

MICHAEL J. JACOBSON, PH.D.

Research Professor and Chair of Education
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Professional Experience

The University of Sydney, Sydney School of Education and Social Work. Research Professor and Chair of Education, Co-Director of the Learning, Cognitive, and Brain Sciences Research Group, and Honorary Associate in the *University of Sydney School of Medical Sciences* (2015 to Present); CO-Director of the CoCo Research Centre, Deputy Director, Institute for Innovation in Science and Mathematics Education (IISME), Coordinator, Master of Learning Sciences and Technology program (May 2008 to 2014).

- Promote and coordinate research activities in reserach groups, centres, and institutues.
- Conduct learning sciences research into how technologies may be designed and used to enhance or augment learning of conceptual challenging knowledge.
- Current research focuses on learning about complexity and complex systems in educational virtual worlds and agent-based modelling and visualization systems.
- Supervise masters and doctoral students' research projects.

National Institute of Education, Nanyang Technological University. Associate Professor, Learning Sciences Laboratory (LSL) and Learning Sciences and Technologies (LST) Academic Group (June 2005 to May 2008).

- Helped established the Singapore Learning Sciences Laboratory, the first research center devoted to conducting learning sciences oriented research in education in Asia.
- Conducted learning technology, knowledge transfer, and conceptual change research in challenging conceptual domains involving the use of multi-user virtual environments, hypermedia learning environments, agent-based modelling, and collaborative learning systems.
- LSL *Science as Systems* Strand Leader.
- Taught graduate level courses and supervised masters and doctoral students in the LST Academic Group.

Korea University. Senior Associate Director, Center for Teaching and Learning, and Adjunct Associate Professor, College of Education (September 2003 to June 2005).

- Helped establish the Center for Teaching and Learning.
- Responsible for budgeting and day-to-day operation of all faculty and student related initiatives at the CTL; supervised two researchers and approximately 20 staff, student research assistants, and student workers.
- Taught undergraduate and graduate courses in educational technology and education.
- Directed the Adaptive and Collaborative Learning Technologies research group.
- Was the first non-Korean to have a regular faculty position at Korea University in its 98 year history.

New England Complex Systems Institute. Affiliate (November 1999 to Present).

- Member of program committee for the Fourth International Conference on Complex Systems. (2002)
- Organizing committee member for the Third International Conference on Complex Systems (2000) and the National Initiative on Complex Systems in Education.
- Chief author of the Teaching and Learning section of the NECSI Planning Documents for a National Initiative on Complex Systems in K-16 Education report to NSF.

Research Consultant (January 2001 to August 2003).

Consulting scientist for clients involved with research projects in education and industry, grant writing and proposal development, educational technology development, and e-Learning and distance education.

Allison~LoBue Group, LLC. Chief Learning Scientist and Senior Consultant (September 1999 to January 2001).

- Member of the senior management team responsible for scientific content expertise, product development, and training.
- Developed an agent-based model for executive level decision support and management training.
- Developed Enterprise Dashboards and collaboration tools to provide organizational, decision support, and internal team communication related to quantitative and qualitative dimensions of an organization's operations and competitive environment.
- Negotiated trademark and licensing agreement for the Knowledge Mediator from the University of Georgia.

The University of Georgia. Research Scientist, Learning and Performance Support Laboratory; Assistant Professor, Instructional Technology Department, College of Education (August 1996 to August 1999).

- Principal Investigator for the NSF funded Cognition, Technology, and Complex Systems Project that investigated expert-novice problem solving differences about emerging scientific knowledge.
- Developed the *Knowledge Mediator* problem and case centered hypermedia learning environment.
- Conducted research into problem solving, conceptual change, and knowledge transfer.
- Taught graduate level courses and supervised masters and doctoral students in the Instructional Technology Department.

Peabody College, Vanderbilt University. Senior Research Associate, Learning Technology Center (August 1995 to August 1996).

- Member of development team for the *Scientists-in-Action* multimedia learning series.
- Research and proposal writing.

University of Illinois at Urbana-Champaign. Visiting Assistant Professor, Educational Psychology and Educational Technology; Visiting Research Scientist, National Center for Supercomputing Applications (NCSA), Senior Scientist, Center for the Study of Reading (August 1992 to August 1995).

- Principal Investigator for the US National Science Foundation funded HyperBio Project.
- Directed the HyperBio research group over four years and conducted studies on hypermedia and learning difficult biological concepts and knowledge.

- Researcher on the Teaching TeleApprenticeships Project (Dr. James L. Levin, PI); software development of computer supported collaborative learning tools & approaches (funded by NSF).
- Collaborated with virtual reality CAVE research group at NCSA.

Army Corps of Engineers Construction Engineering Research Laboratory. Research Associate (1992; 1995).

- Worked on human computer interface and training issues for complex CAD systems.
- Research consultant on usability issues related to architects using CAD/CAM programs.

Western State College of Colorado. Instructional Computing Coordinator and Music Department Instructor (August 1981 to August 1985).

- Provided academic computing support to faculty and authored first academic computing master plan for college.
- Computer science and music department instructor.

Education

- Doctor of Philosophy in Education, University of Illinois at Urbana Champaign, January 1991. Educational technology and cognitive science.
- Master of Arts, Western State College of Colorado, August 1980, applied music.
- Bachelor of Arts, Metropolitan State College, Summa Cum Laude, May 1977, applied music.

Books

1. Jacobson, M. J., and Reimann, P. (Eds.) (2010). *Designs for learning environments of the future: International perspectives from the learning sciences*. New York: Springer-Verlag.
2. Jacobson, M. J., & Kozma, R. J. (Eds.). (2000). *Advanced designs for the technologies of learning: Innovations in science and mathematics education*. Mahwah, NJ: Lawrence Erlbaum Associates.

Book Chapters

1. Jacobson, M. J. (2015). Education as a complex system: Implications for educational research and policy. In B. A. Furtado, P. A. M. Sakowski, & M. H. Tóvolli (Eds.), *Modeling Complex Systems for Public Policies* (pp. 301–316). IPEA.
2. Wilensky, U., & Jacobson, M. J. (2014). Learning about complex systems. In K. Sawyer (Ed.), *Cambridge Handbook of the Learning Sciences* (Second ed.). Cambridge University Press: Cambridge, UK. (In press.)
3. Jacobson, M. J., & Kapur, M. (2012). Learning environments as emergent phenomena: Theoretical and methodological implications of complexity. In D. Jonassen & S. Land (Eds.), *Theoretical Foundations of Learning Environments* (Second ed., pp. 303-334). New York: Springer.
4. Rahayu, P., & Jacobson, M. J. (2012). Speaking self-efficacy and English as a foreign language: Learning processes in a multi-user virtual environment. In M. Piscione (Ed.), *Effectively implementing Information Communication Technology in Higher Education in the Asia-Pacific Region* (pp. 161-182). Hauppauge, NY: NOVA Science Publishers, Inc.
5. Jacobson, M. J., Kim, B., Miao, C., Shen, Z., & Chavez, M. (2010). Design perspectives for learning in virtual worlds In M. J. Jacobson & P. Reimann (Eds.), *Designs for learning*

- environments of the future: International learning sciences theory and research perspectives* (pp. 111-142). New York: Springer-Verlag.
6. Jacobson, M. J., & Reimann, P. (2010). Invention and innovation in design future learning environments. In M. J. Jacobson & P. Reimann (Eds.), *Designs for learning environments of the future: International perspectives from the learning sciences* (pp. 1-16). New York: Springer-Verlag.
 7. Reimann, P., & Jacobson, M. J. (2010). Afterword: Opportunities for transformational learning. In M. J. Jacobson & P. Reimann (Eds.), *Designs for learning environments of the future: International learning sciences theory and research perspectives* (pp. 283-285). New York: Springer-Verlag.
 8. Jacobson, M. J. (2006). From non-adaptive to adaptive educational hypermedia: Theory, research, and design issues. In G. Magoulas & S. Chen (Eds.), *Advances in web-based education: Personalized learning environments* (pp. 302-330). Hershey, PA: Idea Group.
 9. Jacobson, M. J., Angulo, A. J., & Kozma, R. B. (2000). Introduction: New perspectives on the designing the technologies of learning. In M. J. Jacobson, & R. B. Kozma (Eds.), *Innovations in science and mathematics education: Advanced designs for technologies of learning* (pp. 1-10). Mahwah, NJ: Lawrence Erlbaum Associates.
 10. Jacobson, M. J., & Archodidou, A. (2000). The Knowledge Mediator Framework: Toward the design of hypermedia tools for learning. In M. J. Jacobson, & R. B. Kozma (Eds.), *Innovations in science and mathematics education: Advanced designs for technologies of learning* (pp. 117-161). Mahwah, NJ: Lawrence Erlbaum Associates.
 11. Jacobson, M. J., & Spiro, R. J. (1995). Hypertext learning environments and epistemic beliefs: A preliminary investigation. In S. Vosniadou, E. DeCorte, & H. Mandl (Eds.), *Technology-based learning environments: Psychological and educational foundations* (pp. 290-295). Berlin: Springer-Verlag.
 12. Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1992). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. In T. M. Duffy, & D. H. Jonassen (Eds.), *Constructivism and the technology of instruction: A conversation* (pp. 57-75). Hillsdale, NJ: Lawrence Erlbaum Associates.

