

Exploration and Practice of Blended Teaching Model in Textile Chemistry Course

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Abstract: Higher education of postpandemic has undergone significant transformations compared to prepandemic standards. Various blended teaching models, including online/offline blending, flipped classroom, etc. have been rapidly developed. This paper presents a method of blended teaching for undergraduate Textile Chemistry curriculum based on its characteristics and the limitations in our college while ensuring high educational standards and students' satisfaction. Firstly, it proposed the necessity of practicing blended learning in Textile Chemistry. Then, it designed and constructed the online teaching resources for this course. Finally, the new blended learning model was conducted on the sophomore experimental class. Feedback from students showed that blended learning mode is suitable and accepted by most of the students, and it has improved the course's classroom efficiency.

Keywords: Blended Teaching Model; Textile Chemistry; Undergraduate; Online Resources.

1. Introduction

Under the background of engineering certification of universities and the integration of art and industry, science and technology innovation in Chinese higher education, the course of Textile Chemistry has become a compulsory course for non-chemical engineering profession students [1-3], such as textile engineering, apparel design and engineering, and fiber fashion experimental classes in textile and apparel colleges and universities. Plus, the higher education of postpandemic has undergone significant transformations compared to prepandemic standards with the development of the computer networks, mobile self-media, and other advanced technologies. Various blended teaching models, including online/ offline blending, flipped classroom, technology-enhanced pedagogies, etc. have been rapidly developed [4-5]. The content of Textile Chemistry is broad and varied, involving knowledge of basic organic chemistry, dye chemistry, fiber chemistry, auxiliary chemistry, chemical analysis and other aspects. Figure 1 shows the main content of Textile Chemistry in most textbooks [6-7]. The "Textile Chemistry" course in our school is a compulsory basic course for the experimental class students of art-industry integration. The aim of this course is to introduce Textile Chemistry related knowledge, mainly including dye chemistry and surfactant chemistry to students based on their knowledge of organic and inorganic analytical chemistry. The course is the foundation for students to further their study of textile materials science, clothing finishing science and other courses [8]. In addition, the course has distinctive cross-disciplinary characteristics of textile and chemistry, which is of great significance for the cultivation of composite engineering talents with cross-disciplinary knowledge structure [9].

This paper presents a mode of blended teaching for undergraduates in their Textile Chemistry course based on the author's years of teaching experience. It was conducted with the help of the Chinese Super Star Learning platform for students. Among them are the online teaching resources redesigning and constructing, and the operation of the blended teaching model in the sophomore experimental class students. The learning effect was evaluated upon completion

of the course instruction.

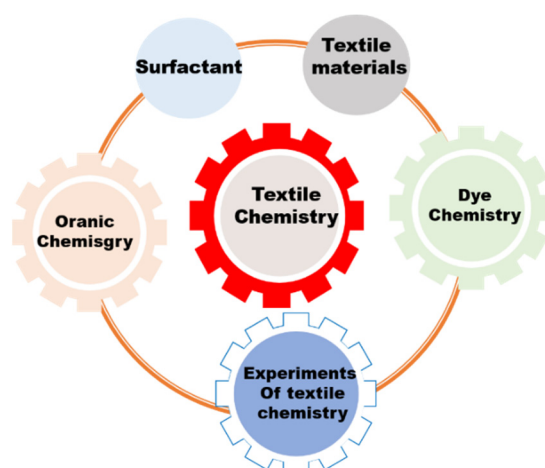


Figure 1. Main content of textile chemistry

2. The Importance of Blended Learning in Textile Chemistry

Textile Chemistry is a course with a large coverage of knowledge and strong theory, but the lecture time of the course is only 16 hours, so the students can't master what they have learned effectively. Textile Chemistry course is usually opened in the first semester of the sophomore year, and most of the students already have a basic knowledge of organic chemistry from their high school studies, but their chemical base is still weak. The traditional "lecture-based" teaching method, as the most widely used method of instruction on college campuses, is easy to conduct and organize for teachers, but considering the large amount of information in the classroom teaching, the students do not have enough time and basis to accept and understand, and resulting in passive acceptance for students, which is not proper for students' independent learning. With the development of web information, various online teaching resources have been greatly enriched. If offline traditional lecture and online network learning are organically combined, the two parts complement each other and mutually penetrate and promote, which can greatly improve the students' learning effect.

Therefore, immersing blended learning methods into the instruction of the "textile chemistry" course, and emphasizing the students' centered role in college education, not only can play the leading role of the teacher regulating the classroom, but also can improve the initiative and enthusiasm of the students as the main body of learning. This can also make up for the lack of offline lecture time and break through its contradiction with the large content.

Another primary challenge in Textile Chemistry teaching is that the quantitative aspects of this course, which are explained in lecture rooms (including dyeing mechanisms, surface tension, surface contact angle, wetting ability etc.) need to be applied to experimental operations in laboratories. However, most of the student's lack the basic chemical laboratory skills as they have never experienced such practice. Assuming that on-demand videos displaying laboratory experiments can be provided to students beforehand, they will learn the critical points of the content before even coming in contact with the actual laboratory equipment, leading to efficient improvement of their practical skills.

In addition, learning through web teaching resources online is relatively more effective as compared to learning at the laboratory or classroom since students can practice the experiment operation virtually or study potentially at any time and from any place, rather than relying on the limited room space and resources of the university [10]. Students will spend more time on their doubts by using class time for group activities or asking questions, which will help to increase students' interest in learning and develop good study habits. We hope that undergraduate students majoring in textile science will have the means to acquire comprehensive knowledge of Textile Chemistry through the redesigned course.

