

Research on the Reform and Practice of online and Offline Blended Teaching Modality

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Abstract: With the development of digital media and technology in e-education, online and offline blended teaching modalities provides new opportunities for deepening the reform and innovating of education. The purpose of this study is to analyze the application of online and offline blended teaching modalities in “Transportation of Aviation Dangerous Goods” a course to determine if there are improvements in student academic outcomes and course satisfaction. The analysis of the overall performance of students indicated that the blended teaching modality designed by the instructor is effective in the implementation of this course.

1. Introduction

Online and offline blended teaching, as a new task of educational modernization and strengthening education, has changed the form of education and teaching and updated the talent training mode[1]. Transportation of Aviation Dangerous Goods is a core professional and practical course that perceived as challenging by both students and instructors. Specifically, it needs students to complete the theoretical knowledge acquirement in advance and then master the basic operation skills under the instructor’s demonstration face to face. However, in the traditional teaching modality, the process of lecture is a simple transfer of knowledge from students by instructors. The majority of students receive information passively, but independently construct their own framework of knowledge[2]. Therefore, the traditional teaching modality leads to many problems such as waste of time with excessive explanation of theory, insufficient in-class activities for instructing professional skills, deep learning and so on. The blended teaching modality effectively integrates traditional class teaching with online learning and adopts the merits of these two teaching modalities and abandons their defects[3]. The blended modality offers more students the opportunities to practice the skills and tools of transportation of aviation dangerous goods through

moving a significant portion of the transmission of knowledge component of the course outside of the traditional classroom. Meanwhile, faculty can exercise greater flexibility and selectivity in designing blended curricula, ultimately allowing them to optimize their teaching for more students.

2. Practical Application of Online and Offline Blended Teaching

“Transportation of Aviation Dangerous Goods” that I have taught for over 3 years is redesigned. The goal of the redesign consist of knowledge objective, ability objective and quality objective.

Knowledge objective: To identify the classification of aviation dangerous goods and master basic regulations for carrying dangerous goods by passengers and the crew and cabin staff, and lay a foundation for subsequent professional courses;

Ability objective: To cultivate the ability to solve emergencies in the transport of dangerous goods by air, and dangerous goods transportation skills of packaging, marking, labelling and placarding;

Personal quality objective: To raise students' awareness of safe transport of dangerous goods, and regard the safety of production as the starting point, we make safety consciousness a new criterion to standardize students' actions in their academic and professional careers.

2.1. Selecting Participants

Sixty-eight students registered for the undergraduate “Transportation of Aviation Dangerous Goods”, and their ages span between 20 and 21 years of age. In the end-of-semester evaluation, all sixty-eight students participated in the questionnaire[4].

2.2. Preparation

1) Establishing Flipped Class

Flipped class is a typical form of blended teaching, requiring students to complete automated modules online and freeing up valuable traditional classroom time for constructive tasks to reinforce basic knowledge and professional operation skills.

2) Online Resources Design and Planning

The online resources are designed on the premise of the composition of the professional teaching contents and curriculum system, and we decide to import the existing high-quality online course videos and make our own online teaching resources. To blended teaching modality to work, the instructor conducts many appropriate procedures to ensure that students are being exposed to the resources that the instructor is no longer covering in the traditional classroom. Firstly, given recent data has shown that 12,500 MOOC courses have launched in China with more than 200 million students, we select many suitable MOOC courses as extensive learning materials. Secondly, according to the content of the ten chapters, we make 23 micro-videos, 345 minutes, 10 PowerPoint lecture notes, 47 handouts, 766 practice quizzes and external resource links which are available to students in the blended modality[5].

2.3. Practical Application

According to the characteristics and teaching objectives, highlighting the cultivation of the students' practical and innovative ability, the teaching contents and highlights of the online stage are different from offline part: Online teaching focuses on theoretical knowledge, while offline teaching focuses on practical teaching.

