual Change*. Madrid, Spain, November.

Speaker, "What Makes Human Tutoring Effective?" Circle Seminar Series on Tutoring. Carnegie Mellon University, December.

1999

Speaker, "What makes human tutoring effective?" National Science Foundation, Washington D.C., Jan.

Speaker, "Why are decentralized concepts so hard to learn?" at the UCI Conference on Decentralization. Sponsored by the Institute for Mathematical Behavioral Sciences and the Department of Economics, University of California at Irvine, February.

Speaker, "Assessment of Conceptual Change", presented to the Committee on the Foundation of Assessment, National Academy of Sciences/National Research Council, Board on Testing and Assessment, Irvine, CA, May.

Guest speaker, "Understanding Emergent Versus Causal Mechanisms: Overcoming Obstacles to Learning Science Concepts", along with Jay McClelland, at a Seminar on *How the Brain Learns*, Harrisburg, PA, June.

Keynote speaker: Annual meeting of the American Society for Engineering Education, St. Louis, June.

Colloquium speaker, "Misclassifying Processes as Objects and Emergence as Causality: Why We Misunderstand Many Complex Concepts and Phenomena". NEBARS at University of Connecticut, November.

Workshop speaker on Classroom and Tutorial Discourse. Organizers: Brian MacWhinney, Catherine Snow and Steven Bird. Carnegie Mellon University, Pittsburgh, PA, December.

2000

Speaker, "Emergent versus Causal Schemas", presented at an interactive symposium on

Conceptual Change and Complex Causality, organized by David Perkins, American Educational Research Association, New Orleans, April.

Distinguished Lecturer, "Assessment of Learning at Three Different Grain Sizes", presented at the American Society for Engineering Education Conference, St. Louis, June.

Presenter, "How Can We Enhance Students' Learning?" at a workshop of the University of Pittsburgh Medical Complex School of Profusion, Nov. 2000.

2001

"Why do students fail to understand *complex dynamic* type of concepts?" Presented in the symposium *Conceptual change and complex causality: Furthering the conversation*. American Educational Research Association, Seattle, April 2001.

Participant in a Workshop, sponsored by the Russell Sage Foundation, to react to their report on their Literacy Program. New York, NY, June 2001.

2002

Presenter, "Learning through collaborative observation of tutoring" at the CIRCLE Advisory Board Meeting, Pittsburgh, March.

One of the scholars whose work was highlighted at an American Educational Research Association poster session called *Reach for the Stars*. New Orleans, LA, April 2002.

Presenter, "Learning from physics text: Effects of interactive and observed discourse with tutors and peers", at a Symposium on Conceptual Learning from Scientific Text and Discourse, at the Society for Text and Discourse conference. Chicago, IL, June 2002.

Commentary provided for the Graduate Record Exam Symposium, at the Graduate Record Exam Board Meeting, Seattle, June 2002.

Workshop presenter, to help Office of Naval Research shape a new 6.1 ONR program on Cognitive Science and Human Performance. Las Cruces, NM, October 2002.

2003

Distinguished Speaker, "Emergent systems versus Causal Events: Schemas for Overcoming versus Generating Misconceptions in Science", presented for the Cognitive Science Colloquium Series, Department of Psychology, Georgia Tech, Atlanta, Georgia, March 2003.

Keynote speaker, "Emergent versus Commonsense Causal Processes: How Misconceptions in Science Arise and How They Can Be Overcome," presented at the 10th European Association for Research on Learning and Instruction, Padova, Italy.

2004

Keynote speaker, "How Students Learn". Colloquium on Teaching and Learning, Rensselaer Polytechnic Institute, May 2004.

2005

Discussant at the Adaptive Expertise Colloquium, organized by the LIFE Science of Learning Center, VaNTH Engineering Research Centers, and SRI International, Palo Alto, CA, Sept 2005.

2006

Participant at the Santa Fe Institute's Educational Outreach Workshop on *Complex Dynamic Systems*, Santa Fe, NM, March 2006.

