Lei Bao

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Education

Ph.D., Physics, 1999, University of Maryland at College Park
M.S., Physics, 1996, University of Maryland at College Park
M.S., Electrical Engineering, 1992, SouthEast University, Nanjing, China
B.S., Electrical Engineering, 1990, SouthEast University, Nanjing, China

Appointments

10/2011 – present	Professor, Department of Physics and School of Teaching and Learning, The Ohio State University
10/2006 – 09/2011:	Associate Professor, Department of Physics, The Ohio State University. Associate Professor (Courtesy appointment) School of Teaching and Learning, College of Education and Human Ecology, The Ohio State University.
08/2000 – 09/2006:	Assistant Professor, Department of Physics, The Ohio State University.
08/1999 – 07/2000:	Research Associate, Physics Department, Kansas State University.
08/1994 – 07/1999:	Graduate Research and Teaching Assistant, Physics Department, University of Maryland.

Academic Affiliations

09/2010 – present:	Guest Professor at NingXia University, YingChuan, China
06/2010 – present:	Guest Professor at South China Normal University, GuangZhou, China
05/2009 – present:	Guest Professor at Beijing Normal University, Beijing, China
10/2008 – present:	Guest Professor at Beijing JiaoTong University, Beijing, China
09/2003 – present:	Guest Professor at SouthEast University, Nanjing, China

Member of the OSU China Gateway Faculty Advisory Committee.
Leader of the developing team of the STEM Education Center of OSU China Gateway.
Member of American Association of Physics Teachers (AAPT)
Past Chair of AAPT international education committee (2009.1-2011.1)
Council member of the Chinese National Association of Research in Higher Education of Physics
Director of International Partnership of Education Research Communities (iperc.org) (2008-present)
Editor of *Research in Education Assessment and Learning* (2009-present)
Member of the Advisory Team of the Center for School Curriculum Research & Development, GuangXi Normal University, Guilin, China (2006-present)
Member of the editorial board of "WuLiTongBao" (physics bulletin) published under the Chinese Physical Society.

Research Interests and Fields

Inquiry based and technology assisted education methods and curriculum for science learning and scientific reasoning.
Assessment instruments for assessing science content knowledge and scientific reasoning skills.
Measurement and assessment methods

- Model Analysis – multi-dimensional modeling for assessing learning.
- Dynamic models of learning and a unified probability framework for education measurement, which integrates Model Analysis, normalized gain and IRT under a single coherent theoretical frame.
- Development of quantitative assessment instruments and methods for assessing content knowledge, reasoning, and views and attitudes.
- Large scale quantitative assessment and targeted comparisons.
- International assessment data center.

Computational models of student learning processes such as neural network models
Experimental technology and methods for measuring and modeling behavioral data of student learning (e.g. automatic group dynamics analysis and eye-tracking analysis of human interactions with computer simulations).
Technologies in education (e.g. in-class polling, web based interactive learning modules and virtual reality experiments)

Current and Past Grants (Current grants are marked with *)

1. **Developing Scientific Reasoning Assessment Tools for STEM Education and Teacher Preparation*, NSF, PI, $199,801, 2010~2012
2. **Science Learning and Scientific Reasoning*, NIH, PI, $998,658, 2009~2012.
3. **Mathematics Coaching Program* – Year Six funded by the Ohio Department of Education for $1.36 million from 2010-2011. Share of Budget $53,015.
4. **Developing Scientific Reasoning Abilities in Pre-service Teachers*, NSF, CCLI, Co-PI, $125,000, 2010~2012.
5. **Virtual Experiments for Physics Labs*, NSF, CCLI, PI $100,396, 2007~2011.
6. *Building a solid foundation for multidisciplinary STEM education research*, NSF, CCLI, Co-PI, $148,711, 2008~2011.
7. *STEP: Gateway into first-year STEM curricula: A community college/university collaboration promoting retention and articulation*, NSF Subcontract, $18,827, 2008~2010.
8. *Creating Research-based Single-Concept Question Sequences for In-class Polling Systems*, NSF CCLI, Co-PI, 2006~2010, $489,999.
9. *Develop and Assess The Ohio State Standardized Clicker System*, OSU, Co-PI, 07/2005~06/2007, $84,796.
10. *Scientific Misconceptions: From Cognitive Underpinnings to Educational Treatment*, CASL, US Department of Education, Collaborator (10%) 09/2005~08/2008, $933,397.
11. *Context Cues, Associative Memory and Learning of Physics.* NSF (REC 0126070) PI. 01/2002 – 12/2005, $269,305.
12. *Technology & Model-Based Conceptual Assessment.* NSF (REC 0087788) Co-PI. (Subcontract from Kansas State University – PI. at OSU) (01/2001 – 12/2004), $241,947 at OSU.
13. Ohio State University Seed Grand PI 2001-02 $9,000.