Online Teaching before Class

This stage needs students to complete theoretical knowledge transfer by student's self-study in advance, and they can have a comprehensive grasp of teaching content. Students are required to practice chapter exercises after watching teaching videos to ensure the achievement of course objectives. The chapter quizzes are presented online, and students are allowed to use online resources while completing these exercises. The scores of all quizzes constitute 20% of the overall course grade so that students have more explicit motivation for increasing online activity and engagement. The instructor encouraged peer-to-peer interactions and created channels of open communication between the students and the instructor through timely responses and constructive feedback on students' online posts including questions and thoughts. Online discussion time is primarily spent addressing problems or reflecting on what has been learned during the online class.

Offline teaching in classrooms

The offline teaching of the course is mainly for students to cultivate their practical ability, and it assists the instructor to explain the complex points of teaching materials. In the class, the instructor utilizes digital media and provides face to face lectures according to students' phased examination in the online course, focusing on the explanation of the important concepts and mistakes in exercises. The Instructor encourages students to demonstrate their learning outcomes according to the online resource and present what they have learned to other classmates through PowerPoint. Then the instructor designs some discussion topics based on the course, students are divided into five groups, each comprised of seven members, and are required to respond to at least one of the missions. Depending on students' answers, the instructor selects one person, who consistently expresses exemplary perspective, to demonstrate a sample work and encourage students to provoke new ideas.

The instructor significantly decreases the amount of time spent lecturing theoretical knowledge in the traditional sense, while more opportunities and activities related to practical skills are provided to students. These in-class activities involve the application of Dangerous Goods Transportation Manuals to identification, the practice of filling air waybills and shipper's declaration for dangerous goods and/or the use of packaging materials and facilities for packing.

2.4. Different between Traditional and Blended Teaching Modalities

Table 1: Different between traditional and blended teaching modalities

Components	Traditional	Blended
Lecture	Face to Face	Online + Face to Face
Student Activities	Passive reception	Passive and Automatic
Learning Environment	In class	In class + Online

The lecture is changed from the traditional face to face classroom teaching to the combination of online and offline teaching modality, while the emphasis of teaching modality shifts from the teacher-centered inculcation to student-centered inquiry. The blended teaching modality enables students to acquire resources which are uploaded by instructors accessibly, and learning rhythms and content can be scheduled in accordance with their personal situation. Learning is not simply and passively completing information transfer, but a process in which students acquire the perception of knowledge. In terms of learning environment, the blended teaching modality consists real classroom environment and virtual network environment and breaks the limits of time and space, while the knowledge is spread by audio and video and digital media, as shown in Table 1.

3. Assessment and Results

3.1. Academic Outcomes

The measures regarding students' actual grades for one theoretical examination, one practical examination, assignments, and the overall course total were administered in this study because the purpose is to assess the achievement of course objectives with the blended teaching modality. The theoretical examination contains 20 multiple-choice questions, 5 calculation questions and 2 short essay questions, which accounts 40% of the total score. The final examination assesses hands-on practical skills including packaging, marking, labelling and placarding, and each part is 25 points. Performance on assignment represents 20% of a student's overall grade, there are 10 chapter quizzes (10points × 10) involved.

To verify if there are improvements in student academic outcomes in different teaching modality more objectively, the instructor takes the academic outcomes of students in traditional as the standard, and compare the academic outcomes students in blended teaching modality with that. The midterm examination, final examination and assignments are of comparable difficulty with similar rubrics in 2020 and 2021, as shown in Table 2.

Table 2: Descriptive statistics of academic outcomes by across different teaching modality

Items	Theoretical Exam		Practical Exam		Assignments	
	FTFa	Blendedb	FTF	Blended	FTF	Blended
Mean	83.17	86.53	80.35	88.27	90.7	92.36
SD	8.62	5.31	9.07	5.65	6.53	4.18

Classes taught fall 2010 semester(N=65)

Classes taught fall 2011 semester(N=68)

According to the results, students in the blended modalities have demonstrated a high level of operation proficiency and were able to reach better academic outcomes than students in the traditional face-to-face modality. There is no significant difference between student assignments score before and after one. The reason for this phenomenon is that students are allowed to complete each assignment with their classmates and discuss answers before the day that the assignment is due, responses submitted are typically correct so that no significant differences in students' assignment score between traditional face-to-face teaching modality and blended teaching modality. However, both the theoretical and practical exam grades (Mean=86.53, SD=5.31; Mean=88.27, SD=5.65) were higher on average in the operation skills of transportation of aviation dangerous goods taught using the blended teaching modality than in the traditional face-to-face classroom. This result indicated that the implementation of blended teaching modality has successfully broken the limit of insufficient time and focused on the explanation of the questions students encounter in the online course, so that more time can be spent on practical teaching and hands-on work such as packaging, marking, labelling and placarding.