Discussant for the symposium *How to support explanation in the classroom: The role of teachers and tasks*. American Educational Research Association meeting, San Francisco, CA, April 2006.

Lead discussant at the NSF workshop on *Transfer and Expertise*, Arlington, November.

Colloquium speaker, *Learning from Tutoring and Observing Tutoring Collaboratively*, OISE, Toronto, Canada, November 2006.

2007

Participant in the Evolution Challenge Workshop, Las Vegas, NV February.

Lead discussant on *Expertise* at the National Science Foundation meeting, Oct.

A discussant, along with Rich Shavelson, for a Presidential session on "Professional Expertise", Chicago, IL, April 2007.

2008

"Co-construction from Joint Explaining". Paper presented at International Conference of the Learning Sciences, Utrecht, Netherlands, June 2008.

Keynote address: "Qualitative misunderstanding of emergent processes." Presented at the VI European Meeting in Conceptual Change, Turku, Finland, August 16, 2008.

"Qualitative misunderstanding of emergent processes." Presented to Arts, Media and Entertainment, ASU, Oct 2008.

"Does Qualitative Understanding of Emergent Processes Transfer to Learning Science concepts? A Pilot Intervention." Presented a colloquium to kick off the colloquium series at Duke University's Science Center, Nov. 2008.

2009

"What are misconceptions and how might they be overcome?" Brownbag presented to the Applied Psychology Program, Polytechnic Campus, ASU, Feb 2009.

"Ways of optimizing student learning." Talk presented at K-12, Hendon, VA, May 7, 2009.

"Expert learners." Talk presented at the 36th Carnegie Cognition Symposium on Expertise June 2, 2009.

"Why are some processes so hard to understand? An instructional module targeted at misconceptions." Talk presented at the Cognitive Science Symposium on Transfer of Learning.

"Ways to optimize student learning: A learner-centered approach." Colloquium presented at the Cognitive Science Colloquium Series, Bloomington, Indiana, Oct.

"An instructional module targeted at misconceptions." Talk presented at the symposium From Child to Scientist: Mechanisms of Learning and Development, Carnegie-Mellon University, Oct

2010

"Using a Cognitive Framework of Differentiated Overt Learning Activities (DOLA) for Designing Effective Classroom Instruction in Materials Science and Nanotechnology," Michelene T.H. Chi, Stephen Krause, & Muhsin Menekse, a poster presented at the NSF-sponsored Awardee Conference, Reston, Va. Jan.

“Dialogue Analyses for Learning.” Paper presented at the *Communication Analyses Workshop*, Tempe, AZ Feb.

Discussant, for IES symposium *Solving Problems in School: Concepts, Procedures, and Instruction to Support Learning*, at the 2010 APS Annual Convention in Boston, May.

“Intelligent Tutoring Systems and Games for STEM instruction.” Invited participant at an ONR-sponsored workshop, UCLA CRESST, Nov.

2011

“Engaging Students with Differential Effectiveness: The ICAP (Interactive>Constructive>Active>Passive) Hypothesis.” Invited presentation at the *Frontiers in Education Workshop*, Pearson, Boston, Feb.

“Misconceived Causal Explanations for Emergent Science Processes.” Invited talk for the symposium *New Approaches to the Problem of Conceptual Change in the Learning of Science and Math*. Presented at the 33rd Annual Conference of the Cognitive Science Society, Boston, July.

“Students’ Self-explanations.” Invited talk for the symposium *Explanation-based mechanisms for learning: An interdisciplinary approach*. Presented at the 33rd Annual Conference of the Cognitive Science Society, Boston, July.

Panel member to discuss explanations for the impact of dialog, in *Socializing Intelligence Through Academic Talk and Dialogue*, Talk title was: “What accounts for the benefits of dialoguing or learning collaboratively, for learning?” Pittsburgh, Sept.

Highlighted session speaker, at the International Conference on Computers in Education, for the sub-conference track Computer-supported Collaborative Learning, Chiang-Mai, Thailand, Nov.

2012

Invited participant at a Gates Foundation M.I.T sponsored workshop on *Quality Matters*. Boston, MA: Jan. 24-25.

