Annual Report of Faculty Activities
(January 2003 – December 2003)

N. Sanjay Rebello

Teaching Activities

Courses Taught	*Contact Hours*	*Enrollment*	*Semester*
PHYS 113: General Physics – I (Recitation)	1 Recitation	42	Fall 2003
PHYS 636: Physical Measurement & Instrumentation	8 Lab	7	Spring 2003
PHYS 655: Physics of Solids	3 Lecture	6	Fall 2003
PHYS 807: Seminar in Physics Education	1 Seminar	8	Spring 2003

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

Staff and Students Advised

Name	*Position*	*Start*	*Expected Completion*	*Degree*
Paula V. Engelhardt	Postdoc	Sept. 2002	July 2004	N/A
Edgar G. Corpuz	Graduate Student	June 2002	August 2005	Ph.D. Physics
Kara E. Gray	Graduate Student	Sept. 2001	May 2004	M.S. Physics
Darryl J. Ozimek	Graduate Student	June 2002	August 2004	M.S. Physics

Active Grants

Title	*Role*	*Source*	*Amount (US$)*	*Award Start*	*Award End*
CAREER: Research on Students' Mental Models, Learning and Transfer as a Guide to Application-Based Curriculum Development and Instruction in Physics.	P.I.	NSF	436,796	03/15/02	03/15/07
ASA: Assessing Student Transfer and Retention of Learning in Mathematics, Physics, and Engineering Courses.	Co-P.I., [P. I.: A. Bennett, Mathematics]	NSF	500,000	06/01/02	05/31/06

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

Grant Proposals Submitted

Status	*Title*	*Role*	*Source*	*Amount (US$)*	*Award Start*	*Award End*
Declined	Information Technology Research: Researching the Impact of a Handheld Wireless Classroom Interaction System.	P.I.	NSF	996,743	09/01/03	08/31/06
Funded	Travel to the Second International GIREP Seminar on Quality Development in Teacher Education and Training.	P.I.	KSU FDA	1,500	09/01/03	09/06/03
Declined	Using online homework to enhance and assess student reasoning in mathematics and science.	Co-P.I. [P.I.: D. Zollman]	U.S. Dept. of Educ.	895,140	01/01/04	12/31/07

Status	*Title*	*Role*	*Source*	*Amount (US$)*	*Award Start*	*Award End*
Declined	Promoting high quality teaching of 20th century physics & physical science in Kansas through online and hands-on activities for in-service teachers	P.I. [Co-PI: L. Weaver]	Kansas Dept. of Educ.	58,715	05/01/03	04/30/05
Declined	AVQM: EAS - Advanced Visual Quantum Mechanics: Engineering and Applied Sciences.	P.I.	NSF	74,987	03/01/04	04/30/05
Pending	Collaborative Project (KSU & Univ. of Northern Iowa): Micro-MODELS: Microscopic Modeling of Devices in the Everyday Lives of Students	P.I.	NSF	976,635	03/01/04	05/31/08
Full Proposal Encouraged	MINTS: Modeling in Nano-Technology and Science [Preliminary Proposal]	P.I.	NSF	744,205	09/01/04	08/31/07
Pending	Transfer between macroscopic models and microscopic contexts: Building a research foundation for nanoscience education.	P.I.	NSF	520,685	08/01/04	07/31/07
Pending	Implementation of the Interactive Studio Concept to an Upper Level Physics Course: Studio Optics	Co-PI, [P. I: C. Sorensen]	NSF	99,935	06/01/04	05/31/06

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

Departmental and University Committee Assignments

1. Physics Coordinator for the Math-Physics Computer Lab.
2. Physics Department Computer Committee.

Positions in Professional Societies

1. President of the Arkansas-Oklahoma-Kansas (A-O-K) Section of AAPT.
2. Member Organizing Committee of the Joint Fall Meeting of the A-O-K and Nebraska Sections of the AAPT & the Big-12 Physics Education Research Conference.
3. Member Area Committee of Educational Technologies of the AAPT.
4. Member Organizing Committee of the 2004 Physics Education Research Conference.