Teaching

Physics 107: Physics By Inquiry (Sp 2011)
Physics 106: Physics By Inquiry (Wi 2010)
Physics 131: Introductory Mechanics (Au 2009)
Physics 107: Physics By Inquiry (Sp 2008)
Physics 132I: Introductory E&M for Engineering Honors (Wi 2008)
Physics 131J: Introductory Mechanics for Engineering Honors (Au 2007)
Physics 133J: Introductory Modern Physics for Engineering Honors (Sp 2007)
Physics 132J: Introductory E&M for Engineering Honors (Wi 2007)
Physics 108: Physics By Inquiry (Au 2006)
Physics 107: Physics By Inquiry (Sp 2006)
Physics 132: Electricity and Magnetism (Wi 2006)
Physics 131J: Introductory Mechanics for Engineering Honors (Au 2005)
Physics 107: Physics By Inquiry (Sp 2005)
Physics 106: Physics By Inquiry (Wi 2005)
Physics 108: Physics By Inquiry (Au 2004)
Physics 107: Physics By Inquiry (Sp 2004)
Physics 106: Physics By Inquiry (Wi 2004)
Physics 107: Physics By Inquiry (Sp 2003)
Physics 131: Introductory Mechanics (Au 2002)
Physics 133: Modern Physics (Sp 2002)
Physics 131J: Introductory Mechanics for Engineering Honors (Au 2001)
Physics 880.20: Theoretical Models and Advanced Mathematical Methods in Physics Education. (Sp 2001)
Physics 780.20: Introductory to Physics Education Research. (Wi 2001)
US Olympic Team: Lab Instructor for US Olympic Physics Team of 1997.
TA for most types of undergraduate courses at the University of Maryland. (09/1994 – 06/1999)

Committee Services

Computer (10-11)
Undergraduate Service Course (09-10)
Undergrad Course (06-07)
Public Relation (06-07)
Personnel Resource Committee (03-04)
Qualify Exam (02-04),

Graduate Study (00-02)

Graduate Students and Post-Docs

Current:

Jing Han (08/2008 ~ Present)	Scientific Reasoning and Educational Assessment
Amy Raplinger (09/2009 ~ present)	Scientific Reasoning and Science Inquiry
Chunhui Du (09/2010 ~ present)	Scientific Reasoning and Educational Assessment
Arron Adair (03/2011 ~ present)	Science Inquiry and Project based Learning
Joseph Fritchman (01/2011 ~ present)	Scientific Reasoning and Science Inquiry

Past Students and Post-Docs:

Gyoungho Lee (Post-Doc 01/2001~09/2002, Assistant Professor at Seoul National University, Korea, and the secretary of the physics education division in the Korean Physical Society since 04/2005).

YeounSoo Kim (Post-Doc 02/2004 ~ 02/2006) Students attitudes, motivations, cognitive conflicts and anxiety. Current position: Physics teacher at the most elite high school in South Korea.

Lin Ding (Post-Doc 07/2007~08/2010), Assistant Professor, School of Teaching and Learning, The Ohio State University.

Keith Oliver (08/2003, Assistant Professor at Grand Valley State University, WI)

Rasil Warnakulasooriy (08/2003, Post-doc in the physics department of MIT)

Florin Bocaneala (06/2005, Thesis on computational modeling of learning process). Project Coordinator/Director of Physics/Astronomy Online Instruction for Present/Future Science Teachers at Fairmont State University, West Virginia. (06~present).

Homeyra Sadaghiani (08/2005, Thesis on student learning in Quantum mechanics, Post-doc in the PER group at the University of Washington) (05~07). Assistant professor in the physics department at California State Polytechnic University in Pomona. (07~present).

Dedra Demaree (09/2003 ~ 09/2006) Thesis "Toward Understanding Writing To Learn In Physics: Investigating Student Writing", Visiting assistant professor at College of the Holy Cross, Massachusetts (06~07). Assistant professor in the physics Department at Oregon State University. (07~present).

Pengfei Li (09/2003 ~ 08/2007) Thesis on voting machine and problem solving, Assistant Professor in Physics Department at Savannah State University, Georgia. (07~present).

Jing Wang (02/2004 ~ 2009) Thesis "Advanced Quantitative Measurement Methodology in Physics Education Research". Assistant professor in Eastern Kentucky University. (09~present).

Albert Lee (07/2006 ~ 2009) Thesis "Development and Evaluation of Clicker Methodology for Introductory Physics Courses". Assistant professor in California State University, Los Angelis. (09~present).

Visiting Scholars:

Li Cheng (08/2009 ~ present), Ph.D. student, South East University, Nanjing, China

Jiawu Fan (09/2010~present), Ph.D. student, Beijing Normal University, Beijing, China

Shaona Zhou (09/2010~present), Ph.D. student, South China Normal University, Guangzhou, China

Qiong Huang (11/2010~present), Ph.D. student, Beijing Normal University, Beijing, China

Li Xie (02/2011 ~ present), Professor, Yangtze University, Jingzhou, Hubei, China

XiaoLi Wu (03/2011 ~ present), Professor, Beijing Institute of Technology, Beijing, China

Liangyu Peng (09/2010~03/2011), Professor, Hunan Normal University, Changsha, China

Xiaojun Wang (11/2010 ~ present), Professor, South China Normal University, Guangzhou, China

Guiqing, Xu (11/09 ~ 05/2010), Ph.D. student, Beijing Normal University, Beijing, China

Yibing Zhang (04/2009 ~ 07/2010), professor, Department of Physics, Ningxia University, Yingchuan, China

Xiumei Feng (09/2008 ~ 08/2009), assistant professor, Department of Physics, HuaZhong Normal University, Wuhan, China

TianFang Cai (09/2007~07/2008), associate professor, Department of Physics, Beijing JiaoTong University, Beijing, China

Kai Fang (04/2007~09/2007), assistant professor, Department of Physics, Tongji University, Shanghai, China

LiJia Yang (02/2007~10/2007), professor, Department of Physics, China National University of Defense Technology, Changsha, China

Publications and Academic Activities

Journal Articles:

