An Experiment with the Old and the New: Online Practice versus Practice by Hand in Learning GAAP for Pension Accounting

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Fifty-six undergraduate accounting students with no knowledge of pension accounting were placed into one of two experimental groups. Both groups listened to the same lecture covering the computation of pension expense. One group practiced and computed pension expense using only pencils and paper while the second group used an online homework tool to practice and compute pension expense. The students who performed the work by hand scored higher on a post-quiz covering pension expense and reported a higher level of confidence in their knowledge of pension expense as compared to students using the online homework tool.

INTRODUCTION

Technology is constantly changing and expanding in all areas of our lives. Over one generation, the computer grew from a minor business tool to something in a variety of shapes, sizes and colors in every pocket or purse. In 1981, the Commodore VIC-20 came on the market, providing a color computer with cassette tape store and killer video games, all of which were shown on a small TV set (Ball 2005). Today iPhones, iPads, iPods and digital friends like Siri and Google Voice are regular parts of our lives.

The 21st Century is hooked on technology. We rarely see a new technology that we do not like or want. The message is clear; the newer the technology, the better it has to be. Sure, the iPhone 6 is great, but Apple lovers cannot wait to purchase the iPhone 7 as soon as it is released. After all, the iPhone 7 might have one more, tiny bit of techno-joy. Why have a computer and a tablet when you can get a gadget that is both? The old tablets require typing but now there is a tablet that the user can write on by hand!

One should ask if our love of technology can go too far. Children today are born staring at a screen and seemingly never turn their eyes away. College students standing in the same room text one another instead of conversing face-to-face. There is even new psychological disorders due to the use of technology. One of these, called "technology addiction," manifests effects in the brain similar to those caused by alcoholism and drug addiction (Hall 2013). Withdrawal symptoms experienced by those deprived of gadgets and technology mimic those of drug addicts or smokers deprived of their chosen addictive substances. Students in one study deprived of technology for just a few hours reported being "fretful, confused, anxious, irritable, insecure, nervous, restless, crazy, addicted, panicked, jealous, angry, lonely, dependent, depressed, jittery and paranoid" (Hough 2011). A second, "Facebook addition," results from fear of not being accepted online by peers, sometimes leading to depression in children (Tahnk, 2015).

No doubt technological advances have made our lives better. Technology can provide greater efficiency, lower time demands and allow us to move away from mundane tasks into more interesting

responsibilities. In managerial accounting, technology has changed greatly over time, causing the role of accountants to change in business settings. During the era of craft product—before the invention of the interchangeable part—accounting was a simple task done by hand. Production was simple, technology was simple, and accounting was simple. With the arrival of mass production, accounting became more complex, as huge inventories were amassed in many industries. Managing inventory, payroll, identifying costs and cost-per-unit became important skills necessary for accountants. Today's lean production environment creates even more complex production structure, as indirect costs outweigh direct costs. Likewise, in financial accounting, the development of the computer allows accountants to do very little computation and bookkeeping by hand. Instead, computers are used to take these redundant tasks.

In the classroom, technology has created major changes. Elementary school children use calculators to add, subtract, multiply and divide instead of practicing the math tables that were once part of their daily classroom routines. Students type notes on computers instead of by hand. Many participate in online classrooms instead of attending face-to-face classes, never seeing a classroom, never physically meeting a classmate and never talking with a professor in person. In such an environment, it is likely wise to take a step back from the mass technology hysteria and question the costs and benefits of all chosen technology. Is it better for children to multiply with a calculator or practice doing so in their heads? Does taking notes by hand help students remember and learn better than typing notes on a computer? Are online classes as effective in student learning as face-to-face classes? How do online learning management systems such as Blackboard best aid students? Do online groups and communities built around discussion boards contribute as much as face-to-face communities and group experiences? Do students learn as much using new technological tools as they would with older methods? How does the brain best create synapses that allow us to retain information—by using computers or writing by hand? To best utilize technology in a learning environment, it is essential to understand what is gained and what is given up in the act of embracing the latest technology. Moreover, it is important for faculty to be familiar with desired student behaviors that best lead to student learning in the specific discipline. With that knowledge, faculty can create incentives for students to engage in best learning behaviors or create the means by which students are required to engage in best learning behaviors, finding ways that technology aids the process and eliminating ways that technology hinders the process. As Waldman (2015) suggests, we should only adopt technologies that support our mission and should avoid or abandon those that disrupt or oppose our goals.