Refereed Papers in Journals

1. Jacobson, M. J., Markauskaite, L., Portolese, A., Kapur, M., Lai, P. K., & Roberts, G. (2016). Designs for learning about climate change as a complex system. *Learning and Instruction*. <http://doi.org/10.1016/j.learninstruc.2017.03.007>
2. Jacobson, M. J., Kapur, M., & Reimann, P. (2016). Conceptualizing debates in learning and educational research: Towards a complex systems conceptual framework of learning. *Educational Psychologist*, 51(2), 210–218. <http://doi.org/10.1080/00461520.2016.1166963>
3. Jacobson, M. J., Taylor, C., Richards, D., & Lai, P. (2015). Computational scientific inquiry with virtual worlds and agent-based models: New ways of “doing” science to learn science. *Interactive Learning Environments*. <http://doi.org/10.1080/10494820.2015.1079723>
4. Kim, B., Pathak, S. A., Jacobson, M. J., Zhang, B., & Gobert, J. D. (2015). Cycles of exploration, reflection, and consolidation in model-based learning of genetics. *Journal of Science Education and Technology*, 24(6), 789–802. <http://doi.org/10.1007/s10956-015-9564-6>
5. Jacobson, M. J., Kim, B., Pathak, S., & Zheng, B. (2013). To guide or not to guide: issues in the sequencing of pedagogical structure in computational model-based learning. *Interactive*

- Learning Environments*, DOI:10.1080/10494820.10492013.10792845. doi: 10.1080/10494820.2013.792845
6. Uddin, S., & Jacobson, M. J. (2013). Dynamics of email communications among university students throughout a semester. *Computers & Education*, *64*, 95–103.
 7. Wang, M., & Jacobson, M. J. (2011). Special issue on knowledge visualization for learning and knowledge management. *Educational Technology & Society*, *14*(3), 1-68.
 8. Wang, M., & Jacobson, M. J. (2011). Guest editorial on knowledge visualization for learning and knowledge management. *Educational Technology & Society*, *14*(3), 1-3.
 9. Jacobson, M. J., Kapur, M., So, H.-J., & Lee, J. (2011). The ontologies of complexity and learning about complex systems. *Instructional Science*, *39*, 763-783. doi: 10.1007/s11251-010-9147-0
 10. Jacobson, M. J., So, H. J., Teo, T., Lee, J., Pathak, S., & Lossman, H. G. (2010). Epistemology and learning: Impact on pedagogical practices and technology use in Singapore schools. *Computers & Education*, *55*, 1694-1706.
 11. So, H.-S., Lossman, H., Lim, W.-Y., & Jacobson, M. J. (2009). Designing an online video based platform for teacher learning in Singapore. *Australasian Journal of Educational Technology*, *25*(3), 440-457.
 12. Jacobson, M. J. (2008). Hypermedia systems for problem-based learning: Theory, research, and learning emerging scientific conceptual perspectives. *Educational Technology, Research, and Development*, *56*, 5-28.
 13. Jacobson, M. J., & Azevedo, R. (2008). Advances in scaffolding learning with hypertext and hypermedia: Theoretical, empirical, and design issues. *Educational Technology, Research, and Development*, *56*, 1-3.
 14. Azevedo, R., & Jacobson, M. J. (2008). Advances in scaffolding learning with hypertext and hypermedia: A summary and critical analysis. *Educational Technology Research and Development*. *56*, 93-100.
 15. Jacobson, M. J., & Wilensky, U. (2006). Complex systems in education: Scientific and educational importance and research challenges for the learning sciences. *Journal of the Learning Sciences*, *15*(1), 11-34.
 16. Jacobson, M. J., Kim, Y., Lee, J., Kim, H., & Kwon, S. (2005). Learning sciences principles for advanced e-learning systems: Implications for computer-assisted language learning. *Korean Association of Multimedia-Assisted Language Learning*, *8*(1).
 17. Jacobson, M. J. (2004). Cognitive visualizations and the design of learning technologies. *International Journal of Learning Technologies*, *1*(1), 40-62.
 18. Jacobson, M. J. (2001). Problem solving, cognition, and complex systems: Differences between experts and novices. *Complexity*, *6*(3), 41-49.
 19. Jacobson, M. J., & Archodidou, A. (2000). The design of hypermedia tools for learning: Fostering conceptual change and transfer of complex scientific knowledge. *The Journal of the Learning Sciences*, *9*(2), 149-199.
 20. Levin, J. A., Stuve, M. J., & Jacobson, M. J. (1999). Teachers' conceptions of the Internet and the World Wide Web: A Representational Toolkit as a model of expertise. *Journal of Educational Computing Research*, *21*(1), 1-23.
 21. Jacobson, M. J. (1997). The Jasper Project: Lessons about learning lessons. *Journal of Educational Computing Research*. *17*(2), 187-195. (Invited.)
 22. Jacobson, M. J., Maouri, C., Mishra, P., & Kolar, C. (1996). Learning with hypertext learning environments: Theory, design, and research. *Journal of Educational Multimedia and Hypermedia*, *5*(3/4), 239-281.

23. Jacobson, M. J., & Levin, J. A. (1995). Conceptual frameworks for network learning environments: Constructing personal and shared knowledge spaces. *Journal of Educational Telecommunications*, 1(4), 367-388.
24. Jacobson, M. J., & Spiro, R. J. (1995). Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. *Journal of Educational Computing Research*, 12(5), 301-333.
25. Jacobson, M. J. (1994). Issues in hypertext and hypermedia research: Toward a framework for linking theory-to-design. *Journal of Educational Multimedia and Hypermedia*, 3(2), 141-154. (Invited paper.)
26. Jacobson, M. J., & Spiro, R. J. (1994). A framework for the contextual analysis of technology-based learning environments. *Journal of Computing in Higher Education*, 5(2), 3-32.
27. Jacobson, F. F., & Jacobson, M. J. (1993). Applying representative cognitive learning theories to bibliographic instruction: A case study of end user searching. *Research Strategies*, 11(3), 124-137.
28. Waugh, M. L., & Jacobson, M. J. (1989). The influence of videodisc-enhanced drill on student achievement in an introductory art education course. *Visual Arts Research*, 15(2), 31-41.
29. Jacobson, M. J., & Weller, M. H. (1987-88). A profile of computer use among the University of Illinois Humanities Faculty. *Journal of Educational Technology Systems*, 16 (2), 83-98.

Refereed Papers Published in Conference Proceedings

1. Jacobson, M. J., Kapur, M., & Reimann, P. (2014). Towards a complex systems meta-theory of learning as an emergent phenomenon: Beyond the cognitive versus situative debate. *Learning and Becoming in Practice: The International Conference of the Learning Sciences (ICLS) 2014*, (1993), 362–369.
2. Jacobson, M. J., Kapur, M., & Reimann, P. (2014). Towards a complex systems meta-theory of learning as an emergent phenomenon: Beyond the cognitive versus situative debate. *Learning and Becoming in Practice: The International Conference of the Learning Sciences (ICLS) 2014*, (1993), 362–369.
3. Jacobson, M. J., Lund, K., Hoadley, C., Vatrappu, R., Kolodner, J. L., & Reimann, P. (2016). Beyond Just Getting Our Word Out: Creating Pipelines from Learning Sciences Research to Educational Practices. In C. K. Looi, J. L. Polman, U. Cress, & P. Reimann (Eds.), *Transforming Learning, Empowering Learners: The International Conference of the Learning Sciences (ICLS) 2016, Volume 1* (pp. 1071–1073). Singapore: International Society of the Learning Sciences.
4. Portolese, A., Markauskaite, L., Lai, P. K., & Jacobson, M. J. (2016). Analyzing Patterns of Emerging Understanding and Misunderstanding in Collaborative Science Learning: A Method for Unpacking Critical Turning Points. In C. K. Looi, J. L. Polman, U. Cress, & P. Reimann (Eds.), *Transforming Learning, Empowering Learners: The International Conference of the Learning Sciences (ICLS) 2016, Volume 1* (pp. 410–417). Singapore: International Society of the Learning Sciences.
5. Hanna, N., Richards, D., & Jacobson, M. J. (2012). *Automatic acquisition of user models of interaction to evaluate the usability of virtual environments*. Paper presented at the 12th International Workshop on Knowledge Management and Acquisition for Intelligent Systems (PKAW 2012) (pp. 43-57), Kuching, Malaysia, LNAI 7457.

