ONLINE HOMEWORK VERSUS PEN AND PENCIL HOMEWORK: DO THE BENEFITS OUTWEIGH THE COSTS?

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This article discusses the advantages and disadvantages of online versus pen and pencil homework completions. While the use of online homework completion is rapidly growing, concerns remain as to its educational effectiveness. Online courses appear to be well suited for online homework completion in particular, though online homework is not a requirement, as students can submit homework via dropboxes for instructor grading. A survey of the literature was conducted and relevant study results evaluating the learning value of online homework completion are presented. The advantages and disadvantages of online homework completion and real life personal observations are discussed in detail. Reviewed research evidence suggests homework completion decisions should consider the type of course, student enrollments, motivation level of students, and related costs.

Introduction

Online homework is a rapidly growing educational use of the Internet. These homework assignments are submitted electronically and computer graded. This practice is growing in all academic areas, including business, math, chemistry, health and other sciences. These homework systems, which permit instant grading and allow errors to be corrected at the option of the instructor, are replacing or supplementing traditional pen and pencil homework that is handed in during class, graded by the instructor or an assistant, and returned with marks and comments days or weeks later. Prior researchers contend that using online homework technology to assign problems, provide feedback, determine grades, and allow retries is one way technology may be used to enrich the students' experiences in the course. Most certainly the grading of homework is important, as observed by Walberg, Paschal and Weinstein (1995) in that homework graded or commented on improved student learning, whereas homework without feedback had only a small effect on student learning. Feedback from pen and pencil homework varies considerably across instructors, while standardized online homework is typically graded immediately, informs students where they went wrong, and allows retries. Instructors, however, may not be aware of learning difficulties among individual students, as they are not personally grading the homework. Further, allowing multiple submissions by students may encourage lazy habits among students and professors. Khanlarian and Singh (2010) reported one student attempted a solution 205 times before finding the correct answer – entering 1, and then 2, and so forth. Students all too often approach homework without reading the book, and with dropdowns, templates and unlimited tries available with online homework, may actually reduce their effort to solve the homework assigned. Through this

process, learning unquestionably suffers. In addition, computer graded homework may further impersonalize the course, regardless of its impact on learning. This paper investigates the pros and cons of online homework systems, reports on the results of related studies, and provides personal observations from the authors. A purpose of the paper is to provide instructors with a partial framework useful when making important pedagogical decisions.

Use of Online Homework

Computers should not be viewed as a passive addition to any classroom; they change the classroom environment and learning atmosphere and are never neutral in effect. Computer applications must have a purpose and be carefully planned, given their effect. Similarly, the role of computer technology must be purposeful. Requiring students to complete homework online simply to aid in grading is not a sufficient purpose, though this unfortunately is a prevalent reason for doing so. Professors have a variety of competing demands on their time, including committee assignments, publication requirements, AACSB mandated faculty involvements, recruiting and placement demands. However, without proper planning, application of computer technology may have dysfunctional consequences. The completion of homework online, as an alternative or supplement to pen and pencil assignments, must fulfill basic outcomes such as

- Generates efficiencies and productivity benefits to students and faculty, by requiring less class content for the required homework;
- Enables expansion of the curriculum to include new topic areas not able to be covered with extant course time constraints;
- Facilitates student learning by understanding accounting interrelationships and accounting concepts;
- Assists processes of education by contributing directly and indirectly to the development of a broad range of skills, such as writing and interpersonal and computer skills (Boyce, 1999).

Technical Skills Are Not Enough

In addition to technical skills, non-technical skills that include communication, interpersonal, critical thinking, and problem solving, are increasingly identified as important by the profession. Specifically, essential non-technical, soft skills include:

- Well-developed interpersonal communication skills;
- Logical, deductive, abstract, and critical thinking abilities, as well as ability to exercise judgments;
- Ability to identify, analyze, synthesize, and solve both financial and non-financial problems;
- Leadership and management knowledge;
- Personal attributes, such as morality, honesty and integrity;
- Knowledge of business and economic environments;
- Versatility, flexibility and adaptability;
- Computer literacy and information systems knowledge (Accounting Education Change Commission, 1990; Review Committee of the Accounting Discipline in Higher Education, 1990).