LITERATURE REVIEW

Over the last 20 years, vast changes have taken place in the creation of advanced learning technologies. These include intelligent tutoring systems (Aleven, McLaren, Sewall, & Koedinger, 2009; Beal, Arroyo, Cohen, & Woolf, 2010; Graesser, Chipman, Haynes, & Olney, 2005) educational animations and simulations (Ainsworth, 2008; Mayer, 2005). In addition, educational games (Johnson & Valente, 2008; Sabourin et al., 2011) have become more popular. The goal is to increase student engagement in activities in the hopes that increased engagement will lead to increased learning (Corbett, 2001; VanLehn, 2011). D'Mello (2013) reports the results of a meta-analysis of 24 studies in using technology to aid in learning. Results show that some effective learning is achieved with intelligent tutoring systems, serious games, simulation environments, and simple computer interfaces; however, the researcher also found boredom, confusion and frustration as part of the unassisted learning state (D'Mello, p. 12).

Various studies suggest that student grades are just as strong in online classes as they are in traditional on-site classes (Chamberlin, 2001 and Yin et. al, 2002). However, most of these studies do not indicate the use of proctored tests for online class examinations, and very few address accounting classes. For example, Rich and Dereshiwshy (2011) found that online undergraduate Intermediate Accounting students performed just as well on exams in the online accounting format as in the face-to-face format; however, the online accounting students were not given proctored exams. Moreover, most instructors of online classes do not have the means to determine if the students taking the class are the students doing

the work for the online class. Other research suggests that online learners and offline learners perform differently when there are differences in student perception, available learning tools, use of the learning tools, and other technical issues (Barker, 2002; Dunbar, 2004; Woods, 2002). Students taking online courses may be older, commute longer distances and work more hours than those taking in-class courses (Dosch, 2010). Du (2011) reports that having students do work online before attending the face-to-face lecture and class improves the student final examination scores. Huh, Jin, Lee and Yoo (2010) find that the effects of GPA and gender predict differences in performances for students in traditional classes versus online classes. Students taking face-to-face accounting courses show higher confidence in accounting concepts than those taking online accounting courses (Connor, 2010).

Technology is a tool that should be used to enhance student learning, but in some cases, it has become the end unto itself. Existing research is inconclusive regarding the effectiveness of online accounting courses (Bernard, Abrami and Borokhovski, 2004), and very little research covers hybrid accounting courses—those that combine classroom meetings with online instruction (Young, 2002; Aycock, Garnham, and Kaleta, 2002; Waddoups and Howell, 2002). In comparing online, traditional on-site and hybrid courses, Robertson and Clark (2007) find that accounting students who attend sections that meet in a traditional, face-to-face class have the highest test scores on five separate course exams when online, hybrid and traditional students were all given the same lecture notes, PowerPoints, practice problems, practice problem solutions and proctored exams. Waters and Robertson (2009) report that students taking online accounting courses perceive that the use of recorded lectures to be effective in assisting their learning.

Student involvement is an important part of student success and retention. Lack of student participation in the introductory accounting courses is widely documented even in on-site courses, but involvement is even lower in online classes (Keddie, 1997). Professors often complain about class size having an adverse effect on student learning. However, in online courses, large class size may lead to more instructor support and better organization of online classes (Drago and Peltier, 2004). Certified Public Accountants (CPAs) surveyed overwhelmingly prefer to hire candidates that earn the necessary classes for CPA designation in a traditional classroom environment and would not recommend or would recommend with reservation an applicant with a degree earned partially or entirely online (Jeancola, 2011). However, recruiters view MBAs from online universities no differently when presenting candidates to potential employers (Metrejean and Noland, 2011). These conflicting results leave many questions unanswered about the effectiveness and perceived value of online classes in accounting.

Others find that online learning is limited to the motivational level of the students in the online classroom (Castillo-Merino and Serradell-Lopez (2013). In essence, a motivated student can learn much better in an online environment than a student who is not as motivated. Fratto and Morris (2013) found that using online assistance in addition to the classroom experience aids students in learning accounting. Broad, Matthews and McDonald (2004) argue that online tools may encourage autonomous learning. Morgan (2013) attempts to construct a model to guide the use of online homework tools in accounting. In 2012, Ng reported that online accounting tools can be used effectively for accreditation assessment purposes.

