

# The Cost of High Production Quality: A Preliminary Discussion of the Value of Production in Asynchronous Online Modalities

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**Abstract**— What would happen if online course content was produced at television- or even cinematic-level quality? Would students become more engaged? Would they learn more and more deeply? If so, would the gains be worth the expenditure of time and funds that higher video production quality requires? To put it another way: Do investments in video production quality result in measurable increases in students' achievement of learning outcomes and objectives? Questions such as these are at the heart of this preliminary discussion of production value for online content creation, which investigates a grand challenge facing higher education and society generally, as we navigate the spectrum of modalities in a post-pandemic world. This questions that this paper proposes stands at the intersection of educational scholarship, course content creation, student retention and persistence, and the achievement of learning outcomes and objectives. It, therefore, seeks to push forward a model for change and improvement in university education and teaching and learning on our campuses.

**Keywords**— *pedagogy, eLearning, content production, data-driven teaching, outcomes and assessment, educational scholarship, higher education (key words)*

## I. INTRODUCTION

What would happen if online course content was produced at television- or even cinematic-level quality? Would students become more engaged? Would they learn more and more deeply? If so, would the gains be worth the expenditure of time and funds that higher video production quality requires? To put it another way: Do investments in video production quality result in measurable increases in students' achievement of learning outcomes and objectives? Questions such as these are at the heart of this preliminary discussion of production value for online content creation, which investigates a grand challenge facing higher education and society generally, as we navigate the spectrum of modalities in a post-pandemic world. This questions that this paper proposes stands at the intersection of educational scholarship, course content creation, student retention and persistence, and the achievement of learning outcomes and objectives. It, therefore, seeks to push forward a model for change and improvement in university education and teaching and learning on our campuses.

## II. DESCRIPTION OF PROBLEM

### A. A New Context

Originating from the distance education model of the British “open university” in the 1960s and 70s, online education with slogans like “education for all” provided a means to expand higher learning beyond the campus-based model that had dominated the landscape for millenia (Lee 2017, 17). Higher education—Hamilton and Feenberg (2012) claim because of its traditionalist rhetoric—resisted online education through the 1990s. However, as internet access has expanded and virtual technologies have proliferated, online offerings have grown exponentially and traditional brick and mortar institutions of higher learning are racing to grab a share of the market from the online universities that had dominated the industry. Even with this large-scale movement into online education, the question of the efficacy of online education is debated in faculty meetings far too regularly.

Despite any faculty misgivings, online modalities have become an increasingly large part of higher education, especially in the past few years as a result of the COVID-19 pandemic. During the pandemic's height, enrollment in online courses increased by 93% from Fall 2019 to Fall 2020 throughout universities in the US (Lederman 2021).

While most of the movement toward online modalities was necessitated by pandemic-related precautions, according to *Inside Higher Ed*, 57% of students and 58% of faculty surveyed during this time report that they are more optimistic about online learning (McKenzie 2021). 73% of those students indicated that they would like to take more online courses in the future (McKenzie 2021). More recent data have shown that this trend forecast is already coming to fruition and now 51.8% of all undergraduates take at least one online course per semester (Smalley 2021). In the Best Colleges “2022 Online Education Trends Report” one of the key findings confirmed that “a majority (60%) of remote learners said they were likely to enroll in online courses or programs after their campuses return to normal operations” (Venable 2022, 4).

These trends have also proven true at my home institution, University of Arizona, with the steady increase in undergraduate Student Credit Hours (SCHs) in Online Campus growing by 59% from FY19 to FY21 compared to a decrease of 5% in overall SCHs on Main Campus. Arizona Online predict growth to continue at approximately 21% annually for the next three years (Taylor 2022).

There, however, is a concerning counterbalance to the promise and extant growth, namely online education is trending downward in terms of student satisfaction and overall perception. The number of students who thought online education was *better than* or *equal to* in-person education dropped by 4% over the past year, and the amount of students who thought there was a positive return on their investment dipped by 3% from the previous year (Venable 2022, 5). Possible explanations for the decrease in student satisfaction are manifold, but they can be categorized in two directions—student-generated and instructor-generated—or more likely a combination of both. The most relevant student-generation catalyst is the rapid and sudden influx of online learners who found themselves involuntarily moved from traditional in-person modalities and new learners who sought online opportunities because of both involuntary workforce changes and in search of new professional horizons. In each of these contexts, the upheaval, which was often involuntary created a difficult environment for effective learning. Additionally, for many of these learners, online learning as a new modality that was accompanied by all the growing pains related to learning new skillsets. The surge in demand for online learning was met from the other side by an increased supply in instructor-generated content and courses. Again, the pandemic necessitated hurried movement from in-person modalities to online modalities. Many faculty were not provided with suitable training in online pedagogy nor given ample time to rethink their courses in new format or produce new course assets. As a result, some, if not most, instructors simply displaced their in-person course into the new online environment. As a result, the overall perception of online education fell from 79% pre-pandemic to 71% in 2022 (Venable 2022, 9).

