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Development and Use of the “Homeworkhelper”, An Online Homework Grader

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Abstract

The use of weekly problem sets is a common way to help students enrolled in introductory economics courses learn the usefulness and importance of economic principles. Difficulty in using this approach arises when courses are large. A “Homework Helper,” or computer homework grader was developed and used in AGECE 120, Principles of Agricultural Economics and Agribusiness, at Kansas State University. The Homework Helper is a tool that provides web access to a faculty member for the creation of homework assignments and provides web access to students for completing the weekly problem sets. Use of the online homework manager allowed students to get weekly practice at solving economic problems, and weekly feedback on their understanding of the material. The instructor was able to devote a large amount of saved time and energy to preparing lectures, working with students, providing feedback to students, and to the pursuit of other

scholarly activities. Synergy between the instructor and the computer specialist allowed for many improvements and enhancements to the homework manager throughout the semester. The Homework Helper has been used in other economics courses, and will be used to administer course examinations in the future.

Introduction

The major goal of economic education is to provide students with the ability to usefully apply economic principles to new situations, issues, and events. The ability to “think like an economist” requires practice. Courses in economics and agricultural economics often require students to do problem sets (homework assignments), typically due once each week (Barkley, 1995; Becker and Watts, 1998). One difficulty that arises with the use of using weekly problem sets to learn economics is the high costs of grading assignments, particularly when class size is large. This study reports on the development and use of a technological solution to homework assignments in large classes. The “Homework Helper” was developed for use in

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AGEC 120, Principles of Agricultural Economics and Agribusiness at Kansas State University, and implemented during Spring semester, 1999. The success of the online homework manager has led to the adoption of the homework grader by other instructors serving over 3000 students, and the use of the technology for class examinations during Spring semester, 2000.

Software was developed with two objectives: (1) to maintain the enhanced learning associated with weekly homework assignments, and (2) to diminish the large commitment of instructor time and energy of grading. One traditional solution to this dilemma has been to employ teaching assistants to grade homework assignments. This approach can (1) free up instructor time for other scholarly activities; (2) provide teaching experience and a small amount of money to the teaching assistants; and (3) provide synergy between the instructor and the teaching assistants. The downside to the use of teaching assistants is the loss of direct communication between the instructor and students on a weekly basis. Also, the logistics of employing teaching assistants require time and effort to ensure good management of the assistants, who are often inexperienced and may need training. Lastly, teaching assistants require financial resources, which are often unavailable.

An alternative to traditional grading of assignments by teachers or teaching assistants is the use of computer technology. Classroom technology had previously been incorporated into the course lectures (Barkley 1998), making the transition to the online homework grader easier for both the instructor and the students. The use of computer technology in classrooms throughout higher education has increased dramatically in the past several years. Bekkum and Miller (1994) summarized survey results that demonstrated the belief that, "computing will become more integrated into courses throughout the curriculum," and that, "the computer will become more of a teaching/learning tool for instructors and students to use in analyzing and solving problems" (p. 46). Pompelli and Hobbs (1995) reported successful adoption of a computer-based tutorial in an Agricultural Economics course.

Evidence continues to accumulate that technology, when used appropriately, can enhance teaching and learning (Green and Gilbert, 1995; Gilbert 1996). Kulik and Kulik (1991) showed that students in a computer-based course achieved higher scores than students enrolled in traditional courses. Murphy and Terry (1995) analyzed over 250 articles that compared student learning in computer-based courses and traditional classes, and found that computers could improve instruction. Newman et al. (1996) concluded that the internet increased student achievement in an agricultural technical writing course. O'Kane and Armstrong (1997) provided a description and enthusiastic recommendation of their use of

a Web-based multiple choice test at North Carolina State University.

To find out more about the possibility of using technology to grade homework assignments, the advice of Sosin (1998) was followed: "...take advantage of specialization of labor. Get help from your campus computer specialists when possible." The Instructional Technology and Design Services branch of the Information Technology Assistance Center (ITAC) at Kansas State University was contacted to develop software that would provide grading of weekly assignments. Collaboration between the instructor and the ITAC staff resulted in the "Homework Helper," a developmental tool that integrates applications by utilizing active server pages to implement an internet browser interface to a database.

Student access to computers was considered to be a potential problem with the adoption of the Homework Helper at Kansas State University, but was found to be of no consequence. Prior to the introduction of the software, it was not known if there was a large enough capacity of computers to accommodate the large number of students doing weekly assignments on the internet. Previous studies alleviated some of these fears: Green (1996) reported that one-third of all college students own their own computers. More recently, Donaldson et al. (1999) found that a majority of students in the College of Agricultural Sciences at Pennsylvania State University owned a computer, and that a lack of access to a computer in a computer lab was the biggest source of frustration associated with the use of computers in coursework.

