FROM FIRST ATTEMPTS TO MASTERY: INTEGRATING PRODUCTIVE FAILURE AND FLIPPED LEARNING IN VR VIDEO TRAINING FOR UNDERGRADUATE STUDENTS

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Abstract

In higher education, mass lectures remain a predominantly didactic method for imparting knowledge, often supplemented by tutorials to foster greater engagement in smaller groups. However, developing hands-on skillsets requires intentional curriculum design that prioritizes practical application. In an undergraduate Training and Development course for business students, proficiency in technology-based training methods is essential. To meet the evolving demands of the business world, students must acquire both theoretical knowledge and practical skills to design and implement digital training solutions, including immersive virtual reality (VR) training materials.

This paper presents a pilot implementation of a reengineered instructional design aimed at promoting active learning outcomes. Recognizing the limitations of traditional lectures, the course adopted a structured flipped learning approach over a 13-week semester in Spring 2025. Central to this approach is the F.A.I.L. (First Attempt In Learning) model, which integrates experiential learning and a productive failure process within the flipped classroom framework. Students began with a concise mini-lecture to build foundational technical skills for producing 360-degree videos, followed by small group field exercises and on-site mentorship. Their fieldwork, 360-degree videos, was showcased in a six-sided CAVE (HiVE), enabling the class to immerse themselves in the shooting locations. These videos were then used as discussion materials in flipped learning sessions to analyze initial mistakes and identify key learning points. The second stage, focused on VR video production, involved collaborative group work, iterative feedback, and additional mentorship sessions. This two-stage process, post-class fieldwork and in-class reflection, enhanced students' ability to critically assess the challenges they encountered, thereby increasing their readiness to collaborate on subsequent VR video production projects.

Results indicate that students benefited significantly from "aha" moments during their initial attempts, achieving higher academic performance and project grades compared to previous cohorts who received only direct instruction. Student feedback further highlighted substantial improvements in technical skills relevant to professional development in human resources.

Keywords: Active learning, Flipped learning, Higher education, Instructional design, Productive failure, Training and Development, Undergraduates, Virtual Reality.

1 INTRODUCTION

In the corporate world, the use of virtual reality (VR) and augmented reality (AR) for employee training has been on the rise. This trend is driven by advancements in technology, as well as the increasing affordability and comfort of VR headsets. Traditional training methods often require significant time from HR or training managers, and can be especially challenging when employees are located in various places. VR training can reduce the need for repetitive training sessions and lower long-term costs. Most importantly, VR can immerse employees in real-life scenarios, allowing them to immerse in role-playing and decision-making simulations. Some corporations have already integrated VR into their training programs. For example, Walmart utilizes VR for retail training to help employees improve customer interactions (Incao, 2018). Intel employs VR for electrical safety training, allowing employees to safely practice handling hazardous situations (SHRM, 2026). Hilton Hotels has implemented VR to train its housekeeping staff, helping them understand daily challenges, foster empathy, and improve internal communication. As a result, Hilton is able to train staff more quickly and at a larger scale, successfully reducing in-class training time from four hours to just twenty minutes (Hotel Management Network, 2025).

Given the trend of utilizing VR as a digital training solution in corporations, it is essential to equip future training professionals with relevant skills and knowledge to support employees' developmental needs. Therefore, to meet these evolving demands, our business students in the "Training and Development"

https://doi.org/10.21125/inted.2026.0536
ISBN: 978-84-09-82385-7

course should gain both theoretical understanding and practical experience in designing and implementing digital training solutions, including immersive VR materials.

However, acquiring technical skills requires more than traditional didactic lectures. Research and experience show that experiential hands-on learning is more effective when curriculum design emphasizes real-world application. As such, this paper presents a pilot implementation of a redesigned instructional approach aimed at enabling students to create VR training videos and materials as digital training solutions.

2 METHODOLOGY

Recognizing the limitations of traditional lectures, the course adopted a structured flipped learning approach over a 13-week semester in Spring 2025. The cohort consisted of 19 undergraduate students in their third and fourth years of study in a university in Hong Kong. All of whom had no prior experience in producing 360-degree videos for VR applications. Upon completion of the project, students participated in a post-survey questionnaire to provide feedback on learning new skills in VR video production and their flipped classroom approach.

To equip students with skills in using VR as a digital training solution, they were organized into groups and taught the technical aspects of capturing and editing 360-degree videos. The objective was to enable them to develop VR videos that support training goals, such as employee onboarding programs.

Central to redesigned instructional approach is the F.A.I.L. (First Attempt In Learning) model (Kapur, Hattie, Grossman, & Sinha, 2022), which integrates experiential learning and productive failure within the flipped classroom framework. A key concept of the “First Attempt in Learning” (FAIL) model is productive failure (Kapur, et al., 2022). This model examines whether students benefit more from engaging in problem-solving before receiving instruction, or from instruction before problem-solving. Research findings indicate that learning through productive failure is more effective than traditional instruction-first methods. When students are given the opportunity to attempt problem-solving beforehand, they activate relevant prior knowledge, which helps them recognize misconceptions and become aware of gaps in their understanding (Kapur, et al., 2022). Furthermore, learning from productive failure enhances student engagement and motivation to master targeted concepts (Belenky & Nokes-Malach, 2012).