Whatever the mix of these catalysts, the worrisome statistics are even more troubling when coupled with data above regarding the increasing demand from learners that encourage administrators to provide online modalities. Indeed, the majority of administrators, see online as integral to their institutional operations moving forward. In a survey conducted by the National Council for State Authorization Reciprocity Agreements (SARA), 59% of institutions planned to continue some or all other emergency remote offerings via distance education. In a similar survey of 324 higher ed administrators, 43% said that they plan to continue both remote and online options for students, while only 6% planned to fully develop them as online courses (Venables 2022, 23). This begs the question, how do we meet the rising demand from online education while maintaining high student satisfaction and helping them achieve their learning outcomes?

### B. Evaluating Investment and Allocation of Resources

According to the Chronicle of Higher Education, amongst the most important needs of faculty for successful online teaching is professional development, training in ed-tech tools, and clearer guidance on policies (June 2020). In a study of student surveys about online courses, Jennifer Luzar (2014) found that along with instructor interaction, course production and design were the most important feature that students looked for in online courses. Quality of instruction was the second largest concern about the remote/online learning

experience for potential online learners, only behind balancing education with work, family, and household obligations (Venable 2022, 11).

As institutions of higher learning make commitments to growing their institution by continuing online endeavors it is increasingly important to prioritize investments that have the greatest return on the investment of time, money, and effort. As online instruction in higher education continues to grow and continues to expand its online offerings, it is imperative that we study how different modalities support rigorous and accessible online education. The latter portion of this paper details one such project that seeks to be to fill this lacuna through a methodical study of asynchronous online pedagogy by determining the correlation coefficient between production quality and student success by assessing the achievement of learning outcomes and objectives, student satisfaction, and student attention. Despite the ubiquity of pre-recorded traditional two-dimensional video in asynchronous courses, this project is the first known study of the relationship between video production and student success over a multi-year period, especially one that considers it from a return-on-investment perspective. The project will investigate possible correlations between cost and learning benefit. In so doing, it aims to identify a range of investment thresholds that can provide course material producers and senior leadership guidance on when the proverbial “bang” of production may or may not be worth the “bucks” (including time and energy) required to develop them.

### III. STATE OF THE FIELD

Perhaps because of the subjectivity of “quality” or the fear of appearing gauche, production quality and its relationship to the achievement of learning outcomes is extremely understudied. Many of the earliest studies of audio-visual production originated in the context of second language acquisition (e.g., Chaix 1983, Lockwood 1998) in which audio and video assets were utilized in conjunction with in-person instruction and in self-guided courses. With the advent of accessible internet and comprehensive learning management systems software (LMS), early online learning studies focused on links between learning, course, design, and student satisfaction, which was conveniently summarized by George Lorenzo (2012). Emerging from this body of data was an emphasis on collaborative, active learning with a greater emphasis on the design of unique online pedagogies, the culmination of which can be seen in the recently published *Advancing Online Teaching* (Kelly and Zakrajsek 2020). This direction of study provided a necessary intervention in the field of online/distance education in which researchers demonstrated that online instruction could be at least as rigorous and effective as in-person courses while increasing accessibility to higher education; however, different modalities had distinctive pedagogies.