Current Research Activities

1. Students' mental models of real-world applications and phenomena and the development of these models.
2. Influence of question order on student responses to survey and interview questions.
3. Development and implementation of an analytical framework to help characterize students reasoning in an interview.
4. Transfer and of learning – different dimensions: real-world to classroom, classroom to the real world, one class to another etc.

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

Recognition

Boeing Autometric Award for Best Paper in Image Analysis and Interpretation in 2003. Presented to Youngsinn Sohn & N. Sanjay Rebello for "Supervised and Unsupervised Spectral Angle Classifiers," by American Society for Photogrammetry and Remote Sensing.

Refereed Publications

Journals

1. "The vocabulary of introductory physics and its implications for learning physics," Salomon F. Itza-Ortiz, N. Sanjay Rebello, Dean A. Zollman, Manuel Rodriguez-Achach, *The Physics Teacher*, Vol. 41, September 2003, pp.41-46.
2. "Students models of Newton's second law in mechanics and electromagnetism," Salomon F. Itza-Ortiz, N. Sanjay Rebello, Dean A. Zollman, *European Journal of Physics*, Vol. 25, 2004, pp.81-89.
3. "How many students does it take before we see the light," Paula V. Engelhardt, Kara E. Gray, N. Sanjay Rebello, *The Physics Teacher*, (in press).
4. "Student explorations of quantum effects in LEDs and luminescent devices," Lawrence T. Escalada, N. Sanjay Rebello, Dean A. Zollman, *The Physics Teacher*, (in press).

Conference Proceedings

5. "Students' mental models of Newton's second law: mechanics to electromagnetism," N. Sanjay Rebello, Salomon F. Itza-Ortiz, & Dean A. Zollman, *Proceedings of the Annual Meeting of the National Association for Research in Science Teaching (NARST),* March 23-26, 2003, Philadelphia, PA.
6. "The vocabulary of physics and its impact on student learning," Salomon F. Itza-Ortiz, N. Sanjay Rebello & Dean A. Zollman, *Proceedings of the Annual Meeting of the National Association for Research in Science Teaching (NARST),* March 23-26, 2003, Philadelphia, PA.
7. "A framework for the dynamics of student reasoning in an interview," Salomon F. Itza-Ortiz, Alicia R. Allbaugh, Paula V. Engelhardt, Kara E. Gray, Zdeslav Hrepic, N. Sanjay Rebello, & Dean A. Zollman, *Proceedings of the Annual Meeting of the National Association for Research in Science Teaching (NARST),* Vancouver BC, April 1-3, 2004, (to be published).

Book Chapter

8. "Dynamic transfer: A perspective from physics education research," N. Sanjay Rebello, Dean A. Zollman, with contributions from Alicia R. Allbaugh, Paula V. Engelhardt, Kara E. Gray, Zdeslav Hrepic, Salomon F. Itza-Ortiz, in *Transfer of Learning: Research and Perspectives*, Ed. Jose P. Mestre, Amherst MA, (to be published).

Copies of pre-prints or manuscripts of publications listed above are in Appendix E.

Oral Presentations & Posters

Invited

1. "Student reasoning during an interview: A possible framework & implications," Alicia R. Allbaugh, Paula V. Engelhardt, Kara E. Gray, Zdeslav Hrepic, Salomon F. Itza-Ortiz & N. Sanjay Rebello, Invited Poster, Physics Education Research Conference, Madison, WI, August 6-7, 2003.
2. "Contemporary physics for future teachers with limited mathematics skills," N. Sanjay Rebello & Dean A. Zollman, Invited Talk, Second International GiREP Seminar, Udine, Italy, September 1-6, 2003.
3. "Enhancing the teaching of contemporary physics through online instruction for teachers," Dean A. Zollman, N. Sanjay Rebello, Kirsten Hogg & Salomon & F. Itza-Ortiz, Invited Talk, Second International GiREP Seminar, Udine, Italy, September 1-6, 2003.
4. "Physics education research as a guide to application-based curriculum development," N. Sanjay Rebello, Invited Talk, Fall Section Meeting, American Association of Physics Teachers, Western Pennsylvania Section, Latrobe, PA, October 24, 2003.