Unfortunately, accounting graduates are often deficient in many of these skills. Moreover, because computer literacy is but one of these non-technical, soft skills, its emphasis may be to the detriment of the development of the other required skills. Furthermore, educators must be aware that education is more than preparing students for their (possible) vocation. A narrow focus can harm students and society by failing (a) to consider the likelihood that students will not work in “mainstream”

accounting after graduation, (b) to adequately develop soft skills, and (c) to provide students with critical skills needed to assess the impact of accounting on society and people. Students need skills resolving conflicting interests peaceably, allocating proceeds fairly, and distributing information equitably (Boyce, 1999). To be positioned for maximum success, students must possess critical thinking abilities and become proficient in more than the technical knowledge of a profession. This partially ensures students are able to adapt and thrive as the profession evolves.

Online Homework Versus Pen and Pencil Homework

Online education has grown considerably, with many higher education students taking one or more online courses (National Science Foundation [NSF], 2014 b). Online courses are certainly well suited for online homework completions. These two seem to go hand in hand. However, several schools, including schools like Kaplan University, are predominately online universities but do not necessarily use online homework systems. Rather, students frequently place homework in a virtual drop box, and instructor's grade those submissions. Consequently, both online homework and pen and pencil homework completion are viable choices for traditional classrooms, hybrid and online settings. All too frequently homework is assigned online to economize, cut costs for the university, improve "productivity", and to partially offset heavy workloads and other duties assigned to faculty. Proper thought as to the advantages and disadvantages of online homework is paramount, however, ensuring the purpose is reasonable and in the students' best interest.

Table 1 presents the results of numerous studies evaluating the learning value of online homework completion. The benefits and drawbacks, as well as overall effectiveness assessments, are presented. Some studies report learning advantages with online homework while others cite no learning advantages.

Article Name	Article Journal	Authors	Year Published	Benefits/Drawbacks	Overall Assessment
Faculty Perceptions of Online Homework Software in Accounting Education	Journal of Accounting Education	Humphrey R.L. and D. F. Beard	2014	A survey of faculty teaching online revealed online homework systems were beneficial in promoting student learning, and were also helpful in minimizing instructor grading time. However, questions remain about learning effectiveness, student perceptions vary, and costs to students are increased.	Inconclusive

Do Online Homework Systems Improve Student Performance?	Advances in Accounting Education: Teaching and Curriculum Innovations	Gaffney M.A., D. Ryan and C. Wurst	2010	When completing cases and a cycle problem, the online homework system students outperformed traditional students. However, there were no significant performance differences on quizzes or exams. Online homework system completion did not enhance student satisfaction.	Inconclusive
Online Homework Managers and Intelligent Tutoring Systems: A Study of Their Impact on Student Learning in the Introductory Financial Accounting Classroom	Issues in Accounting Education	Hahn W., C. Fairchild and W. Dowis	2013	In problem solving and exam scores no learning advantages were observed in online homework users.	Unfavorable
Student Performance in Intermediate Accounting: A Comparison of the Effectiveness of Online and Manual Homework Assignments	The Accounting Educators' Journal	Fatemi, D., L. Marquis and S. Wasan	2014	Online homework students performed significantly better in solving problems. However, those students performed significantly worse on multiple choice questions, when those questions were designed for deeper understanding.	Inconclusive
Evidence on the Effectiveness of On-Line Homework	College Teaching Methods & Styles Journal	Dillard-Eggers, J., T. Wooten, B. Childs and J. Coker	2008	There was a strong, positive correlation between online homework completion and course grades.	Favorable