Numerous online learning tools exist for homework practice in accounting. McGraw-Hill Connect, Wiley Plus and Pearson's MyAccountingLab are three examples of such tools, all of which provide a way for the student to complete homework on the computer. All of these provide useful hints and give students the answers when they submit their work. The tools set up the problems in proper format for the students and ask that the students type in answers in the blanks. Professors often love these tools because they automatically grade the work, saving professors an enormous amount of time. These tools now cost up to $135 per class—often in addition to the cost of the text or in combination with an e-text.

Very little work has been done in testing whether or not online tools are effective in student learning. The question of whether or not having the format laid out for the student is helpful or not helpful has not been raised. Moreover, there is nothing to suggest whether or not students find the use of the homework tools to aid in their learning or simply make things easier to complete homework. This study investigates

potential differences in learning effectiveness in doing homework by hand or with online homework tools.

EXPERIMENT

This experiment examines differences in perceived and measured learning obtained by students using online homework tools versus doing work by hand. Sixty student volunteers were divided randomly into two experimental groups. Subjects received $10 each to participate. The researcher recruited the students off campus, and the students have no affiliation with any particular college. Both groups of students listened to a live lecture covering the proper computation of pension expense. After that, one group completed working homework assignments practicing pension expense computations using an online homework tool, a four-function calculator and the text. The second group completed the same assignments using only a four-function calculator, pencils, paper and the text. Members of both groups were able to ask questions of the researcher as they completed their tasks. After completion, students took a short quiz on pension expense and answered a short questionnaire. One question asked students to report their confidence in knowledge of pension expense on a scale from one to five with five being the highest confidence level.

Hypothesis 1- Perceived Learning

> *H_0 = There will be no difference in confidence in learning reported by students who do practice work by hand versus those that practice using an online learning homework tool.*
>
> *Ha = There will be a difference in confidence in learning reported by students who do practice work by hand versus those that practice using an online learning homework tool.*

Measures were taken for gender, reported grade point average and age. These were included in the model as follows:

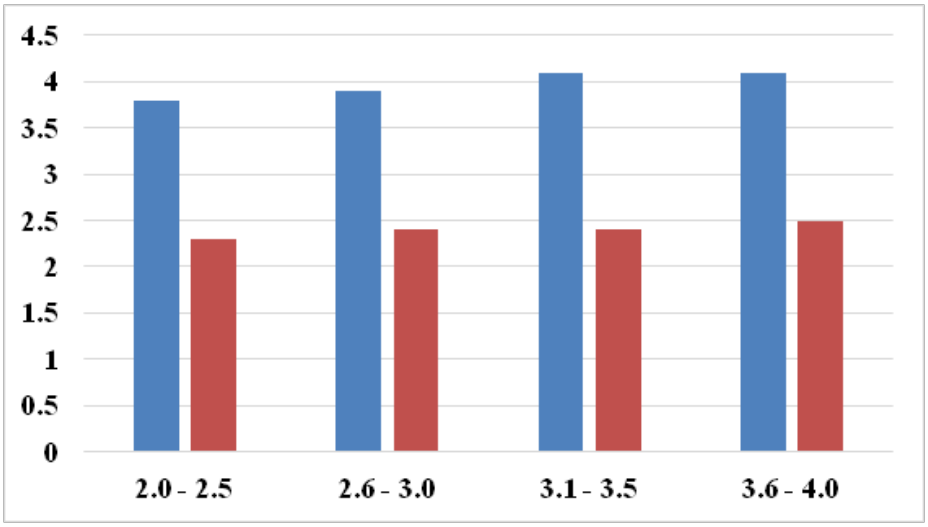
$$Y_1 = aX + bX + cX + e$$

Where:

Y_1 = reported confidence level in learning
a = gender
b = age
c = grade point average

