Department of Physics
Illinois State University

Assessment Plan

(May 31, 2002)

Learning Objectives Shared By All Three Sequences		
Introductory Level		
The learning objective is:	**The assessment tools to be used are:**	**Accomplishment of this objective will be judged by and in:**
Basic understanding of physical laws	Exams, online exercises, other assignments, pre/post tests	Successful completion of PHY 110,111, and 112. Pre/post tests are given in the freshmen and senior years.
Become comfortable and competent with required tools: math, computer and experimental analysis		
Math (calculus and vector analysis)	Exams and other assignments	Successful completion of pre- and co-requisite math courses (MAT 145, 146, 147) and competent use of those methods in physics courses.
Computer analysis (elementary programming and graphical visualization of data)	Computer assignments in physics courses. Assignments and exams in ACS programming courses (not required in all sequences)	Successful completion of programming assignments in PHY 110, 111, and 112. Successful completion of ACS courses for those who take them.
Experimental analysis (elementary measurement techniques)	Reports of basic lab assignments in physics courses.	Successful completion of the laboratory component of PHY 110, 111, and 112.
Begin to be able to model and solve real-world problems.	Qualitative problems (exams, quizzes, online exercises) focused on translating problems into physics models. Integrative problems covering several aspects of real-world physics. Out-of-class assignments and projects in some classes. Initiation of research experiences for some students.	Successful solution of qualitative and integrative problems in PHY 110, 111, 112. Progress on research projects for those students participating in one.
Begin to be able to communicate methods and results.	Written lab and computer project reports and homework writing assignments.	Successful performance on PHY 107 writing assignments and lab and computer project reports in PHY 110, 111, and 112.

Intermediate Level

Acquire an understanding of physical laws at the next deeper level, further strengthening physical intuition.	More sophisticated homework problems, exams, and other assignments	Successful completion of PHY 217, 220, 240, 270, 284 (and 288 for Computer Physics sequence).
Deepen skills with tools: math, computer and experimental analysis.		
Math (vector calculus, linear algebra, elementary differential equations)	Homework problems involving proofs and/or rigorous derivations, exams, and other assignments	Successful completion of MAT 175, PHY 217, and MAT 340 and competent use of those methods in physics courses.
Computer analysis (more sophisticated numerical methods, symbolic computing, 2-D visualization)	Computer projects involving analusis and solution of physics problems by numerical methods.	Successful solution of computer assignments in physics courses and in research projects.
Experimental analysis (error analysis, more sophisticated measurement techniques)	Experiments and lab reports	Successful completion of PHY 270, in which assessment mainly involves formal lab reports.
Sharpen modeling and approximation skills and the ability to use symmetry as a tool for understanding and problem solving.	Homework problems requiring these skills, exams, and other assignments	Successful completion of PHY 217, 220, 240, 270, 284 (and 288 for Computer Physics). Performance on research projects for those involved in them.
Sharpen communication skills	Explanatory writing in homework problems, lab reports and computer project reports. Oral and poster presentations in some classes and for research experience participants.	Competent writing of lab reports and other written reports in PHY 217, 220, 240, 270, 284 (and 288 for Computer Physics). Giving quality presentations (oral or poster) for in-class assignments or for research. Research presentations at regional undergraduate physics conferences, for research participants.

Advanced Learning Objectives for *Physics* and *Engineering Physics* Sequences		
Broaden and deepen understanding of physical laws at the advanced undergraduate level.	Emphasis shifts toward detailed and more complex homework problems, but exams and other assignments are still used.	Successful completion of advanced courses such as PHY 320, 325, 340, 384, other 300-level electives, or upper-level engineering courses. At this stage a significant participation in research projects also occurs, but is not required in this sequence.
Deepen skills with tools: *math* (partial differential equations, Fourier analysis, eigenanalysis), *computer analysis* (simulation methods, symbolic computing,	Primarily advanced problem solving, computer projects, and laboratory projects. Exams.	Successful completion of problems and projects in 300 level classes. Advanced elective physics (375, 388, 389), math, and computer courses and competent application of those

visualization), *experimental analysis* (experimental and apparatus design, computer interfacing).		methods in the solution of physics problems. Successful completion of advanced special projects for courses or for research.
Sharpen modeling skills	Homework problems and computer projects requiring (1) modeling of reality, (2) development of a solution methodology, and (3) using that methodology to solve the problem.	Successful completion of assignments or projects designed to model a particular physical system in advanced elective physics courses or in research projects.
Sharpen communication skills	Lab reports, assignment write-ups, in-class presentations, research presentations (for research participants).	Generation of quality lab reports in PHY 270 and quality write-ups and presentations in other advanced courses. Students involved in research projects should present their results at the highest appropriate venue (local, regional, national/international conferences).