6. Kelly, N., Jacobson, M., Markauskaite, L., & Southavilay, V. (2012). Agent-based computer models for learning about climate change and process analysis Techniques. In J. van Aalst, K. Thompson, M. J. Jacobson & P. Reimann (Eds.), *The future of learning: Proceedings of the 10th international conference of the learning sciences (ICLS 2012) – Volume 1, Full Papers* (pp. 25-32). Sydney, Australia: ISLS.
7. Richards, D., Jacobson, M. J., Porte, J., Taylor, C., Taylor, M., Newstead, A., . . . Hanna, N. (2012). Evaluating the models, reasoning, and behaviour of 3D intelligent virtual animals in a predator-prey relationship. In Conitzer, Winikoff, Padgham & v. d. Hoek (Eds.), *Proceedings of the 11th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2012)* (Vol. 1, pp. 79-86). Richland, SC, USA: International Foundation for Autonomous Agents and Multiagent Systems.
8. Jacobson, M. J., Richards, D., Kapur, M., Taylor, C., Hu, T., Wong, W.-Y., & Newstead, A. (2011). Collaborative virtual worlds and productive failure: Design research with multi-disciplinary pedagogical, technical and graphics, and learning research teams. In H. Spada, G. Stahl, N. Miyake & N. Law (Eds.), *Connecting Computer-Supported Collaborative Learning to Policy and Practice: CSCL2011 Conference Proceedings. Volume III* (pp. 1126-1129). Hong Kong: International Society of the Learning Sciences
9. Jacobson, M. J., Richards, D., Kennedy-Clark, S., Thompson, K., Taylor, C., Hu, C., Taylor, M., & Kartiko, I. (2010). Scenario-based MUVE for science inquiry. In M. D. Sharma (Ed.), *16th UniServe Science Annual Conference* (pp. 47-52). Sydney: University of Sydney.
10. Kapur, M., & Jacobson, M. J. (2010). Leaning as an emergent phenomena: Methodological implications. In Gomez, K., Lyons, L., & Radinsky, J. (Eds.) *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2, Short Papers, Symposia, and Selected Abstracts.* (pp. 192-193). International Society of the Learning Sciences: Chicago IL.
11. Jacobson, M. J., & Kapur, M. (2010). Ontologies as scale free networks: Implications for theories of conceptual change. In Gomez, K., Lyons, L., & Radinsky, J. (Eds.) *Learning in the Disciplines: Proceedings of the 9th International Conference of the Learning Sciences (ICLS 2010) - Volume 2, Short Papers, Symposia, and Selected Abstracts.* (pp. 193-194). International Society of the Learning Sciences: Chicago IL.
12. Pathak, S., Kim, B., Jacobson, M. J., & Zhang, B. (2009). Failures and successes in collaborative inquiry: Learning the physics of electricity with agent-based models. In C. O'Malley, D. Suthers, P. Reimann & A. Dimitracopoulou (Eds.), *Computer-supported collaborative learning practices: CSCL2009 conference proceedings* (pp. 199-203). Rhodes, Greece: International Society of the Learning Sciences.
13. Jacobson, M. J., Miao, C., Kim, B., Shen, Z., & Chavez, M. (2008). Research into learning in an intelligent agent augmented multi-user virtual environment. In *2008 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology* (pp. 348-351).
14. Pathaka, S. A., Jacobson, M. J., Kim, B., Zhang, B., & Deng, F. (2008). Learning the physics of electricity with agent-based models: The paradox of productive failure. In T.-W. Chan, G. Biswas, F.-C. Chen, S. Chen, C. Chou, M. Jacobson, Kinshuk, F. Klett, C.-K. Looi, T. Mitrovic, R. Mizoguchi, K. Nakabayashi, P. Reimann, D. Suthers, S. Yang & J.-C. Yang. (Eds.), *Proceedings of the International Conference on Computers in Education* (pp. 221-228). Taiwan.
15. Zhang, B., Jacobson, M. J., Kim, B., Deng, F., Pathak, S., & Lossman, H. G. (2008). Exploring modeling and visualization technology (MVT) Enhanced biology teaching and learning in Singapore. In P. A. Kirschner, F. Prins, V. Jonker & G. Kanselaar (Eds.),

- Proceedings of the International Conference of the Learning Sciences - ICLS 2008* (Vol. 3, pp. 392-399). Utrecht, The Netherlands.
16. Jacobson, M. J., Lim, S. H., Lee, J., & Low, S.-H. (2007). *Virtual Singapura: Design considerations for an intelligent agent augmented multi-user virtual environment for learning science inquiry*. Paper presented at the 15th International Conference on Computer in Education, Japan: Hiroshima.
 17. Jacobson, M. J. (2007). Complex systems in cognitive sciences: A universal acid? In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th Annual Cognitive Science Society* (p. 29). Austin, TX: Cognitive Science Society.
 18. Jacobson, M. J. (2006, May). *Beyond compartmentalized curricula in science and mathematics: Educational and research implications of complex systems*. Invited paper in the Proceedings of the Broadening Research at International Network (BRAIN): Developing a cross-domain research framework for science and mathematics education. Taipei: National Taiwan Normal University.
 19. Jacobson, M. J. (2005). Exploring fundamental issues in problem-oriented hypermedia. In C. K. Looi, D. Jonassen, & M. Ikeda (Eds.) *International Conference of Computers in Education* (pp. 148-155), Amsterdam, Netherlands: IOS Press.
 20. Kim, H., Lee, J., & Jacobson, M. J. (2005, January). *From human computer interactions to learner centered designs: Issues for development of e-learning systems*. Paper presented at Twenty-First International Conference of Human Computer Interaction in Daegu, Korea.
 21. Jacobson, M. J. (2000). Problem solving about complex systems: Differences between experts and novices. In B. Fishman, & S. O'Conner-Divelbiss (Eds.), *Fourth International Conference of the Learning Sciences* (pp. 14-21). Mahwah, NJ: Erlbaum.
 22. Jacobson, M. J., Brecher, K., Clemens, M., Farrell, W., Kaput, J., & Wilensky, U. (1999). Education in Complex Systems. *Proceedings of the Second International Conference on Complex Systems*. Nashua, NH: New England Complex Systems Institute.
 23. Jacobson, M. J., & Jacobson, P. C. (1998). *Lessons learned and lessons to be learned: An overview of innovative network learning environments*. (pp. 661-667). *Proceedings of ED-MEDIA 98 & ED-TELECOM 98 World Conference on Educational Multimedia and Hypermedia & World Conference on Educational Telecommunications* (pp. 696-701). Freiburg, Germany: Association for the Advancement of Computers in Education.
 24. Jacobson, M. J. (1997). The Evolution Thematic Investigator: Research and the design of hypermedia learning environments. *Proceedings of ED-MEDIA 97 & ED-TELECOM 97 World Conference on Educational Multimedia and Hypermedia & World Conference on Educational Telecommunications* (pp. 696-701). Calgary, Alberta, Canada: Association for the Advancement of Computers in Education.
 25. Jacobson, M. J., Sugimoto, A., & Archodidou, A. (1996). Evolution, hypermedia learning environments, and conceptual change: A preliminary report. In D. C. Edelson, & E. A. Domeshek (Eds.), *International Conference on the Learning Sciences, 1996: Proceedings of ICLS 96* (pp. 151-158). Charlottesville, Virginia: Association for the Advancement of Computing in Education.
 26. Jacobson, M. J., & Levin, J. A. (1993). Hypertext and network-based learning environments: Technology for the construction of personal and shared knowledge spaces. In Tak-Wai Chan (Ed.), *Proceedings of the 1993 International Conference on Computers in Education: Applications of Intelligent Computer Technologies* (pp. 282-287). Taipei, Taiwan: International Conference on Computers in Education.
 27. Jacobson, M. J., & Levin, J. A. (1993). Network learning environments and hypertext: Constructing personal and shared knowledge spaces. In D. Foster & D. V. Jolly, (Eds.),

Proceedings of Tel-Ed '93 (pp. 190-197). Dallas, Texas: International Society for Technology in Education.

28. Levin, J. A., & Jacobson, M. J. (1992). Towards a distributed network learning framework: Theory and technology to support educational electronic learning environments. *Proceedings of the Fourteenth Annual Conference of the Cognitive Science Society* (pp. 927-932). Hillsdale, NJ: Erlbaum.
29. Jacobson, M. J., & Spiro, R. J. (1991). Hypertext learning environments and cognitive flexibility: Characteristics promoting the transfer of complex knowledge. In L. Birnbaum (Ed.), *The International Conference on the Learning Sciences: Proceedings of the 1991 Conference* (pp. 240-248). Charlottesville, Virginia: Association for the Advancement of Computing in Education.

Papers Presented at Professional Societies

1. Levin, J. A., & Jacobson, M. J. (2015). *Education as a complex system: Implications for educational research and policy*. Paper presented at the Annual Meeting of the American Educational Research Association, San Antonio, TX, USA.
2. Jacobson, M. J., Markauskaite, L., Portolese, A., Lai, P. K., & Kapur, M. (2016). *Understanding climate change as a complex system with agent-based models: Issues in the sequencing of pedagogical structure*. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, D.C.
3. Jacobson, M. J., Markauskaite, L., Jung, Y. M., Lai, P., & Stokes, P. G. (2014). *Learning climate change as a complex system: Analogical encoding meets agent-based models*. Paper to be presented at the annual meeting of the American Educational Research Association, Philadelphia, PA.
4. Levin, J. A., Jacobson, M. J., & Markauskaite, L. (2014). *Combining computational modeling, theory, and data: Steps toward a meta-model framework for the study of learning*. Paper presented at the annual meeting of the American Educational Research Association, Philadelphia, PA. .
5. Jacobson, M. J., Taylor, C., Richards, D., & Lai, P. (2013). *Computational scientific inquiry with virtual worlds and agent-based models: New ways of "doing" science to learn science*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA, USA.
6. Jacobson, M. J., Markauskaite, L., & Kelly, N. (2012). *Model-based learning about climate change with productive failure: Preliminary findings*. Paper presented at the Annual Meeting of the American Educational Research Association, Vancouver, Canada. *Paper selected for AERA 2012 Division C Key Session Technology-Supported Learning in K-12 Science*.
7. Markauskaite, L., Jacobson, M. J., Southavilay, V., & Kelly, N. (2012). *Using process analysis techniques to understand students' learning strategies with computer models*. Paper presented at the Annual Meeting of the American Educational Research Association, Vancouver, Canada.
8. Jacobson, M. J., Thompson, K., Hu, C., Kennedy-Clark, S., & Howard, S. (2010). *Failure and success in sequences of model-based learning: Research outcomes and pedagogical reflections*. Paper presented at the 2010 Annual Meeting of the American Educational Research Association, Denver, Co.
9. Jacobson, M. J., Kim, B., Pathak, S., & Zhang, B. (2009). *Failure and success in learning the physics of electricity with agent-based models*. Paper presented at the Computer-supported Collaborative Learning conference, Rhodes, Greece.