Schurle (1997) emphasized aspects of the use of technology for homework assignments that must be considered prior to the development and use of such a tool as the Homework Helper: "...the cost of development and other problems such as academic honesty that is hard to monitor are substantial deterrents to the widespread use of technology..." (p. 9). These issues will be addressed in what follows, where the development and use of the Homework Helper are described in detail.

Methods


The Homework Helper allows faculty to create online assignments for students enrolled in their courses. The Homework Helper is installed online and operates separately for each faculty member. The faculty member creates an online assignment by logging on to the "Homework Authoring Center" (Figure 1) and entering questions into a database. Next, the author makes the homework assignment accessible to students by selecting the "Accessible to Students" button on the Homework Authoring Center (Figure 1). After the homework assignment has been made accessible to students online,

Homework Authoring Center


Faculty member Andrew Barkley logged in.

SELECT	Test Name	Properties	Accessible to Students	Take the Test	Layout Change
<input type="checkbox"/>	Assignment One	Properties	YES	Preview	Layout
<input type="checkbox"/>	Assignment Two	Properties	NO	Preview	Layout
<input type="checkbox"/>	Assignment Three	Properties	NO	Preview	Layout
Edit	Results			Delete	NO


- DELETE removes the selected test profile and all of its responses. The questions for that test will remain in tact.
- If you are editing a test, it is strongly recommended that you make that test inaccessible to students.




[Create a NEW TEST](#)



[Edit Class Roster](#)



[Edit Question Classifications](#)



[Edit Faculty Roster](#)

Explore your files

Authoring Center Tour

Exit System

Figure 1. The Homework Authoring Center Homepage.

each student must be able to login to submit his or her answers on the homework assignment. To accomplish this, the faculty member must provide a "userid" and "password" for each of the students listed on the class roster. Once the homework assignment questions and the class roster have been entered by the faculty member, the Homework Helper is ready for use.

The Homework Helper has the capability of asking questions in several formats: (1) multiple choice (including true/false questions), (2) very short answer (four characters or fewer), (3) short answer, and (4) long essay. Multiple-choice questions can have any number of answers. Also, the Homework Helper could be used as a tutorial only, by displaying information with answers in the "instructional"

mode. Currently, the grading function of the Homework Helper can be used only for multiple choice and very short answer questions, since essay questions require more sophisticated grading programs. Each week, students can access a list of twenty multiple-choice questions on the internet. Questions are accessible one week prior to the due date of each assignment to allow students to work on the material, either alone or in groups, for several days prior to submitting the answer on the Homework Helper. Students log on to the Homework Helper from any computer that has an internet connection.

Once the responses for the homework have been submitted, the faculty member can access the results by logging on to the "Summary Results" homepage (Figure 2).

[GO HOME](#)

Assignment One Results															
Authored by barkley		Profile Last Changed On 1/20/99 7:22:37 AM													
<table border="1"> <tr> <td> <p>DELETE ALL</p> <p>NO</p> </td> <td> <p>DELETE ALL removes all the responses for this test and also deletes the E-mail attachment file which holds a copy of the responses. You must enter YES in the text field before clicking this button.</p> </td> </tr> </table>				<p>DELETE ALL</p> <p>NO</p>	<p>DELETE ALL removes all the responses for this test and also deletes the E-mail attachment file which holds a copy of the responses. You must enter YES in the text field before clicking this button.</p>										
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Figure 2. The Summary Results Homepage.

Results are then printed from any computer by the faculty member and entered into a spreadsheet. The results can be sent via electronic mail to any individual, typically the faculty member, for easy entry into a grade spreadsheet. Grades are made available to students on the internet.

The software provides color-coded grading on the summary screen, to provide the faculty member with a "feel" for the overall success or failure of the assignment. This feature also allows for quick identification of any questions that may not be written well by finding the incorrect answers of student results. The faculty member can easily identify when many students miss the same question, and delete the question from the assignment, when appropriate. To simplify grading, each question can be assigned a different number of points. The software provides answer keys to each assignment to the students. Students receive rapid and accurate feedback on the weekly assignments, allowing them to rework missed questions or receive help from the instructor.

If the faculty member wishes to give other individuals access to the Homework Helper, he or she can grant permission with the "Edit Faculty Roster" feature located on the "Homework Authoring Center" homepage (Figure 1). This allows teaching assistants, other faculty members, and/or administrators to view the homework assignments and results.

Results and Discussion

The Homework Helper was used without difficulties for twelve homework assignments in AGEC 120 during the Spring semester of 1999. Since the online homework grader was being developed during the course of the semester, there were a small number of difficulties with the software program. These issues were quickly identified and resolved. As with the introduction of anything new, the problems that arose led to an improved product once the issues were addressed.