“ICAP: A Hypothesis Generated from a Framework for Differentiating Levels of Cognitive Engagement in Active Learning.” Invited talk for *Pearson’s Mastering Leadership Conference*, Scottsdale, AZ: March.

Invited participant in an NSF brainstorming session to discuss the potential synergies of having engineering education researchers partner with Engineering Research Centers (ERCs), which are ten-year, \$40M projects, Arlington, VA., March 6, 2012.

Invited participant in a workshop on *Optimal Teaching Workshop*, UC San Diego, May.

“Two Approaches to Enhancing Learning: Dialogue Videos and Engagement Activities.” Talk presented at the 2012 University/Microsoft Research Summer Institute, titled *Crowdsourcing Personalized Online Education*, Suncadia, WA: July.

“Two Kinds and Four Sub-types of Misconceived Knowledge, Ways to Change it, and the Learning Outcomes.” Colloquium to be presented to the Mathematics and Science Education Ph.D. Program, UC San Diego: Oct.

“Two Kinds and Four Sub-types of Misconceived Knowledge, Ways to Change it, and the Learning Outcomes.” Colloquium to be presented to the joint Cognitive Science and the Learning Sciences program, Northwestern University, Nov.

2013

“Overcoming misconceptions for conceptual understanding,” presented at the *Improving Middle School Science Instruction Using Cognitive Science*, A National Conference, sponsored by IES’s National R & D Center for Cognition and Science Instruction Conference, Washington, DC: May 21-22.

“Using the ICAP hypothesis to Design Instruction and Student Assignments.” Talk presented at the 2013 Gordon Research Conference on Chemistry Education Research and Practice, Newport, RI, June.

“Why are dialogues better instructional materials than monologues?” Paper presented at the symposium *Trends in Support for the Analysis of Collaborative Learning, Part 1: Support*, organized by Nikol Rummel & Tamara Van Gog, Ruhr-Universität Bochum: Aug. 2013.

2014

“ICAP: Differentiating four levels of engagement for active learning.” Presented at *How to Actively Engage Your Students: A Workshop on Active Learning*. Arizona State University: March.

“Differentiating 4 Modes of Engagement in Active Learning: From theory to practice.” Sylvia Scribner Award lecture, AERA, April.

“Generic and Specific Issues in Conceptual Change in Science,” Plenary panel presentation at the *Conceptual Change Sig* meeting at Bologna, Italy: August, 2014.

Invited participant at IES annual meeting, Sept. 2014.

Plenary speaker on “Conceptual Change Across Domain: Science,” Conceptual Change Sig meeting of the European Association for Research on Learning and Instruction, Bologna, Italy: August, 2014.

2015

“Modeling and correcting students’ misunderstanding for conceptual domains (especially in science).” Featured speaker at the Rice Workshop on Personalized Learning, Houston, TX: April 1.

“Differentiating four modes of engagement in active learning.” Colloquium speaker at the Learning Sciences Research Institute, University of Illinois at Chicago Circle: April 3.

Invited presentation on a panel on how fundamental principles of cognitive science, technology and data impact K-12 teaching and learning to the Carnegie Corporation of New York, NY: June 15.

Thorndike Award Address: “ICAP: A theoretical framework for ways of engaging students to promote deeper learning.” Presented at the American Psychological Association, July.

One of 32 outstanding scholars of education selected to participate in the AERA Scholars Retreat. Santa Fe, NM: October 1-4.

“Teaching the crosscutting concept of emergent cause-and-effect to overcome misconceptions.” Paper presented at the Conference on Complex Systems ’15. Tempe, AZ: September 29.

“Ways to enhance your understanding while you are learning.” Talk presented at Penn State University to their instructors and professors. State College, PA: October 19.

“Differentiating four modes of engagement for active learning: The ICAP framework.” A university-wide talk sponsored by the Schreyer Institute for Teaching Excellence Penn State University, State College, PA: October 20.

“Engaging students cognitively in active learning.” Talk presented at the AERA Coordinated Committee Meeting. Washington, DC: October 23.