1. Shaona Zhou, Jing Han, Nathaniel Pelz, Xiaojun Wang, Liangyu Peng, Hua Xiao, Lei Bao, Inquiry Style Interactive Virtual Experiments: A Case on Circular Motion, European Journal of Physics. (in-press)
2. Lin Ding, Neville Reay, Albert Lee, and Lei Bao, Exploring the role of conceptual scaffolding in solving synthesis problems, Physical Review ST-PER. (in-press)
3. Koenig, K., Schen, M., Edwards, M. & Bao, L. (in press). Addressing STEM Retention through a Scientific Thought and Methods Course. Journal of College Science Teaching.
4. Albert Lee, Lin Ding, N. W. Reay, and Lei Bao, "Single-Concept Clicker Question Sequences," The Physics Teacher, (in press).
5. Jing Wang and Lei Bao, "Analyzing Force Concept Inventory with Item Response Theory," Am. J. Phys., 78 (10), 1064-1070 (2010).
6. Lei Bao, Tianfan Cai, Kathy Koenig, Kai Fang, Jing Han, Jing Wang, Qing Liu, Lin Ding, Lili Cui, Ying Luo, Yufeng Wang, Lieming Li, Nianle Wu, "Learning and Scientific Reasoning", ***Science,*** Vol. 323. no. 5914, pp. 586 – 587 (2009).
7. Lei Bao, Kai Fang, Tianfang Cai, Jing Wang, Lijia Yang, Lili Cui, Jing Han, Lin Ding, and Ying Luo "Learning of Content Knowledge and Development of Scientific Reasoning Ability: A Cross Culture Comparison," *Am. J. Phys.*, 77 (12), 1118-1123 (2009).
8. Lin Ding, Neville W. Reay, Albert Lee and Lei Bao, "Are we asking the right questions? Validating clicker question sequences through student interviews," *Am. J. Phys.*, 77 (7), 643-650 (2009).
9. L. Bao, S. Stonebraker, and H. Sadaghiani, "A Flexible Homework System," *Am. J. Phys.*, 76 (9), 878-881 (2008).
10. Lin Ding, Neville W. Reay, Albert Lee and Lei Bao, "The effects of testing conditions on conceptual survey results," Phys. Rev. ST Phys. Educ. Res. 4, 010112 (2008).
11. David E. Pritchard, Young-Jin Lee and Lei Bao, "Mathematical learning models that depend on prior knowledge and instructional strategies," Phys. Rev. ST Phys. Educ. Res. 4, 010109 (2008)
12. N.W. Reay, P. Li, and L. Bao, "Testing a New Voting Machine Methodology," *Am. J. Phys*. 76 (2) 171-178 (2008).
13. L. Bao and E. F. Redish, "Model Analysis: Assessing the Dynamics of Student Learning," *Phys. Rev. ST Phys. Educ. Res. 2, 010103 (2006)*.
14. L. Bao, "Theoretical Comparison of Average Normalized Gain Calculations," *Am. J. Phys.* 74 (10) 917-922 (2006).
15. Gyoungho Lee, Jongho Shin, Jiyeon Park, Sangho Song, Yeonsoo Kim, Lei Bao, "An Integrated Theoretical Structure of Mental Models in Science Education: Students' ideas of the circular motion," *J. Korea Assoc Res. Sci. Edu.* 25-6, 698-709 (2005).
16. M. C. Wittmann, J. T. Morgan, and L. Bao, "Addressing student models of energy loss in quantum tunneling," Eur. J. Phys. 26 939-950 (2005). Chosen for "Highlights of 2005" by the journal.
17. N. W. Reay, L. Bao, P. Li, R. Warnakulasooriya and G. Baugh, "Toward an effective use of voting machines in physics lectures," *Am. J. Phys*. 73, 554 (2005)
18. L. Bao and E. F. Redish, "Understanding probabilistic interpretations of physical systems: A pre-requisite to learning quantum physics", *Am. J. Phys.* 70 (3), 210-217, (2002)
19. L. Bao, K. Hogg, and D. Zollman, "Model Analysis of Fine Structures of Student Models: An Example with Newton's Third Law," *Am. J. Phys.* 70 (7), 766-778 (2002).
20. L. Bao and E. F. Redish, "Concentration Analysis: A Quantitative Assessment of Student States," *PERS* of *Am. J. Phys.* 69 (7), S45-53, (2001).

Selected Media and News Coverage:

Nature Physics: Science education: Lessons to be learned, Vol.6, 6, 2010.
Science News: Feature: Think Like a Scientist, Vol.175 #13 (p. 20), 06/20, 2009.
NPR: Can Scientific Reasoning Be Taught? 1/30, 2009
NPR Science Friday: Learning Facts vs Learning to Reason. 1/30, 2009
The Columbus Dispatch: Study: Chinese students know more science facts than U.S. counterparts, 1/29, 2009.
China Daily: Science students lack ability to reason 1/30, 2009.
Inside Higher Ed: Blinding Them with Science 1/30, 2009

Book/Chapters (Peer Reviewed):

1. L. Bao and E. F. Redish, "Educational Assessment and Underlying Models of Cognition" In *The Scholarship Of Teaching And Learning In Higher Education: The Contributions Of Research Universities* , Ed. William E. Becker & Moya L. Andrews, pp 221-264, Indiana University Press, 2004.

