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<th>Assessment Method: Evidence of Student Learning</th>
<th>Planned Teaching &amp; Learning Activities / Pedagogy</th>
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| ULO 1: Writing           | • Demonstrate an understanding of the nature of conceptions about physical phenomena their students are likely to present in their future classrooms  
• Identify student conceptions of physical phenomena from their observations of the students’ actions in class and of the students’ oral and written communications in class and from the research literature. | Each teacher candidate will write a focused, annotated bibliography on the topic of students’ conceptions of physical phenomena typically treated in high school physics. This bibliography will be assessed for:  
• Adherence to the purpose of the annotations  
• Voice appropriate to the science teaching community  
• Following the conventions of style and form in the field  
• Writing in the genre of physics education, for teachers  
• Use of articles from a wide variety of research journals in the field, exercising judgment as to the usefulness of information from the articles encountered  
• Use of the revision process established for the course and appropriateness of response to comments and suggestions  
• made by the instructor; Attention to the rhetorical situation and the audience of other science teachers. | Each teacher candidate in the course will:  
• Develop an annotated bibliography focused on students’ conceptions concerning physical phenomena from the physics education research literature. The primary initial source will be an 8,400-entry, unannotated, bibliography that serves the fields of physics education research and physics education  
• The phenomena considered will span the range of those typically treated in high school physics courses and junior high school physical science  
• Develop the skills to identify the typical conceptions their students are likely to have on their entry into class from evidence presented in the literature  
• Develop their annotated bibliographies in a series of bi-weekly revisions as their writing and conception identification skills develop based on interactions on their document each time from the instructor  
• Standard APA conventions will be followed with respect to bibliographic listings  
• Studying evidence of student conceptions and conceptual change from student work  
• Experience learning in a pedagogy that concentrates on engaging students in critically examining their own conceptions and developing changes in them when they do not fit the evidence of experience. |
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| ULO 3: Critical Inquiry | - Construct descriptions of conceptions students might be using in their thinking about a physical phenomenon  
- Identify the presence of an alternative conception  
- Give evidence from observable student behavior to support possible descriptions of the alternative conception  
- Make a reasoned argument in support of a particular description of the alternative conception  
- Evaluate possible descriptions for the alternative conception for fit to the evidence of student behavior | Descriptions of the student conceptions developed by the teacher candidate based on evidence of student behaviors presented in the research literature and in class for the annotated bibliography will be assessed for evidence that the candidate can carry out the skills described in the CLO described in the second column. | • Through an iterative revision process the teacher candidates will be constructing descriptions of students’ conceptions of physical phenomena in their annotated bibliographies  
• This work will be supported by the experience of learning activities in class designed to focus teacher candidates’ attention on their own conceptions, the fit of these conceptions to experiences in lab-like activities and constructing modified conceptions to better fit the evidence of experience  
• The teacher candidates will be engaged in examining classroom sets of evidence from students from which the presence and nature of students’ conceptions can be discerned  
• In the course an on-going examination of the nature and status of people’s conceptions of physical phenomena will be conducted. |
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| ULO 4a: Innovation      | • Construct new ways of conceptualizing physical phenomena in response to evidence that existing ways fail to fit new evidence  
  • (This process of constructing new personal knowledge is the same whether one is examining physical phenomena or the classroom phenomena or the classroom phenomenon called learning.) | Teacher candidates will be asked to apply the revised conceptions they develop with their classmates to novel situations in order to examine their responses for evidence that new understanding is present * This may be either in written or verbal form  
Because to develop new understandings the elements of innovation in thinking are required, the candidate success in demonstrating the presence of understanding is evidence of innovation in their thinking. | Teacher candidates will work through lab-like activities In these activities they will experience disequilibrations as they encounter aspects of a phenomenon that do not match their expectations They will work collaboratively to each construct new personal conceptions of the phenomenon to resolve the disequilibrations. |
| ULO 4b: Teamwork        | Work effectively in a team to meet the challenges of disequilibration between experience and expectations about the behavior of a phenomenon by constructing new conceptions of the phenomenon that fit experience more closely. | The instructor will monitor the teams of teacher candidates as they work through the activities for evidence of the contributions each candidate makes in each of the elements of teamwork. | Teacher candidates will work through lab-like activities In these activities they will experience disequilibrations as they encounter aspects of a phenomenon that do not match their expectations They will work in teams of four as they collaborate to construct conceptions of the phenomenon to resolve the disequilibrations. |