

**Annual Report of Faculty Activities
(January 2002 – December 2002)**

N. Sanjay Rebello

Teaching Activities

<i>Courses Taught</i>	<i>Contact Hours</i>	<i>Enrollment</i>	<i>Semester</i>
PHYS 636: Physical Measurement & Instrumentation	2 Lecture, 6 Lab	5	Spring 2002
PHYS 101: Physical World – I	3 Lecture	138	Fall 2002
PHYS 214: Engineering Physics – II (Studio)	4 Studio	40	Fall 2002
PHYS 807: Seminar in Physics Education	1 Seminar	8	Fall 2002

A Summary of teaching, syllabi, sample course materials, examples exams etc. are in Appendix A.

Staff and Students Advised

<i>Name</i>	<i>Position</i>	<i>Start</i>	<i>Expected Completion</i>	<i>Degree</i>
Salomon F. Itza-Ortiz ¹	Postdoc	July 2001	July 2003	N/A
Paula V. Engelhardt	Postdoc	September 2002	July 2004	N/A
Kara Gray	Undergraduate	September 2001	May 2003	B.S. Physics

¹Salomon F. Itza-Ortiz is under formal supervision of D. Zollman. My advisement is in an informal capacity.

Active Grants

<i>Title</i>	<i>Role</i>	<i>Source</i>	<i>Amount (US\$)</i>	<i>Award Start</i>	<i>Award End</i>
CAREER: Research on Students' Mental Models, Learning and Transfer as a Guide to Application-Based Curriculum Development and Instruction in Physics.	PI	NSF	436,796	03/15/02	03/15/07
ASA: Assessing Student Transfer and Retention of Learning in Mathematics, Physics, and Engineering Courses.	Co-PI, A. Bennett [PI] (Mathematics)	NSF	500,000	06/01/02	05/31/06
Physics Teaching Web Advisory (Pathway) - A Digital Library for Enhancement and Preparation of Physics Teachers.	Co-PI, D. Zollman [PI]	NSF	276,382	09/01/02	08/31/04

Project summaries and budgets of active grants above are in Appendix B.

Grant Proposals Submitted

<i>Status</i>	<i>Title</i>	<i>Role</i>	<i>Source</i>	<i>Amount (US\$)</i>	<i>Award Start</i>	<i>Award End</i>
Declined	MRI: Acquisition of a Remote Personal Interaction System for Research on Students' Mental Models and their Development through Instruction.	PI	NSF	194,281	07/01/02	06/31/04
Declined	ITR: Infusing Pedagogical Content Knowledge and Metacognitive Reflection into a Physics Course for Pre-Service Elementary Teachers Using a Web-Based Course.	PI	NSF	239,873	01/01/03	12/31/04

<i>Status</i>	<i>Title</i>	<i>Role</i>	<i>Source</i>	<i>Amount (US\$)</i>	<i>Award Start</i>	<i>Award End</i>
Declined	Spanning the Atlantic for Teacher Education: International Collaboration with a Context-Rich Physics Curriculum (SPATE: Intl.).	PI	FIPSE – U.S. Dept. of Ed.	74,952	10/01/02	09/30/04
Declined	Innovations in Nuclear Infrastructure and Education Program at Kansas State University	Co-PI, P. Whaley [PI] (Mech & Nuc. Engg.)	U.S. Dept. Energy	2,146,239	07/01/02	06/30/07
Declined	Collaborative Research: AVQM:EAS - Advanced Visual Quantum Mechanics: Engineering and Applied Sciences - Kansas State University and University of Virginia.	Co-PI, D. Zollman [PI]	NSF	230,944	01/01/03	12/31/05
Declined	IMD: How Things Work: Learning Physics Through Real-World Applications.	PI	NSF	766,614	03/01/03	02/28/06
Pending	STEMTP: Infusing Pedagogical Content Knowledge and Metacognitive Reflection into a Physics Course for Pre-Service Elementary Teachers Using a Web-Based Course.	PI	NSF	497,720	03/01/03	02/28/06
Pending	Implementation of the Interactive Studio Concept to an Upper Level Physics Course: Studio Optics	Co-PI, C. Sorensen [PI]	NSF	100,000	06/01/03	05/31/04

Copies of project summaries and budget of the pending proposals above are in Appendix C.

Departmental and University Committee Assignments

1. Physics Coordinator for the Math-Physics Computer Classroom.
2. Physics Department Course and Curriculum Committee (Spring 2002).
3. Physics Department Computer Committee (Fall 2002).

Positions in Professional Societies

1. Vice-President of the Arkansas-Oklahoma-Kansas (A-O-K) Section of AAPT.

Current Research Activities

1. Students' mental models of physical concepts (e.g. Newton's II Law, Energy conservation) in various contexts, and the development of these models through instruction.
2. Students' mental models of real-world applications (e.g. bicycle, light-bulbs etc.) and the development of these models through instruction.
3. Factors (e.g. question order) influencing students' responses on multiple-choice questions.
4. Transfer and retention of knowledge from physics to engineering courses.

Statement of current research activities will be provided in Appendix D.