While this surge in research advocacy elevated the methodology of online education to new heights, it failed to consider the impact(s) of content creation on student learning in the execution of online instruction.<sup>1</sup> In many ways, this

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<sup>1</sup> The notable exception to this is the amount of scholarly attention paid to length of online prerecorded lectures. While this is an important aspect to consider, the different formats and the quality of production

lacuna replicated many of the pitfalls decried by online education advocates by simply assuming that the delivery of content material (e.g., lectures) was translatable from in-person contexts to online. This neglect has real-world implications for faculty who teach online receive, especially in the training and professional development received via institutional support. Faculty subject matter experts (SME) who teach online distance courses, if they are lucky, are trained in broad online pedagogy and evaluated through rubrics like Quality Matter®, but it is assumed that they to have the skills and savvy to create accessible audio-visual materials and post them to their LMS.<sup>2</sup>

As the market for online learners has become more saturated and institutions have competed for a market share, the need for production value and professional training has increased. As a result, there are more resources available for faculty to self-develop using third-party training programs like Adobe's Education Exchange or to engage in professional development at their home institution, like the University of Arizona's Adobe Digital Learning Institute. Additionally, some scholars have attempted to provide scholarly resources on content production, like the recently published "Production Processes for Creating Educational Videos" in *CBE- Life Sciences Education* (Castillo, Calvitti, Shoup, Rice, Lubbock, and Oliver 2021). As vital as these resources are for instructors, the impetus remains on instructors to spend their time training and learning new skills and software competencies to develop their own course assets. Some universities administrators have invested in small studios to which online instructors have access and small production teams who either assist or control post-production. In both cases, these moves have sought to increase production quality, but it comes as a great financial and time expense to the university and its employees. And still, the question remains: *does production quality help our students learn more and more deeply?* In the world of overall course quality and design, creation and production and their effects on learning have been an afterthought at best.

There have, however, in the past decade been occasional studies that have emerged in which education research examined the role of video production quality as part of overall course design that have provided important insights into how it affects student learning. Guo, Kim, and Robin (2014) provided an early example of this when they examined the effectiveness of different styles and lengths of MOOC videos. Van Wermeskerken and Van Gog (2017) examined the benefits created when the lecturer's face was included in pre-recorded lectures that were delivered asynchronously online. They determined that the instructor's face drew attention away from the material, but that learning was neither "facilitated nor comprised" by the inclusion of the instructor's face. While the results were somewhat inclusive, Van Wermeskerken and Van Gog had devised a way of studying

production and learning that provides a useful model for future researchers.

The subfield on production and student learning took an important leap forward with the work that emerged from a research collaboration between the Center for Learning Experimentation, Application, and Research at the University of North Texas and the Center for Innovation in Teaching and Learning at the University of Illinois at Urbana-Champaign. In their publications (Wu, Heap, Fein, Owens, Ostman, Cunningham, and Forbes 2018; Fein, Wu, and Heap 2019), based on research conducted in Illinois Coursera courses, they found that higher production quality led to better knowledge retention than those with lower production quality and that this impact increased with the difficulty of the concepts.<sup>3</sup> Though the conclusions of this study were tentative because of the limitations of the intensive two-month duration of the data collection, the findings demonstrated that professional video production positively affected knowledge retention and assessment when compared to instructor-produced lecture materials covering the same content. Importantly, they also note that future studies should consider which elements of production were most impactful, a point to which I will return.

A similar, more recent study that was conducted by researchers at University of North Carolina-Greensboro measured how student satisfaction and perceived learning correlated to video quality in one semester of their online MBA program (Rickleby and Kemp 2021).<sup>4</sup> Rickleby and Kemp's study found a positive but weakly significant correlation between video quality and student satisfaction, their primary variables. However, their study's data confirmed the findings of the team from Illinois and North Texas that video quality was a strong positive predictor of student perceived learning. Indeed, this aligns with anecdotal evidence that led me to this topic. I have noticed in my own large general education courses at the University of Arizona that my students perform better on assessments and express the content more accurately with more in-depth understanding as my course content production quality is improved. However, another question arises: *are the expenditures of time, effort, and money worth the gains?*

None of the aforementioned studies, including the work of Illinois and North Texas sought to analyze the costs associated with the production of these materials or the potential returns on the investment within their studies. For some in higher education, this issue is a little uncomfortable. We often assume that if something increases student learning and the achievement of learning outcomes then the endeavor is worth undertaking. In reality, however, this is never the case. As individual faculty, we are constantly but implicitly balancing our time and effort (and altogether too often our financial) resources to provide our students with the best possible educational experience given our limited resources, including time and money. Higher education administrators are faced with these questions more explicitly as they must determine

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will inherently play a role in the amount of time a learner will engage in audio-visual material. Influenced by Tik-Tok, low quality self-produced attention might only be a few minutes; however, influenced by binge culture, well-produced podcast-quality audio or television-quality video will generate longer attention spans.

<sup>2</sup> This metric-based definition of quality is questioned in Robert Stephan's "Student Feedback Regarding Online Course Production Value: Effectiveness, Engagement, and Enjoyment" published in this volume in which he shows a positive correlation between increased production of online course content and student satisfaction.