Advanced Learning Objectives for *Computer Physics* Sequence		
Broaden and deepen understanding of physical laws at the advanced undergraduate level with a focus on computational methods and simulation.	Emphasis shifts toward detailed and more complex homework problems, but exams and other assignments are still used.	Successful completion of 300 level physics courses and computational-specific courses PHY 288 and 388.
Deepen skills with tools: *math* (partial differential equations, Fourier analysis, eigenanalysis), *computer analysis* (simulation methods, symbolic computing, 3-D and stereo visualization), and *data analysis*.	Primarily advanced problem solving and computer projects. Exams.	Successful completion of problems and projects in 300 level classes including PHY 388. Advanced elective computer physics (380.01, 380.03), math, and computer courses and competent application of those methods in the solution of physics problems. Successful completion of advanced special projects for courses or for computational/simulation research.
Sharpen computational modeling and physical system simulation skills	Homework problems and computer projects requiring (1) modeling of reality, (2) development of a solution methodology, and (3) using that methodology to solve the problem.	Successful completion of assignments or projects designed to model and simulate a particular physical system in advanced computer physics courses or in computational/simulational research projects.
Sharpen communication skills	Computational assignment write-ups, in-class presentations, research presentations.	Generation of quality write-ups and in-class presentations for computational assignments in PHY 288 and 388. Students involved in research projects should present their results at the highest appropriate venue (local, regional,

		national/international conferences).
Develop research experience with capstone course	Formal report and in-house presentation	Large-scale computational research project in PHY 390.

Advanced Learning Objectives for *Physics Teacher Education* Sequence
The Physics Teacher Education sequence has developed a well-developed assessment plan in concert with the National Science Teachers Association. The latest assessment matrix is included in this document, beginning on the next page.

National Science Teachers Association

Program Review Matrix

DRAFT DOCUMENT

Name of Program(s):
Physics
Level(s): 9-12

1.0 Rationale. State the rationale for the content organization and structure of the program and explain how and why the conceptual content in each licensure area (if appropriate) has been selected.
The content for the Illinois State University Physics Teacher Education program has been selected in such a way as to prepare teachers whose performance complies with ten sets of national, state, professional, and University standards. National standards include those formulated by the National Council for Accreditation of Teacher Education, the Council of Chief State School Officers (INTASC), and the National Board for Professional Teaching Standards. State standards include the Illinois Professional Teaching Standards, the Illinois Content Standards (nos. 1-18) and (nos. 41-47), and the Illinois Learning Standards (areas 11-13). Professional standards include those formulated by the National Science Teachers Association, the National Research Council (NSES), and the American Association of Physics Teachers. University standards include the conceptual framework for teacher education -- *Realizing the Democratic Ideal.* The content of the standards-based Physics Teacher Education Program was organized to provide a gradual and progressive orientation to the profession of secondary-level physics teaching. Physics teaching majors become well grounded in physics primarily during their freshman and sophomore years, though this grounding continues through the senior year. During their junior year physics teaching majors are introduced to the teaching profession, with culminating experiences taking place during their senior year. The structure of the Physics Teacher Education Program was established after consultation with Illinois State University's Performance-based Assessment Task Force, other teacher educators at Illinois State University and at Alverno College, and in cooperation with members of the Science Teacher Education Oversight Committee, the Departmental Committee on Teacher Education,

and the Physics Teaching Advisory Council**.** The program's structure provides for continual standards-based assessment of student performances and the program of study that leads to initial licensure. The systematic assessment plan may be found in Appendix as item #4.

2.0 Program Structure. Provide program indicators, practices and assessments in the table below, making sure that related items begin on the same line.

Program Standard	Indicator(s)	Learning Experiences	Assessments and Performance Data
2.1 <u>Content</u> The program prepares candidates to structure and interpret the concepts, ideas and relationships in science that are needed to advance student learning in the area of licensure as defined by state and national standards developed by the science education community. Content refers to: Concepts and principles understood through science. Concepts and relationships unifying science domains. Processes of	1. Demonstrates knowledge of the basic concepts of physical science to meet the goals of the National Science Education Standards.	1a. Students complete 46 semester hours of physics, chemistry, and astronomy courses that address indicated concepts.	1a. Students must have a 2.50 GPA in all major content courses (must earn a "B" or better in PHY 110-112 or complete remediation and re-testing) before being admitted to student teaching.
		1b. Students complete an AAPT comprehensive physics examination dealing with physics content knowledge and create a remediation plan based upon results (PHY 310 syllabus)	1b. Student must take and pass the state-administered Illinois Certification Testing Examination in physics, a comprehensive test of basic content knowledge, with a score of 70% or higher before receiving state teaching certificate.
	2. Identifies and uses themes, including those from the National Science Education Standards, to unify science and science teaching across disciplines.	2a. Students participate *in Building Bridges Symposium* in which a multi-disciplinary integrated teaching unit plan is prepared.	2a. Students present integrated unit plan to symposium participants and to PHY 311 course instructor.
		2b. Students participate in integrated science lesson dealing with the human eye as part of methods course (PHY 311 syllabus,)	2b. Students prepare and present an integrated science lesson (PHY 311 syllabus, §V.)
	3. Performs a variety of scientific research projects requiring data acquisition, analysis, and interpretation in order to communicate results.	3a. Students complete 12 research projects as part of two semesters of a intermediate-level physics lab course (PHY 270 syllabus, §)	3a. Students submit written reports describing their research findings. (PHY 270 syllabus, §