“Robust misconceptions: What are they and how to overcome them.” Colloquium speaker at the Human Development Department Colloquia at Columbia University. New York, NY: November 3.

2016

Public Scholarship Ed-Talk, presented at the Presidential Session on *Challenging Common Sense Conceptions of Learning*, Feb.

“ICAP: A theoretical framework for active learning.” Presented to the Education Development Center (EDC), Inc. New York, NY. Feb. 24.

“ICAP: A theoretical framework for active learning.” Centennial colloquium speaker at 100th Anniversary Colloquium Series at Carnegie Mellon University Psychology Department. Pittsburgh, PA: April 19.

Poster presented at the Modeling and Model-Based Reasoning in STEM Conference at Purdue University titled, “Misconceptions in STEM are Misrepresentations of One Kind of Processes as Another Kind”. Lafayette, Indiana. August 26th.

Presented at the EnFUSE Symposium hosted by the NSF’s division of undergraduate education with the talk titled “Learning from Dialog versus Monolog Videos”. April. D.C.

Invited participant on an NSF-funded workshop to promote collaboration between cognitive science and discipline-based education research on STEM learning. Washington D.C. September, 2016.

Keynote speaker: “Counter-intuitive Findings and Implications for Teaching from the Sciences of Learning.” Snell Conference: Practicing the Art and Science of Teaching, Center for the Art and Science of Teaching, ASU, Oct.

2017

(For 2017 & 2018, I also include below conference presentations by myself, my students, postdocs, and my collaborators, with presenters’ names shown. Students & postdoc names are underlined.)

Chi, M.T.H. “*ICAP: A theoretical framework for how to engage students to promote deeper learning*,” at the Strengthening Institutional Linkages initiative Faculty Development Seminar, MLFTC, ASU, Jan.

Chi, M.T.H. Featured scholar in the Wisconsin Ideas in Education Series at the University of Wisconsin, “*ICAP: A theoretical framework for how to engage students to promote deeper learning*.” Madison, Feb.

Chi, M.T.H. Brown Bag: *“Translating ICAP on Student Engagement into Practice,”* Presented to the Graduate School of Education, Rutgers, Feb.

Chi, M.T.H. Brown bag presentation at the University of Pittsburgh’s Discipline-Based Science Education Research Center (dB-SERC) on: *“ICAP titled: ICAP: A Theoretical Framework for Active Learning to Promote Deeper Understanding.”* Pittsburgh, March.

Chi, M.T.H. Plenary speaker, *“Teaching Emergence: An attempt at differentiating science concepts of processes.”* National Association for Research in Science Teaching, Baltimore, April.

Chi, M.T.H. Presentation at Presidential Session on *Acquired Wisdom: Lessons Learned by Distinguished Researchers*, AERA, April.

Chi, M.T.H. Award address for the Distinguished Contributions to Research in Education Award: *“Translating ICAP on Student Engagement into Practice”*, AERA, April.

Bowers, N., Jordan, M., & Chi, M.T.H. presented a paper at AERA at the *Everyday Science* session titled, *“Identifying Ontological Difficulties in Causal Explanation of Everyday Science”*. May.

Adams, J. & Chi, M.T.H. presented a paper presented at AERA 2017 titled, *“How Should Collaborative Pairs Be Grouped?”*

Bruchok, C. & Zillmer, N. & Chi, M.T.H. presented a poster titled, *“Teaching Teachers to Differentiate Learning Behaviors: Translating Learnings from Interactive>Constructive>Active>Passive Into Professional Development,”* at AERA .

Stump, G., Li, N. & Chi, M.T.H. presented a poster titled, *“Utilization of the Interactive, Constructive, Active, and Passive Framework to Analyze Student Learning,”* at AERA, May.

Chi, M.T.H. Keynote speaker at the TRUSE conference on STEM education, hosted by St. Thomas University, *“ICAP: How to promote deeper active learning engagement.”*

Chi, M.T.H. Keynote speaker, *“ICAP: How to promote deeper active learning engagement,”* presented at the National Conference on Technology-enhanced Learning, hosted by the National University of Singapore, Nov.