10. Jacobson, M. J., Kim, B., Pathak, S. A., & Zhang, B. (2009). *Learning the physics of electricity with agent-based models: Fail first and structure later?* Paper presented at the 2009 Annual Meeting of the American Educational Research Association, San Diego, CA.
11. Jacobson, M. J., & Kapur, M. (2009). *Ontological network theory: Implications of scale free network topologies for learning about complexity and for theories of conceptual change.* Paper presented at the annual meeting of the American Educational Research Association, San Diego
12. Jacobson, M. J., So, H. J., Teo, T., Lee, J., & Pathak, S. A. (2008). *Teachers' beliefs about knowledge and learning: A Singapore perspective.* Paper presented at the International Conference of the Learning Sciences, Utrecht, The Netherlands.
13. Jacobson, M. J., Kim, B., Lee, J., Lim, S. H., & Low, S. H. (2008). *Virtual Singapura: Learning in an intelligent agent augmented multi-user virtual environment for learning science inquiry.* Paper presented at the annual meeting of the American Educational Association, New York, NY.
14. Jacobson, M. J. (2007). *Virtual Singapura: Design and research issues for agent-augmented multi-user virtual environments.* Paper presented at the *Second Distributed Learning and Collaboration Symposium*. Singapore: Learning Sciences Laboratory, National Institute of Education, Nanyang Technological University.
15. Jacobson, M. J. (2007). *Complex systems in education: A universal acid?* Paper presented at the annual meeting European Association for Research on Learning and Instruction, Budapest, Hungary.
16. Kapur, M., Hung, D., Jacobson, M., Voiklis, J., & Victor, C. D.-T. (2007). *Emergence of Learning in Computer-Supported, Large-Scale Collective Dynamics: A Research Agenda.* Paper presented at the Computer Supported Collaborative Learning Conference, New Brunswick, NJ.
17. Wong, L.H., Zhang, B., & Jacobson, M.J. (2007), *Co-designing inquiry-based pedagogy with a primary science teacher when integrating computer-based modelling: Opportunities and challenges.* GCCCE'07, Guangzhou, China.
18. Jacobson, M. J., Lee, J., Lim, S. H., & Low, S. H. (2007). *Research into designing hypermedia environments for advanced learning with problems and cases: Contrasting and comparing systems in two domains.* Paper presented at the annual meeting of the American Educational Association, Chicago, IL.
19. Zhang, B. H., Wong, L. H., & Jacobson, M. J. (2007). *Primary science students' computer-based models and their association to student understanding of content and modeling.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
20. Jacobson, M. J. (2006, June). *Complex Systems In Education: Importance, Implications, and Issues.* Paper presented at the *International Conference on the Learning Sciences*, Bloomington, Indiana, USA: Indiana University.
21. Jacobson, M. J. (2006). *Complex systems and education: Issues and implications.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
22. Jacobson, M. J. (2005). *Adaptive hypermedia systems for problem-based learning: Theory, research, and implementation issues.* Paper presented at the annual meeting of the American Educational Research Association, Montreal, Canada.
23. Jacobson, M. J. (2003). *Complex systems and education: Research issues, learning, and future directions.* Paper presented at the symposium *Understanding Complex systems for learning science with computer-based learning environments: An exploration of the*

- theoretical, empirical and design issues* (Chairs C. E. Hmelo-Silver, & R. Azevedo). Symposium presented at the annual meeting of the American Educational Research Association, Chicago, IL.
24. Jacobson, M. J. (2000). *Butterflies, traffic jams, and cheetahs: Problem solving and complex systems*. Paper presented at the annual meeting of the American Educational Research Association, New Orleans, LA.
 25. Jacobson, M. J., Allison, M. A., & Ropella, G. E. P. (2000). *Agent-based modeling of disrupted market ecologies: A strategic tool to think with*. Paper presented at the Fourth International Conference on Complex Systems, Nashua, NH.
 26. Jacobson, M. J., & Angulo, A. J. (2000). Complex systems, cognition, and problem solving: A preliminary investigation of differences between novices and experts. In Y. Bar-Yam (Eds.), *Proceedings of the Second International Conference on Complex Systems*. Nashua, NH: New England Complex Systems Institute.
 27. Jacobson, M. J., & Angulo, A. J. (1999). *Complex systems, cognition, and problem solving: Investigating differences between novices and experts*. Paper presented at the 1999 annual meeting of the American Educational Research Association, Montreal, Canada
 28. Hynd, C., Jacobson, M., Reinking, D., Heron, A., & Holschuh, J. (1999). Reading like a historian: Development of cross-text intertextuality and disciplinary knowledge in a hypertext environment. Paper presented at the 1 annual meeting of the American Educational Research Association, Montreal, Canada.
 29. Jacobson, M. J. (1998). Cognitive scaffolding in technological environments: Promoting deep and flexible conceptual understandings of complex knowledge. Paper presented at the ED-MEDIA 98 conference, Freiberg, Germany.
 30. Jacobson, M. J., Serrano, R., & Glenn, S. (1998, April). The sciences of complexity, learning, and the educational process: Emerging perspectives on ways of thinking and doing. Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA.
 31. Jacobson, M. J., & Archodidou, A. (1997, August). Case-based hypermedia and learning neo-Darwinian evolutionary biology: Designs for promoting conceptual change of complex scientific knowledge. Paper presented at a symposium at the 7th European Conference for Research on Learning and Instruction, Athens, Greece.
 32. Jacobson, M. J. (1997, February). Case-based hypermedia environments and learning complex knowledge: Theory, design, and research. Talk given at the annual meeting of the Association for Educational Communications and Technology, Albuquerque, NM.
 33. Jacobson, M. J. (1997, January). Case-based hypermedia learning environments and conceptual change: The evolution of understandings about evolution. Invited talk given at the Eighth Annual Winter Text Conference, Jackson Hole, Wyoming.
 34. Jacobson, M. J., & Archodidou, A. (1997, March). Case- and problem-based hypermedia learning environments and conceptual change: The evolution of understandings about evolution. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.
 35. Jacobson, M. J., Jehng, J. C., & Maouri, C. (1996, April). Culture, domain specificity, and epistemological beliefs: A cross cultural study of Taiwanese and American university students. Paper presented at the annual meeting of the American Educational Research Association, New York, NY.
 36. Jacobson, M. J. (1995). Evolution, conceptual models, and hypermedia learning environments: Designs for making thinking visible. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.

37. Jacobson, M. J., Levin, J. A., Jun, Y., & Uno, Y. (1995, June). Conceptual frameworks and software tools for Teaching TeleApprenticeships. Presentation at the NECC '95 conference, Baltimore, MD.
38. Jacobson, M. J. (1994, January). Epistemic beliefs, cognitive flexibility, and knowledge transfer: Research into learning with hypertext learning environments. Invited presentation for symposium session on interactive multimedia systems, Fifth Annual Winter Text Conference, Jackson Hole, WY.
39. Jacobson, M. J., Kolar, C., Langley, R., Levine, B., Maouri, C., Mishra, P., & Spiro, J. (1994, February). Cognitive flexibility, epistemic beliefs, and the design of hypertext learning environments: Factors influencing the transfer of complex knowledge. Presentation given at the 35th International Conference of the Association for the Development of Computer-Based Instructional Systems, Nashville, TN.
40. Jacobson, M. J., Mishra, P., Ravlin, R., Langley, R., & Spiro, R. J. (1994, September). Hypermedia learning environments, conceptual change and learning complex biological knowledge. Presentation at the European Symposium on Conceptual Change, Jena, Germany.
41. Jun, Y., Levin, J., & Jacobson, M. (1994). The Message Assistant: A communication tool for educational networks. Paper presented at KRnet '94, Seoul, Korea.
42. Jacobson, M. J. (1993, November). Network learning environments, theory, and research. Invited panelist for special theme session "Research on telecommunications and learning: Theoretical and methodological approaches," Tel-Ed '93 International Conference, Dallas, TX.
43. Jacobson, M. J., & Levin, J. A. (1993, April). The Message Assistant: A rule-based electronic mail program for constructing hypertextual knowledge spaces. Division C Technology Demonstration presented at the annual meeting of the American Educational Research Association, Atlanta, GA.
44. Jacobson, M. J. (1992, July). Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. Poster session given at the Psychological and Educational Foundations of Technology-based Learning Environments. NATO Advanced Study Institute, Kolymbari, Crete.
45. Jacobson, M. J. (1992). Cognitive flexibility, epistemology, and hypertext learning environments: Research into the transfer of complex knowledge. Presentation given at the 34th International Conference of the Association for the Development of Computer-Based Instructional Systems, Norfolk, VA.
46. Jacobson, M. J., & Levin, J. A. (1992). A rule-based electronic mail processor for collaborative electronic learning environments. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
47. Jacobson, M. J., & Spiro, R. J. (1992). Hypertext learning environments, cognitive flexibility, and the transfer of complex knowledge: An empirical investigation. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.
48. Jacobson, M. J. (1991, November). Hypertext learning environments and computer-based drills: A comparison of contrasting designs for the acquisition of complex knowledge [Summary]. In D. W. Dalton (Ed.), *Proceedings of the 33rd International Conference of the Association for the Development of Computer-Based Instructional Systems* (p. 48). Columbus, OH: The Ohio State University.
49. Jacobson, M. J. (1991, July). A hypertext learning environment for the acquisition of complex knowledge: Theory, demonstration, and implications. Software demonstration given at the Thirteenth Annual Meeting of the Cognitive Science Society. Chicago, IL: University of Chicago.

