

# Comparing the Effectiveness of OSHA-10 Online and In-Person Safety Courses: Case Study

**Tim Bartolomei**

Cal Polytechnic, San Luis Obispo  
San Luis Obispo, California

Since 1970, the Occupational Safety and Health Act (OSHA) was designed to create a safe workplace for everyone, has increased safety awareness, and decreased occurrences of injury and death on construction-related job sites. Until 2001, construction safety education was taught through face-to-face interaction between an instructor and an employee. However, in 2001, safety courses became available through multiple online platforms with the ability to be completed virtually. Online safety courses provide an alternative from face-to-face training and allow the employee to complete the training at their own pace. However, some research indicates that online safety courses are not as effective in training employees on the skills necessary to identify and mitigate unsafe working conditions. Utilizing a quantitative survey, a wide variety of Cal Poly construction management students, who completed ClickSafety's OSHA-10 online course, took a quiz designed to test their knowledge of OSHA-10 course material. The survey results suggest that the majority of students are not retaining the information addressed in the online safety course. The findings of this case study demonstrate the need for more research to determine the effectiveness of online safety courses.

**Key Words:** Construction Safety Training, Online Instruction, Online Construction Safety, OSHA, Online Construction

## Introduction

The construction industry is projected to reach \$15.5 trillion globally, with significant developments in India, the United States of America, and China over the next ten years (Graham Robinson, n.d.). Until recently, construction has made little effort to change their methodologies and has remained relatively stagnant over the decades, but many new studies are suggesting innovative approaches to safety education (Edward Taylor, 2015). With a focus on construction productivity, the construction industry is continuing to look for ways to streamline the construction industry. Within the past two decades, many construction professionals see changes in the way construction projects are completed. One significant advancement that many industries have used to streamline aspects of their processes is with the internet. The internet offers a platform for faster collaboration and education, specifically online safety courses.

Implementation and education of occupational health and safety practices in the construction industry have become more widely adopted since OSHA's inception in 1970. However, construction is still an inherently dangerous industry that requires constant evaluation of proper safety training programs and field safety procedures. On any construction site, it is common to see workers operating heavy and dangerous machinery, working in unavoidable hazardous situations, or dealing with potentially harmful materials. According to the U.S. Bureau of labor statistics, the number of fatal work injuries sustained by employees has slowly increased over the past five years (Number of Fatal Work Injuries by Employee Status, 2018). The majority of those incidents occurring at work are due to lack of

appropriate supervision, lack of knowledge or safety training, or lack of means to carry out the task safely (Shendell & Milich & Apostolico & Patti & Kelly, 2017). It is vital to ensure that employee education platforms are useful in teaching the required materials, so employees know how to mitigate and avoid these life-threatening situations.

According to the National Safety Council, the construction industry has the largest number of preventable fatal work injuries of any industry sector (Work Safety Introduction – Injury Facts, 2020). While over the years, the overall number of construction-related deaths has decreased, there is still a sobering number of construction injuries and deaths each year (Work Safety Introduction – Injury Facts, 2020). By implementing safety protocols and training, construction firms are working towards mitigating construction hazards for their employees. However, it can be expensive and difficult for smaller firms to achieve. Online safety courses provide a cheaper alternative than face-to-face training, but the question is: are the online safety courses effective in teaching the required material? With advancements in technology, exploration into online construction safety courses for compliance and employee competency makes sense; the hard part is determining which training method is the best choice (Greene, H.E, Marcham, Cheryl, 2019).

## **Literature Review**

In 1970, Congress passed the Occupational Safety and Health Act to improve everyone's workplace health and safety. The Occupational Safety and Health Administration (OSHA) is a division of the U.S. Department of Labor that is responsible for enforcing up to date health and safety practices as well as educating the public on new or changing codes (Summary of the Occupational Safety and Health Act, 2019). OSHA is well known for its basic safety training courses, OSHA-10-hour course, and the OSHA-30-hour course. In 2001, OSHA began to offer online safety courses for both their 10-hour course and 30-hour course.

