

# The Impact of COVID-19 on Performance on a Flipped Construction Management Classroom



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## Abstract

Supplemental instructional videos (SIVs) are a subcategory of instructional videos that are designed to complement and magnify other learning methods, mediums, and materials, such as in-person teaching, readings, and group work, but not substitute for them (Kay, 2012). In the Spring of 2020, 46 students in a residential construction technologies course participated in a semester-long research study to evaluate the ability of SIVs to support pre-class readings in a flipped classroom environment. Unexpectedly, exactly halfway through the semester, the COVID-19 pandemic disrupted the original research plan, forcing all in-class work to move online. **We observed that after the move online overall class performance significantly improved**, irrespective of SIV treatment and control groups.

## Methods

The supplemental instructional videos (SIVs) used in the research study were designed and developed in accordance with an interdisciplinary synthesis of best practices from recent literature as illustrated in **Figure 1**. Thus, they were short, scripted, segmented by topic, had high production quality, teacher-made, engaging, clear, personalized, active, connected with other learning activities, and properly paced. The SIVs were delivered to students online as supplemental learning materials in a within-subject, withdrawal-of-treatment, **repeated-measures crossover experiment that measured improvement as a difference in pretest and posttest scores.**

## Conclusions

The sudden shift to online learning because of COVID-19 likely had no impact on the effectiveness of the supplemental instructional videos (SIVs) because technology was already a substantial dimension of the flipped classroom structure. Only isolated, in-person classroom activities - mentored instruction, group work, and the administration of the posttests - were impacted, and not beyond the ability of a virtual environment to accommodate. As for the overall improvement that was found to be statistically significant (Table 2), the data indicate that the transition to online instruction could be the factor that triggered the improvement in student scores. Alternatively, it is possible that the observed improvement in student performance with the transition to fully online learning was a result of the students being more familiar with the course structure in the latter half of the semester. Also, the specific combination of construction topics presented in the first and second halves of the study may have influenced the outcome. To confirm why the move to exclusively online instruction produced a significantly positive impact on scores, follow-up research would need to be conducted that counterbalances the order of in-person and online learning.

A major contribution of this study is empirical evidence that modern educational technology can now adequately, though not necessarily optimally, substitute for in-person instruction under certain conditions, and when necessary. It is likely that even a decade ago, before the widespread adoption of many advances in educational technology, such as live classroom video streaming and robust learning management system technology, **COVID-19 would have been far more disruptive and devastating to the learning experience.**

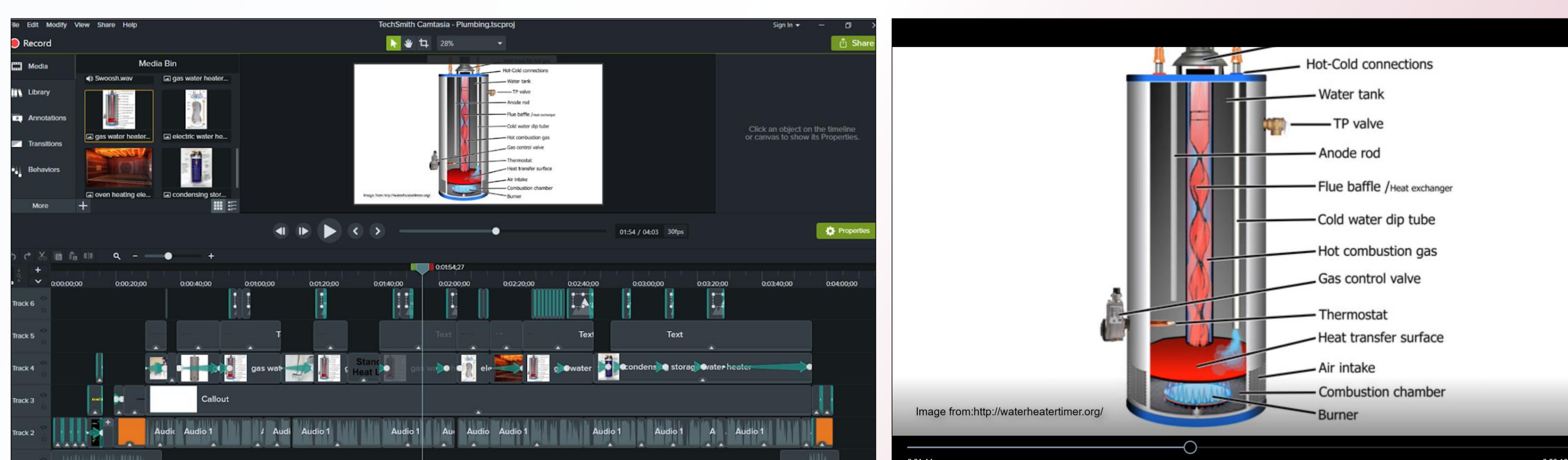


Figure 1 Screenshot of the teacher-made, in-progress Camtasia project for an SIV in the research course.

## Introduction

More than ever before undergraduate students are showing interest in technology-based learning mediums, specifically video. To illustrate this trend, three years ago, in 2018, Pearson Education commissioned a national, online survey through the Harris Poll, aimed at understanding the differences in educational interests, outlook, and values between Millennials (i.e., those born between 1980-1994) and Generation Z (i.e., those born between 1995 and 2015). Generation Z now constitutes most undergraduates in higher education. Responses from the approximately 2500 participants in the Pearson survey revealed that **Generation Z prefers YouTube over all other learning methods** listed in the survey, including books, interactive group activities, and learning apps and games. Considering these findings and the fact that increasingly, the forces of technology, finance, and pedagogical innovation are causing the traditional teaching practices of higher education to shift, we wanted to investigate the ability of videos — the learning medium of choice of the current college-age generation — to support undergraduate construction management students. This all led us to experiment with a new technologically-based pedagogical alternative called supplemental instructional videos (SIVs). SIVs, in contrast with other types of instructional video (i.e., lecture-based, enhanced, worked examples), supplemental instructional videos are designed to support other teaching materials and methods, not substitute for them.

## Results

Following the completion of the data collection, a two-way ANOVA revealed no significant change in the effectiveness of SIVs on student performance between the treatment and control groups before and after COVID-19 shutdown ( $p = .741$ ) as shown in **Table 1**. However, examining the ANOVA for overall student performance before and after the move online irrespective of SIV treatment and control groups, significant differences in student performance were detected ( $p = .037$ ) as shown in **Table 2**.

Table 1

Type of Instruction	Group	N	Mean		F	P-Value
			Improvement Score	Standard Deviation		
In-person Instruction (First half of semester)	SIV	124	3.87	1.58	0.109	0.741
	No SIV	134	3.80			
Online Instruction (Second half of semester)	SIV	118	4.12	1.64		
	No SIV	122	4.14			

95% C.I.

Table 2

Type of Instruction	N	Mean		F	P-Value
		Improvement Score	Standard Deviation		
In-person Instruction (First half of semester)	258	3.83	1.59	4.354	0.037
Online Instruction (Second half of semester)	240	4.13	1.546		

95% C.I.

## References

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