



Quantifying the benefits of narrated screen capture videos

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This article provides a quantitative analysis of student results for an Excel-based statistics assignment in a first year statistics course, before and after the implementation of narrated screen capture teaching videos as the primary method of teaching the statistical functions of Excel in the course. It describes the production of the videos and then examines how student performance changed after their implementation. A two-sample t-test found a significant difference between the mean assignment mark before and after the implementation of the videos. This was followed up with a multiple regression model which controlled for other factors that may have influenced the assignment marks. Once these factors were controlled for, the implementation of the videos still showed a positive effect on the assignment marks of the students.

Keywords: narrated screen capture video, statistics course, teaching excel, technology in the classroom, pedagogy

Introduction

A screen capture video is a recording of what is occurring on the computer screen. It can be amended with subtitles, animation and narration. A set of narrated screen capture videos was developed to teach the basic statistical functions of Excel to first year business studies students in a compulsory first year business statistics class. Yuen (2004) describes the effectiveness of narrated screen capture videos, although his work is largely based on anecdotal evidence from student and staff feedback. The intention of this article is to quantify the effect of implementing the narrated screen capture videos on the marks of the Excel-based assignments used in the course. Similar quantitative analysis has been conducted by Basturk (2005, 2010).

The videos were produced with CamStudio 2.0 (<http://www.camstudio.org>), a free open source screen recording program. Narration was recorded at the same time via a plugged in microphone, explaining each step of the various statistical analyses and why they were being done. Where relevant, the videos also related the steps in Excel to examples that had been completed in class. The videos were recorded in a high definition full screen AVI format, with the audio encoded as MP3s at 22 kHz, 56 kBit/s. The videos needed to be of sufficient clarity and definition that students could observe cursor movements and the sound needed to be of a quality that the narrations could be clearly heard and understood, even through low quality computer speakers. As a result, reduced size videos for mobile devices were not considered. Students were encouraged to use the VLC freeware media player (www.videolan.org) to watch the videos. The videos were not directly interactive. However, students were provided copies of the files used in the demonstrations so they could work alongside the videos.

Narrated screen capture videos provide numerous advantages over other methods of teaching students to use computer software. They offer both visual and aural stimulus and the ability for students to

replay lessons as required rather than relying on the traditional method of teaching, where the tutor demonstrates at the front of the class and there is possibly a handout to take away.

Methodology

Student assignment results the three semesters prior to using the videos, and the first three semesters of using the videos were collated, and matched with demographic information from the institution's database. Six semesters of data was used to try to eliminate any potential student cohort effect. Students who were repeating the course were removed from the analysis to eliminate any potential learning effect. Any student who did not complete all of the parts of the assignment, or had marks deducted for plagiarism were also removed from the analysis. No information on individual student usage behaviour was recorded, so the analysis relies on comparing the pre- and post-implementation cohorts and using the demographic information about them. However, further research on how the students used videos is proposed at the end of this article.

Table 1 shows the variables used in the analysis. The key variable of interest is the student assignment marks which are measured as a mark out of 100. The marks are being compared between the students completing assignments before and after the implementation of the videos. The age, gender, enrolment status (part or full-time), and ethnicity of each student were also collected and are used as control variables in the regression.

Table 1: Variables

Variable	Measurement
Assignment mark	Mark out of 100 for Excel-based statistics assignment
Before/After indicator variable	Indicator (0/1) of after implementation of videos (vs before)
Age	Age in years
Full/Part Time	Indicator (0/1) for full-time (vs part-time)
Ethnicity	Categorical variable: European (base), Chinese, Other
Gender	Indicator (0/1) for male (vs female)

The data was analysed using SPSS 18. A two-sample t-test and a Mann-Whitney test were used to compare the mean and median assignment marks of students who had not used the videos, with the mean and median mark of the students who had used the video. This analysis was supplemented with a least squares regression model, where the effect of using the videos was analysed with the demographic variables used to control for variation between the groups. The regression features two models. The first model includes all of the control variables. The second model is the result of a step-wise regression, where only the statistically significant variables are included.