Peer Reviewed Conference Proceedings:

1. Liangyu peng, Lei Bao. Application of Matlab/Simulink and Orcad/PSpice Software in Theory of Circuits. 2010 International Conference on Broadcast Technology and Multimedia Communication (BTMC 2010), 2010 Second Pacific-Asia Conference on Knowledge Engineering and Software Engineering (KESE 2010). Chongqing, China, December 13-14, 2010. Volume III: 514-517. (IEEE publication)
2. Liangyu peng, Lei Bao, Manchi Huan. Research of Generalized Lorenz System Family and Chua's Circuit Based on Simulink. 2011 International Conference on Computers, Communications, Control and Automation (CCCA 2011). Hong Kong, China, February 20-21, 2011. Volume I: 417-420. (IEEE publication)
3. Liangyu peng, Lei Bao, Manchi Huan. The Study of Removing Image Noise with Median Filter and Wavelet Transform. 2011 International Conference on Computers, Communications, Control and Automation (CCCA 2011). Hong Kong, China, February 20-21, 2011. Volume I: 421-424. (IEEE publication)
4. Scott Zollinger, Patti Brosnan, Diana B. Erchick, and Lei Bao, "Mathematics Coaching: Impact on Student Proficiency Levels After One Year of Participation", North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA), (2010).
5. L. Ding, N. W. Reay, A. Heckler, and L. Bao, "Sustained effects of solving conceptually-scaffolded synthesis problems", PERC Proceedings (2010).
6. Lin Ding, Neville Reay, Albert Lee and Lei Bao, "Using Conceptual Scaffolding to Foster Effective Problem Solving" *PERC proceedings* (2009).
7. Homeyra R. Sadaghiani and Lei Bao, "Student Difficulties in Understanding Probability in Quantum Mechanics" *PERC proceedings* (Aug. 2005).
8. Yeounsoo Kim, Lei Bao and Omer Acar, "Students' Cognitive Conflict and Conceptual Change in a PBI Class," *PERC proceedings* (Aug. 2005).
9. Yeounsoo Kim and Lei Bao, "Development of an Instrument for Evaluating Anxiety Caused by Cognitive Conflict," PERC proceedings (Aug. 2004).
10. Gyoungho Lee, Jiyeon Park, Yeounsoo Kim and Lei Bao, "Alternative Conceptions, Memory & Mental Model in Physics Education," PERC proceedings (Aug. 2004).
11. Dedra Demaree, Stephen Stonebraker, Wenhui Zhao and Lei Bao, "Virtual Reality Experiments in Introductory Physics Laboratories," PERC proceedings (Aug. 2004).
12. Rasil Warnakulasooriya and Lei Bao, "Procedural Rules in Students' Reasoning," *PERC proceedings* July 2003.
13. Neville W. Reay, Lei Bao, Gordon Baugh and Rasil Warnakulasooriya, "Business-Style" Group Work in a Freshman Engineering Honors Class," *PERC proceedings* July 2003.
14. Florin Bocaneala and Lei Bao, "Neural Network Modeling for Physics Learning: A Case on E&M," *PERC proceedings* July 2003.
15. Homeyra Sadaghiani and Lei Bao, "Lecture Demonstrations in Modern Physics: Quality vs. Quantity," *PERC proceedings* July 2003.
16. Homeyra R. Sadaghiani and Lei Bao, "Immediate Informative Feedback Using a New Homework System," *PERC proceedings* Aug. 2002.
17. Keith Oliver and Lei Bao, "Student Resources in Quantum Mechanics, or Why Students Need Meta Resources," *PERC proceedings* Aug. 2002.
18. Gyoungho Lee and Lei Bao, "Context Map: A Method to Represent The Interactions Between Students' Learning and Multiple Context Factors," *PERC proceedings* Aug. 2002.
19. Rasil Warnakulasooriya and Lei Bao, "Toward a Model-Based Diagnostic Instrument in Electricity and Magnetism - An Example," *PERC proceedings* Aug. 2002.
20. Gyoungho Lee and L. Bao, "Graduate and undergraduate students' views on learning and teaching physics," *PERC proceedings*, July 2001.
21. R. Warnakulasooriya and L. Bao, "Students' understanding of Electricity and Magnetism for the development of a model based diagnostic test," *PERC proceedings*, July 2001.
22. Richard N. Steinberg., Michael. C. Wittmann, Lei Bao, and Edward F. Redish, "The Influence of Student Understanding of Classical Physics When Learning Quantum Mechanics," Research on the Teaching and Learning of Quantum Science, NARST Annual Meeting, Boston, March, 1999. Http://www.phys.ksu.edu/perg/paper/narst/.
23. Zhonghan Woo, Lei Bao, Wang Ling and Yuan Chunwei, "AFM Analysis on the Bioelectric Property of Fish Scale Plates," The Eighth Symposium on Electrets, Paris, Sept., 1994.

24. Zhonghan Woo, Lei Bao, et al, "Electrostatic Technology and Clean Engineering," International Conference on Air and Water Cleaning Technology, China, June, 1993.
25. Lei Bao, Yiming Ling, "Ozone Synthesis with UV and Silent Discharge," The Asia-Pacific Conference on Plasmas Science and Technology, China, Sept. 1992.

**PERC proceeding is an AIP publication that currently publishes one issue annually. The acceptance rate is about 50%.*

Invited Review Papers:

1. Lei Bao and ZuRen Wu, "Physics Education in China: From Past to Future," AAPT Interactions, 38 (1), 24-25, (2008).

Peer Reviewed Papers in Non-English Journals:

1. Ying Luo and Lei Bao, "Implications from the comparison of scientific reasoning abilities between Chinese and US college students," *Journal of Education in China*, 10, 20, 2009 (Chinese)
2. Kai Fang, Lijia Yang, Tianfang Cai, Jing Wang, and Lei Bao, "Assessment of Physics Education Research," *College Physics*, (in press, Chinese).
3. Kai Fang, Lijia Yang, Tianfang Cai, Jing Wang, and Lei Bao, "Review of Physics Education Research," *College Physics*, (in press, Chinese).