3.2. Course Satisfaction

The questionnaire was conducted to determine that most students are satisfied with the learning environment of this kind of blended teaching modality the instructor created and gave an objective evaluation. The questionnaire consists of five criterions which are Relevance, Interactivity, Instructor Support, Peer Support, and Technology, and the question of each criterion is listed below. Participants responded use a five-level Likert Scale (1 = strongly disagree, 5 = strongly agree) and explained the answer.

Relevance: Do you agree that the online resources are relevant to your professional course? Why?

Interactivity: Do you agree that the blended teaching modality bring you more interaction? Why?

Tutor Support: Do you agree that tutors provide support and guidance to your learning activities? Why?

Peer Support: Do you agree that your classmates provide positive and encouraging support? Why?

Technology: Do you agree that digital media enables your online study easier? Why?

Table 3: Student opinion in blended teaching modality

Evaluation	Percentage					Mean	SD
	1	2	3	4	5		
Relevance	0	0	9	32	59	4.50	0.71
Interactivity	0	0	5	29	66	4.62	0.74
Tutor Support	0	7	28	32	29	3.75	0.78
Peer Support	0	0	13	36	51	4.45	0.71
Technology	0	0	5	40	53	4.61	0.89

According to the questionnaire, the following Table 3 summarized the results of students' course satisfaction and the overall quality of the course in the blended teaching modality. Concerning relevance, 91% of the students agreed that the extensive online resources are relevant to professional course. The mean score (Mean=4.56, SD=0.71) also indicated that overall students had a positive attitude toward online classes. In terms of interactivity, 95% of student positively responded that the blended teaching modality strengthened instructor-to-student and peer-to-peer interactions not only in-class but also outside of the class time. The finding confirms that blended teaching modality is thought to construct students' active interaction and enhance students' interest in learning. Through the analysis of tutor support, 69% of student generally were satisfied with online learning environment, knowledge explanation, and communication channels the instructor created. However, the students with negative response presented that the personal feedbacks given by instructor are too inadequate to guide them to explore knowledge.

Besides, 87% of student positively reported that they could learn from each other better with the reason that flipped classes provide a forum where learners from different college can discuss and debate. Meanwhile, group tasks assigned by instructor improved students' ability of innovation and cooperation. It was hypothesized that technology tools enable students to acquire extensive knowledge and discuss with each other easier than the students in the traditional class. As expected, half of the students had positive attitudes toward using the computers and software application as they could easily schedule learning time by slowing, pausing or repeating the video in accordance with their personal situation. However, 5% of students responded "neither agree nor disagree".

Overall, facts have proved that more students prefer to the blended teaching modality and recognize that online study is an imperative prelude and continuation of their learning experience.

4. Challenge

4.1. Lack of Blended Teaching Experience

It is the first time that the course "Transportation of Aviation Dangerous Goods" has adopted an online and offline blended teaching modality. The instructor with less experience with online teaching modality received insufficient pedagogical support in resolving emergencies such as failure of the flipped class or network outages in an entirely teaching process. The instructor unfamiliar with the blended teaching mode may understandably struggle to produce quality student outcomes without adequate emphasis on technology input and modern teaching training. In addition, the instructor was not conscious of quality teacher-student interaction which is an integral part of student learning in course delivered online. Thus, in several chapter lecturing, online classrooms

were less effectiveness than face-to-face classrooms with inadequate time for feedback and faculty engagement.