2018

Adams, J., & Chi, M. T. H. (2018, February). *Fostering Collaboration in Engineering Classrooms.* Poster presented at the 2018 ASU Learning Innovation Showcase, Tempe, AZ.

Caplan, M. R., & Chi, M. T. H. (2018, February). *Dialogue vs monologue videos in engineering classrooms.* Poster presented at the 2018 ASU Learning Innovation Showcase, Tempe, AZ.

Ding, L., & Chi, M. T. H. (2018, February). *Using monologue- and dialogue-videos in an authentic flipped college-level biology course: A 2-year study.* Poster presented at the 2018 ASU Learning Innovation Showcase, Tempe, AZ.

Lai, P., & Chi, M. T. H. (2018, February). Emergence thinking for understanding science. Poster presented at the 2018 ASU Learning Innovation Showcase, Tempe, AZ.

Morris, J. A., & Chi, M. T. H. (2018, February). Developing and revising instructional activities to optimize cognitive engagement. Poster presented at the 2018 ASU Learning Innovation Showcase, Tempe, AZ.

Keynote. Chi, M.T.H. *“Conceptual change in understanding collective versus cumulative causality.”* Presented at the 2nd Interdisciplinary REASON Spring School, Munich Center for the Learning Sciences, Munich, Germany, March.

Workshop speaker, Chi, M.T.H. *“Principles and methods of coding qualitative data.”* Presented at the 2nd Reason Spring School, Munich, Germany.

Keynote speaker, Chi, M.T.H. *“Teachers translating a theory of cognitive engagement into practice,”* To be presented at the Subway Summit conference, Teachers’ College, Columbia University, June.

Chi, M. T. H. (2018, June). *Concrete definition of beneficial collaborative dialogues.* Poster to be presented at the 13th International Conference of the Learning Sciences, London, United Kingdom.

Ding, L., Adams, J., Stephens, M. D., Brownell, S., & Chi, M. T. H. (2018, June). *Failure to replicate using dialogue videos in learning: Lessons learned from an authentic course.* Paper to be presented at the 13th International Conference of the Learning Sciences, London, United Kingdom.

Chi, M. T. H. (2018, July). How students engage to learn. Paper to be presented at the 40th Annual Meeting of the Cognitive Science Society, Madison, WI.

Chi, M.T.H. Invited paper, *“Learning the underlying structures of causal and acausal processes* presented at the symposium Learning-to-learn from novice to expertise: New challenges and approaches for one of the oldest topics of cognitive science. Symposium organized by Perez, R., Gray, W. D (2018, July) at the 40th Annual Meeting of the Cognitive Science Society, Madison, WI.

SERVICES (EXTERNAL)

Advisor or Consultant on Executive Committees, Boards, etc. (listing since 2007 only)

Participated in a meeting on 21st Century Skills, Sponsored by the Spencer and Russell Sage Foundations, New York, May, 2007.

A member of a 3-member visiting team to participate in the self-study process at Teachers College, Columbia University, for their Psychology and Education Program, December, 2007.

A member of the Executive Committee of the Pittsburgh Science of Learning Center, 2004-2009.

Consultant: “Adaptive Simple Sequencing Instruction Support Toolkit”, SBIR Phase II, Intelligent Automation, Inc. July 2007.

Mentoring Spencer postdoctoral fellows at the National Academy of Education, at the Keck Center, Washington, Feb. 2011.

A member of the Standing Review Committee, National Academy of Education, 2011-2014.

Co-chaired the inaugural conference on Learning@Scale, sponsored by ACM, 2013-2014.

A Member of Advisory Boards (since 2008 only)

Advisory board for a grant by Ronald L. Miller P.I. (Professor of Chemical Engineering, Colorado School of Mines) "Developing ontological schema training methods to help students develop scientifically accurate mental models of engineering concepts." NSF Engineering Education Program. 2006-2011.