Invited Talks / Seminars:

1. L. Bao, "STEM Education: US-China Comparison," Plenary Talk, Advanced Workshop on Investigative Learning, Nanjing, China, August, 2011.
2. L. Bao, "Scientific Reasoning and Science Education," Plenary Talk, OCPA7 Biannual Meeting, Kaohsiung, Taiwan, August, 2011.
3. L. Bao, "STEM Learning and Scientific Reasoning," NARST Annual Meeting, Orlando, FL, April, 2011.
4. L. Bao, "Assessment of Advanced Ability in Chinese College Admission Test," AAPT Winter Meeting, Jacksonville FL, January, 2011.
5. L. Bao, "Science Learning and Scientific Reasoning," Indiana University Purdue University Indianapolis, October, 2010.
6. L. Bao, "Advanced Methods in Education Assessment," Beijing Education Testing Center, Beijing, September, 2010.
7. L. Bao, "Current Trends in Physics Education Research," Beijing University of Posts and Telecommunications, Beijing, September, 2010.
8. L. Bao, "Introductory to Physics Education Research," Beijing Institute of Technology, Beijing, September, 2010.
9. L. Bao, "Interactive Classrooms for Fostering Student General Abilities," Central China Normal University, WuHan, September, 2010.
10. L. Bao, "Physics Education and Training of Scientific Reasoning," South China Normal University, GuangZhou, August, 2010.
11. L. Bao, "Physics Education Research: A Research based Framework for Education Reform," Hunan Normal University, ChangSha, August, 2010.
12. L. Bao, "Recent Development in Physics Education Research," Plenary Speech, Annual Meeting of the Chinese National Association of Research in Higher Education of Physics, YunNan Normal University, KunMing, August, 2010.
13. L. Bao, "Developing Interactive Classroom Environments," TongJi University, ShangHai, August, 2010.
14. L. Bao, "Assessment Methods and Instrument Design," Beijing Normal University, Beijing, August, 2010.
15. L. Bao, "Physics Education Research Around the World," 2010 International Physics and Science Education Research Forum, the Annual Meeting of Chinese Society of Education, Physics Education Committee, August, 2010.
16. L. Bao, "Current Trends in Physics Education Research: Methodology and Development," Plenary Speech, Annual Meeting of the Education Committee of the Chinese Physical Society, Beijing, July, 2010.
17. L. Bao, J. Han, and K. Koenig, "Assessment of Scientific Reasoning: A Case in Proportional Reasoning," AAPT-PERC, Portland, OR, July, 2010.
18. L. Bao, "Learning and Scientific Reasoning," University at Buffalo (SUNY), July, 2010.
19. L. Bao, "Learning to Teach and Teaching to Learn," APS/AAPT Winter Meeting, Washington DC, February, 2010.
20. L. Bao, "Learning and Scientific Reasoning" OSU Physics Colloquium, OSU, January, 2010.
21. L. Bao, "Establishing a Productive Global Collaboration," OSU Research Symposium on Research and the Global University, OSU, November, 2009.
22. L. Bao, "Assessment of Learning and Reasoning," AAPT Summer Meeting, Ann Arbor, July, 2009.
23. L. Bao, "Assessment and training in scientific reasoning," IPERC Summer Workshop, Columbus, Ohio, July, 2009

24. L. Bao, “Connections between Science Content, Instruction, and Development of Scientific Reasoning: Developing a Research Based Framework for Sustainable Education Improvement,” Forum for School Science, AAAS Annual Meeting, Chicago, February, 2009.
25. L. Bao, “Physics Education Research Methods and Current Development,” China Eastern Normal University, ShangHai, November, 2008.
26. L. Bao, “Methods and Current Development in Science Education and Education Research,” Southeast University, Nanjing, November, 2008
27. L. Bao, “Physics Education Research: A Research Based Framework for Sustainable Education Improvement,” Higher Education Forum, TongJi University, ShangHai, November, 2008
28. L. Bao, “K-12 Science Education and Education Research,” BoYa Colloquium, HuaZhong Normal University, Wuhan, November, 2008.
29. L. Bao, “Physics Education Research,” Annual Meeting of the Education Committee of the Chinese Physical Society, Peking University, Beijing, November, 2008.
30. L. Bao, “Science Education and Education Research,” Forum on Physics Education and Teacher Training, Beijing Normal University, Beijing, November, 2008.
31. L. Bao, “Assessment of Learning: Review on Methodology,” IPERC Workshop, Beijing Jiaotong University, Beijing, November, 2008.
32. L. Bao, “Assessment of Scientific Reasoning,” Center for Research on College Science Teaching and Learning, Michigan State University, September, 2008.
33. L. Bao, “Cross Culture Comparison of Student Content Knowledge and Reasoning Ability,” AAPT Summer Meeting 2008.
34. L. Bao, “Student Learning/Reasoning Ability and Content Knowledge,” Wright State University, March 2008.
35. L. Bao, “Understanding Quantitative Assessment: Probability Frames and Methods,” University of Maryland, November, 2007.
36. L. Bao, Plenary Talk -- “Measurement and Cognitive Modeling,” Biennial Meeting for Foundations and Frontiers of Physics Education Research, Bar Harbor, Maine, 2007.
37. L. Bao, “Comparing the probabilistic frameworks of popular quantitative education measurement methods,” AAPT Summer Meeting 2007.
38. L. Bao, “Cognitive Modeling and Measurement in Education Research,” Center for Learning Science, Southeast University, Nanjing, China, July, 2007
39. L. Bao, “Research and Measurement Methodology in Physics Education,” GuangXi Normal University, Guilin, China, July, 2007
40. L. Bao, “Modeling Quantitative Assessment Data,” Tsinghua University, Beijing, China, June, 2007
41. L. Bao, “Physics Education Research and Quantitative Assessment,” BeiJing Normal University, Beijing, China, June, 2007
42. L. Bao, “Physics Education Research: An Interdisciplinary Field of Research,” BeiJing JiaoTong University, Beijing, China, June, 2007
43. L. Bao, “Model Analysis: Representing and Assessing the Dynamics of Student Learning,” APS April Meeting, Jacksonville Florida, April 15-17, 2007
44. L. Bao, “Theoretical Analysis of Models and Methods for Quantitative Assessment,” AAPT Summer Meeting 2006.
45. L. Bao, “Introduction to Model Analysis,” University of Toledo, Oct. 2005.
46. L. Bao, “Physics Education Research at The Ohio State University,” Tsinghua University, Beijing China, Aug. 2005.
47. L. Bao, “Research in Physics Education: An Overview,” Nanjing University, Nanjing China, Aug. 2005.
48. L. Bao, “Research and Development in Physics Education,” China-Japan-US Symposium on Physics Education and Experiment in University, Hangzhou China, Aug. 2005.
49. L. Bao, “Physics Principles in Modeling Education Assessment,” AAPT Summer Meeting, 2005
50. L. Bao, N. Reay, and L. Pengfei “Formative Use of In-Class Polling Technology in Physics Lectures,” AAPT Summer Meeting, 2005
51. L. Bao, “Theoretical and Experimental Approaches in Physics Education Research,” Invited Seminar, University of Washington, May 2005.
52. L. Bao, “Formative Use of In-class Polling Technology in Physics Lectures,” Invited Seminar, Rutgers University, April 2005.
53. L. Bao, “Model Analysis: a Framework for Cognitive Representation and Educational Assessment,” Physics Colloquium, North Carolina State University, Nov. 2004.
54. L. Bao, “Model Analysis as a Method for Cognitive Representation and Measurement,” AAPT *Announcer* 34 (2) 90 (Aug. 2004).
55. L. Bao, “Recent Advancement in Physics Education Research,” Symposium on Physics Research and Education, Nanjing, China, Aug. 2004.
56. L. Bao, “Formative Assessment: Theory, Methodology and Applications,” Fifth National Competition of Multi-Media and Internet Materials for Physics Education, ShiJiaZhuang, China, Aug. 2004. Keynote Speech.

