

ASCILITE 2024

Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

How worked example Echo360 videos and embedded polls with students as partners improved learning outcomes in accounting

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This paper reports the use of worked example videos, with students as partners, using Echo360 and containing embedded polls in a postgraduate accounting subject which offered limited opportunity for in-class practical activities. A total of twelve worked example videos were produced and deployed to assist students with their learning. Each video included embedded polls which aimed to further engage students and reinforce key concepts. Results were compared for students who engaged with the videos and polls with those who had not. Findings revealed that students who viewed the videos and participated in the polls demonstrated significant improvement in the final exam and overall marks. This study is one of the first to examine the use and benefits of using dialogue videos with embedded polls as a means of increasing learning, engagement, and overall student results.

Keywords: Worked example videos, active learning, problem solving, polling, students as partners, higher education, mixed methods

Introduction

Financial Accounting Processes is a postgraduate introductory accounting subject at the [authors' institution] and is typically a first-semester subject that is taught in a 3-hour lecture block. Enrolment is typically 90% international. To meet the accreditation requirements of the Australian professional accounting bodies, an invigilated final exam forms most of the assessment and is worth 60%, covering topics 6 onwards. The first two assessment items were a quiz and an assignment, each worth 20%, covering topics 1 to 5. At the time of this study (Semester 1, 2023) 63 students were enrolled.

This project was initiated following restructuring which eliminated tutorials and reduced class time for in-depth examples. Student evaluations also showed that students were frequently unclear about how to solve accounting problems. The unit coordinator and learning designer explored asynchronous methods to boost student engagement and build accounting abilities via self-directed learning activities to augment synchronous courses. We aimed to produce activities that were easily accessed, comfortable, and engaging for students, which is in line with recent research demonstrating the importance of these factors (Kemp et al., 2024). Considering the student needs, we decided that worked example videos (Dart et al., 2020) were a promising method to meet our educational needs and added the element of polling as an additional method of engagement, which had the benefit of feedback to the lecturer regarding student attainment. Here, we report on the production and impact of a series of worked example videos (WEVs) with embedded polls that were chosen as the design intervention to assist student learning and improve engagement and satisfaction in the face of reduced synchronous class time.

Literature Review

Dialogue style videos have been effective in providing social connectedness and better learning experiences (Nugraha et al., 2023). Most students preferred dialogue style videos, noting that they were more interesting, interactive and enabled critical thinking. WEVs are a form of dialogue style videos that incorporate explicit instruction and modelling (Wu et al., 2022). While there has been evidence to support WEVs in subjects such as engineering (Dart et al., 2020), mathematics (Judd et al., 2021) and physics (Morphew et al., 2020), there is limited research around the use of technology in accounting (Kwak, 2015). Further, while there is much evidence as to the usefulness of WEVs, there appears to be no research investigating the combination of using WEVs with embedded polling.

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WEVs are a flexible and engaging way to demonstrate techniques for novice students who lack domain-specific skills (Dart et al., 2020) and are an engaging alternative to simple knowledge acquisition by reading. The use of movement, colour, voice, and social expression in WEVs such as tone, pitch, or visuals of the presenter, elicits the brain's curiosity and evokes interest (Wu, et al., 2022). Additionally, this also activates the brain's visual pathways to accompany verbal explanation by the instructor in ways that do not overwhelm the learner's working memory (Manson & Ayres, 2021). Student outcomes and satisfaction can improve when instructors facilitate rather than act as pedagogical sources of information (Arbaugh, 2002). By including a student peer, students can learn from each other's strengths and weaknesses and gain confidence for self-directed study (Choi & Zhi, 2021), making the video more relevant and interesting.

