Annual Report of Faculty Activities
(January 2004 – December 2004)

N. Sanjay Rebello

Teaching Activities

Courses Taught	*Contact Hours*	*Enrollment*	*Semester*
PHYS 636: Physical Measurement & Instrumentation	8 Lab	4	Spring 2004
PHYS 620: Teaching University Physics	3 Lecture	7	Fall 2004

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

Staff and Students Advised

Name	*Position*	*Start*	*Completion*	*Degree*
Paula V. Engelhardt[1]	Post-doc	9/2002	7/2004	N/A
Kara E. Gray[2]	Graduate Student	9/2001	7/2004	M.S. Physics
Darryl J. Ozimek[3]	Graduate Student	6/2002	8/2004	M.S. Physics
Jasmine Shrestha	Undergrad. Smith College	6/2004	8/2004	N/A
Charles Mamolo	Graduate Student	6/2002	6/2005 (Expect)	M.S. Physics
Carina Poltera	Undergraduate	6/2004	5/2005 (Expect)	B.S. Physics
Edgar G. Corpuz[4]	Graduate Student	6/2002	8/2006 (Expect)	Ph.D. Physics
Peter R. Fletcher	Post-doc	9/2004	8/2006 (Expect)	N/A

1. Currently tenure-track physics faculty at Tennessee Tech. University
2. "*The Effect of Question Order on Student Responses to Multiple Choice Physics Questions*," M.S. Thesis, Physics, Kara E. Gray, defended, May 2004. (Currently – doctoral student, Physics Department, University of Colorado, Boulder)
3. "*Student Learning, Retention, and Transfer from Trigonometry to Physics*," M.S. Thesis, Physics, Darryl J. Ozimek, defended, July 2004. (Currently – Physics Instructor, Duquesne University)
4. "*Students' microscopic modeling of friction and related phenome*na," (working title) Ph. D. Dissertation, Physics, (Passed Oral Exam, March 2004).

Active Grants

Title	*Role*	*Source*	*Amount (US$)*	*Award Start*	*Award End*
CAREER/PECASE: Research on Students' Mental Models, Learning and Transfer as a Guide to Application-Based Curriculum Development and Instruction in Physics.	P.I.	NSF	436,796	03/15/02	03/14/07
ASA: Assessing Student Transfer and Retention of Learning in Mathematics, Physics, and Engineering Courses.	Co-P.I., [P. I.: A. Bennett, KSU, Mathematics]	NSF	500,000	07/15/02	07/14/06
HP Technology for Teaching Grant	P.I.[$]	HP	[$]57,500	09/01/04	09/06/05
Curriculum Resources for Physics Instruction Using Interactive Technologies and Digital Formats	P.I.	Kansas Dept. of Education	28,681	06/18/04	05/31/05
CoMPASS: Integrating Digital Text in Design-based Science Classrooms	P.I. (KSU)[#]	NSF	82,343	01/01/05	12/31/09

[$] The grant provided for equipment, stipend, travel allowance and services totaling about $58K

A collaborative project with faculty at Univ. of Wisconsin (lead), Univ. of Conn. and Bentley College.

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

Grant Proposals Submitted (**In *addition* to the last three in the above table**)

Status	*Title*	*Role*	*Source*	*Amount (US$)*	*Award Start*	*Award End*
Declined	MINDS -- Modeling and Inquiry in the Nanoworld Designed by Students	P.I.	NSF	1,422,205	09/01/04	08/31/07
Declined	ROLE: Transfer to the Nanoworld: Building a Research Foundation for Nanoscience Education	P.I.	NSF	911,182	01/01/05	12/31/08
Pending	EMD (Proof of Concept): Infusing Nanoscience into the Undergraduate Curriculum: Out-of-Class Enrichment Activities for Upper-Division Physics Students	P.I.	NSF	74,995	03/01/05	08/31/06
Pending	Studio Electronics: Modeling & Active Learning in an Electronics Course for Physics Majors	P.I.	NSF	99,298	06/01/05	05/31/07
Pending	Implementation of the Interactive Studio Concept to an Upper Level Physics Course: Studio Optics	Co-PI, [P. I: C. Sorensen]	NSF	99,985	05/01/05	04/31/07

Project summaries of the 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. Past-President of the Arkansas-Oklahoma-Kansas (A-O-K) Section of AAPT.
2. Member Area Committee of Educational Technologies of the AAPT.
3. Member Physics Education Research Leadership Organizing Committee (PERLOC).
4. Organizer 2004 Physics Education Research Conference, Sacramento, CA, August 4-6, 2004.

Current Research Activities

1. Students' mental models of real-world applications and phenomena and the development of these models.
2. Development and implementation of a model of students' dynamic transfer of learning in an interview.

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

Recognitions

1. *Presidential Early Career Award for Scientists and Engineers* (PECASE) in May 2004. The award was given to a total of 57 science professionals. The White House Office of Science & Technology Policy press release it as the "nation's highest honor for professionals at the outset of their careers."
2. *Schwenk Teaching Award,* presented by KSU Physics majors in recognition of teaching in upper-division physics courses, May 2004.

Refereed Publications

1. "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 and Salomon F. Itza-Ortiz in *Transfer of Learning from a Modern Multidisciplinary Perspective*, Ed. Jose P. Mestre, Information Age Publishing, in series *Current perspectives on*

cognition, learning and instruction, Series Editor: James M. Royer, University of Massachusetts, Amherst (in press).

