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Helping Elementary Education Majors Brush Up on Mathematical Modeling: Insights from a Field Test of a New Online Learning Prototype

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Abstract: This paper describes insights related to the potential use of on-line training modules with elementary education pre-service teachers for enhancing their experience and background in mathematical modeling. These insights resulted from a field test of a new online learning prototype developed within a National Science Foundation Proof-of-Concept project. The insights listed in the paper are further supported by two URL addresses that link to detailed notes, background documents, and various demonstration pieces.

Various studies and national reports have suggested that elementary education majors are often weak within academic content areas, and particularly mathematics and science (see web-site for references). Such studies and reports often suggest the need for remedial content instruction within teacher

preparation programs.   However, these future teachers may have a difficult time receiving the remedial help they need within a traditional university setting, since as a elementary education major they are often already taking a full load of courses representing numerous disciplines. Thus, the potential of other approaches, such as the use of on-line learning modules, need to be examined for filling this remedial content need of pre-service elementary teachers.

Related to this potential assistance, several online learning strategies are being examined at the University of Nebraska at Omaha with pre-service elementary teachers, including the use of a new online learning module, developed within a National Science Foundation Proof-of-Concept project related to mathematical modeling. The module and other simulations used represent several innovations in online instruction, such as a node-based database structure for the instructional pieces. The assessment questions and answers, sequence of nodes visited by the student, and duration of time a student visits an instructional node are all recorded. A detailed map of a student's path through the instructional process is also generated to help in the overall analysis of an individual student's learning process. For more information see the extensive URLs at http://ois.unomaha.edu/aflearn/index.html and http://ois.unomaha.edu.

The investigation of these online learning strategies is just beginning, but some initial insights are already apparent from the results of some initial field tests. These include the following:

1) Response patterns reflect that elementary teachers indeed have a wide range of background and experience in mathematics and mathematical modeling.

2) The pre-service elementary teachers sampled recognized that online learning might be a useful strategy for their own remedial work in mathematics.

3) The pre-service elementary teachers were at first uncomfortable and impatient with the "discovery learning" approaches used within the modules and simulations.

4) The pre-service elementary teachers eventually preferred to work in groups of two or three, rather than to work on the on-line activities individually.

5) A periodic discussion component (that accessed a real teacher) was seen as essential by the pre-service elementary teachers when using on-line learning activities.

6) After some initial resistance with the on-line instruction, the elementary pre-service teachers eventually embraced on-line training that contained some periodic discussion components.

The overall vision for the use of such technology based learning environments is one that is consistent with many national visions and documents. For the pre-service elementary teacher, the use of such learning environments within methods classes may not only help them extend their own backgrounds, but also allow them to experience a potentially powerful new learning environment that will become increasingly available to both themselves and their elementary students.