Some of the advantages of the OSHA-10 online construction course are that online delivery allows for consistency, timeliness, efficiency, standardized accreditation, and ease of updating course material (Williams, 2005). Also, as previously stated, online safety courses are a cheaper alternative to in-person courses. For the small to medium-sized firms, the most substantial barriers for in-person training are the time and cost required to ensure staff is adequately educated (Wood, 2005). With online courses, the individual taking the course can learn at their own pace and on their own time so that employers do not have to send employees to physical training courses.

Some of the disadvantages or concerns of online safety courses listed by OSHA are inconsistent training, insufficient program monitoring, difficulty with participant oversight, individuals completing online courses on behalf of another registered student, poor technical support, and the difficulty of distinguishing OSHA -authorized courses (Online Delivery of OSHA's Outreach Training T 10- and 30 Hour Courses, 2019). A complete picture of the disadvantages of online safety courses has not yet been created. However, all of the concerns listed above should constitute further research into the effectiveness of online safety courses compared to in-person safety courses.

Before 2001, safety courses were taught in person and by a licensed instructor. In 2001, ClickSafety and a handful of other online platforms started offering OSHA accredited online safety courses. Online safety courses are starting to see an increase in popularity among general contractors and subcontractors. In 2015, 20% of general contractor projects utilized online safety training, and 19% of the subcontractors utilized online safety training (Safety Management in the Construction Industry, 2017). Most recently, in 2019, the percentage of projects that utilize online safety training jumped to 49% of all general contractors' projects and 41% of all subcontractor projects (Safety Management in

the Construction Industry, 2017). Online safety training is gaining popularity among general contractors and subcontractors due to its low cost and ability to complete it at home. With more people taking their safety training online, online exams must be competent in teaching the material rather than a cheap bandage for general contractors to check off a box.

## **Research Goals and Objectives**

This case study aims to evaluate the effectiveness of OSHA-10 online safety courses compared to OSHA-10 in-person safety courses. The goal of this case study is to determine if online safety courses are an effective means of training for safety. This paper's objective is to inform industry professionals that further research is needed to determine if online safety courses are an effective means of teaching safety material.

## **Research Methodology**

In order to compare the effectiveness of the OSHA-10 in-person training to OSHA-10 online, a 25-question quiz covering OSHA\_10 course material on Microsoft Forms was created. The OSHA-10 quiz created for this project was designed with the help of Swinerton's San Francisco Division safety manager and a Cal Poly Construction Management Professor. The questions are designed to challenge individuals on material that is present in the OSHA-10 course. The 25-question quiz will be administered to both groups upon the completion of their respective OSHA-10 safety training course. For the means of data collection, this survey will utilize California Polytechnic State University's Jobsite management classes and individuals at Swinerton Builders who will take the OSHA-10 course in-person. The test will be administered upon completion of each group's respective safety courses, working in conjunction with Swinerton's San Francisco Safety Division Manager and California Polytechnic State University professors. The test results will be graded on an academic grading scale: A=100%-90.00%, B=89.99%-80.00%, C=79.99% - 70.00%, D=69.99% - 65.00%, D- =64.99% - 60.00%, F or Not Effective = 69.99% or less.

To ensure the results of this case study were as reliable as possible, each exam participant was asked if the participant had received any prior in-person or online safety training. If they answered yes, they were removed from the data set. This project recognizes the limitations of using college students compared to industry professionals due to the industry professionals potentially inherent knowledge of simple safety. Swinerton's employees that have hands-on industry experience may obtain higher scores in comparison to Cal Poly Students. Unfortunately, due to the current pandemic, Swinerton Builders have decided to suspend in-person OSHA-10 training for the safety of their employees. So, for the duration of this paper, the focus will take an in-depth look at the results of the 39 California Polytechnic State University students.

## **Survey Analysis**

Thirty-nine of California Polytechnic State University's Jobsite management students took the 25 question OSHA-10 examination quiz upon completion of their OSHA-10 online course. Of the 39 Cal Poly students, there are 17 fourth years, and 21 third-year students. The administration of Microsoft Forms conducted data collection. Data analysis was conducted with R statistical software on the RStudio platform. RStudio was used to analyze the data and build graphical representations.