Simulation-based games, mobile devices, and virtual environments can improve student-centred instruction by helping students retain information, stay engaged, develop skills, and meet learning goals (Grotzer et al., 2015). With this type of technology, students have the ability to link relevant material to their learning requirements at a speed that is most effective for them. This makes learning more relevant via interactive polls and WEVs for several reasons. First, as the student leads the discussion, there is a dialogue between the lecturer and student, adding interest and narrative. Secondly, the WEVs have integrated polling for comprehension and active learning. Thirdly, the WEVs address misconceptions since the talks were spontaneous and unscripted, thus students made errors while answering the problems. Finally, WEVs enable student voice and community (Dart et al., 2020).

Methods

Design and delivery of WEVs

The WEVs were carried out collaboratively, involving students leading the discussion and the instructor, who helped as needed during the videos. This process emphasised the active engagement of the student, with the instructor's guidance, leveraging the instructor's online presence effectively (Joia & Lorenzo, 2021). Ethics approval was obtained to allow past students to participate in the study, and participants were recruited via the Facebook group "Past and Present Students." Two domestic and one international student were selected to participate. The videos were produced using Echo360 in a recording room that simultaneously captured the image of the lecturer and student on one view as well as the recording of the worked problem. Twelve accounting problems were selected ranging from simple problems to more complex.

Students were given the autonomy to select between either Word, Excel or handwriting to record the steps involved in the solution. Handwriting was problematic for professional appearance and information flow in the first trial. Therefore, students choose Word or Excel depending on their comfort level and the question and calculation style required. Some students typed as they went, while others found that generating a solution with white text and changing the font to black reduced their working memory load and allowed them to concentrate on discussing their thinking process. The videos varied in length between 10 and 40 minutes, with the shortest video covering a relatively simple accounting problem while the longest video covered a complex problem involving several steps. Embedded polls were added to the videos to check for understanding. The number of polls varied from one to five. The video plays, then pauses for students to interact with the poll, and then continues. The types of polls varied between numerical, multiple-choice, and true/false. Feedback was provided in the poll to highlight how the student responded and what the correct answer was.

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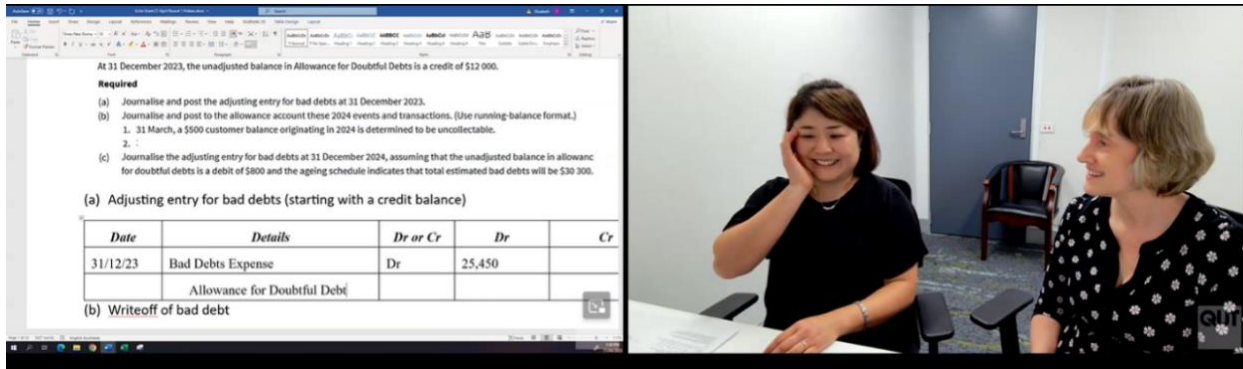