50. Levin, J. A., & Jacobson, M. J. (1991, June). The Message Assistant: A rule-based electronic mail processor for collaborative electronic learning environments. Software demonstration given at the Thirteenth Annual Meeting of the Cognitive Science Society. Chicago, IL: University of Chicago.
51. Jacobson, M. J., & Jehng, J. C. (1990, November). A multifaceted theoretical framework for computer-enhanced learning systems [Summary]. In D. W. Dalton (Ed.), *Proceedings of the 32nd International Conference of the Association for the Development of Computer-Based Instructional Systems* (p. 104). Columbus, OH: The Ohio State University.
52. Jacobson, M. J., & Spiro, R. J. (1989). *Towards a conceptual framework for the development and utilization of computer-enhanced learning systems* [Summary]. *Proceedings of the 31st International Conference of the Association for the Development of Computer-Based Instructional Systems* (p. 471). Bellingham, WA: Western Washington University.
53. Spiro, R. J., Jacobson, M. J., & Jehng, J. C. (1988). *Hypertext and cognitive psychology: Theory and technology for computer-based instruction in complex knowledge domains* [Summary]. *Proceedings of the 30th International Conference of the Association for the Development of Computer-Based Instructional Systems* (p. 440). Bellingham, WA: Western Washington University.
54. Waugh, M. L., & Jacobson, M. J. (1988). The influence of videodisc-enhanced drill on student achievement in an introductory art course [Summary]. *Proceedings of the 30th International Conference of the Association for the Development of Computer-Based Instructional Systems* (p. 421). Bellingham, WA: Western Washington University.
55. Jacobson, M. J., & Weller, M. H. (1987). Changing attitudes towards computing: A survey of the Humanities Faculty at the University of Illinois at Urbana-Champaign [Summary]. In W. C. Ryan (Ed.), *Proceedings: National Educational Computing Conference* (p. 60). Eugene, OR: University of Oregon, International Council on Computers for Education.

Sessions Organized and Chaired or Service as a Discussant at Professional Meetings

1. Jacobson, M. J. (2010). *Learning about complexity and beyond: Theoretical and methodological implications for the learning sciences*. Organizer of symposium presented at the annual meeting of the International Society of the Learning Sciences, Chicago, IL. (Chair: U. Wilensky. Presenters: M. Jacobson, M. Kapur, P. Sengupta, U. Wilensky, M. Wilkerson. Discussant: P. Reimann).
2. Jacobson, M. J. (2010). *To structure or not to structure: New perspectives on success and failure in learning*. Organizer of a symposium presented at the annual meeting of the American Educational Research Association, Denver, CO. (Chair and Discussant: A. Collins. Presenters: J. Gobert, C. Hu, M. Jacobson, M. Kapur, S. Kennedy-Cark, , N. Krach, O. Montalvo, N. Rummel, M. Sao Pedro, K. Thompson, E. Toto, & K. Westermann).
3. Jacobson, M. J. (2009). *Complexity, learning, and research: Under the microscope, new kinds of microscopes, and seeing differently*. Organizer of a symposium presented at the annual meeting of the American Educational Research Association, San Diego, CA. (Chair: U. Wilensky. Presenters: D. Abrahamson, P. Blickstein, M. Jacobson, M. Kapur, S. Levy, P. Sengupta, H. So, J. Voiklis, U. Wilensky, M. Wilkerson. Discussant: N. Sabelli).
4. Jacobson, M. J. (2008). *Complex systems and learning: Empirical research, issues, and "seeing" scientific knowledge with new eyes*. Organizer of a symposium presented at the annual meeting of the International Conference of the Learning Sciences, Utrecht, the Netherlands. (Presenters: U. Wilensky, P. Blickstein, P. Sengupta, H. So, J. Lee, S. T. Levy).

5. Jacobson, M. J. (2008). *Digital media and a new looking glass for learning: Theoretical, methodological, and empirical issues for 3D multi-user virtual and serious game environments*. Organizer of a symposium presented at the annual meeting of the American Educational Research Association, New York, NY. (Chair: C. Dede. Presenters: M. Jacobson, Y. Kafai, C. Dede, J. Clark, S. Zuiker, S. Barab. Discussants: H. Jenkins, M. Linn).
6. Jacobson, M. J., Goldstone, R., Chi, M., Abrahamson, D., Kapur, M., & Clancey, W. J., (2007). Complex systems and the cognitive sciences: Potential for pervasive theoretical and research implications? In D. S. McNamara & J. G. Trafton (Eds.), *Proceedings of the 29th Annual Cognitive Science Society* (p. 29). Austin, TX: Cognitive Science Society. (I was the organizer of this symposium.)
7. Hamilton, E., Jacobson, M. J., Looi, C. K., & Carmona, L. (2007). *Second Distributed Learning and Collaboration Symposium*. Singapore: Learning Sciences Laboratory, National Institute of Education, Nanyang Technological University. Organizing committee members; project funded by the US National Science Foundation and the US Air Force Office of Scientific Research.
8. Jacobson, M. J. (2007). *Complex systems and education: Conceptual principles, methodologies, and implications for education and educational research*. Organizer of a symposium presented at the annual meeting of the European Association for Research on Learning and Instruction, Budapest, Hungary. (Presenters: M. Jacobson, S. Levy, P. Blikstein, U. Wilensky, M. Kapur. Discussant: M. Chi).
9. Jacobson, M. J. (2007). Member of the Program Committee for the *AGILEviz, (Assessment of Group and Individual Learning through Intelligent Visualization)* workshops held at the AIED 2007 and CSCL 2007.
10. Jacobson, M. J. (2007). *Case-based instruction: Factors that influence reasoning and problem solving*. Discussant for paper session held at the annual meeting of the American Educational Research Association, Chicago, IL.
11. Jacobson, M. J. (2007). *Innovations in technology research: From embedded phenomena to embedded sensing*. Discussant for paper session held at the annual meeting of the American Educational Research Association, Chicago, IL.
12. Jacobson, M. J. (2006). *Complex systems in education: Conceptual principles, methodologies, and implications for research in the learning sciences*. Organizer of a symposium for the International Conference of the Learning Sciences, Bloomington, IN. (Presenters: R. Goldstone, R. Lesh, U. Wilensky, M. Jacobson, R. Azevedo, C. Hmelo-Silver. Discussant: N. Sabelli).
13. Jacobson, M. J. (2006). *Complex systems, learning, and education: Conceptual principles, methodologies, and implications for educational research*. Organizer of a symposium presented at the annual meeting of the American Educational Research Association, San Francisco, CA. (Presenters: M. Jacobson, U. Wilensky, R. Lesh, & C. Hmelo-Silver, R. Azevedo. Discussants: J. Bransford & C. Bereiter.)
14. Jacobson, M. J. (2005). *Scaffolding learning with hypermedia: An exploration of theoretical, empirical, and design issues*. Co-chair and co-organizer of a symposium presented at the annual meeting of the American Educational Research Association, Montreal, Canada. (Presenters: D. Jonassen, A. Shapiro, R. Azevedo, & A. Baylor. Discussant: C. Dede.)
15. Jacobson, M. J. (2005). *Learning and cognition in hypermedia environments*. Discussant for a paper session at the annual meeting of the American Educational Research Association, Montreal, Canada. (Presenters: C. Ou, S. Crooks, D. R. White, Q. Wang, M. Kapur, C. K. Kinzer, B. D. Homer, J. L. Plass, L. Blake).