Advisory board for two grants (IES and NSF), to Wayne Ward and Ron Cole, Boulder Language Technologies, to improve science learning in third, fourth and fifth grades through spoken dialog interaction with a virtual tutor (2008-2011)

Advisory board for the Center for Advanced Technology in the Schools (CATS), Led by Jim Stigler from UCLA Psychology, Greg Chung and Eva Baker of UCLA Center for Research on Evaluation, Standards, and Student Testing (CRESST). The Center will combine research on cognitive psychology, assessment, and games in the area of middle school learning (2008-2011).

Advisory board for an NSF grant on Cumulative Learning using Embedded Assessment Results (CLEAR), Marcia Linn and Chad Dorsey, co-P.I.s, Berkeley, CA. (2009-2012)

Advisory board for a NSF funded project Transfer of Perceptually Grounded Principles, Rob Goldstone and Sam Day, Indiana University (2009-2011).

Advisory board for a CAREER Award, The Role of Conceptual Change in Knowledge Acquisition, Andrew Shtulman, Dept. of Psychology, Occidental College, Awarded 2010-2015.

Advisory board on College Ready Work, for the Bill and Melinda Gates Foundation, (2010-2013).

Advisory board for an NSF grant, An Integrated Model of Cognitive and Affective Scaffolding for Intelligent Tutoring Systems, by Dr. James Lester (Dept. of Computer Science), North Carolina State University, Awarded 2010.

Advisory board for an NSF Career Award, In-class Peer Tutoring, by Dr. Shane Brown, Dept of Civil & Environmental Engineering, Washington State University, 2010-2015.

Advisory board for an NSF Career award, A Cognitive Science of Explanation, Tania Lombrozo, Dept. of Psychology, UC Berkeley. 2011-2016.

Advisory Board for an NSF Career Award, A Rational Analysis of How Teachers' Examples Constrain Learning and Inference. Dr. Patrick Shafto, Dept. of Psychology, University of Louisville, 2012-2017.

Advisory Board for NSF REESE project Digital Games as Analogical Sources for Science Learning, Wendy Martin, Center for Children and Technology/Education Development (2014-2016).

Re-imagining Video-based Online Learning, Dr. Joanne Lobato, Dept. of Mathematics and Statistics, San Diego State University, 2014-2016.

Advisory board for NSF funded project: Learning by Teaching a Synthetic Peer: Investigating the effect of tutor scaffolding for tutor learning. Drs. Noboru Matsuda, Ken Koedinger, William Cohen, Human-computer Interaction Institute, Carnegie-Mellon University, 2013-2016.

Advisory Board for MIT's Online Education Policy Initiative, the initiative is supported by the Carnegie Foundation and the National Science Foundation, Nov. 2014-2016.

Advisory meeting at the meeting on the Science of Learning & Development (SoLD) hosted by the Chan Zuckerberg Initiative, June, 2017.

Served on the advisory board for an IES funded project called CourseMirror (PI: Muhsin Menekse), 2018

National Committees

1979-1981	Elected Secretary of Division C, American Educational Research Association
1980-1984	Cognition, Emotion and Personality Research Review Panel, National Institute of Mental Health
1985-1986	Cognition and Survey Research Committee, Social Sciences Research Council
1989-1990	Publications Committee, Governing Council of the Society for Research in Child Development
1989-1991	Committee on Techniques for Enhancing Human Performance, National Research Council, National Academy of Sciences
1992-1993	GRE External Advisory Committee on Reasoning in Context, Educational Testing Service
1993-1999	Board of Governors, Cognitive Science Society
2001	Review Panel for ROLE (Research On Learning and Education) Proposals
2001	Guest speaker on the GRE Board, Educational Testing Service
2005-2006	Dissertation Selection Committee, the Spencer Foundation
2005-2007	IES Math and Science Review Panel
2007-2009	Fellows Selection Committee, Cognitive Science Society
2007-2008	Reviewer for Fellow Selection, Center for Advanced Study in the Behavioral Sciences
2010-2012	Member of the review panel for Spencer's Small Grant program.
2012	Member of the Selection Committee for this Inaugural Year for the AERA Div. C Early Career Award
2011-2013	Member of the Standing Review Committee of the National Academy of Education
2013-2015	Fellows Selection Committee, Cognitive Science Society
2014-2017	Chair of the Research Advisory Committee, AERA
2017-2018	Participant in the Science of Learning and Development (SoLD) meeting of the Chan-Zuckerberg Initiative
2015-2020	Selection committee, Sylvia Scribner Award