Contributed

1. "Mental models of energy — Mechanics contexts," Salomon F. Itza-Ortiz, Benjamin Lawrence, N. Sanjay Rebello & Dean A. Zollman, Contributed Talk, 126th AAPT National Meeting, January 11-15, 2003, Austin, TX.
2. "Ordering effects in multiple choice exams and interviews," Paula V. Engelhardt & N. Sanjay Rebello, Contributed Poster, 126th AAPT National Meeting, Austin, January 11-15, 2003, TX.
3. "Problem context and Newton's second law: A further look," Alicia R. Allbaugh, N. Sanjay Rebello & Dean A. Zollman, Contributed Talk, 126th AAPT National Meeting, January 11-15, 2003, Austin, TX.
4. "Students' mental models and their application to a bicycle," N. Sanjay Rebello & Paula V. Engelhardt, Contributed Talk, 126th AAPT National Meeting, Austin, January 11-15, 2003, TX.
5. "The effect of question order on responses to interview questions," Kara E. Gray, N. Sanjay Rebello & Dean A. Zollman, Contributed Talk, 126th AAPT National Meeting, January 11-15, 2003, Austin, TX.
6. "The vocabulary of physics and its impact on student learning," Salomon F. Itza-Ortiz, N. Sanjay Rebello & Dean A. Zollman, Contributed Talk (Peer Reviewed), *Annual Meeting of the National Association of Research in Science Teaching,* March 23-26, 2003, Philadelphia, PA.
7. "Students' mental models of Newton's second law: mechanics through electromagnetism," N. Sanjay Rebello, Salomon F. Itza-Ortiz & Dean A. Zollman, Contributed Talk (Peer Reviewed), *Annual Meeting of the National Association of Research in Science Teaching,* March 23-26, 2003, Philadelphia, PA.
8. "Developing a real-time assessment of students' mental models of sound propagation," Zdeslav Hrepic, Dean A. Zollman & N. Sanjay Rebello, Contributed Talk, International School of Physics "Enrico Fermi," July 15-25, 2003, Varenna, Italy.
9. "Investigating students' understanding of light bulbs and complete circuits," Kara E. Gray, Paula V. Engelhardt & N. Sanjay Rebello, Contributed Talk & Poster, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
10. "Modeling cycle pedagogy in an electronics course: First impressions," N. Sanjay Rebello & Kara E. Gray, Contributed Poster, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
11. "Retention and transfer of physics knowledge to engineering courses," N. Sanjay Rebello, Paula V. Engelhardt & Salomon F. Itza-Ortiz, Contributed Talk, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
12. "Student understanding and perceptions of the content of a lecture," Zdeslav Hrepic, Dean A. Zollman & N. Sanjay Rebello, Contributed Talk, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
13. "Students' views of how sound is produced by musical instruments," Paula V. Engelhardt & N. Sanjay Rebello, Contributed Talk, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
14. "Students' energy models: Mechanics through electromagnetism," Salomon F. Itza-Ortiz, Benjamin Lawrence, N. Sanjay Rebello & Dean A. Zollman, Contributed Talk, 127th AAPT National Meeting, August 2-6, 2003, Madison, WI.
15. "Student goals and expectations in a large-enrollment physical science class," N. Sanjay Rebello, Contributed Poster, Physics Education Research Conference, August 6-7, 2003, Madison, WI.
16. "The Teaching Experiment - What it is and what it isn't," Paula V. Engelhardt, N. Sanjay Rebello, Edgar G. Corpuz, & Darryl J. Ozimek, Contributed Poster, Physics Education Research Conference, August 6-7, 2003, Madison, WI.

Copies of abstracts of the talks and posters listed above are in Appendix F.