investigation in a science discipline. Applications of mathematics in science research.		3b. Students complete 3 calculator-based labs and 3 microcomputer-based lab as part of computer applications course for high school physics (PHY 302 syllabus, §)	3b. Students submit written reports describing their research findings. (PHY 302 syllabus,)
	4. Demonstrates an ability to independently perform research projects to reach reasonable and valid conclusions (includes identification of problem, experimental design, statistics, and assessment of results).	4a. Students read *Experimentation: An Introduction to Measurement Theory and Experiment Design* (D. C. Baird, 1962) and work through five problem sets. (PHY 302 syllabus, §) 4b. Students independently complete open-ended research experience as part of a "capstone" project (PHY 302 syllabus, §	4a. Students complete a series of five homework assignments dealing with measurement errors, propagation of uncertainty, nature of experimenting, experiment planning, and experiment evaluation. (PHY 302 syllabus,) 4b. Student present findings from capstone project. (PHY 302 syllabus, §
	5. Understands the central concepts, tools of inquiry, and structure of discipline, and supports other educators and students in creating learning experiences that are meaningful to all students.	5a. Students become intimately familiar with the National Science Education Standards through readings and continual in-class discussion (PHY 310 syllabus, ; PHY 311 syllabus,)	5a. *Student Teacher Evaluation Form* used to assess student performance againsteight criteria (Content Knowledge).

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.2 <u>Nature of Science</u> The program prepares teachers to engage students in activities to define the values, beliefs and assumptions	1. Reports on the nature of science, including principles, conventions of scientific research, rules of evidence and explanation, laws, predictions, hypotheses, and theories.	1. Students read a book and six papers dealing with the nature of science, and participate in two classroom discussions. (PHY 310 syllabus,	1. Students prepare a 4-6 page essay on the nature of science following detailed guidelines asking 26 questions. (PHY 310 syllabus,)
	2. Distinguishes between science and	2a. Students attend and discuss a	2a. Students, in a written report, draw an

inherent to the creation of scientific knowledge within the scientific community, and contrast science to other ways of knowing. Nature of science refers to: Characteristics distinguishing science from other ways of knowing. Characteristics distinguishing basic science, applied science and technology. Processes and conventions of science as a professional activity. Standards defining acceptable evidence and scientific explanation.	other ways of knowing based upon rules of evidence.	presentation entitled "Knowing and Believing." (PHY 310 syllabus, § 2b. Students attend presentation dealing with the nature of scientific discovery. (PHY 310 syllabus,	analogy between religion and science taught didactically, and between religion and science taught through inquiry. 2b. Students participate in group project to trace the sources of knowledge of a number of physics concepts.
	3. States, explains, and provides examples of the relationships between basic science, applied science, and technology.	3. Students participate in examination of a modeling project in which	3. Students create an activity for teaching that connects pure and applied science with technology.
	4. Characterizes science as an empirical activity whose conclusions are tentative, referring to historical development of foundational concepts in physics and astronomy.	4. Students read 50+ articles by prominent physicists, astronomers, and philosophers of science who have written over the course of 2,000 years. (PHY 312 syllabus, §	4. Students trace the development of a historical concept from its earliest days to present time in a term paper. (PHY 312 syllabus, §
	5. States the basic ethical principles of science, and the reasons for these principles.	5. Students read and discuss an NAS article dealing with science ethics. (PHY 310, §	5. Students individually review, report on, and critique a case of unethical scientific behavior.
	6. Interprets the nature of science, engages students in activities examining the values, beliefs, and assumptions underlying the creation of scientific knowledge, and compares science with other ways of knowing.	6. Students read a book about the nature of science and participate in a follow-up discussion; write a paper about the nature of science; attend a presentation that deals with the nature of scientific knowledge as opposed to mere belief. (PHY 310 syllabus, §	6. *Student Teacher Evaluation Form* used to assess performance based upon three criteria.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**