Confidence in the reliability of the Homework Helper rose rapidly, as the online grader became extraordinarily efficient and convenient to use. Students were asked to turn in a hard copy of their answers each week to provide evidence of completion of the assignment in the case of technological failure. These copies were never used or needed, and this initial requirement has been dropped due to the reliability of the Homework Helper.

The software development costs are high for the Homework Helper, when the total number of hours of programming is taken into consideration. However, when these "start-up" costs are compared to the enormous amount of time and energy saved in instructor grading, the benefits of the Homework Helper clearly outweigh the costs. This is particularly true as the use of the Homework Helper expands. Currently, over 3000 students use the software each semester. We anticipate that the investment of hard work in the development of the online grader will pay off handsomely as it is expected to be widely adopted by instructors of large classes at Kansas State University.

Access to computers was not an issue, due to many students owning their own computers, and others using public computer laboratories at the University. Another concern about the use of computer technology is the possibility of cheating (Schurle). Students are encouraged to work together on the assignments, since discussion and debate of the homework questions is a great way to learn economics. While working in groups is advocated, students are worried that "free-riding" on another student's work will result in a lack of learning and poor performance on the course examinations.

Prior to the adoption of the Homework Helper, class assignments were hand-written. This assured that each student wrote out his or her own answer, even if they worked with others. With the introduction of the online grader, students could now rely solely on another student's answers when submitting their own assignment. While this is a possibility, it appears to be unlikely that the level of cheating is different between the hand-written and the online assignments. The answers for the multiple choice questions appear in random order for each student, requiring students to read all of the answers, rather than just checking an answer provided by another student.

Summary

O'Kane and Armstrong (1997) concluded that "...one of the most exciting aspects of the Web lies in its widespread acceptance among students and faculty once they have been given the opportunity to get involved." Our experience with the development and use of the Homework Helper was in accord with this view. Students enjoyed the ability to use the online grader and to receive rapid and

accurate grading of assignments throughout the semester. The amount of paper used and paperwork were reduced enormously. The convenience of logging on to the internet at any time in any location was appreciated by the students. Although most students have had experience with computers and the internet, many learned computer skills explicitly for the computer assignments. Given the increasing importance of computer skills in the workplace, this is a desirable outcome of the use of the Homework Helper.

The major benefits of the Homework Helper accrued to the teacher. The large number of hours that had previously been devoted to grading assignments in a large class could now be devoted to other aspects of the course. Specifically, the energy level of the lectures and student interactions was greatly enhanced, making the teacher more effective and the material more meaningful. Based on our positive experience, we anticipate a large and increasing number of faculty members will adopt and use the Homework Helper in the near future.

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Attitudes of Michigan Agriscience Teachers Toward Diversity

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Introduction

A number of scholars (Fullwood III and Healy, 1994; Goode, 1993; Grogan, 1991; Henry, 1990; Johnson and Packer, 1987; Sivy, 1997) have written extensively on major demographic changes that are occurring in the United States. Growing percentages of our country's population are people of color. Many are immigrants whose first language is not English. Those with disabilities are exercising their rights to participate in society in greater numbers. The gap between the rich and the poor is widening. The fastest growing religion in this country is not Christianity. And those with life styles and sexual orientations different from "the norm" are less likely than in the past to hide or attempt to "blend in."

As a result, many systems including government, education, the private sector, and non-profit organizations are giving issues of diversity a high priority. A review of the literature indicates that various organizations are actively examining their vision and mission statements, philosophy, goals, priorities, and workforce composition (Lattimer, 1998). For example, Monsanto's Vision of Diversity is measured through four objectives: a) how they develop and treat people; b) where people come from; c) how they hold themselves accountable; and d) how they have built a more

diverse community (Monsanto Corporation, 1997).

Issues of diversity are moving up on the agendas of educators, as well. In fact, according to an Association of Teacher Educators survey of critical issues in teacher education, "Preparing teachers for multiethnic, multicultural settings" was determined to be one of the three most critical issues to be addressed (Buttery et al., 1990). Further, the National Council for Accreditation of Teacher Education (NACTE) uses multicultural education as a specific criteria for evaluating teacher preparation programs (Reiff, 1992). It is predicted that by the year 2000, 40% of students in public schools will be from ethnically different backgrounds. At the same time, 94% of teachers in the year 2000 are expected to be White (Reiff, 1992). Teachers will need to relate effectively with an increasingly diverse student population in public schools (Henry, 1990).

The increased diversity of the Michigan population has created a challenge for colleges and universities to determine the extent to which they are adequately preparing teachers to serve a more diverse student body. Adams and Marchesani (1999) express this challenge. "The understandable difficulty for faculty socialized within another historical and cultural situation is to know how best to facilitate diverse student learning within an increasingly multicultural