Editorial Boards

1985-1990	Cognitive Development
1987-1992	Human Development
1990-1998	Journal of the Learning Sciences
1993-1995	Cognition and Instruction
1993-1995	Co-Editor of Lawrence Erlbaum Series: Human and Machine Expertise
1993-1996	Behavioral Research in Accounting
1993-1995	Cognitive Science (Senior Editor)
1996-1997	Cognitive Science
2000-2003	Journal of the Learning Sciences

Current: Routinely review for many journals.

Mentoring

I frequently mentor postdocs and graduate students, such to the Spencer postdoctoral and pre-doctoral fellow, sponsored by National Academy; or talk to junior faculty and graduate students about academic careers, organized by conferences, such as for AERA's Division C Faculty Mentorship Program. April.

Dissertation committee for non-ASU student

Most recently, I served on the dissertation committee for Toi Sin Arvidsson, a Ph.D. Student at Teachers' College, Columbia University, 2018.

Teaching

2017 DC1791: Proposal Writing Seminar, MLFTC, ASU.
 2018 DCI 790: Reading and Conference, DCI 792: Research, MLFTC, ASU.
 2020 DCI 691: Improving Teaching and Learning, MLFTC, ASU

SERVICES (LOCAL, only major effortful ones are listed below)

Committees (2001-present)

2000-2001 Ad Hoc Tenure Review Committees (at the University Level)
 2000-2002 Selection Committee (to select faculty members for the University level Ad Hoc Tenure Review committees)
 2004-2007 Member of the Executive Committee of the Pittsburgh Science of Learning Center
 2007-2008 Chancellor's Distinguished Research Award Committee
 2013-2014 Director of the Arizona State University Learning Sciences Institute

Major Conferences Organized

1982 The Nature of Expertise, Pittsburgh, PA
 2008 Talk, Dialogues, and Learning (also included organizing a festschrift for L. Resnick), Pittsburgh, PA
 2013-14 Co-chaired the inaugural conference on Learning@Scale, Atlanta, March, 2014

Postdocs Mentored and their current position

Paul Feltovich (1978-80), Senior Research Scientist, Florida Institute for Human and Machine Cognition
 Mitch Rabinowitz (1980-82), Professor, Dept. of Psychology, Fordham University
 Camilla Gobbo (1983-84), Professor emeritus, Dept. of Psychology, Padova University, Italy
 Matthew Lewis (1984-85), Executive Vice President, Interactive Video Technologies
 Miriam Bassok (1985-87), Prof., Dept. of Psychology, Univ. of Washington
 Peter Reimann (1984-88), Professor, University of Sydney, Australia
 Jean Hutchinson (1986-88) Professor, Department of Geological Sciences and Geological Engineering, Queen's University
 Miriam Reiner (1988-89) Head of the Virtual Reality and NeuroCognition lab at the Technion-Israel Institute of Technology.
 Joanne Striley (1988-89) Professor, Department of Teacher Education, Michigan State University
 Mei-Hung Chiu (1990-91), Professor and chair, Graduate Institute of Science Education, National Taiwan Normal University.

Takeshi Okada (1994-95), Professor, Graduate School of Education and Interfaculty Initiative in Information Studies, The University of Tokyo, Japan

Michel Ferrari (1996-1998), Associate Professor, Ontario Institute for Studies in Education, Toronto

Cindy E. Hmelo (1996-1998), Professor & Director of Institute, School of Education, Indiana University

Judith McQuaide (1998-1999), Senior Researcher Manager, National Education Association

Takeshi Yamauchi (1998-2000), Associate Professor, Dept. of Psychology, Texas A&M

Heisawn Jeong (1998-2000) Professor in Cognitive Science and Learning Sciences, Hallym University, Korea

Randy Engle (2001-2003), Assistant Professor, Berkeley School of Education (deceased)

Marguerite Roy (2001-2003), Research Analyst, Medical Council of Canada

Agnieszka Kosminska Kristensen (2003-2005).