<sup>3</sup> The author is currently working in collaboration with the teams from Illinois and North Texas on the project detailed below. This study will build upon the research findings from Wu, et al 2018 and Fein, Wu, and Heap 2019.

<sup>4</sup> The redesigned course was compared to data from student evaluations from previous years (2016-18). Um, et al. (2012) has similarly tested the correlation of design and production on student satisfaction and perceived learning, compare with Van Wermeskerken and Van Gog (2017).

how to budget and allocate financial and human resources through the institution. While many, if not most, of these important decisions are based on data, allocation of funding for online course content is often only tied to increased enrollments, not scholarship on teaching and learning.

Cost-benefit analysis of education expenditures and student achievement of learning outcomes is not a new concept. There is a wealth of research on this relationship on a macro-scale, particularly those, like Womack, Roberts, Bell, and Womack (2015), that use public data to examine per-student government spending and its correlation to standard testing scores. But to understand how this could be utilized on a macrolevel, we can turn to the field of outcomes and assessment, which has grappled with similar issues since the mid-1980s. In 1986, Ewell and Jones (1986) published an article with a series of an investment ranges for different approaches to assessment budgeting (i.e., better, cheaper, faster) to provide guidance for the institutional assessment expenditures from variety of institutional perspectives (e.g., private liberal arts college, major public research university, etc.).<sup>5</sup> Cost-benefit analysis related to expenditures in assessment of learning on an institutional level was discussed in a series of occasional papers for the National Institute for Learning Outcomes Assessment published in 2010. In an essay on higher education spending, Wellman (2010) argued that analysis of spending was less important because effectiveness was also tied to institutional intentionality. Swing and Coogan (2010), on the other hand, suggest that actuarial techniques could be employed to develop standards to quantify the value of learning that could inform cost-benefit analysis of learning outcomes achievement. Additionally, they provide a model through which an institution or future researchers could conduct an in-depth study that weighs the cost and benefits from a learning perspective.

#### IV. STUDY DETAILS

In this final section, I detail my current research project that seeks to incorporate and combine the methodologies from the previously discussed studies to build upon their findings and to answer the questions that remain:

*Does production quality help our students learn more and more deeply?*

*If so, are the expenditures of time, effort, and money worth the gains?*

In doing so, my research will measure achievement of learning outcomes, student satisfaction, and attention as it relates to the production of prerecorded video lectures that will be delivered asynchronously over the course of 3 years in twelve 7-week fall/spring semester sessions and six 5-week summer semester sessions.

##### A. Anticipated Impact & Expected Outcomes

My intention is not to replicate these studies but to test their findings over a longer period with more subjects and to

pick up the directions for future research that were suggested by the authors. Therefore, my anticipated impact and outcomes include:

- testing the findings of the short-term studies of Fein, et al. (2019), Wu, et al. (2018), and Rickley and Kemp (2021) over a more sustained period;
- disaggregating “high quality production” into specific components to determine which aspects of production yield the highest impact on the achievement of learning outcomes;
- outlining the cost-benefit ratios of different production strategies, all with eye toward aiding teaching personnel in the selection of optimal course material production strategies;
- considering opportunity costs to understand how investment of time and money in online course production fits into a strategic plan aimed to better our students’ learning;
- providing guidance for higher education administrators and faculty to effectively invest in online education content creation.

##### B. Study Design

This study will be conducted in collaboration with undergraduate research assistants over the course of three years in order to substantiate its findings through rigorous and sustained longitudinal data collection and analysis..

###### 1) Year 1: Development and Implementation of Basic Course Content Assets and Assessments

During the Fall of Year 1, two key components of the study will be put in place. First, I will teach two online lecture-based general education courses (RELI 350, n $\approx$ 85/semester; RELI 160A1, n $\approx$ 325/semester) using lectures that are instructor-produced and contain either PowerPoint slides with voice overs or PowerPoint slides with a live lecturer. In these courses, we will begin collecting data related to the following variables:

###### a) Dependent Variables:

Perceived learning/achievement of learning outcomes & objectives, student satisfaction, & attention

###### b) Independent Variable Production:

quality suites (see below)

###### c) Control Variable:

Course length (7-week or 5-week), course size, & expected grade

The dependent variables will be measured through direct and indirect measures. Achievement of learning outcomes and objectives<sup>6</sup> will be directly assessed by the instructor based on

<sup>5</sup> This approach was later critiqued by Marc Chun (2006) who argued that the different approaches were often mutually exclusive and focused on the greatest utility for investment expenditures.