2.3 <u>Inquiry</u> The program prepares candidates to engage students regularly and effectively in science inquiry and facilitate understanding of the role inquiry plays in the development of scientific knowledge. Inquiry refers to: Questioning and formulating solvable problems. Reflecting on, and constructing, knowledge from data. Collaborating and exchanging information while seeking solutions. Developing concepts and relationships from empirical experience.	1. Identifies and explains distinguishing characteristics of inquiry teaching.	1a. Students read and discuss "Inquiry Practices as Subject Matter for Future Physics Teachers" (PHY 311 syllabus, § 1b. Students receive lecture "Why Inquiry?" dealing with inquiry methods. (PHY 311 syllabus, §	
	2. Observes and critically evaluates inquiry and non-inquiry lessons.	2. Students view a videotape of inquiry and non-inquiry lessons by same teacher covering similar content. (PHY 311 syllabus, §	2. Students critically compare, contrast, and evaluate videotaped lessons, and make suggestions for improvement (PHY 311 syllabus, §
	3. Experiences, prepares, and presents a variety of inquiry-oriented lessons.	3a. Students participate in seven hour-long inquiry lessons during which cooperative, small-group methods are modeled by course instructor. (PHY 311 syllabus, § 3b. Students use rubrics to evaluate inquiry oriented microteaching experiences presented by student peers. (PHY 311 syllabus, §	3a. Students critically review inquiry lessons and reflect on their value as a way of learning the content and processes of science, as well as critical thinking skills. (PHY 311 syllabus, § 3b. Students prepare and present four inquiry microteaching lessons (PHY 311 syllabus, §
	4. Leads discussions using listening and questioning skill appropriate to inquiry teaching.	4. Students receive extensive information about listening and questioning skills, question types, discussion types, discussion leading strategies, and assessment strategies, and participate in a number of inquiry-oriented discussions. (PHY 310 syllabus, §	4. Students lead a number of discussions after which questioning behavior is evaluated by self, peers, and instructor using a grading rubric.
	5. Collects experimental data and determines relationships between variables.	5a. Students complete approximately thirty directed lab experiences as part of physics content courses. (PHY 110-	

		112), and a similar number in required chemistry content courses (CHE 140, 141) 5b. Students learn to collect data and perform regression analysis using computer hardware and software. (PHY 302 syllabus,	5b. Students collect data using calculator-based and microcomputer-based laboratory technology, perform an analysis of and interpret data.
	6. Engages the students effectively in science-related exploration of the natural environment.	6. Students compare a definition of science as both content and process with didactic ways of teaching; they then participate in eight model inquiry lessons that emphasize both content and process. (PHY 310 syllabus,)	6. *Student Teacher Evaluation Form* used to evaluate student performance as judged against four criteria.
	7. Demonstrates an ability to plan and deliver an inquiry-based science program for their students.	7. Students oriented to need of teaching under National Science Education Standards guidelines (PHY 353 syllabus,)	7. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.4 <u>Context of Science</u> The program prepares candidates to relate science to the daily lives and interests of students and to a larger framework of human	1. Analyzes values and processes of decision-making about science and technological issues and applications of the physics discipline.	1. Students participate in an inquiry oriented, problem-based learning experience entitled *"County Board Dilemma: A Nuclear Waste Dump for Your Home Town?"* Students search World Wide Web and other resources to evaluate both sides of issues surrounding topic. (PHY 311 syllabus, §	1. Issues are argued before a "judge" in a role-playing activity. (PHY 311 syllabus, §

endeavor and understanding. The context of science refers to: Relationships among systems of human endeavor including science and technology. Relationships among scientific, technological, personal, social and cultural values. Relevance and importance of science to the personal lives of students.	2. Prepares a rationale for physics that includes the needs of students, society, and the professions.	2. Students participate in a role-playing situation in which a "local school board member" wants answers about why physics should be included in the school's curriculum. (PHY 311 syllabus,	2. Students cooperate to create a single extensive written rationale for the inclusion of physics in the high school curriculum. (PHY 311 syllabus,
	3. Relates science in general and physics in particular to applications in the community and in the lives of the students they teach.	3a. Students participate in a field trip to an industrial park or medical center to evaluate from firsthand experience the relevance of basic physics applied through technology or via treatment. (PHY 311 syllabus,) 3b. Student receive presentation *Education to Careers* (PHY 311 syllabus,)	3a. Students relate the value of physics to the students they teach as part of a rationale for selected physics content in a unit plan project. (PHY 311 syllabus, § 3b. Students search out, identify, and characterize resources (industry, law enforcement, fire department, etc.) wherein physics is applied in the local community.
	4. Analyzes an instrument of modern technology and identify and explains underlying physics principles.	4. Students, taking an example from field trip (see 3a above), undertake an independent research project to determine applicability of physics (PHY 311 syllabus,)	4. Students give an in-class presentation of the applicability of physics to technology or treatment of their choice.
	5. Demonstrates the ability to use common sources of information (newspapers, magazines, television, WWW) to relate science instruction to contemporary issues and events.	5. Students participate in an issue-oriented science inquiry lesson of relevance to students modeled by course instructor. (PHY 311 syllabus, §	5. Students select a science issue, and create and present an issue-oriented science inquiry lesson that is assessed using a rubric.
	6. Relates science to the daily lives and interests of students, as well as to a larger framework of human endeavor and understanding.	6. Students become intimately familiar with the National Science Education Standards through continual in-class discussion (PHY 310	6. *Student Teacher Evaluation Form* used to assess student performance against three criteria.