16. Jacobson, M. J. (2004). *Examining the effects of technology in science instruction*. Discussant for a paper presentation session at the Annual Meeting of the American Educational Research Association, San Diego, CA. (Presenters: W. Winn, R. Mayer, C. M. Angeli, G. Barnett, K. D. Squire, J. O. Campbell, & S. L. Tanimoto).
17. Jacobson, M. J. (2002). *Complex systems in education: Integrative conceptual tools and techniques for understanding the education system itself*. Chair and organizer for symposium presented at the 83rd Annual Meeting of the American Educational Research Association, New Orleans, LA. (Presenters: Uri Wilensky, Jim Kaput, Jay Lemke. Discussant: Nora Sabelli).
18. Jacobson, M. J. (1999, August). *Designing the technologies of learning: Innovations, explorations, and research*. Chair and organizer of a symposium presented at the 8th EARLI Conference, Göteborg, Sweden. (Presenters: J. Bliss, D. Hickey, M. Jacobson. Discussant: S. Vosniadou.)
19. Jacobson, M. J. (1999, August). *Producing hypertexts: Thinking processes and learning effects*. Discussant for a symposium at the 8th EARLI Conference, Göteborg, Sweden. (Organizer and Chair: R. Bromme, Presenters: C. Bereiter, G. Rijlaarsdam, E. Stahl, A. Talamo, K. D. Wolf, & W. Schnotz.)
20. Jacobson, M. J. (1999, April). *Complexity and complex systems: Emerging cognitive, learning, and pedagogical perspectives*. Chair and organizer of a symposium presented at the annual meeting of the American Educational Research Association, Montreal, Canada. (Presenters: M. Chi, U. Wilensky, M. Resnick, & W. Stroup. Discussant: P. Horwitz.)
21. Jacobson, M. J. (1998, October). *Education in complex systems: Emerging cognitive, pedagogical, and curricular issues*. Chair and organizer of a special session given at the Second International Conference on Complex Systems, Nashua, NH. (Presenters: U. Wilensky, J. Kaput, M. Clemens, W. Farrell; & K. Brecher)
22. Jacobson, M. J. (1998, June). *Scaffolding constructivism in the learning of complex knowledge: International perspectives on the design, use, and evaluation of technological learning environments*. Chair and organizer of panel presented at the ED-MEDIA 98 conference, Freiberg, Germany. (Presenters: Y. S. Chee, B. Collis, & M. J. Hannafin.)
23. Jacobson, M. J. (1998, April). *Complexity and cognition: Ways of thinking about self-organization, emergence, and natural selection*. Chair and organizer of symposium presented at the annual meeting of the American Educational Research Association, San Diego, CA. (Presenters: U. Wilensky, M. Resnick, & J. St. Julien. Discussant: R. Ginsberg.)
24. Jacobson, M. J. (1998, April). *Knowledge acquisition and problem-solving in vocational training*. Discussant for structured poster session presented at the annual meeting of the American Educational Research Association, San Diego, CA. (Presenters: H. Mandl, H. Gruber, A. Renkl, D. Sembill, & H. Niegemann, R. Witt.)
25. Jacobson, M. J. (1997). *Cognition and learning the sciences of the 21st century: International perspectives on the design of advanced technology learning environments*. Chair and organizer for symposium presented at the 7th European Conference for Research on Learning and Instruction, Athens, Greece. (Presenters: R. Kozma, C. Dede, B. Loftin, & H. Mandl. Discussant: E. Lehtinen.)
26. Jacobson, M. J. (1997). *Cognition and learning the sciences of the 21st century: New directions in the design of advanced technology learning environments*. Chair and organizer for a symposium session held at the annual meeting of the American Educational Research Association, Chicago, IL. (Presenters: C. Dede, B. White, J. Frederiksen; J. Kaput, J. Roschelle. Discussant: Nora Sabelli.)

27. Jacobson, M. J. (1997). *Learning via the Internet: Experiments and case studies*. Chair and discussant of paper session held at the annual meeting of the American Educational Research Association, Chicago, IL.
28. Jacobson, M. J. (1996). *Epistemological beliefs and learning: A consideration of current theoretical and research issues*. Chair and organizer of symposium presented at the annual meeting of the American Educational Research Association, New York, NY.
29. Jacobson, M. J. (1995). *Advanced technologies for learning biology: Theoretical, research, and implementation perspectives*. Chair and organizer of symposium presented at the annual meeting of the American Educational Research Association, San Francisco, CA. (Presenters: B. White, P. Horwitz, E. Soloway, R. Spiro, M. Jacobson. Discussant: Alan Collins.)
30. Jacobson, M. J. (1994). *Building 'instructional' planes that really fly: Reconciling theory, research, and practice*. Discussant for symposium, AECT Conference, Nashville, TN. (Presenters: L. Rieber, S. Tripp, J. Bransford.)
31. Jacobson, M. J., Grabowski, B., Jonassen, D., Leshin, C., Merrill, M. D., & Tripp, S. (1992). *What is the place of theory in instructional design? A discussion of the issues for research and application*. Panel organizer and presenter for session at the 34th International Conference of the Association for the Development of Computer-Based Instructional Systems, Norfolk, VA.

Reports and White Papers

1. Jacobson, M. J. (2006). *Empirical research into learning in 3d virtual and game environments: Selected review of the literature* (Working Paper). Singapore: Learning Sciences Laboratory, National Institute of Education, Nanyang Technological University.
2. Jacobson, M. J. (2005). *The use of the EduCel Dynamic Knowledge Transfer System at Chiron: An evaluation*. Report prepared for EduCel, Inc. Seoul, Korea.
3. Jacobson, M. J. (2004). *From Human-computer interactions to science of learning based designs: E-Learning principles for 21st century learning*. (Policy Report Series.) Seoul: Korea IT Industry Promotion Agency.
4. Jacobson, M. J. (2003). *Models for centers of teaching and learning in the United States: A report on meetings with four directors*. Seoul: Korea University, Center for Teaching and Learning.
5. Jacobson, M. J. (2003). *The use of the EduCel Dynamic Knowledge Transfer System at the Brookhaven National Laboratory: An evaluation*. Report prepared for EduCel, Inc. San Francisco, CA: COGNITIVELEARNING, Inc.
6. Jacobson, M. J., Sloan, K., Rockman, S., & Char, C. (2002). *The academic value (and value added) of hands-on craft projects in elementary schools: Final report to the Hobby Industry Association*. San Francisco, CA: ROCKMAN ET AL.
7. Allison, M. A., Jacobson, M. J., & Allison, E. (2001). Report on Meetings at the Maui High Performance Computing Center on the Alternate Distribution Channel Agent Based Model Project. New York, NY: The Allison Group.
8. Hsi, S. H., & Jacobson, M. J. (2001). Design for an Online Mentoring and Tutoring Program (Report prepared for the University of California College Preparatory Initiative). Berkeley, CA: Metacourse, Inc.
9. Hsi, S. H., & Jacobson, M. J. (2001). Online Mentoring Programs (Report prepared for the University of California College Preparatory Initiative). Berkeley, CA: Metacourse, Inc.

10. Hsi, S. H., & Jacobson, M. J. (2001). Online Tutoring Services and Programs (Report prepared for the University of California College Preparatory Initiative). Berkeley, CA: Metacourse, Inc.
11. Jacobson, M. J., & Allison, M. A. (2001). *Agent-based modeling: Overview and applications to performance challenges in business (White Paper)*. Brooklyn, NY: The Allison Group, LLC.
12. Kaput, J., Bar-Yam, Y., & Jacobson, M. J. (1999). *Planning Documents for a National Initiative on Complex Systems in K-16 Education (Report to the National Science Foundation)*. Cambridge, MA: New England Complex Systems Institute. Online source: <http://necsi.org/events/cxedk16/cxedk16.html>. (Was lead author for Part 2: Teaching and Learning.)
13. Jacobson, M. J. (1999). *Complex adaptive systems, problem solving, and cognition: Preliminary research towards the design of advanced learning technologies (Final report to the National Science Foundation Applications of Advanced Technologies program)*. Athens, GA: The University of Georgia, Learning and Performance Support Laboratory.
14. Jacobson, M. J., & Jehng, J. C. (1998). *Epistemological beliefs: Scales and items (Technical Report)*. Athens, GA: The University of Georgia, Learning and Performance Support Laboratory.
15. Jacobson, M. J., & Spiro, R. S. (1997). *Learning and applying difficult science knowledge: Research into the application of hypermedia learning environments (Final report to the National Science Foundation Applications of Advanced Technologies program)*. The University of Georgia, Learning and Performance Support Laboratory.
16. Jacobson, M. J., & Jacobson, P. C. (1997). Lessons learned and lessons to be learned: An overview of network learning environments in the United States of America. In *Computer networks in schools* (pp. 51-69). Seoul, Korea: Asia-Pacific Economic Cooperation (APEC) and Korean Ministry of Education.