Achievement of Accounting Students Relative to Individual Learning Styles and Locus of Control: Experiment Involving Internet-Based Instructional Technology	UMI Dissertations Publishing	Basile, A.	2001	Students performed equally well in traditional and online homework environments.	Inconclusive
An Investigation of Online Homework: Required or Not Required?	Contemporary Issues in Education Research	Wooten, T. and J. Dillard-Eggers	2013	Online homework users had higher course grades. Online homework systems appear to most benefit lower ability students.	Favorable

Online homework completions may allow students a perception that it is easy to solve accounting problems, which from an initial learning perspective may be fine; though Helmi (1986) argues that motivation is then lost as students work to comprehend the concepts and principles of the subject matter. The traditional course content is reinforced with online homework, frequently at the expense of developing higher order skills (Gow, Kember & Cooper, 1994). Online homework can create the impression that accounting is precise and objective. Instructors must properly assign homework, especially in the online environment, to emphasize skills such as analysis, judgment, and problem solving. Students must also be active participants in their own learning processes, and not passive receivers of information (Accounting Education Change Commission, 1990). In so doing, students must on occasion struggle with unstructured problems, multiple information sources, conflicting information, and questions that have no right answer. Students must be empowered to take control of their own learning, which is potentially more challenging in the online homework environment. Moreover, students are more or less required to organize their own self-study, which can be problematic in situations where students are poor self-managers or are novices to this mode of learning (Sangster, 1992).

So, does online homework improve learning? Wooten and Dillard-Eggers (2013) found no significant difference in grade improvement between users and nonusers of online homework, with higher performing students performing close to their GPA whether they use online homework or not. Wooten and Dillard-Eggers (2013) concluded that high intrinsic motivated students will do well using both the online system or pen and pencil systems; homework systems are unlikely to increase student motivation; and may even inhibit students from being pushed to their full potential. Alternatively, low intrinsic motivated students may benefit from online homework, or other alternative teaching methodologies like quizzes, in-class activities, test-retest, and other collaborative learning activities (Wooten & Dillard-Eggers, 2013).

Referring again to Table 1, student reaction to online homework is generally positive, though somewhat mixed. In non-accounting contexts, there is some evidence that computer-assisted learning may improve student attitudes toward their course of study and may enhance their perceptions of course quality and organization (Leidner & Jarvenpaa, 1995). Teacher-student interaction is an important aspect of the educational process. As such, computer-assisted learning cannot perform all of the functions of a teacher (Leidner & Jarvenpaa, 1995). Nevertheless, students value the immediate feedback and being

able to resubmit assignments, whereas instructors typically like not having to grade student work manually.

Student learning may, however, be impacted by the choice of homework systems. In a study conducted in 2003, Bonham, Deardorff and Beichner determined that calculus- and algebra- based introductory physics students performed equally well on regular exams, conceptual exams, quizzes, laboratory and homework when assigned to either pen and pencil or web-based homework. In contrast, Alkafaji and Schroeder (1986) reported that students who used a manual practice set felt more strongly about the usefulness of the practice set than did students who used a computerized set. However, sample students showed no differences in satisfaction of the learning experience or in interest of becoming a financial accountant. Similarly, Wilkinson and Echternacht (1998) found no significant differences in perceptions regarding the subject matter between students who completed Internet-based homework and students who were assigned traditional homework in a financial management class. Further, Basile and D'Aquila (2002) found no significant differences in course attitudes between students exposed to computer-mediated instruction and students exposed only to traditional instruction. Hauk and Segalla (2005) found that online homework was at least as effective as traditionally graded paper and pencil homework for students learning college algebra. In addition, Bikrimirov and Klassen (2005) found a positive relationship between student performance and access to solutions. However, Lindquiest and Olsen (2007) found that providing students with homework solutions, no solutions, or check figures did not impact students' test scores. Klimek (2012) found that students' overall academic competence as measured by prior GPA and ACT scores, rather than the technique used to deliver homework, are better predictors of student performance. Similarly, Hahn, Fairchild, and Dowis (2013) did not identify a learning advantage associated with either online homework or intelligent tutoring systems on several performance measures and on exam results. Likewise, Palocsay and Stevens (2008) found that in business statistics courses the type of homework system used in a course did not make a significant difference in the students' performance. Given the conflicting results of the aforementioned studies and others contained in Table 1, it is unclear whether student attitude or learning is affected by the use of online homework.