The grade distribution of the students, represented in Figure 1, highlights the results of all 39 students. It should be noted that there were no grades above a C-. All 39 respondents received a C-, D, D-, or F. It can be seen that a majority of respondents (71.8%) received an F and subsequently failed the quiz. Such an overwhelming number of failing grades could indicate that students who are taking the course online do not retain the information well. However, to test this hypothesis, it would be required to run a proper statistical analysis comparing scores for students who completed their training in-person vs. online.

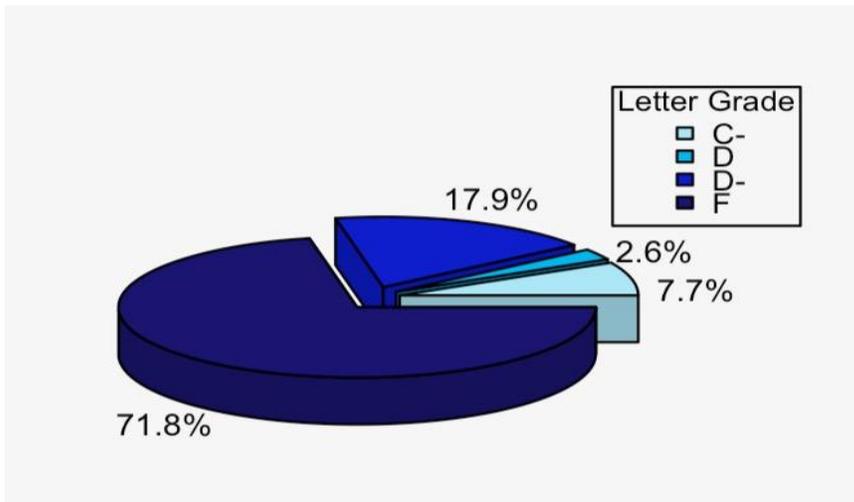


Figure 1: Pie Chart of Letter Grade Distribution

The chart labeled Fig. 2 further illustrates the grade distribution depicted in Fig. 1: the grade distribution of student test grade on the quiz. It can be seen that there is an overwhelming amount of Fs compared to the low but passing grades of C-, D, and D-.

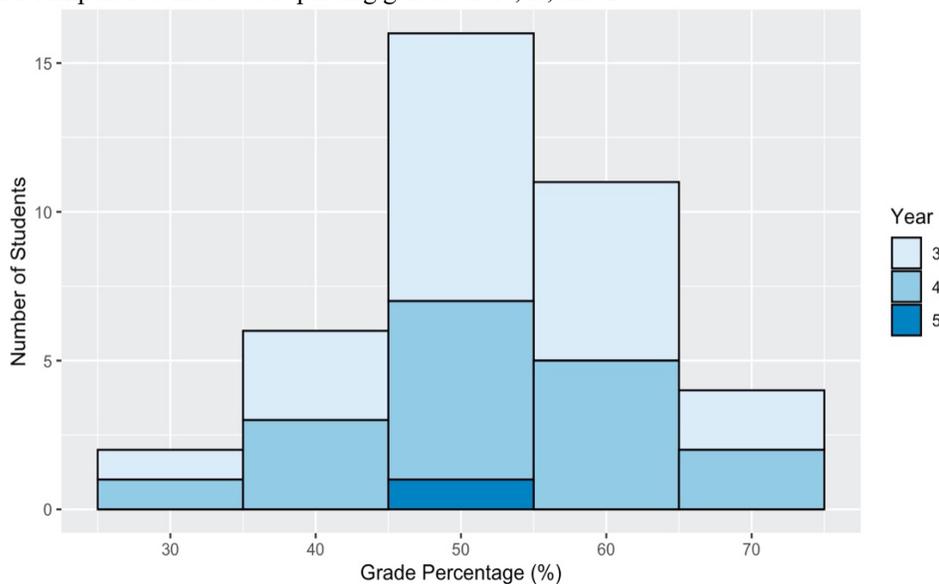


Figure 2: Histogram of Test Grades (In %)

In Figure 3, the distribution of test grade (in percentage) is modeled, and the columns are stacked to show the grade breakdown of each scoring range. Overall, data appears to be normal and bell-shaped with the average test score of 51.84%. Additionally, the distributions of the scores by year in college appear to be normal for third and fourth years. Note that the sample distribution of fifth-years who took the quiz cannot be determined due to the small sample size ( $n = 1$ ).