2. "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 and Dean A. Zollman, *Proceedings of the Annual Meeting of the National Association for Research in Science Teaching*, April 1-3, 2004, Vancouver BC.
3. "A framework for student reasoning in an interview," Paula V. Engelhardt, Kara Gray, Zdeslav Hrepic, Salomon F. Itza-Ortiz, Alicia R. Allbaugh, N. Sanjay Rebello and Dean A. Zollman, Invited Paper, *Proceedings of the 2003 Physics Education Research Conference*, August 2-6, 2003, Madison, WI.
4. "How many students does it take before we see the light," Paula V. Engelhardt, Kara E. Gray, and N. Sanjay Rebello, *The Physics Teacher*, Vol. 42, April 2004, pp. 216-221.
5. "Student explorations of quantum effects in LEDs and luminescent devices," Lawrence T. Escalada, N. Sanjay Rebello, and Dean A. Zollman, *The Physics Teacher*, Vol. 42, March 2004, pp.173-179.
6. "Implications of a framework for student reasoning in an interview," Kara Gray, Zdeslav Hrepic, Salomon F. Itza-Ortiz, Alicia R. Allbaugh, Paula V. Engelhardt, N. Sanjay Rebello and Dean A. Zollman, Invited Paper, *Proceedings of the 2003 Physics Education Research Conference*, August 2-6, 2003, Madison, WI.
7. "Student goals and expectations in a large-enrollment physical science class," N. Sanjay Rebello, *Proceedings of the 2003 Physics Education Research Conference*, August 2-6, 2003, Madison, WI.
8. "The teaching experiment – what it is and what it isn't," Paula V. Engelhardt, Edgar G. Corpuz, Darryl J. Ozimek and N. Sanjay Rebello, *Proceedings of the 2003 Physics Education Research Conference*, August 2-6, 2003, Madison, WI.
9. "Student understanding and perceptions of the content of a lecture," Zdeslav Hrepic, Dean A. Zollman and N. Sanjay Rebello, *Proceedings of the 2003 Physics Education Research Conference*, August 2-6, 2003, Madison, WI.

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

Oral Presentations & Posters

Invited

1. "Changing Distracters on Questions of the Force Concept Inventory," N. Sanjay Rebello and Dean A. Zollman, Invited Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
2. "Dynamic transfer of learning in physics education research," N. Sanjay Rebello, Invited Talk, *APS April Meeting*, May 1-4, 2004, Denver, CO.

Contributed

1. "Research of students' mental models learning and transfer as a guide to application-based curriculum development and instruction in physics," N. Sanjay Rebello, Peter R. Fletcher, Edgar G. Corpuz, Contributed Poster, *NSF's REC PI Meeting*, October 18-19, 2004, Arlington, VA.
2. "Retention and Transfer from Trigonometry to Algebra-based Physics," N. Sanjay Rebello, Darryl J. Ozimek and Paula V. Engelhardt, Contributed Talk, *Fall Meeting of the A-O-K Section of the AAPT*, October 8-9, 2004, Little Rock, AR.
3. "College Students' Mental Models of Atomic Friction and Lubrication," Edgar G. Corpuz and N. Sanjay Rebello, Contributed Talk, *Fall Meeting of the A-O-K Section of the AAPT*, October 8-9, 2004, Little Rock, AR.

4. "Movie Physics: Transfer of Knowledge by Observation," Carina M. Poltera and N. Sanjay Rebello, Contributed Talk, *Fall Meeting of the A-O-K Section of the AAPT*, October 8-9, 2004, Little Rock, AR.
5. "Investigating Students' Knowledge of the Particle Structure of Matter: A Preliminary Study in the U.S," Lili Cui, Dean A. Zollman and N. Sanjay Rebello, Contributed Talk, *Fall Meeting of the A-O-K Section of the AAPT*, October 8-9, 2004, Little Rock, AR.
6. "Issues in Addressing and Representing Hybrid Mental Models," Zdeslav Hrepic, Dean A. Zollman, and N. Sanjay Rebello, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
7. "Investigating Students' Knowledge of Particle Structure of Matter in Different Cultures," Lili Cui, Dean A. Zollman, and N. Sanjay Rebello, Contributed Poster, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
8. "Using Interview Data to Explore Transfer of Student Learning," Paula V. Engelhardt and N. Sanjay Rebello, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
9. "A Summary of the Effects of Question Order," Kara E. Gray and N. Sanjay Rebello, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
10. "Modeling Cycle and Research-Based Pedagogy in an Electronics Course," N. Sanjay Rebello and Kara E. Gray, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
11. "Students' Microscopic Models of Friction: A First Look," Edgar G. Corpuz and N. Sanjay Rebello, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
12. "Retention and Transfer of Learning from Trigonometry to Algebra-Based Physics," Darryl J. Ozimek, Paula V. Engelhardt and N. Sanjay Rebello, Contributed Talk, *129th AAPT National Meeting*, July 31- August 4, 2004, Sacramento, CA.
13. "Light bulbs and complete circuits: What one says about the other," Paula V. Engelhardt, Kara E. Gray and N. Sanjay Rebello, Contributed Talk, *APS April Meeting*, Denver, CO, May 1-4, 2004.
14. "A perspective on transfer of learning," N. Sanjay Rebello, Alicia R. Allbaugh, Paula V. Engelhardt, Kara E. Gray, Zdeslav Hrepic, Salomon F. Itza-Ortiz and Dean A. Zollman, Contributed Talk, *128th AAPT National Meeting*, January 24-28, 2004, Miami Beach, FL.
15. "Learning about teaching -- How students understand sound in musical instruments," Paula V. Engelhardt, N. Sanjay Rebello and Edgar G. Corpuz, Contributed Talk, *128th AAPT National Meeting*, January 24-28, 2004, Miami Beach, FL.
16. "A real-time assessment of students' mental models of sound propagation," Zdeslav Hrepic, Dean A. Zollman and N. Sanjay Rebello, Contributed Talk, *128th AAPT National Meeting*, January 24-28, 2004, Miami Beach, FL.

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