Refereed Publications (Proceedings & Journals) Accepted

1. "The effect of question order on responses to multiple choice questions," Kara Gray, N. Sanjay Rebello and Dean A. Zollman, Proceedings of the Physics Education Research Conference (PERC), August 7-8, 2002, Boise, ID.
2. "A summary of students' mental models and their applications in contexts pertaining to Newton's II Law," Salomon F. Itza-Ortiz and N. Sanjay Rebello, Proceedings of the Physics Education Research Conference (PERC), August 7-8, 2002, Boise, ID.
3. "Identifying student models of sound propagation," Zdeslav Hrepic, Dean A. Zollman and N. Sanjay Rebello, Proceedings of the Physics Education Research Conference (PERC), August 7-8, 2002, Boise, ID.
4. "Supervised and unsupervised spectral angle classifiers," Youngsinn Sohn (Univ. of Maryland, Baltimore County) and N. Sanjay Rebello, Photogrammetric Engineering & Remote sensing (PE&RS).
5. "Ordinary words with odd meanings: The vocabulary of introductory physics and its implications to learning physics," Salomon F. Itza-Ortiz, N. Sanjay Rebello and Dean A. Zollman, The Physics Teacher.
6. "The vocabulary of physics and its impact on student learning," Salomon F. Itza-Ortiz, N. Sanjay Rebello and Dean A. Zollman, Proceedings of the National Association for Research in Science Teaching (NARST) Annual Meeting, March 23-26, 2003, Philadelphia, PA.
7. "Students' mental models of Newton's second law: Mechanics to electricity and magnetism," N. Sanjay Rebello, Salomon F. Itza-Ortiz, and Dean A. Zollman, Proceedings of the National Association for Research in Science Teaching (NARST) Annual Meeting, March 23-26, 2003, Philadelphia, PA.

Copies of the manuscripts of selected publications from above are in Appendix E.

Oral Presentations & Posters (Conferences & Colloquia)

1. "Investigations of students' mental models and their applications in Newton's II law problems," N. Sanjay Rebello and Salomon F. Itza Ortiz, Contributed Talk, AAPT Winter Meeting, January 19-23, 2002, Philadelphia, PA.
2. "Learning physics in the context of a bicycle," N. Sanjay Rebello, Robert G. Fuller (Univ. of Nebraska), Ewa Mioduszewska (AMSTEL Institute – The Netherlands), William M. Wehrbein (Nebraska Wesleyan Univ), Contributed Poster, AAPT Winter Meeting, January 19-23, 2002, Philadelphia, PA.
3. "The use of physics words in everyday language and implications for student learning," Salomon F. Itza Ortiz, N. Sanjay Rebello and Dean A. Zollman, Contributed Talk, AAPT Winter Meeting, January 19-23, 2002, Philadelphia, PA.
4. "Visual Quantum Mechanics – hands-on activities integrated with computer visualizations," Physics Department Colloquium, March 4, 2002, Southwest Missouri State University, Springfield, MO.
5. "Using K-State Online and an In-class Personal Response System in a Large Enrollment Physical Science Class," N. Sanjay Rebello, Contributed Talk, Convergence of Digital Learning Conference, April 15-16, 2002, Manhattan, KS.
6. "Student goals and expectations in a conceptual physics course," N. Sanjay Rebello, Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
7. "Using technology in a large enrollment physical science class," N. Sanjay Rebello, Contributed Poster, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.

8. "The effect question order on student responses to multiple-choice questions," Kara Gray, N. Sanjay Rebello, Dean A. Zollman, Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
9. "The effect of problem context on student use of Newton's II Law: A first look," Alicia Allbaugh, N. Sanjay Rebello, Dean A. Zollman, Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
10. "Students' mental models and their applications of Newton's II law in electricity and magnetism," Salomon F. Itza-Ortiz, N. Sanjay Rebello, Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
11. "Students' mental models of sound propagation," Zdeslav Hrepic, Dean A. Zollman and N. Sanjay Rebello, Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
12. "International Bicycle Project: Summary of student exchanges and curriculum development," Doyle Davis (New Hampshire Comm. Tech. College), S. Raj Chaudhury (Norfolk State Univ.), N. Sanjay Rebello, Dean A. Zollman, et. al. Contributed Talk, AAPT Summer Meeting, August 3-7, 2002, Boise, ID.
13. "Assessing student retention and transfer of physics knowledge to engineering courses," N. Sanjay Rebello, Paula V. Engelhardt, Salomon F. Itza-Ortiz, Contributed Talk, A-O-K Section Meeting of AAPT, October 4-5, Ada, OK.
14. "Students' mental models and their applications in a real-world context – the bicycle," Paula V. Engelhardt and N. Sanjay Rebello, Contributed Talk, A-O-K Section Meeting of AAPT, October 4-5, Ada, OK.
15. "Problem context and Newton's second law: A further look," Alicia Allbaugh, N. Sanjay Rebello, and Dean A. Zollman, Contributed Talk, A-O-K Section Meeting of AAPT, October 4-5, Ada, OK.

Copies of selected abstracts from above are in Appendix F.