57. L. Bao, “Internet and Virtual Reality Technology for Teaching Science,” Rainbow Education Research Institute, ShuZhou, China, Aug. 2004.
58. L. Bao, “Education Research in US,” Department of Education, ShengZheng BaoShang District, China, Aug. 2004.
59. L. Bao, “Computational Modeling of the Learning Process: A neural net simulation of students’ learning of charge distribution and polarization,” University of Maryland, Oct. 2003.
60. L. Bao, “Virtual Reality in the Teaching and Learning of Physics,” China Physics Society (CPS) Autumn Annual Meeting, HeFei, China, Sept. 2003.
61. L. Bao, “Recent Advancement in Physics Education Research: Theories and Experiments,” Physics Colloquium, SouthEast University, Nanjing, China, Aug. 2003.
62. L. Bao, “Current Research Issues and Advancement in Physics Education Research,” International Conference on Physics Education Research and Reform, JiAn, China, Aug. 2003. Keynote Speech.
63. L. Bao, “Model Analysis and Education Assessment,” AAPT *Announcer* 33 (2) 90 (Aug. 2003).
64. L. Bao, “Cognitive Representations: Philosophy and Design of Measurement,” AAPT *Announcer* 32 (2) 143 (Aug. 2002).
65. L. Bao, “States and Perturbations of Cognitive Processes in Learning Quantum Mechanics, ” Gordon Research Conferences, June, 2002, *Physics Research And Education: Quantum Mechanics*.
66. L. Bao, “Quantum Cognition: Are we ready?” AAPT National Conference, January, 2002, *Announcer* 31 (4) 67.
67. L. Bao, “Research on Physics Education,” International Conference on Physics Education Research and Reform, Hangzhou, China, April 1997.
68. L. Bao, “Physics of Flash Memory and Applications in Instruction of Quantum Mechanics”, University of Maryland, September 2000.
69. L. Bao, “Introduction to Model Analysis,” University of Washington, November 1999.
70. L. Bao, “Dynamics of Student Modeling and Assessment Method,” Rutgers University, October 1999.
71. L. Bao, “Model Analysis: A Quantitative Approach to Study Student Understandings of Physics,” Syracuse University, May 1999.

Contributed Conference Presentations:

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1. Shaona Zhou , Hua Xiao, Jing Han , Yu'an Pi , Lei Bao, “Students’ Understanding of the Concept of Sampling” AAPT Summer Meeting: Omaha, Nebraska (2011)
2. Li Chen, Jing Han, Liangyu Peng, Yan Tu, Lei Bao, “The impact of sample size in using IRT with FCI,” AAPT Summer Meeting: Omaha, Nebraska (2011).
3. Jiawu Fan, Shaona Zhou, Chunhui Du, Jing Han, Lei Bao, ”The Impact of Virtual Experiments on Students’ Reasoning in Physics” AAPT Summer Meeting: Omaha, Nebraska (2011).
4. Jiawu Fan, Shaona Zhou, Chunhui Du, Jing Han, Lei Bao, ”Using virtual experiments to help student reasoning in physics” AAPT Summer Meeting: Omaha, Nebraska (2011)
5. Lei Bao, Jing Han, Kathy Koenig, and Tianfang Cai, “Assessment of Scientific Reasoning: A Case in Probabilistic Reasoning,” AAPT Winter Meeting: Jacksonville, FL (2011).
6. Li Chen, Jing Han, Jing Wang, Yan Tu, Lei Bao, “Comparison of Item Response Theory Methods,” AAPT Winter Meeting: Jacksonville, FL (2011).
7. Li Chen, Jing Han, Jing Wang, Yan Tu, Lei Bao, “Item Response Theory: A Comparison of Algorithms,” AAPT Winter Meeting: Jacksonville, FL (2011).
8. Lei Bao, Jing Han, Guiqing Xu, Yibing Zhang, and Kathleen M. Koenig, “Large Scale Assessment of Scientific Reasoning,” AAPT Summer Meeting: Portland, Oregon (2010).
9. Jing Han, Guiqing Xu, Li Chen, Kathleen M. Koenig and Lei Bao, “Developing Assessment Instruments on Scientific Reasoning,” AAPT Summer Meeting: Portland, Oregon (2010).
10. Kathleen M. Koenig and Lei Bao, “Developing Scientific Reasoning in Middle School Students”, AAPT Summer Meeting: Portland, Oregon (2010).
11. Kathleen M. Koenig, Michael Edwards, Lei Bao, “Motivating First-Year College Students to Continue as a Science Major,” AAPT Summer Meeting: Portland, Oregon (2010).
12. Lin Ding, Neville W. Reay, Lei Bao, and Albert H. Lee, “The Role of Conceptual Scaffolding in Students’ Solving Synthesis Problems,” AAPT Summer Meeting: Portland, Oregon (2010).
13. Nathaniel Caldwell, Jing Han, Lei Bao, “Interactive Tutorial for Developing Scientific Reasoning,” AAPT Summer Meeting: Portland, Oregon (2010).
14. Tom Carter, Albert H. Lee, Lin Ding, Neville W. Reay, and Lei Bao, “Clicker Question Exchange for Introductory Physics Classes”, AAPT Summer Meeting: Portland, Oregon (2010).
15. Kathy Koenig, Melissa Schen, Sachiko Tosa, and Lei Bao, “The Development of Scientific Reasoning Abilities in Pre-service Teachers,” AAPT Winter Meeting: Washington DC (2010)
16. Kathleen M. Koenig, Michael Edwards, Douglas Bradley-Hutchison, and Lei Bao, “Using an Innovative Skills-based Course To Improve First Year Retention,” AAPT Winter Meeting: Washington DC (2010)