Scotty Craig (2005-2007). Associate Professor, Arizona State University

Kirsten Butcher (2005-2007). Associate Professor, University of Utah

Jing-Wen Lin (2007). Faculty, Department of Science Education, National Taipei University of Education, Taiwan

Paul E. Hand (2009-2010)

Kasia Muldner (July 1, 2010-2012), Associate Professor, Carleton University

Glenda Stump (June 1, 2010-2012; 2014-15). Education Research Scientist, Open Learning, MIT

Ruth Wylie (Dec. 1, 2011), Associate Director, Science of the Imagination Institute, ASU.

Seokmin Kang (July 16, 2012-2015), Teaching faculty, Hallym University, Korea

Kathleen McEldoon (2013-2015), Deputy Director of Research, Tennessee State Board of Education

Matt Lancaster (2012-2014), Assistant Professor, Department of Psychology, Lourdes University

Susan Trickett (2013-2014), Knowledge Management Specialist, Denver Public Schools

Na Li (2013-2016), Assistant Professor, Shenzhen Institute of Advanced Technology (SIAT), Chinese Academy of Sciences (CAS), visiting scholar at University of Southern California

Emily Bogusch (2014-2015), Mathematics Teacher (11th /12th grade), Phoenix Coding Academy, Phoenix, Arizona.

Nicole Zillmer (2016), Director of Research, Authentic Connections, Arizona State University

Polly Lai (2017-2020), Lecturer, Learning and Teacher Development, Queensland Institute of Technology, Australia

Joshua Morris (2017-2019), Assistant Professor, College of Education and Human Services, University of Illinois

Lu Ding (2017-2019) Instructional Designer, Faculty Development and Innovation Center, Eastern Illinois University

Soojeong Jeong (2019-current)

John Cho (2019-current)

Yingxiao Qian (2019-current)

Graduate Students

Christopher Roth (M.S. 1983);

Gao Man (M.S., School of Education, 1986)

Rebecca Leas (Ph.D., 1992; Department of Physical Education). Professor at Clarion University of Pennsylvania.

Jeffrey Sampler (Ph.D., 1992; Katz Graduate School of Business)

James Slotta (Ph.D., 1997), Junior Chair, Associate Professor, Ontario Institute of Education.

Heisawn Jeong (Ph.D., 1998), Associate Professor, Hallym University, Korea

Christine Carlock (M.S. 1999; Ph.D. Katz Graduate School of Business), Assoc. Professor, Univ. of Connecticut

Ahmad Hashem (Ph.D., Psychology and Informatics, 2000), Global Healthcare Industry Manager, Microsoft
Nick de Leeuw (M.S. 2000), Adjunct Professor of Psychology, Vassar College
Stephanie Siler (M.S., 1998). Research Associate, Dept. of Psychology, at Carnegie-Mellon University.
Roger Taylor (M.S., 2002). Assistant Professor, CUNY.
Bob Hausmann (M.S., 2001; Ph.D. 2005, Psychology). Research Associate, Carnegie-Learning.
Rod Roscoe (M.S. 2004, Ph.D. 2007, Dept. of Psychology)
Soniya Gadgil (Masters, 2009, Dept. of Psychology, University of Pittsburgh)
Stephanie Touchman (Science Education, College of Education, ASU), 2009-11
Cheryl Berg (Science Education, College of Education, ASU) – graduated 2011
Brenda Fonseca (Psychology in Education, College of Education, ASU)
Muhsin Menekse (Science Education, College of Education, ASU), Ph.D. 2012
Floris Blankenstein—A visiting student from Maastricht University, Holland
Rachel Lam (Education), Ph.D. 2012
Dongchen Xu (Psychology), M.S. 2015
Christi Bruchok (Education), 2015-2016
Joshua Adams (Education), 2014-2019
Man Su (Education)