Invited and Keynote Talks

1. *Beyond Carts and Horses: Issues in the Design of Advanced Learning Technologies*. Keynote talk given at the 14th International Forum on Educational Technology (IFET2015), Shaanxi Normal University, Xi'an, China, 2015, September.
2. *Three Knowledge Exchange Workshops*. Invited speaker for university initiative, Hong Kong University, 2015, February.
3. *Beyond serious games*. Keynote talk given at the 4th Science and Art: International Forum on Digital Art, Beijing University of Technology, 2012, November.
4. *Educational technology research in Australia: An overview of recent trends and developments*. Keynote talk given at the Enhancing Education Through Technology Conference, Tsinghua University, 2012, August.
5. *Advanced learning technologies and advancing learning in higher education*. Invited talk given at the Adobe Education Leadership Forum, Hong Kong, 2011, March.
6. Gave three invited talks as a Visiting Scholar at Hong Kong University, 2011, May.
7. *Designing Learning Environments of the Future: Research into the Sciences and Technologies of Learning*. Keynote talk given at the 50th Anniversary Meeting of the Japanese Information Processing Society, University of Tokyo, 2010, March.
8. *Using Intelligent Agent-augmented Multi-user Virtual Environment Technologies to Advance Research in the Learning Sciences*. Invited talk given at the Centre for Information

- Technologies as part of the Sciences of Learning Strategic Research Theme, Hong Kong University, 2009, December.
9. *Beyond Heat from a Burning Fire: Virtual Worlds and Distributed Environments for Innovations in Learning*. Keynote talk given at the Integrated Learning Strategies Workshop sponsored by Liquid Learning. Sydney, 2009, October.
 10. *After How Comes What: Implications of "Restructuration" for Research*. Invited public lecture sponsored by the School of Education. University of New South Wales, August, 2009.
 11. *After How Comes What: Implications of Restructuration for What We Research and How We Do So*. Keynote talk presented at the Faculty of Education and Social Work's Research Students' Forum. The University of Sydney, 2008, October.
 12. *Agent-augmented Multi-user Virtual Environments and Computational Agent-based Models: Beyond Heat from a Burning Fire?* Keynote talk presented at the National Uniserve Science Conference. The University of Sydney, 2008, October.
 13. *Through the Looking Glass From Real to Virtual to Real: Explorations in Learning in an Agentized Intelligent Multi-User Virtual Environment*. Invited talk presented at the LEGO Engineering 2007 Conference. Singapore: National Institute of Education, 2007, March.
 14. *Complex Systems, Education, and Learning Sciences Research: A Universal Acid?* Invited talk presented at the Distributed Learning and Collaboration Workshop: Theory, Research, and Practice. Shanghai Jiao Tong University, China, 2006, June.
 15. *Challenges in Learning 21st Century Knowledge, How People Learn, and Pedagogical Paradigms: Implications for Reforming Asian Educational Systems*. Keynote presented at the workshop Technology-integrated Science and Engineering Education: Developing and Deploying Technologies for Science and Engineering Classrooms. Taipei: National Taiwan Normal University, 2006 May.
 16. *Complex Systems in Education: A Universal Acid?* Invited talk at the Santa Fe Institute for a meeting on *Building a Complex Systems Science Education Roadmap*, New Mexico, USA, 2006, March.
 17. *Challenges in Learning 21st Century Knowledge, How People Learn, and Pedagogical Paradigms: Implications for Reforming Asian Educational Systems*. Keynote talk given at the International Conference on Educational Research, Seoul National University, Korea, 2005, October.
 18. *The Science of Learning and Medical Education: Challenges and Opportunities for Enhanced Learning and Transfer in Problem-based Environments*. Invited talk given at the 3rd Congress of the Asian Medical Educational Association Conference, Seoul, Korea, 2005, October.
 19. *An Introduction to the Field of the Learning Sciences: Foundations, Intriguing Findings, and Current Research Issues*. Learning Sciences Lab Seminar Series. National Institute of Education, Singapore, 2005, September.
 20. *Challenges and Opportunities for Powerful Media and e-Learning Infrastructures to Innovate and Reform Educational Practice in Korea*. Invited talk given at the Korean Association for Educational Information and Media Conference, Seoul, Korea, 2005, May.
 21. *Seductive Sirens and E-learning in the Twenty First Century: The Clash of Learning Paradigms, Technical Standards, and Commercialization?* Talk given at the Center for Technology in Learning, SRI, International, Palo Alto, CA, USA, 2004, September.
 22. *Twenty First Century E-Learning Issues in Korea*. Invited talk given at the Korea IT Industry Promotion Agency sponsored seminar E-Learning Tech 2004: New Technology Trends in e-Learning seminar, Seoul, Korea, 2004, July.

23. *Complex Systems in Education: E-Learning Technologies and Enabling New Ways of Thinking for the Twenty First Century*. Invited talk at the Workshop on Technological Tools for Learning: Design, Research, and Policy Issues for 21st Century Science and Mathematics, Chung-Yuan University, Chung-Li, Taiwan, 2004, July.
24. *Beyond metaphor in complex systems in education: Ideas, learning, and implications*. Invited talk at the Chaos and Complexity Theories SIG Business Meeting. Annual Meeting of the American Educational Research Association, San Diego, CA.
25. *Digital communications and e-Learning in the twenty first century: The clash of learning paradigms, technical standards, and commercialization?* Invited keynote talk given at the First International Conference on Digital Communication, Chia-Yi, Taiwan, ROC, 2003, November
26. *Learning in e-Learning: New wine in old bottles?* Invited talk given at the ASEM e-Learning Seminar, Seoul, Korea, 2003, October.
27. *Towards the principled design of organizational eLearning environments*. Invited talk given at the Concord Consortium, Concord, MA, 2001, February.
28. *Beyond edutainment? Theory, research, and the technologies of learning*. Invited talk given to the Challenges '99 conference, University of Minho, Braga, Portugal, 1999, May.
29. *Technology, text, and promoting conceptual change of complex scientific knowledge*. Invited talk given to the Text, Technology, and Learning Strategies SIG at the annual meeting of the American Educational Research Association, San Diego, CA, 1998, April.
30. *The Knowledge Mediator framework: Designing technological tools to foster conceptual change and transfer*. Invited talk given at the First Annual Congress on the Impact of Technology on Learning, Wake Forest University, Winston-Salem, NC, 1999, March.
31. *The design of technological environments for learning complex knowledge: Theory, research, and future prospects*. Invited keynote talk given at the International Conference on Computer Assisted Instruction, Kaoshiung, Taiwan ROC, 1998, March.
32. *Technology environments for learning difficult knowledge: Theory, research, and future prospects*. Invited talk given at Hanyang University, Seoul, Korea, 1997, September.
33. *Advanced technologies, cognition, and unifying themes in science: Learning mental models of self-organization and complexity*. Invited talk given at the University of Munich, Germany.
34. *Technology environments for learning complex knowledge: Theory, research, and future prospects*. Invited talk given at the University of Munich, Germany, 1997, January.
35. *Informing the design, use, and dissemination of educational innovations: New perspectives from the cognitive and learning sciences*. Invited talk given at the NSF *Frontiers of Innovation in Education* Project Directors meeting, Salt Lake City, UT, 1996, November.
36. *Hypermedia learning environments, mental models, and evolution: Promoting conceptual change of complex knowledge*. Invited talk given to the Computer Science Department, Vanderbilt University, 1996, March.
37. *Learning with hypertextual learning environments: Theory, Research, and Future Prospects*. Invited talk given at the Instituto de Educacao e Psicologia, Universidade do Minho, Portugal, 1996, March.
38. *Hypermedia, network learning environments, and knowledge transfer: Theory, research, and issues*. Invited talk given at the University of Munich, Germany, 1994, September.
39. *Hypertext and hypermedia learning environments, epistemic beliefs, and the transfer of complex knowledge*. Invited talk given at the National Taiwan Normal University, Taipei, Taiwan, 1993, December.

Grants

1. Lead Chief Investigator on a \$666,000 project funded by the Australian Research Council (2010-2013): *Agent-based virtual environments for learning science*. (2015– 2017), Australian Research Council Discovery grant.
2. Chief Investigator on a \$350,000 project funded by the Australian Research Council: *Solving the inert knowledge problem*. (2015– 2017), Australian Research Council Discovery grant.
3. Lead Chief Investigator on a \$350,000 project funded by the Australian Research Council (2010-2013): *Multi-user virtual environments and research into the learning and transfer of scientific knowledge and inquiry skills*. (2010– 2013) - Australian Research Council Discovery grant (with Dr. Micah Goldwater and Dr. Evan Livesey).
4. Lead Chief Investigator on a \$560,000 project funded by the Australian Research Council and the NSW Department of Education and Training (2010-2014): *Learning the complexity of scientific knowledge about climate change with computer modelling and visualization technologies*.
5. Lead author and International Research Consultant on a \$1.3 million (Singapore) project funded by the Singapore Interactive and Digital Media Initiative (2008): *Intelligent agent-augmented multi-user virtual environments: Research and development for learning environments of the future*.
6. Principal Investigator on a \$120,000 U.S. project funded by Singapore Ministry of Education (2006): *Virtual worlds and intelligent agents for learning science: Innovative technology and pedagogy for Singaporean schools*. This is a collaborative research project with Chris Dede's group at Harvard University.
7. Principal Investigator on a \$120,000 U.S. project funded by Singapore Ministry of Education (2005): *Teachers' beliefs, leadership, and technology use in Singapore schools: An exploratory study*. This project is exploring possible relationships between teachers' beliefs about the nature of knowledge and learning, the ways they might employ technology to achieve their pedagogical goals, and aspects of the Singapore school environment.
8. Principal Investigator on a \$30,000 U.S. project funded by Singapore Ministry of Education (October 2005 to June 2006): *Technological tools to support learner centered teaching: Content development and research into advanced learning with case and problem oriented pedagogies*.
9. Principal Investigator on 29,300,000 won (\$28,000 U.S.) project funded by the Korea IT Industry Promotion Agency (July 2004 to November 2004): A framework for effective e-learning: Integrating perspectives from HCI and learning-centered design.
10. Principal Investigator on approximately 60,000,000 won (\$58,000,000 U.S.) project funded by the Korea IT Industry Promotion Agency (30,000,000 won grant from KIPA and matching funds from the Digital University Network [DUNET]; July 2004 to November 2004): *Prototype development of a case-based system for industry standard e-learning*.
11. Principal Investigator on a grant of \$75,000 from the National Science Foundation Applications of Advanced Technologies program (September 1996 - September 1998): *Complex adaptive systems, problem solving, and cognition: Preliminary research towards the design of advanced learning technologies*.
12. Project Director and Co-principal Investigator on a grant of \$689,000 from the National Science Foundation Applications of Advanced Technologies program (September 1992 - August 1995): *Learning and applying difficult science knowledge: School-based research into the application of hypermedia learning environments*.