17. Jing Han, Tianfang Cai, Kathy Koenig, Jing Wang, Lei Bao, “Exploring the Effects of Cultural Backgrounds on Student Attitudes on Learning” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
18. Jing Han, Tianfang Cai, Kathy Koenig,, Jing Wang,, Lei Bao, “Cross Cultural Comparison of Students' Attitudes on Learning” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
19. Jing Wang, Tianfang Cai, Kathy Koenig, Jing Han, Lei Bao, “The Developmental Trend of Scientific Reasoning Skills” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
20. Lin Ding Neville Reay, Albert Lee, Lei Bao, “Why Don't We Bring into Play Diverse Problems?” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
21. Young-Jin Lee, Lei Bao, David E Pritchard, “Modeling How Pre/Post Gain Depends on Prior Knowledge” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
22. Mark Schober, Hugh Ross, Kathleen Koenig, Lei Bao, “ Correlation Analysis of High School Students' Coursework and Reasoning” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
23. Xiumei Feng, Tianfang Cai, Ying Luo, Kathy Koenig, Lei Bao, “Item Analysis of Gender Difference on Scientific Reasoning Test” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
24. Albert H. Lee, Lin Ding, Neville W. Reay, Lei Bao, Tom Carter, “Exchange of Clicker Questions for Your Introductory Physics Classes” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
25. Neville W. Reay, Lin Ding, Albert Lee, Lei Bao, “Developing, Validating and Evaluating Clicker Question Sequences” AAPT Summer Meeting: Ann Arbor, Michigan (2009)
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34. Jing Wang, Jing Han, Xiumei Feng, Kathy Koenig, Lei Bao, “Statistical analysis of developmental data of scientific reasoning ability,” AAPT Winter Meeting 2009.
35. Jing Wang, Jing Han, Xiumei Feng, Kathy Koenig, Lei Bao, “Validity and reliability of Lawson’s classroom test of scientific reasoning,” AAPT Winter Meeting 2009.
36. Kathy Koenig, Tianfang Cai, Jing Wang, Jing Han, Lei Bao, “Lawson Classroom Test of Scientific Reasoning Scores and Student Background,” AAPT Winter Meeting 2009.
37. Kathy Koenig, Tianfang Cai, Jing Wang, Jing Han, Lei Bao, “Connections between student backgrounds and scientific reasoning scores,” AAPT Winter Meeting 2009.
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40. Lei Bao, Tianfang Cai, Jing Wang, Jing Han, and Kathy Koenig, “On the Measurement of Scientific Reasoning Ability: A Developmental Perspective,” AAPT Summer Meeting 2008.
41. Lei Bao, Tianfang Cai, Jing Wang, Jing Han, and Kathy Koenig, “Assessing Scientific Reasoning Ability: Analysis of Skill Dimensions,” AAPT Summer Meeting 2008.
42. Kathleen M. Koenig, Tianfang Cai, Jing Han, Jing Wang, and Lei Bao, “Assessing Middle School, High School, and College Students’ Reasoning Ability,” AAPT Summer Meeting 2008.
43. Kathleen M. Koenig, Tianfang Cai, Jing Han, Jing Wang, and Lei Bao, “Student Scientific Reasoning Ability and Academic Performance,” AAPT Summer Meeting 2008.
44. Albert H. Lee, Lin Ding, Neville W. Reay, and Lei Bao, “Do Experts See What Students See in Clicker Sequences? Validation I,” AAPT Summer Meeting 2008.
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49. Lei Bao, Jing Wang, "Flipping the mind: switch effect as a tool for measurement," AAPT Summer Meeting 2007.
50. David Pritchard, Young-Jin Lee, Lei Bao, "How Prior Knowledge Affects Learning: Common Learning Theories Lead to Different Learning Models," AAPT Summer Meeting 2007.
51. Stephen Stonebraker, Lei Bao, "Studying Fine Structures of Mixed Mental Model States," AAPT Summer Meeting 2007.
52. Jing Wang, Lei Bao, "An item response analysis of existing concept surveys," AAPT Summer Meeting 2007.
53. Albert Lee, Lei Bao, Pengfei Li, Neville Reay, Jing Wang, "Gender Differences in Using Voting Machine in Introductory Physics Courses," AAPT Summer Meeting 2007.
54. Dedra Demaree, Gordon Aubrecht, Lei Bao, "Does feedback improve scientific writing quality independent of grade motivation?" AAPT Summer Meeting 2007.
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56. Pengfei Li, Neville Reay, Albert Lee, Lei Bao, "Designs and evaluations of two types of clicker question sequences," AAPT Summer Meeting 2007.
57. Lili Cui, Eric Anderson, Lei Bao, "Using Online Forum to Foster Interaction Outside Classroom," AAPT Summer Meeting 2007.
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63. Lei Bao, Jing Wang, Jake Mayer, Albert Lee, Neville Reay, "Cross comparison of VM questions, conceptual surveys and common exams," AAPT Summer Meeting 2007.
64. Albert Lee, Lei Bao, Pengfei Li, Neville Reay, Jing Wang, "Testing Voting Machine in Algebra-based Introductory E&M Course," AAPT Summer Meeting 2007.
65. Lei Bao, Jing Wang, "A Switch Effect in Concept Test Questions," AAPT Summer Meeting 2006.
66. Jing Wang, Lei Bao, "Conceptual Priming in Multiple Choice Questions," AAPT Summer Meeting 2006.
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70. Rebecca Lindell, Lei Bao, Andrew Heckler, "A Mixed-Method Approach to Discovering Conceptual Learning Hierarchies," AAPT Summer Meeting 2006.
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76. Lei Bao, Andrew Heckler, Rebecca Lindell, "Data Modeling of Results from the Lunar Phase Concept Inventory," AAPT Summer Meeting 2006.
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86. Pengfei Li, Lei Bao, Neville Reay, Jing Wang, “New-Information Problem,” AAPT Summer Meeting 2005.
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90. Yeounsoo Kim, Lei Bao, “Using the iCARE for Monitoring Cognitive Conflicts and Anxiety,” AAPT Summer Meeting 2005.
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95. Dedra Demaree, Lei Bao, “Student Difficulties with Wave Representations and their Applications,” AAPT Summer Meeting 2005.
96. Dedra Demaree, Stephen Stonebraker, Wenhui Zhao, Lei Bao, “Outside the Box: An Unexpected Application for Virtual Reality Simulations,” AAPT Summer Meeting 2005.
97. Pengfei Li, Lei Bao, Neville Reay, Jing Wang, “Statistical Analysis of Students' Voting Data in an E&M Course,” AAPT Summer Meeting 2005.
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100. Lei Bao, Florin Bocaneala, Jing Wang, “Computational Cognitive Analysis of Student Learning in Electric Charge Distribution,” AAPT Summer Meeting 2005.
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105. Dedra N. Demaree and Lei Bao, “Using ISLE Laboratories to Enhance a Traditional Lecture-Based Course Meeting,” AAPT Winter Meeting 2005.
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111. Homeyra Sadaghiani and Lei Bao, “Addressing Student Difficulties in Understanding Phase and Phase Difference,” AAPT Winter Meeting 2005.
112. Stephen Stonebraker and Lei Bao, “Student Decision-Making About Homework in an Increased-Freedom Environment,” AAPT Winter Meeting 2005.
113. Jing Wang, Pengfei Li, Homeyra Sadaghiani, Neville W Reay , and Lei Bao, “Developing Voting Machine Questions for Introductory Physics Courses,” AAPT Winter Meeting 2005.
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Workshops:

1. L. Bao, "Interactive Classroom Environment and Inquiry Based Learning," 2010 International Physics and Science Education Research Forum, the Annual Meeting of Chinese Society of Education, Physics Education Committee, August, 2010.
2. L. Bao, "Research in Physics Education: Theory and Methodology," 4-day workshop presented at the Science Education Institute of GuangXi Normal University, Guilin, China, July, 2007.
3. Lei Bao and Neville Reay, "Model Analysis: Theoretical Basis and Methodology for Developing Effective Assessment," AAPT-PERC Summer Meeting, 2005.
4. Lei Bao, "Using Voting Machine Systems as a Tool for In-class Formative Assessment," SouthEast University, Nanjing, China, Aug. 2004.
5. Lei Bao and Edward F. Redish, "Model Analysis: Theoretical Basis and Methodology for Developing Effective Assessment," AAPT *Announcer* 33 (2) 60 (Aug. 2003).
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7. "Visual Quantum Mechanics and Quantum Tutorials", AAPT Workshop, July 2000.
8. "Physics Education Research and Instruction in Modern Physics / Quantum Mechanics", CSAAPT Workshop, UMBC, May 1998.
9. "Tutorials on Teaching Waves in Introductory Physics", CSAAPT Workshop, UVA, Nov. 1998.
10. "Tutorials in Teaching Introductory Physics," Workshops at Dickinson College for the Summer Seminar on Teaching Introductory Physics Using Interactive Methods and Computers, June 1995, June 1996 and June 1997.