Results

Table 2 shows the summary statistics of the assignment marks for the video and non-video groups. The sample size for the semesters after the implementation of the videos was much smaller due to a downturn in student numbers. However, there was no evidence that the student profiles in these two groups were different or should have an effect on the assignment marks. This was verified by confirming no significant differences between the average marks of the other assessments in the course. The mean and median marks both increased following the implementation of the videos (and are compared statistically in Table 3). The spread of the marks in each group are also similar.

Table 2: Summary statistics

	Before Videos	After Videos
Mean	67.8	70.8
Median	70.6	71.7
Standard Deviation	13.1	14.0
N	359	189

Table 3 shows the results of a two-sample t-test and a non-parametric Mann-Whitney test. The tests both show a significant difference between the mean and median exam marks before and after the implementation of the narrated videos. The 95% confidence interval for the difference between the means is 0.7 to 5.4 marks.

Table 3: Hypothesis test results

	Two sample t-test	Mann-Whitney U
Test statistic	2.518	2.542
p-value	0.012	0.011
95% Confidence interval	(0.7, 5.4)	

Table 4 shows the table of regression results. Model 1 includes the Before/After indicator variable and all of the control variables, whilst Model 2 includes only the statistically significant variables. Both models feature significant f-statistics. The models both have low adjusted r-squared values, suggesting that there could be other variables required in the model to capture the variation in the marks.

The Before/After indicator variable is significant, confirming the t-test result, and indicating an increase in the average assignment mark, even once the other variables are controlled before. Both models show that the average increase in marks after implementing the videos was approximately 3.6 (CI: 1.6, 6.0) marks. Chinese students had significantly higher marks than European students. Age was the final significant variable. There were sufficient observations in the higher age groups to ensure that this effect was not just due to one or two high influence points.

Table 4: Regression results

	Model 1		Model 2	
	Coefficient	p-value	Coefficient	p-value
Constant	55.12		55.82	
After (vs before)	3.64	(0.003)	3.66	(0.002)
Age	0.340	(0.000)	0.326	(0.000)
Chinese (vs European)	4.192	(0.016)	4.956	(0.000)
Other (vs European)	-0.763	(0.663)		
Gender (Male)	-0.71	(0.541)		
Full/Part Time	1.39	(0.482)		
f-statistic (p-value)	6.56	(0.000)	12.88	(0.000)
Adjusted R ²	0.208		0.257	

The significant positive coefficient for the age variable was somewhat of a surprise. The intention of this variable was to control for the variation in marks of younger students (mainly school leavers), compared with those of the “mature-entry” students in the class. The mature students tend to have weaker computer skills and often struggle with the statistics paper. The results above indicate that despite this, age is actually positively correlated with the assignment marks. This may be as a result of older students having had work experience and being more familiar with Excel, even though their general computing skills might not be as strong.

Interaction variables were examined to see whether the effect of the videos varied across the other variables. Of particular interest was whether the Chinese students gained additional benefit from the tool as they were able to listen to the narration at their own pace. However, none of the interaction variables were statistically significant, suggesting a fairly uniform improvement in marks after the implementation of the videos. The regression also showed that there was no gender difference in performance or any statistically significant difference between the marks of full-time students and part-time students.

Conclusion and future work

The analysis of the assignment results demonstrated quantitative evidence that demonstrated improved achievement in summative Excel assignments by students following the introduction of narrated screen capture videos. The increase in marks was statistically significant, even after the other variables had been controlled for, confirming the anecdotal evidence that was regularly received from students

regarding the resource. Parametric and non-parametric hypothesis testing showed a significant increase in the mean (and median) assessment mark following the implementation of the video resource.

A regression model was constructed to examine the effect of the resource on the average mark whilst controlling for other factors such as age, gender, ethnicity, and student full/part-time status. The regression model indicated that the average assessment mark was approximately 4 marks (out of 100) greater for students who had used the videos once other factors had been controlled for.

There are two strands of future work that come from this research. The first is to expand the research presented by adding a comprehensive literature review and comparing the results to other published studies. In addition, student and staff comments on the tool will be collated and included in a more comprehensive research article. The second strand of future work is to examine how students are using the tool. I will examine whether different groups of students use the tool in different ways, how it could be utilised to maximise its pedagogical benefits, and what considerations should be given in the production of similar tools in the future.

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