		syllabus, ; PHY 311 syllabus,)	

Program Standard	Indicator(s)	Learning Experiences	Assessments and Performance Data
2.5 <u>Skills of Teaching</u> The program prepares candidates to create a community of diverse student learners who can construct meaning from science experiences and possess a disposition for further inquiry and learning. Pedagogy refers to: Science teaching actions, strategies and methodologies. Interactions with students that promote learning and achievement. Effective organization of classroom experiences. Use of advanced technology to extend and enhance learning. Use of prior conceptions and student interests to promote new learning.	1. Demonstrates the ability to plan and effectively engage in learning science students with diverse backgrounds and learning styles, using both individualized and cooperative learning strategies.	1. Students receive presentations dealing with lesson planning, engaged learning, diversity, learning styles, and individualized and cooperative learning strategies, and participate in four lessons modeled by course instructor (PHY 311 syllabus,	1. Students prepare and present four different types of inquiry lessons (structured inquiry, cooperative learning, problem-based learning, unified science) under the guidance of an instructor who uses clinical supervisory practices that include pre- and post-lesson interview.
	2. Identifies goals and provides a well-reasoned rationale, based on student needs, for choosing particular science content and strategies.	2.	2. Students present goals and rationales to course instructor during pre-lesson interviews. (PHY 311 syllabus,
	3. Uses appropriate technology, including computers, to provide science instruction.	3. Student incorporates computer technology in at least two micro-teaching lessons (PHY 311 syllabus, §	3. Student demonstrates ability to effectively use computer applications for communication, simulation, modeling, calculation, and data collection and analysis associated with research (PHY 302 syllabus, §
	4. Uses diverse teaching methods to address important concepts from different perspectives, and uses learning cycles for some instruction.	4. Students participate in a presentation and discussion that explains the Karplus learning cycle, and then participate in two hour-long lessons over the course of which a learning cycle is explicitly modeled. (PHY 311 syllabus, §	4. Students develop and present for evaluation at least one inquiry lesson that incorporates all phases of the Karplus learning cycle.

	5. Identifies common student pre-conceptions in physics, their source, and appropriate teaching response.	5. Students receive a presentation dealing with constructivism, pre-conceptions and concept change; includes micro-lesson examples. (PHY 311 syllabus,)	5. Students incorporate what is known about selected preconceptions in a unit plan (PHY 311 syllabus, §
	6. Demonstrates disposition and ability to work equitably with all students from a variety of racial, ethnic, religious and social backgrounds.	6a. Students receive presentations dealing with gender equity and diversity, and then assess an inservice teacher's equity and diversity practices. (PHY 311 syllabus, 6b. Students read and discuss teacher education's conceptual framework -- *Realizing the Democratic Ideal*. (PHY 311 syllabus,	6a. Student teaching practice dealing with gender equity assessed with checklist. 6b. Students write an essay dealing with the intellectual and moral virtues expressed, and evaluate their own capacity to live up to these standards in professional life. (PHY 311,
	7. Demonstrates disposition and ability to work effectively with students regardless of exceptionality.	7a. Students receive presentations dealing with gifted/talented students, and with disabilities, and then assess an inservice teacher's classroom practices and evaluate a school's built environment accessibility. (PHY 311 syllabus, 7b. See 6b above.	7a. Student teaching practice dealing with exceptionality assessed with checklist. 7b. See 6b above.
	8. Understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.	8. Students experience first hand and learn about the value of a variety of instructional strategies that are designed to promote critical thinking, problem solving, and performance skills (PHY 310 syllabus, ; PHY 311 syllabus,)	8. *Student Teacher Evaluation Form,* ten criteria.
	9. Understands how individuals grow, develop, and learn and provides learning	9. Students complete course in Educational Psychology (PSY 215 syllabus,)	9. *Student Teacher Evaluation Form,* four criteria.