Figure 1. Screenshot of worked-example video

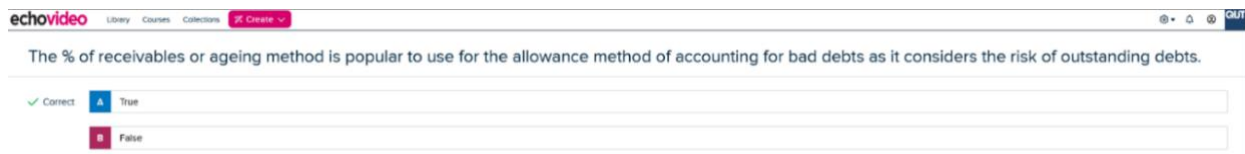


Figure 2. Screenshot of a poll question

The videos were uploaded into a dedicated final exam revision folder within Echo360 in the Learning Management System (LMS). Several announcements were posted in the LMS and demonstrations of how to access the videos were also presented in class to ensure students knew how to access them and that they aligned with the exam content. Students provided qualitative feedback in the Student Voice Survey and several students provided further feedback by email and by interview.

Data Analysis

Video and poll analytic data was downloaded from Echo360 and collated with the final mark from the LMS for each student using anonymous student IDs to connect the two sets of data. Final marks of students in three groups were collated: nil interaction ($n = 39$), watched videos only ($n = 10$), and watched videos and participated in the polls ($n = 14$). An R Shiny script was used to visualise the distributions for each of the three groups. Two-sample t-tests were conducted in Excel to compare the significance of the differences of the means between the different groups of results.

Results and discussion

Visual comparison of the distributions of marks (Figure 3) indicates that the 'watch video and did poll' group outperformed both the 'nil interaction' and 'watched video' groups. The y axis is the probability density and is an indication of probability of achieving a mark within a group.

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Compare interactions with ECHO videos and polls on mark:

[Final Unit Mark]

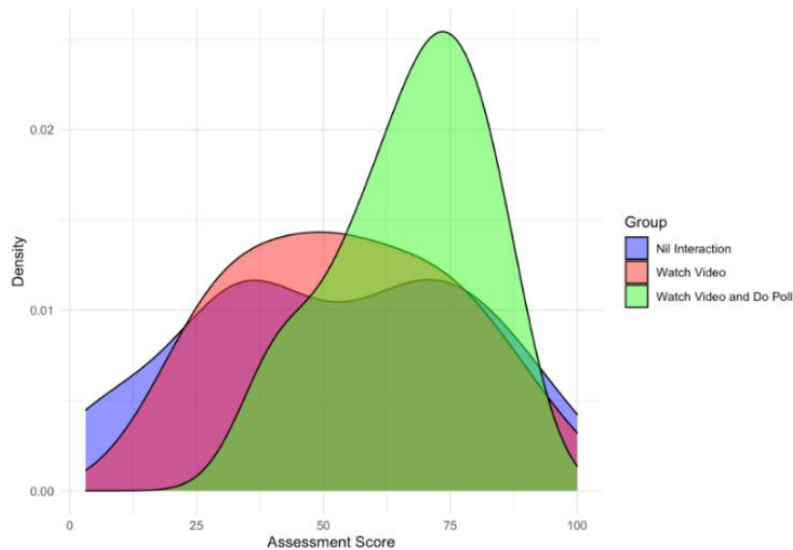


Figure 3: Visual comparison of the three groups' marks distributions

The two-sample t-tests (Figure 4) showed that the difference between the 'nil interaction' group and the 'watched video and did poll' group was significant at the $p = 0.01$ level, demonstrating a one-grade improvement (from 51.85% to 66.94%). While the difference between the 'video only' and 'video and poll' group was not significant at the $p = 0.05$ level, the difference is only 13% due to chance. Both results suggest that most value lies in doing the polls with some benefit of watching the worked example videos beforehand, though this requires further confirmation.