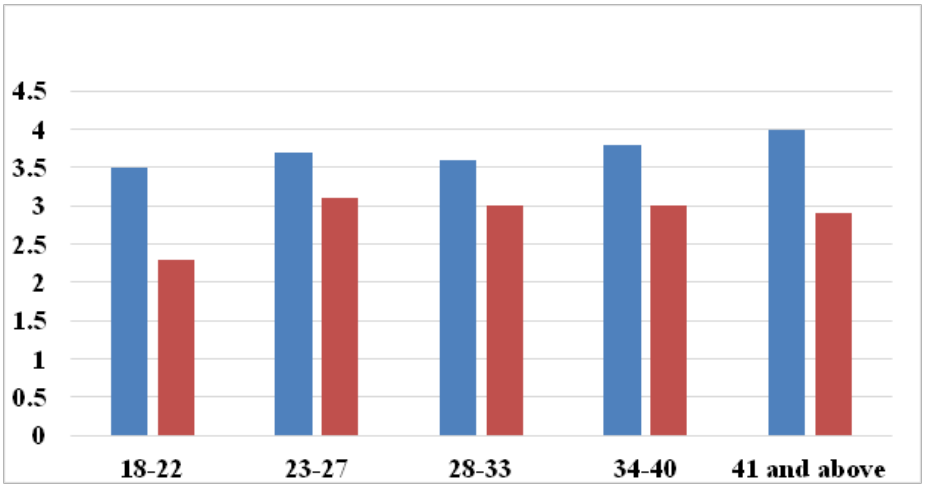
Figures 1, 2 and 3 below illustrate the differences by gender, age and grade point average.

FIGURE 1
GRADE POINT AVERAGES AND CONFIDENCE IN LEARNING WITH WORK DONE BY HAND OR USING ONLINE TOOLS



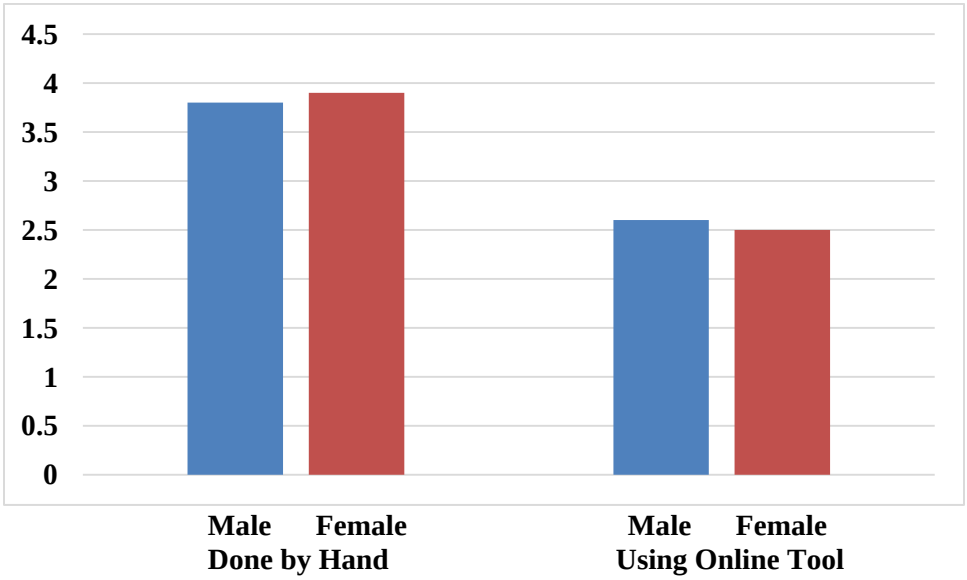
Y = Level of Confidence
1st Column = Done by Hand
2nd Column = Using Homework Tool

FIGURE 2
AGE AND CONFIDENCE IN LEARNING WITH WORK DONE BY HAND OR USING ONLINE TOOLS



Y = Confidence of Learning (1-5, with 5 being highest)
First Column = Done by Hand
Second Column = Done with Homework Tool

FIGURE 3
GENDER AND CONFIDENCE IN LEARNING WITH WORK DONE BY HAND OR USING ONLINE TOOLS



Y = Confidence in Learning (1-5, with five being highest)
X = gender

Hypothesis 2 – Measured Learning

H_{02} = There will be no difference in the post-quiz scores of students who do practice work by hand versus those that practice using an online learning homework tool.

Ha_2 = There will be a difference in the post-quiz scores of students who do practice work by hand versus those that practice using an online learning homework tool.