	experiences that support the intellectual, social, personal, and career development of all students.		
	10. Understands how students differ in their approaches to learning and creates opportunities that are adapted to diverse learners.	10. Students complete course in Educational Psychology (PSY 215 syllabus,)	10. *Student Teacher Evaluation Form,* five criteria.
	11. Demonstrates an ability to guide and facilitate science learning.	7. Students oriented to need of teaching under National Science Education Standards guidelines (PHY 353 syllabus,)	7. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.6 <u>Curriculum</u> The program prepares candidates to develop and apply a coherent, focused science curriculum that is consistent with state and national standards for science education and appropriate for addressing the needs, abilities and interests of students. Science curriculum refers to:	1. Relates instructional goals, materials, and actions to state and national science education standards, analyzing strengths and weaknesses in a particular classroom context.	1. Students become familiar with current curriculum emphases as part of a readings course (PHY 310 syllabus,) and receive a summary presentation as part of a methods course (PHY 311 syllabus,)	1. Students develop an year-long high school physics curriculum that takes into account the needs of students, society, and the professions as described in the National Science Education Standards.(PHY 310 syllabus, §
	2. Assembles a diverse set of potentially useful instructional information and materials using a variety of sources.	2. Students are introduced to physics teacher education resource room during course orientation, and are required to demonstrate ongoing efforts to familiarize themselves with physics teaching resources through a variety of means. (PHY 209 syllabus,	2. Students demonstrate familiarity with physics teaching resources by documenting familiarization efforts as part of their professional teaching portfolio. (PHY 209 syllabus,
	3. Develops and implements long-term unit plan with clear rationale, goals,	3. Students are introduced to the need for appropriate and detailed long-term	3. Students create an exhaustive unit plan by finding, evaluating the suitability of, and

An extended framework of goals, plans, materials, and resources for instruction. The instructional context, both in and out of school, within which pedagogy is embedded.	methods, demonstrations, lab activities, materials and assessments.	planning, and are introduced to methods for preparing unit plans. (PHY 311 syllabus,)	adapting a range of teaching materials from many sources, including the World Wide Web. The lesson plan must align with state, national, and professional goals. (PHY 311 syllabus, §
	4. Understands the role of technology in education and can define a rationale and long-range strategy for including technology in science education.	4. Students learn about the role, need, and importance of technology in experimentation, modeling, and visualization. (PHY 302 syllabus, §	4. Student integrates appropriate learning technology into unit plan. See 3 above for details. (PHY 311 syllabus,)
	5. Understands instructional planning and designs instruction based upon knowledge of the discipline and curriculum goals that are consistent with state and national standards for science education and appropriate to meet the needs, abilities, and interests of students.	5a. Students participate in a number of discussions related to the National Science Education Standards and Illinois Content Standards. Students are provided with a number of examples of lesson plans. (PHY 310 syllabus,) 5b. Students receive instruction on unit planning and are provided with several very complete examples after which they prepare an exhaustive unit plan (PHY 311 syllabus,)	5a. *Student Teacher Evaluation Form* used to assess student performance based upon five criteria (Science Curriculum) 5b. *Student Teacher Evaluation Form* used to assess student performance based upon nine criteria (Planning for Instruction)

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.7 <u>Social Context</u> The program prepares candidates to relate science to the community and to use human and	1. Identifies people and institutions in the community who are willing to assist in teaching certain topics, and plans for their involvement in teaching.	1. Students conduct a number of interviews with conferral and referral personnel within the student teaching site. (STT 399.72, §	
	2. Uses data about a community, its culture and its resources to plan science lessons that are appropriate for and	2. Students review demographic data available through official school report cards, state	2. Students, working as a committee, develop a remediation plan based upon actual school data.

institutional resources in the community to advance the education of their students in science. The social context of science teaching refers to: Social and community support network within which occur science teaching and learning. Relationship of science teaching and learning to the needs and values of the community. Involvement of people and institutions from the community in the teaching of science.	relevant to students from that community.	assessment scores, and school improvement plans that appear on WWW.	
	3. Plans activities that involve families in the science teaching/learning process and communicates effectively with families of students.	3.	
	4. Demonstrates interaction with community resources for culturally diverse populations.	4. Students participate in service learning project with a culturally diverse population during which they are involved in science teaching. (PHY 208 syllabus,)	
	5. Understands the role of the community in education and develops and maintains collaborative relationships with colleagues, parents/guardians, and the community to support student learning and well being		5. *Student Teacher Evaluation Form,* four criteria.
	6. Develops communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning.	6. Students oriented to need of teaching under National Science Education Standards guidelines (PHY 353 syllabus,)	6. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.8 <u>Assessment</u> The program prepares candidates to use a variety of	1. Identifies and uses most appropriate methods for gathering information about student learning, based on student needs and characteristics and	1. Students learn about test writing in class presentation, and then take and critique a specially prepared physics examination. (PHY 311 syllabus,)	1. Students prepare a variety of assessments that align with stated goals in unit plan.