<sup>6</sup> Since the courses in which the study will be conducted are part of the General Education curriculum at the University of Arizona, the learning outcomes are aligned with the standard learning outcomes for the following attributes: (RELI 160A1) EP: Humanists, World Cultures & Society Attribute, and Writing Attribute; (RELI 350) and BC: Humanist/Artist and World Cultures & Society Attribute. The UArizona General Education learning outcomes can be found at <https://ge.arizona.edu>. Additionally, the course learning outcomes

the curriculum map already in place for the course (e.g., quizzes, exams, and written assignments). The students will be asked to complete an anonymous Qualtrics survey in which they self-report their satisfaction, perceived learning/achievement of learning outcomes, along with controls of course length. Student attention will be measured by analytics accessible through D2L LMS and Panopto video hosting service. This semester will thus serve both as a pilot of the assessment and provide baseline data for the remainder of the study.

The second key component of Year 1's Fall semester will be the production of course content assets created in *Adobe Creative Suite*, using the "Production Processes for Creating Educational Videos" designed by Castillo, et al. (2021) and incorporating the basic principles of Cognitive Theory of Multimedia Learning (CTML; see Mayer 2008; Mosley 2017; and Harp and Mayer 2017). These assets will be added to the courses in the study throughout the remainder of the project. Basic post-production modifications made in *Adobe After Effects* (e.g., effects aimed at improving audio and video consistency and aesthetics such as color correction, opening title sequences, shot transitions, and intro and outro sequences) will be made to existing course materials (e.g., lectures, videos, audio clips) for use in subsequent semesters.

In the subsequent semester, the new post-production elements will be added to the course while leaving each course's subject content unchanged, and continue the production of course content assets, using *Adobe Audition* to remaster the audio and *Adobe Premiere* and *After Effects* to insert stock video footage into lectures. Additionally, through personal connections to editors and animators from Disney Television, we will begin to shift to more complex production techniques that will take more time to create, including graphic and animated asset creation using *Adobe Illustrator*, *Animator*, and *Character Animator*. Assessment will continue as in the previous semester with students in each course split over two sections based on production quality (independent variables).

In summer of Year 1, I will teach multiple sections of each course during each Summer Session, integrating the newly enhanced audio and stock footage-enhanced lectures while maintaining the same subject content. Each offering will vary aspects and degrees of the production in order to provide a measure of the effectiveness of each aspect of production and its correlation to students' course success

### 2) Year 2: Assessment and Data Collection

The second year of the program will be used to finish development of the course content assets and integrate them into the lectures, again while maintaining the same subject content. This will result in four distinct production quality suites:

#### a) Instructor-only:

- Voiceover PowerPoint

#### b) Minimal Production:

- Intro/Outro Sequences

- Voiceover PowerPoint

- Remastered Audio

#### c) Extensive Production

- Intro/Outro Sequences

- Green Screen Lecture

- Remastered Audio

- Stock Footage

#### d) Professional Quality

- Intro/Outro Sequences

- Green Screen Lecture

- Remastered Audio

- Stock Footage

- Professional Animations

I will continue the same rotation of courses in Fall, Winter, Spring, and Summer sessions with each course divided into sections based on production quality; we will collect data using the same assessment plan described above.

### 3) Year 3: Analysis of Data

Year 3 will be used to analyze the data collected during years 1 and 2 in the following methods:

- Descriptive statistics related to independent and control variables;
- Pearson correlation coefficients between all study variables;
- Regression discontinuity of independent and control variables;
- ANOVA analysis of variance test;
- Cost-benefit analysis for per student expenditures related to achievement of outcomes.<sup>7</sup>

## V. CONCLUSION

Through this study, I hope to address some of the lingering questions about content creation and video production quality and how it relates to student satisfaction and achievement of learning outcomes. Finally, I hope to isolate the techniques and expenditures that provide the most cost efficient investment in the production of course content to maximize the learning experience for our students while providing affordable access to higher education.

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include the programmatic outcomes from the Religious Studies Bachelor of Arts degree. These learning outcomes can be found at <https://www.arizona.edu/degree-search/majors/religious-studies>.

<sup>7</sup>Modeled after Womack, et al. (2015) and Swing and Coogan (2010).

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