4.2. On-line Monitoring is Insufficient

Online teaching was mainly relied on Internet with little possibility of face to face communication, leading the instructor unable to monitor and manage students' learning in an effective way. For example, the platform only records the downloading and click times of students automatically, instructor cannot realize whether students have learned these materials in accordance with their personal status. In the flipped class, students can control their time in learning materials and watching videos in accordance with their personal situation. However, poorly-disciplined students are easy to quite learn to be addicted to online games or drama. Since online learning is generally not included in students' actual grades, it may cause insufficient motivation for students to learn online materials.

5. Optimization Strategy

5.1. Improving the Evaluation System

In the blended teaching modality, it is necessary to adopt multiple criteria and methods in the evaluation system to ensure that student's learning status, progress, effect and interactivity are assessed for each online and offline learning module. In face-to-face classroom evaluation system, except the scores of examination and assignments, we should pay attention to students' performance in class and the practical skills test as well. Among them, the performance in class is mainly on the teacher-student interaction, class-exercise, learning atmosphere, attendance, etc. Practical skill is to test the operation proficiency, i.e. goods packaging, filling out declaration, identifying dangerous goods, labelling, etc. In the online learning evaluation system, we should pay more attention to assess the completion of students' online courses through chapter quizzes, online test, peer-to-peer interaction and duration of students' browsing of each material.

5.2. Updating and Enriching the Teaching Content and Resource Timely

In the stage of constructing flipped class, the amount of online resources involved is huge so that instructors are supposed to follow the talents cultivation objective and course characteristics, select the latest and most popular detailed knowledge explanation and keep abreast of the discipline. As many regulations and criterions of dangerous goods update annually, the course content and extensional online resources should be timely supplemented and optimized in order to address the requirement of talents cultivation.

5.3. Raising the Awareness of Blended Teaching

It is predicted that the number of students enrolled in online courses will continue its upward trend in the future. Making a switch from the traditional classroom teaching modality to blended one requires higher education institutions and faculty to raising the awareness of educational reformation and practice. It is necessary to formulate a synchronizing and encouraging mechanism to ensure that the faculty has adequate motivation and development opportunities to conduct blended teaching modality. for example, instructors need to design online resources, provide students with effective feedback, and monitor online learning progress of students. Given the insufficient pedagogical support and heavy workloads that amounts of higher education instructors

faced, advocating for more teachers to be trained in how to effectively utilize digital media, and regard online teaching as instructors' actual teaching hours.

6. Conclusions

As many Chinese institutions of higher education struggle with student overpopulation and budgetary constraints, teaching practices and reform are imminent. Adopting online and offline blended teaching modality as an inevitable trend in educational reform and innovation which is not only the continuation of face-to-face teaching modality, but also the innovation of informatization education in the future. Blended teaching modalities with appropriate incorporation of digital media can allow the instructor to promote higher quality teacher-student interactions, foster increased student engagement, and improve student learning outcomes. When considering the merits of blended teaching mode, there are many institutional and personal obstacles we haven't to be ignored. Making the switch from a purely face-to-face classroom to an online and offline blended environment can be daunting and requires the use of new digital media. However, not all faculty members have the higher level of familiarity, proficiency, and pedagogical support with the technology used in online teaching. Therefore, the tough challenges of technological nonproficiency and inadequate supervision must be addressed.

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References

- [1] Lai Y. A. Choi, Wing S. Tang, "Effects of video-based flipped class instruction on subject reading motivation", *British Journal of Educational Technology*, vol. 50, pp. 385–391, July 2017.
- [2] A Vallée, J Blacher, A Cariou, E Sorbets, "Blended learning compared to traditional learning in medical education: systematic review and meta-analysis", *British Journal of Educational Technology*, vol. 22, pp. 294–311, Aug 2020.
- [3] K.F. Hew, M. Lan, Y. Tang, "Where is the "theory" within the field of educational technology research?", *British Journal of Educational Technology*, vol. 50, pp. 956–971, May 2019.
- [4] T. Anderson, P. Rivera-Vargas, "A critical look at educational technology from a distance education perspective", *Digital Education Review*, vol. 37, pp. 208–229, Jun 2020.
- [5] Lee M C. *Effects of Video Game-Based Instruction on Writing Achievement and Motivation in Postsecondary Accelerated Degree Programs*. proquest llc, 2017.