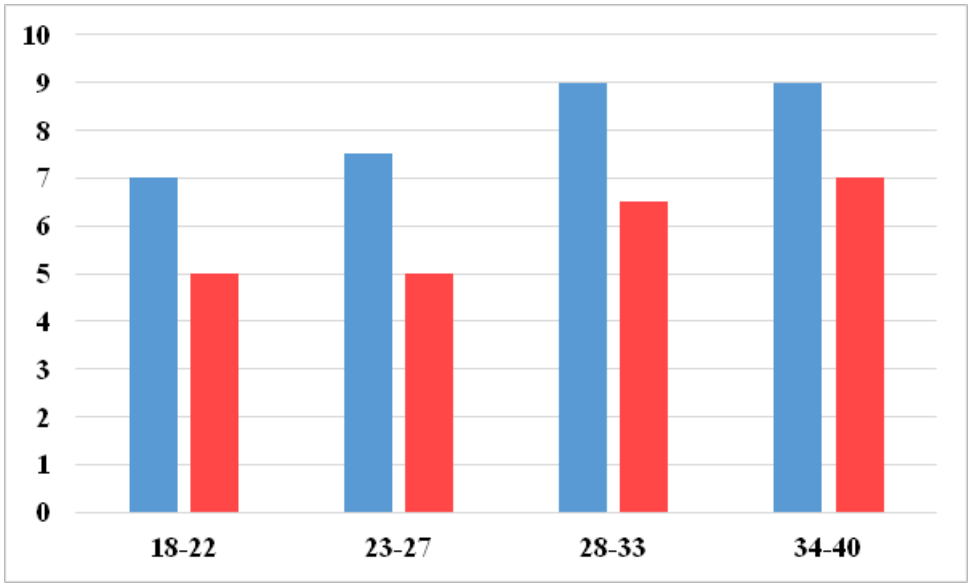
$Y_2 = aX + bX + cX + e$

Where:

Y_2 = score of student
a = gender
b = age
c = grade point average

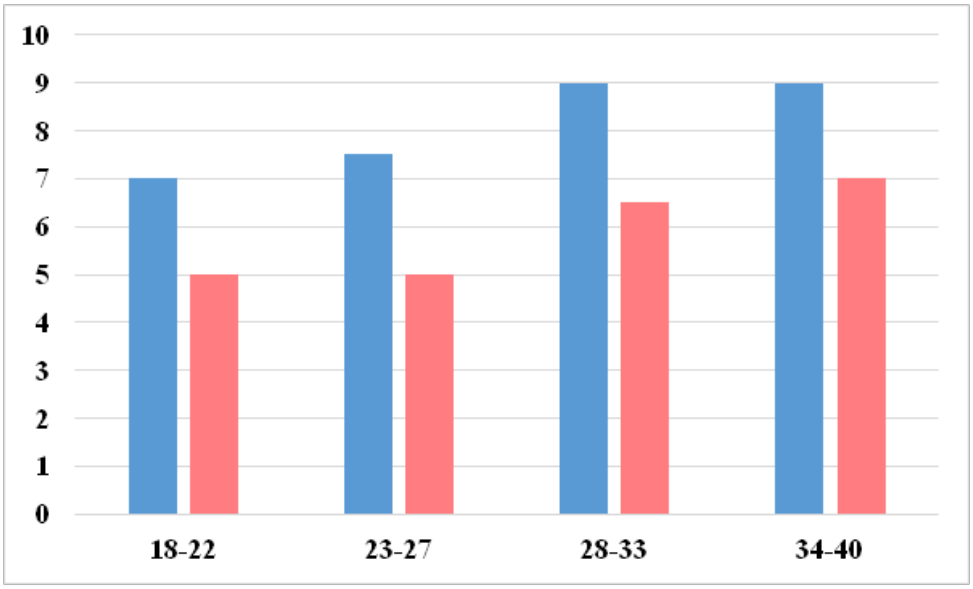
Post-quiz scores indicate that students who completed the task by hand showed slightly better quiz scores. Chi-square measures indicate that the results lean in favor of practice by hand as well with the results showing statistically significant differences as follows: all students ($p<.09$); gender ($p < .05$); age ($p < .03$) and grade point average ($p < .05$). Results suggest that not only do the students perceive that they have learned more in practicing by hand, but they also show a higher measure of learning on the post-quiz. Figures 4, 5, and 6 illustrate the results by grade point average, age and gender.