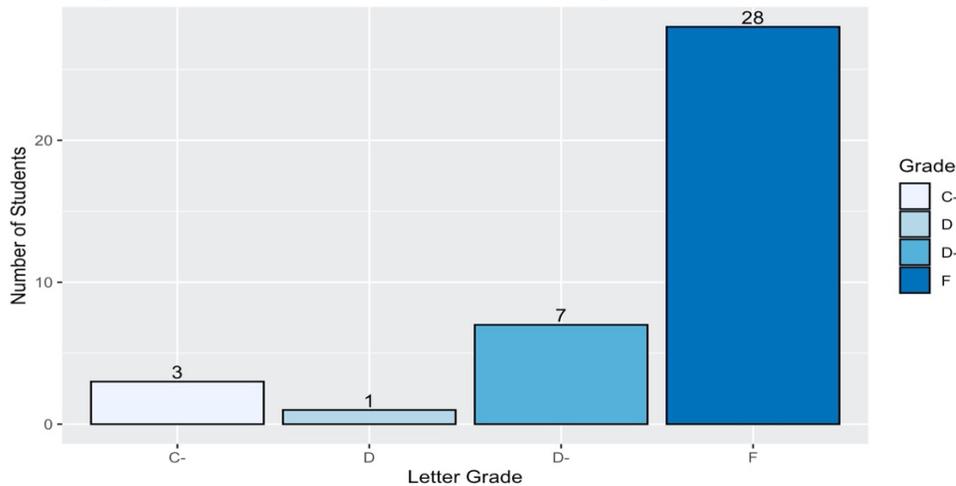


Figure 3: Bar Chart of Test Grades

The most missed question with 35 incorrect answers is: What defines a competent person? The second most missed question with 34 incorrect answers is: Employees who direct or signal crane movements must be? Two questions are tied for second with 34 incorrect answers. The second question is: Employees who direct or signal crane movements must be, and scaffolding should be tied into the building at intervals not to exceed \_\_\_ ft horizontally. The questions are designed to be simple multiple-choice quiz questions that tested the retention of the student. A PDF version of the quiz can be found in the appendix of this paper.

## Conclusion

While online safety courses such as OSHA-10 and OSHA-30 are efficient, cheap, and easy ways for companies to educate and certify their employees, this case study shows further research into the effectiveness of online safety courses is needed.

As previously mentioned, except for 2017, the overall number of construction-related deaths has slowly increased since 2011. The frequency of online testing utilized has also increased in recent years, which could imply that construction personnel are not effectively retaining online safety course information. However, in order to prove this association, further research would need to be conducted.

Concerning the scope of this study, there could be a plethora of reasons for Cal Poly's low-test scores, including, but not limited to: students not paying attention to the online OSHA-10 course, students not taking the examination quiz seriously, or online learning being less useful to internalize information. Cal Poly's average score on the OSHA-10 post-examination quiz was 51.8%, and with further research, there is reason to believe that in-person scores would be higher. Due to the information mentioned earlier, surrounding construction-related deaths, it would be prudent to explore appropriate and effective delivery methods of safety course information as online safety courses become more widely used.

## **Future Research**

For future iterations of this project, it would be ideal to collect in-person course exam results allowing for a direct comparison of in-person and online test scores. For example, if the group taking the in-person test is a company employee, then the individuals taking the face-to-face course should also be employees. This would eliminate any inherent knowledge or uneven background between the individual groups tested, allowing for a more concise result. Other beneficial changes to future attempts at a case study similar to this one should include using survey software that analyzes the data automatically, making sure the quiz gets distributed promptly after the individuals complete their respective courses, and creating some incentive for each individual to do well on the course and exam.

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