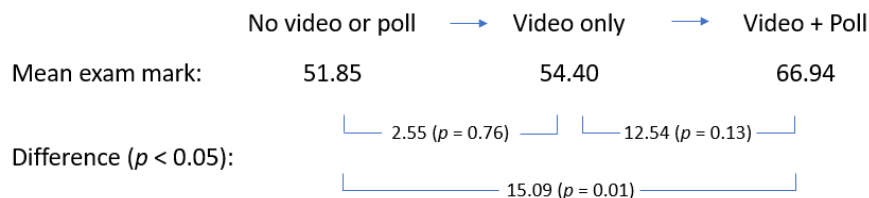


Figure 4: Final Marks (out of 100) t-test results - mean differences and significance

Student feedback

Feedback from students who watched the videos and engaged with the embedded polling was extremely positive. One student said "they really helped to understand and practise all of the topics relevant to the final exam and even in later subjects that I enrolled in." Another stated: "the best thing about them is that are easily accessible and since most of the important topics were covered in those videos, you don't have to refer to other content for those topics." This corroborates other studies where students have described using WEVs as a launching pad to further study (Dart et al., 2020). The students appreciated that the videos saved them time, and some used them as a one-stop-shop to both learn and reinforce the content.

In relation to the polling, students highlighted that they found the active learning beneficial: "They were not only entertaining but engaging with the topics at hand. Especially when sometimes I would choose the wrong answer and you would explain why it was wrong and the right one was correct." This supports metacognitive monitoring where students can identify if they have achieved learning outcomes. One student added that "I think the polls are really helpful as it makes the videos more interactive and a two-way process, but I think that

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there should be more polls like five to six in one video as it would make it more interactive.” and another suggested additional and deeper working.

Given that this is an accounting subject, it was additionally beneficial that we could model effective use of Excel as some students don't have strong Excel skills. The videos are also providing reinforcement to the importance of regular practice of problems in a discipline such as accounting. One student recording the video comments: “I just made a mistake there and that is OK. You just need to remember to keep practising.”

Educator feedback

The WEVs reinforced the importance of adopting a novice learner perspective and pitching at the right level for students, from easier problems to more advanced. As an educator, there were additional incidental benefits in gaining a new perspective on the material and reflecting on the common pain points for students as well as the ability to normalise making mistakes in the learning process.

An unexpected benefit from partnering with students was the ability to create a sense of community. Students who have watched the videos have approached the lecturer and commented that they imagined themselves being involved with the production of future videos and helping others.

Workload leveraging was a significant benefit from an educator's perspective. The videos took a relatively short amount of time (less than 15 hours for 12 videos) to produce and were not edited. These videos are now an enduring resource that continues to be beneficial for students and has significantly reduced student queries and consultation. Additionally, there have been no requests for student final exam consultation for the last two semesters. The videos are also available to students that may not feel comfortable asking questions or are even unsure what questions to ask.

Further Research

While these videos explored predominantly accounting calculation-based problems, future videos could explore essay style or higher-order thinking analysis questions by brainstorming ideas and identifying key relevant points. This could also add enormous value for students who struggle to identify how to start with a written answer. This approach could also be adapted for a variety of other disciplines including STEM and humanities.

Conclusion

We deployed a series of WEVs and embedded polling to improve student engagement and achievement in fundamental accounting skills. Analysis showed that the mean mark increased significantly for the group who watched the videos and participated in the embedded polls, by an average of one grade. Passively watching the video showed a slight increase in mean mark though this was not significant. Furthermore, the variance in marks was greatest for the group who did not watch any videos or do any polls. Thus, those who did the polls were more tightly grouped in terms of marks, implying that poor performers were brought closer to good performers, compared to other groups.

In terms of project aims of comfort, accessibility, and engagement, students reported that the activities were easily accessible and interactive, with suggestions for even more polling to increase the interactions. Students were able to access the materials in the comfort of their own environments and fed back that the topics and learning were useful for the exam, progressing from easy to more challenging. From an educator perspective, one important factor was fostering of a community atmosphere and connection with the students, but also seeing the material from a students' perspective was insightful. The activities were stored in an Echo360 video library, allowing straightforward redeployment.

Overall, student interaction with the polls within the WEVs resulted in improved learning outcomes. Combining the aspects of embedded polling, dialogue, addressing misconceptions, and providing a student voice created videos that were targeted to assist students and reduced educator academic workload.

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