13. Co-principal Investigator on a grant of \$7,500 from the Spencer Foundation Small Grant Program (February 1992 - July 1993): *Cognitive flexibility, epistemology, and hypertext learning environments: Research into the transfer of complex knowledge.*

Editorial Review Boards

Educational Technology Research and Development, Editorial Board.

International Journal of Learning Technologies, Editorial Board.

Journal of Educational Computing Research, Consulting Editor.

Journal of the Learning Sciences, Editorial Board, Learning about Complex Systems Strand Co-Editor (2006-2010).

Reviewer Activities

Australian Research Council (2016, 2017).

Singapore National Research Foundation (2016).

Swiss National Science Foundation (2015, 2016).

Academy of Finland (2013).

Research Grants Council (RGC) of Hong Kong, (2008-2016)

Israeli Science Foundation (2012).

Member of the European Science Foundation Pool of Reviewers (2008-present)

Alberta Innovates—Technology Futures New Faculty Awards, research proposal reviewer (2010)

Canadian Foundation for Innovation, research proposal reviewer (2008)

European Science Foundation Research Networking Programme Competition, research proposal reviewer (2007).

Fonds de Recherche sur la Societe et la Culture Quebec, research proposal reviewer (2006).

NSF Visiting Committee member for Information Technology Research initiative (2002).

NSF review panel member for Applications of Advanced Technology (1994) and CISE (Computer & Information Science & Engineering) proposals (1996, 1997, 1999).

Department of Education Office of Educational Research and Improvement (OERI) reviewer for SBIR grant applications (2002).

Journal of Educational Multimedia and Hypermedia, reviewer.

Teaching and Teacher Education, reviewer.

American Educational Research Association (AERA) annual meeting reviewer (1995-present).

Cognitive Science Society annual meeting reviewer (1998, 1999, 2000, 2007).

Computer Supported Collaborative Learning annual meeting reviewer (2008, 2010).

ED-MEDIA 97 and 98 Conference, reviewer.

International Conference on Computers in Education (ICCE), Theme-based Conference Co-Chair for Emerging Research in Technology Enhanced Learning (2008); Program Committee member and reviewer (2005-2006, 2010)

International Conference on the Learning Sciences reviewer (1997, 1999, 2005, 2009)

International Journal of Science Education (2010)

Mobile Learning 2006, Scientific Committee Member (2006)

Software Development

1. *Omosa Educational Virtual World* (2010-present). Australian Research Council Discovery funded project (two grants) is developing a biology oriented virtual world for students to learn to learn difficult concepts about ecosystems and evolution. Intelligent agents and data mining technologies are also being employed.
2. *Complexity and Climate Change* (2010-2015). Australian Research Council Linkage funded project is developing a web-based system to help students learn about the complexity of climate change with embedded agent-based and equation based computational models and visualizations. Data mining and intelligent agent technologies are being developed that utilize high performance computing available through the Australian eResearch infrastructure.
3. *Virtual Singapura Multi-User Virtual Environment* (2007-2008). Singapore Learning Sciences Laboratory funded project that embedded intelligent pedagogical agents into a 19th century virtual Singapore. System intended to support secondary level science inquiry and content knowledge while engaged in a complex ecological and social system in which pollution and disease agents contribute to public health problems.
4. *Healthy Eating Knowledge Mediator* (2006). A web-based multi-media case and problem based system for Singapore secondary students dealing with nutritional sciences concepts and principles for healthy eating.
5. *Complex Systems Knowledge Mediator* (2004-6). A web-based case and problem based system with embedded agent based models of complex systems phenomena.
6. *SCORM Knowledge Mediator for Problem-based Learning Project* (2004). Development of a commercial prototype system using the Sharable Content Object Reference Model (SCORM) standard to implement Knowledge Mediator Framework design features; technology partner: DUNET; developed problem-based learning materials in medical and science education. Two systems were developed.
7. *Alternate Distribution Channels* (2000-2001) (with G. E. P. Ropella, & M. A. Allison). Prototype agent based model for support of advanced strategic decision making. Model is being ported to run on the supercomputer cluster at the Maui High Performance Computing Center as part of a collaborative research project with the Marine Corps Project Albert group.
8. *Business Knowledge Mediator* (2000). Web problem-based tool for learning advanced business knowledge.
9. *Enterprise and Team Feedback Dashboards* (2000) (with Mary Ann Allison and *flypaper.com*). Developed several Intranet sites designed to provide organizational, decision support, and team feedback related to quantitative and qualitative dimensions of an organization's operations and competitive environment.
10. *The Gulf of Tonkin Incident: Contrasting Historical Perspectives* (1999) (with C. Hynd, C. & D. Reinking). Knowledge Mediator program for fostering historical thinking about conflicting historical texts.
11. *Evolution Knowledge Mediator* (1998-9) (with P. C. Jacobson & R. Serrano). Web mediated problem-based tool for learning evolutionary biology.
12. *The Evolution Thematic Investigator* (1993-4) (with S. Ravlin & P. Mishra). Experimental biology hypermedia and conceptual visualizations program.

13. *The Message Assistant* (1993) (with J. A. Levin). A rule-based experimental electronic mail program with user-defined expert system to process messages and provide hypertext message linking capabilities.
14. *Cognitive Flexibility Hypermedia Authoring Tool* (1993) (with R. J. Spiro & S. Ravlin). Hypermedia authoring system.
15. *Technology and the Twentieth Century: Impact on society and culture* (1990-1991). Experimental hypertext program initially developed for dissertation research with subsequent development funded by the Spencer Foundation.
16. *The Military Strategy of the Indirect Approach* (1989) (with R. J. Spiro, S. Ravlin, and J. C. Jehng). Prototype Cognitive Flexibility hypertext program funded by Army Office of Basic Research.
17. *Exploring thematic structure in Citizen Kane* (1987) (with R. J. Spiro, & J. C. Jehng). Prototype Cognitive Flexibility Theory hypertext program.
18. *Artists* (with M. L. Waugh, & M. Carver (1987). Experimental computer-based drill with National Gallery of Art interactive videodisc.

Academic Consulting Activities

- Singapore National Institute of Education (NIE). Consultations regards research areas of focus and organizational structure for new NIE Learning Sciences Lab (November 2004).
- Instituto de Educacao e Psicologia, Universidade do Minho, Portugal. *Educational networks and learning project* (January 1999). Second phase work on project initially begun in 1996.
- Korean Department of Education and Asia-Pacific Economic Cooperation (APEC), Seoul, Korea. *Utilization of Computer Network Systems for School Education* (Summer 1997).
- North Central Regional Educational Research Laboratory, Chicago. Curriculum support units project (Summer 1996).
- Instituto de Educacao e Psicologia, Universidade do Minho, Portugal. *Educational networks and learning project* (March 1996).

Awards and Honours

- Conference Chair, *International Conference of the Learning Sciences* (2012). Biannual scientific meeting of the International Society of the Learning Sciences.
- Teaching Award (2011). Commendation for teaching excellence from the Dean of the Faculty of Education and Social Work, The University of Sydney.
- Paper selected for AERA 2012 Division C Key Session Technology-Supported Learning in K-12 Science.
- Bibliographic Instruction Publication Award (1995), Association of College and Research Libraries, American Library Association, for 1993-94 outstanding paper (Jacobson, F., & Jacobson, M., 1993)
- American Educational Research Association Division C Outstanding Student Research Award (1992)
- University of Illinois at Urbana-Champaign College of Education Bagley Scholars Fellowship (1989)
- Phi Delta Kappa (1989)
- University of Illinois at Urbana-Champaign Graduate College Fellowship (1988)

Nominee for Outstanding Faculty Member, Western State College (1985)

Professional Organizations

American Educational Research Association (AERA)

Cognitive Science Society (CSS)

International Society of the Learning Sciences (ISLS)

Research Interests

- Cognitive and social factors that influence knowledge transfer, conceptual change, and deep conceptual understanding of challenging ideas
- Design of digital media such as virtual worlds, multi-user virtual environments, hypermedia, and intelligent agent technologies with an emphasis on learning challenging conceptual knowledge domains such as complexity and complex systems
- Applications of agent-based and scale-free network models for learning theory and research
- Implications of complex system conceptual perspectives and methodologies for educational and learning sciences research
- Influence of ontological and epistemological beliefs on learning and teaching
- Formative assessment of online learning with cognitively-based assessment technologies
- Socio-cognitive theories of learning for the design of learning technologies
- Applications of learning sciences theory and research for transformative change of education at the pre-college and tertiary levels