contemporary assessment strategies to evaluate the intellectual, social, and personal development of the learner in all aspects of science. Assessment refers to: Alignment of goals, instruction and outcomes. Measurement and evaluation of student learning in a variety of dimensions. Use of outcome data to guide and change instruction.	goals of instruction.		
	2. Aligns assessment with goals and actions and uses results to alter teaching.	2. Students prepare a unit plan whose objectives align with state and national science education standards, and whose assessments align with stated objectives.	2. Student teachers administer
	3. Demonstrates the ability to use multiple strategies to assess teaching and learning authentically, consistent with national standards and goals for science education.	Student teachers prepare, administer, and analyze the results of a variety of assessments that are aligned with teaching objectives after which they reflect on results and provide recommendations for improvement in teaching practice or plans for remediation.	
	4. Understands various forms of formal and informal assessment and evaluation strategies and uses them to support the continuous development of all students.		4. *Student Teacher Evaluation Form,* five criteria (Assessment)
	5. Demonstrates ongoing assessment of their teaching and student learning.	5. Students oriented to need of teaching under National Science Education Standards guidelines (PHY 353 syllabus,)	5. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.9 <u>Environment for Learning</u> The program prepares candidates to design and manage	1. Creates a learning environment that that is safe and supportive of learning for all students.	1a. Students receive presentation dealing with the seven major safety concerns of physics, and read two publications dealing with safety guidelines and responsibilities. (PHY 311 syllabus, §	1a. Students summarize safety concerns for topics within a unit plan, of their making, and outline the responsibilities that various school personnel have in the enforcement of safety

safe and supportive learning environments reflecting high expectations for the success of all students. Learning environments refers to: Physical spaces within which learning of science occurs. Psychological and social environment of the student engaged in learning science. Treatment and ethical use of living organisms. Safety in all areas related to science instruction.			procedures. (PHY 311 syllabus,)
		1b. Students conduct a safety survey of prospective student teaching sites and make suggestions for any needed improvements. (PHY 311 syllabus, §	1b. Students establish and maintain a safe classroom environment. (STT 399.72 syllabus,
		1c. Students receive presentation dealing with access to labs, classrooms, and science literacy for all students using *Barrier FREE in Brief* resources from AAAS after which they conduct a built environment survey of prospective student teaching sites and note any needed improvements. (PHY 311 syllabus,)	1c. Students conduct a built environment survey of prospective student teaching sites and note any needed improvements. (PHY 311 syllabus, §
	2. Understands and sets up procedures for safe use and maintenance of physics materials, and knows what procedures to take to prevent or report an emergency.	2a. Students receive presentation dealing with safety contracts, and safety procedures to be followed when preparing students for lab work. (PHY 311 syllabus,)	2a. Student teachers demonstrate due concern for safety. (STT 399.72 syllabus,
		2b. Students view and then discuss safety concerns illustrated in a videotape.	2b. Student prepare written comments about safety concerns illustrated in videotapes.
	3. Creates a learning environment that is responsive to the needs to all learners.	3a. Students receive presentations dealing with gender equity, diversity, disabilities, and exceptionalities after which they conduct corresponding assessments of inservice teacher practices. (PHY 311 syllabus, §	3a. Student teachers demonstrate sensitivity to gender equity, diversity, disability, and exceptionality concerns as demonstrated with a performance-assessment checklist. (STT 399.72 syllabus, §)
		3b. Students receive presentation dealing with classroom management,	3b. Student teachers demonstrate effective classroom management skills as

		participate in role playing dealing with classroom disruptions, and conduct an assessment of an inservice teacher's classroom control measures. (PHY 311 syllabus, §	measured with a performance-assessment checklist. (STT 399.72 syllabus, §)
	4. Understands negligence and liability, especially applied to science teaching, and can take action to prevent potential problems.	4. Students receive presentation dealing with negligence and liability, especially as they pertain to science teaching. (PHY 311 syllabus, §	4. Student takes examination dealing with negligence and liability concerns. (STT 311, §
	5. Develops and maintains an atmosphere conducive to the learning of science through investigation and inquiry.	5. Students present lessons that engage students….	
	6. Uses an understanding of individual and group motivation and behavior to encourage positive social interaction, active engagement in learning, and self-motivation.		6. *Student Teacher Evaluation Form,* eight criteria.
	7. Demonstrates an ability to design and manage learning environments that provide students with time, space, and resources needed for learning science.	7. Students oriented to need of teaching under National Science Education Standards guidelines (PHY 353 syllabus,)	7. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