FIGURE 4
GRADE POINT AVERAGE AND POST-QUIZ SCORES WITH WORK DONE BY HAND OR USING ONLINE TOOLS



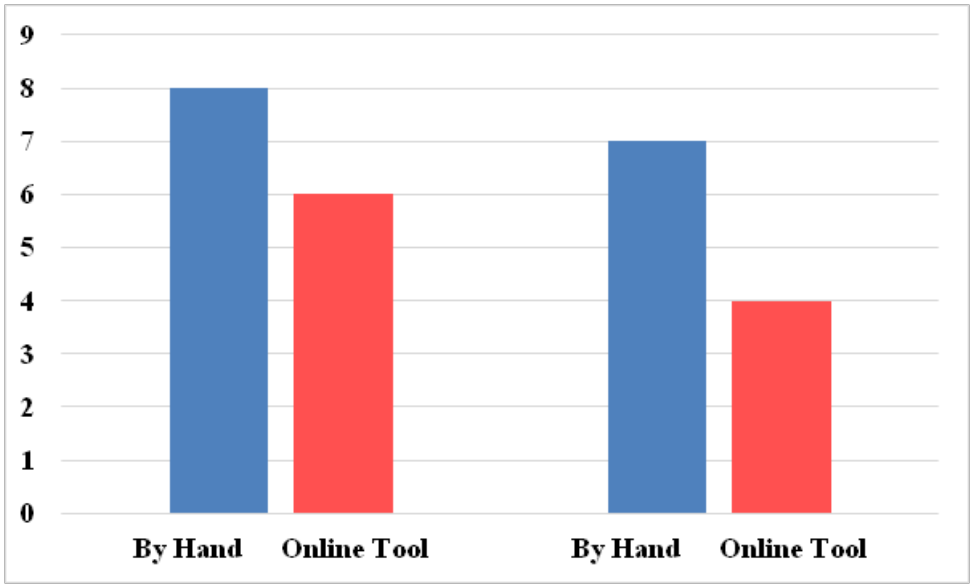
Y = Average Post-Quiz Score
First Column – Done by Hand
Second Column – Done with Homework Tool

FIGURE 5
AGE AND POST-QUIZ SCORES WITH WORK DONE BY HAND OR USING ONLINE TOOLS



Y – Average Post-Quiz Score
First Column – Done by Hand
Second Column – Done with Homework Tools

FIGURE 6
GENDER AND POST-QUIZ SCORES WITH WORK DONE BY HAND OR USING ONLINE TOOLS



Y = Average Post-Quiz Score

DISCUSSION

Results of this experiment indicate that student participants show greater measured learning and greater confidence in what they have learned by using the old-fashioned pencil and paper practice method as opposed to an online homework practice tool. It is possible that if students show higher confidence in learning, their motivation may improve or remain higher (Castillo-Merino and Serradell-Lopez, 2013). Moreover, post-experiment discussions suggest that some students found the online learning tools frustrating and confusing (D'Mello, 2013).

Online homework practice tools give students a format to use and provide answers and hints when the student is off track. This may hinder the student's search for the correct answers and stunt the student's thought processes required to create synapses and stored information that can be retrieved. Frustration and confusion may be greater and learning retention may be less effective.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This study has significant limitations and while may raise many important questions, is not sufficiently substantive to be generalizable to the entire accounting college student population. The sample is a convenience sample derived from advertised open-ended requests for participation. This study deals only with one type of learning problem in one specific discipline; other disciplines and other types of problems or questions might find vastly different results. This student uses only one online learning tool and one way of using that tool.

Whatever the case, it is important for professors and researchers of student learning to recognize that not all technology is additive to learning. We consider new technology to be exciting, but that technology may or may not be effective in aiding student learning. Just because a homework tool saves the professor

time does not meet it helps the students to learn, and the professor may know less about the students because she does not grade the student work.

More research is needed to determine what technology is effective and in what way it is best used. For example, it may be that using technology as an additional tool is useful while using the technology alone is not as useful. One might look into the effects of technology in learning based on age, as younger persons have grown to expect to use computers and other screens for most of their days. It may be that technology is more useful in studying certain subjects than others; a joint study between professors in different disciplines could investigate this proposal. Finally, it may be that narrated slides with examples help students more than a video, or vice versa.

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