Age seems to be a factor in satisfaction levels with online homework as well. Wooten and Dillard-Eggers (2013) and Childs and Coker (2008) found that older students reported significantly lower levels of understanding of topics and problems with online homework and provided lower overall satisfaction ratings of the online homework experience. Older students, however, completed more homework assignments when compared to their younger counterparts. These contradictory findings make it extremely difficult to define the benefits of online homework because different students may react in different ways. This is an avenue for further research and certainly has important implications for existing students.

Concluding Remarks and Personal Observations

Two of the authors have taught in an online setting, and one of the authors, as part of her degree program, enrolls in online courses. Students in these online classes had drop boxes with professors grading in some courses and online homework in other courses. Students primarily correspond with instructors via the Internet. Assignments are submitted online, with many being standardized and directly related to the textbook assigned. The authors also require pen and pencil homework in some of their classes. Frustrations by students have been noted with the online system, either with inabilities to log on or with errors and inconsistencies in the solutions. A student of one of the authors even called him crying during the Super Bowl game. The instructor subsequently identified an error in the solutions. The publisher was immediately notified of the situation, during the Super Bowl game, and the textbook was subsequently dropped. So, these systems are not without errors. However, to be fair, some students do

enjoy the online experience, appreciating the opportunity to receive instant feedback, problem rationale, and multiple attempts; whereas, others would rather submit their homework using a pen or pencil.

Approximately two-thirds of Title IV institutions offer distance education (i.e., courses taken for college credit at off campus locations via Internet, cable television, satellite classes, videotapes, correspondence courses or other means) (NSF, 2014 a). These institutions have a written agreement with the Secretary of Education that allows the institution to participate in any of the Title IV federal student financial assistance programs. The most recently available data from the National Center for Education Statistics (2014) indicate that in 2013, 26.5% of undergraduate students were enrolled in distance education courses as compared to 30.8% of post baccalaureate students.

Both undergraduate and graduate students are increasingly taking advantage of broader access to higher education offered through online forums (NSF, 2014 b). Though it is difficult to identify the precise benefits of Internet homework systems, as evidenced by this review, increasing instructor reach is particularly advantageous. Distance education increases institution reach universally and benefits students in part because of the potential for curriculum expansion, though it is not yet clear how many students can sustain commitment to learning in the absence of more personal contact and to what extent the growing access to higher education will translate into learning and educational achievement (NSF, 2014 b). Further, possible technical difficulties including computer failure, outdated technologies, and poor Internet connectivity may also be a concern with online homework systems.

In summary, research is not clear on the possible benefits of online homework. Most certainly advantages and disadvantages can be found with online homework. The extensive use of drop downs and templates may give students too much structure, thereby promoting rote learning and precluding learning of the concepts behind problem solving. Decisions to use online homework systems should not be made quickly and without thought. These decisions must be purposeful, carefully considering the type of course, student enrollments, motivation levels of students, and costs to students. Courses containing older, non-majors may not be best suited for online homework activities. Courses in a major, especially those at a higher level, with more motivated, traditional students may be more appropriate areas for online homework applications. But even in those courses, students must be exposed to a variety of learning methods to fully develop higher order skills. What is critical, but difficult to attain, is the need for students to use technology to learn about and explore the facets of the subject matter to satisfy a personal desire for knowledge and not simply to satisfy course requirements. Students must increasingly be aware that homework completion is essential for learning and academic growth, rather than to be completed as quickly as possible, checked off the list to complete the course, and to be one step closer to graduation.

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