In implementing this approach, student groups progressed through two stages. In the first stage, students participated in a concise mini-lecture to build foundational technical skills for producing 360-degree videos. This was followed by small group field exercises and on-site mentorship. The 360-degree videos created during their fieldwork were then showcased in a six-sided CAVE (HiVE).

At this point, the productive failure process began, as students immersed themselves in the 360-degree videos at the locations where they had conducted the filming. These videos served as discussion materials in subsequent flipped learning sessions, where students analyzed their initial mistakes and identified key learning points.

The second stage, focused on VR video production, involved collaborative group work, iterative feedback, and additional mentorship sessions. This two-stage process, post-class fieldwork and in-class reflection, enhanced students’ ability to critically assess the challenges they encountered, thereby increasing their readiness to collaborate on subsequent VR video production projects.

3 RESULTS

Based on the instructor’s observation, results indicated that students benefited significantly from “aha” moments during the small group field exercise and initial attempts at video capture. For example, some students initially assumed the task would be easy because of their prior experience with video shooting on their mobile phones. However, some students failed to ensure the camera was set to 360-degree mode prior to recording. Additionally, due to a lack of professional filming skills, some students held the camera unsteadily, resulting in shaky footage that caused dizziness when viewed through the VR headset and the HiVE. These firsthand experiences during the productive failure process enabled students to directly identify and understand gaps in their skills before moving on to the next stage, proving to be more effective than simply having these issues explained by the instructor.

The findings from the mean ratings of student responses to VR video training and the flipped classroom approach indicate that students generally found the learning experience beneficial (see Table 1). Four

statement items were included in the post-survey questionnaire. Students were asked to rate each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). The mean ratings were all relatively high, ranging from 4.26 to 4.79.

Table 1. Mean Ratings of Student Responses to VR Video Training and Flipped Classroom Approach

Statement Items	***Mean***
1. Overall, my digital competence in 360-degree capturing and editing is advanced.	4.37
2. I achieved the learning objectives of the VR project.	4.79
3. The flipped classroom approach enhanced my learning experience.	4.26
4. This flipped classroom approach is worth recommending to others.	4.53

The first statement, "Overall, my digital competence in 360-degree capturing and editing is advanced," received a mean rating of 4.37. Students indicated that they had improved their skills in this area. This new skill set is valuable in preparing them to meet the digital competence requirements expected by corporations in training and development contexts.

The second statement, "I achieved the learning objectives of the VR project," received a very high mean rating of 4.79, indicating that students strongly felt they had met the intended outcomes of the project. This result suggests that, while students were focused on acquiring new technical skills, such as 360-degree video capture and editing, they also recognized the broader value of these competencies. Specifically, students understood that mastering these skills enabled them to produce practical deliverables, such as 360 VR training videos, which can be effectively utilized for onboarding employees in VR training programs. This awareness highlights the relevance and applicability of the learning experience to real-world professional contexts.

In adopting the flipped classroom approach, the last two statements, "The flipped classroom approach enhanced my learning experience" and "This flipped classroom approach is worth recommending to others", yielded mean ratings of 4.26 and 4.53, respectively. These findings indicate that students perceived the flipped classroom as an effective method for teaching new skill sets, which enhanced their overall learning experience. Furthermore, the high level of recommendation suggests that students see value in this pedagogical model and believe it could benefit others. This implies that the flipped classroom approach can be further explored and potentially implemented in this subject as well as in other courses.

4 CONCLUSIONS

This paper presents a pilot implementation of a reengineered instructional design aimed at promoting active learning outcomes. To address the limitations of traditional lectures, the course adopted a structured flipped learning approach based on the "First Attempt In Learning" model, which incorporates experiential learning and a productive failure process within the flipped classroom framework. Importantly, students who participated in the flipped classroom approach demonstrated higher academic performance and project grades compared to previous cohorts who received only direct instruction.

Moreover, the post-survey results indicate that this pedagogical model not only enhances student learning but also holds significant potential for broader adoption in this and other courses. Importantly, the findings highlight opportunities to expand the flipped classroom approach beyond conventional pre-class activities, by integrating more hands-on, experiential learning and real-world applications within the classroom setting.

ACKNOWLEDGEMENTS

This study was supported by the Departmental Learning and Teaching Enhancement Grant (2024/25) for a project titled "Flipped Learning for Active Engagement: Advancing Management Students' Technological Skills for HR Digitization". The authors gratefully acknowledge the financial support provided by the Department of Management and Marketing, Faculty of Business, which made this research possible.

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