Program Standard	**Indicator(s)**	**Learning Experiences**	**Assessments and Performance Data**
2.10 <u>Professional Practice</u> The program prepares candidates to	1. Develops and states personal goals and a philosophy of teaching based on research, contemporary values of the science education community, and the conceptual framework of	1. Students review national, state, professional and university standards for teaching, and create and continually modify a personal teaching	1. Students present a personal teaching philosophy several times over the course of study.

participate in the professional community, improving practice through their personal actions, education and development. Professional practice refers to: Knowledge of, and participation in, the activities of the professional community. Ethical behavior consistent with the best interests of students and the community. Reflection on professional practices and continuous efforts to ensure the highest quality of science instruction. Willingness to work with students and new colleagues as they enter the profession.	teacher education at Illinois State University.	philosophy based upon these standards. (PHY 209 syllabus, §; PHY 310 syllabus, §; PHY 311 syllabus, §; STT 399.72 syllabus, §	
	2. Understands the concepts of a community of learners and interacts with instructors and peers as a member of such a community.	2. Students participate in a continual assessment program that includes student knowledge, skill, and dispositions, and periodic meetings with instructors and advisors. (PHY 107, § ;PHY 208, §;	2. Students' performance is assessed continually.
	3. Documents personal strengths and weaknesses, and seeks opportunities to improve his or her preparation to teach science.	3. Students employ computer-based testing to self-assess content and pedagogical knowledge prior to being admitted to student teaching.	3. Students remediate learning deficiencies and pass Mallard-based tests of content knowledge and pedagogy.
	4. Takes personal responsibility for growth of knowledge, and for assisting others who are preparing to teach science.	4. Students conduct discussions of latest science and science education findings following reviews of sources such as journals, books, and WWW resources. (PHY 310 syllabus,	4. Students maintain and periodically submit for inspection an electronic journal in which they make a record of sources reviewed.
	5. Demonstrates the ability to handle problems and tension calmly and effectively, and to relate to peers, instructors, and supervisors with integrity.		
	6. Participates in student associations, workshops, conferences, and activities related to science teaching, and reads journals of professional associations in the field.		
	7. Engages in systematic and continual self-assessment.	7a. Students create a professional teaching portfolio in which they document	7a. Students submit portfolio for evaluation at several checkpoints along

		abilities and reflect on personal practice in 16 standards-based areas. (PHY 209 syllabus, §	route leading to graduation.
		7b. Student teachers reflect on personal teaching practice. (STT 399.72 syllabus, §	7b. Student completes a weekly reflection and formulates plans for future improvement. (STT 399.72 syllabus, §)
	8. Demonstrates skills as reflective practitioner who continually evaluates how choices and actions affect students, parents/guardians, and other professionals in the learning community and actively seeks opportunities to grow professionally.		8. *Student Teacher Evaluation Form,* four criteria.
	9. Understands education as a profession, maintains standards of professional conduct and ethics, and provides leadership to improve student learning and well being.		9. *Student Teacher Evaluation Form,* thirteen criteria.
	10. Demonstrates compliance with teacher education's conceptual framework *Realizing the Democratic Ideal*	5. Students oriented to need of teaching under conceptual framework guidelines (PHY 353 syllabus,)	5. Students create six-part professional teaching portfolio as capstone project in student teaching demonstrating competency.

3.0 Goals and Self-Analysis. Discuss the data collected from candidate analysis and other sources. Briefly identify and discuss changes you have made or will be seeking to make related to this program standard as a result of your analysis.

During the past five years efforts have been made to align the ISU Physics Teacher Education program with NSTA and other national, state, professional, and local standards. To that end the following major activities have taken place:

Spring 1999 Instituted an INTASC/NSTA standards-based assessment instrument for student teaching.

Fall 1999 Added new required courses to revised Physics Teacher Education curriculum: PHY 209, PHY 310, PHY 311

Fall 1999 Integrated INTASC/NSTA standards into PHY 209 clinical experiences.

Fall 1999 Initiated Science Teacher Education Oversight Committee.

Fall 2000 Began continual assessment activities of physics teacher candidates and Physics Teacher Education program.

Fall 2000 New, temporarily optional courses added to revised Physics Teacher Education plan of study: PHY 312, PHY 353.

Fall 2001 Added new required course to Physics Teacher Education curriculum: PHY 208

Fall 2001 PHY 312 and PHY 353 became requirements in new plan of study for Physics Teacher Education majors.

2001-02 Worked with doctoral student who served as external program reviewer for entire academic year; currently making significant number of changes. In addition, there have been continual adjustments made to course syllabi and teaching methods as a result of in-class experiences and on-going professional development of the program coordinator.