3. Construction of Online Teaching Resources

3.1. Basic Resources of Textile Chemistry Curriculum

Online teaching resources are the basis for the implementation of blended teaching in Textile Chemistry. The teaching team of Textile Chemistry in our school builds an online network teaching platform by utilizing the APP of Super Star Learning Channel, which provides rich online teaching resources, including multimedia electronic courseware, animations, videos, experts' forums, exercise books, supplementary lecture notes etc. In addition, as a subject with great practical properties for textile science, it is important to take some videos of the production of textile chemicals and their application in textile enterprises. Learning materials that related to the textile industry's development of cutting-edge technology and the latest achievements in textile science can also expand the students' knowledge, improving their understanding of the course content and allowing them to have a perceptual understanding of what they have learned from lectures.

3.2. Video Recording and Tasking Assignment of Key Content

Textile Chemistry, as a basic engineering course, is highly theoretical. Besides some concepts and formulas, it also involves lots of abstracted content, which is difficult for students to understand. Therefore, it is necessary to explain

the key and difficult parts of the content to students and this can be recorded as a video in advance and provided to students online before class. The recordings should be concise, highlighted, and with the abstract knowledge supplemented by animations to visualize them. Figure 2 is the video for the explanation of the basic theory of color. All these contents can be assigned to students as "tasks" and asked them to finish learning before the corresponding lectures, so that they can utilize the classroom time more effectively and master the lecture contents. The blended learning model is free and effective for students to study at any time from any place using their fragmented time, leading to a better mastery of knowledge and improving the effect of classroom time. It can also improve the students' studying interests for this course.

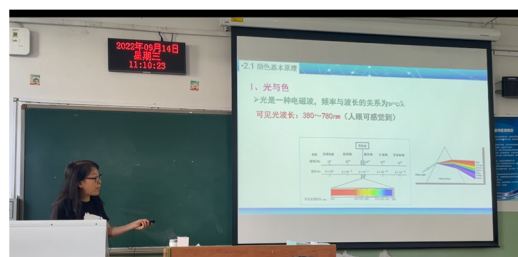


Figure 2. Online Video teaching resources

In addition to the theoretical content, digest video materials were also created for each of the experimental modules through editing a series of prerecorded videos of the teacher conducting experiments. The digest video materials not only involve details of experimental operations (such as how to use the instruments and general precautions), but also include some of the experimental results and on-the-spot analysis of the results, which make it available for students to experience the precise and quantitative nature of the experiments.



Figure 3. Online videos of the teacher conducting experiments

4. Practice of Blending Teaching

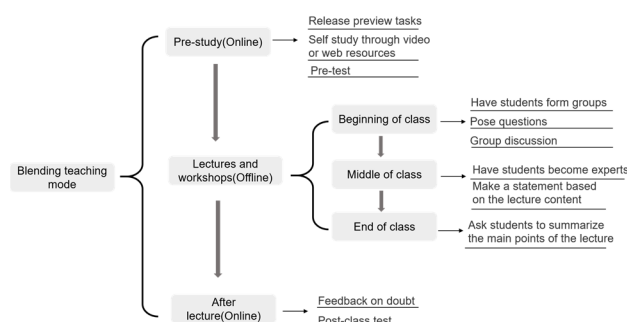


Figure 4. Flow of the blended teaching of textile chemistry.

Blended teaching also called diversified blended teaching refers to a diversified and multiplatform teaching method that combines the advantages of traditional lecture with

information technology [11]. It optimizes the selection and combination of all teaching elements to display the teacher's leading role of guiding, inspiring, and monitoring the teaching process, while fully reflecting the students' initiative, enthusiasm, and creativity in the learning process. The key to blended teaching is to use information technology appropriately for the presentation and transmission of knowledge by specific teacher and learners.

In terms of Textile Chemistry, we performed blended teaching by mixing the instruction of offline lectures and online learning. It is not only a mix of teacher-led activities and active student participation, but also a mix of student led learning and collaborative group learning. Furthermore, through our online teaching platform, it also builds multiple learning environments. This new teaching mode fully manifests the teacher's teaching objectives and the students' characteristics. It mainly includes three steps, and every step contains different parts as shown in Figure 4.

Presenting too much material for a given class is one of the biggest barriers to an effective lecture. Overloading too much information on students to the extent that they become frustrated and give up is an obvious trap for teaching, if fewer points are presented to students in the lecture, they will learn more and better. So it is significant to think carefully about what we can reasonably address in the time allotted. To do this, we arrange our blended teaching with three sequence steps. Firstly, through post preview tasks, we can know what our students already know, as research shows that information is more easily learned when it is linked to what one already knows. Secondly, build a bridge between the students' knowledge base and the new material or subject matter during lecture time. Finally, make sure the students' conclusion or summary ties the important information together. During these steps, we can form students into several groups and make them discuss about the posed questions or use a flipped classroom, as students learn more effectively when they are actively engaged than when they passively receive information. For practical skills, it is important for teachers to emphasize the key points and safety of chemistry laboratories and adopt a more information-based teaching mode to highlight students' independent learning and active exploration.

5. Students' Response

Students who took the Textile Chemistry course in autumn were asked to respond to an online poll asking about their reflections on the course and the usefulness of the flipped learning materials, and the poll results are shown in Figure 5.

From Figure 5, it can conclude that students are willing to accept new knowledge by watching or reading the course video or materials before lectures and then engage in active learning in the university classroom to consolidate or make a full understanding of their knowledge. Many publications have proven that flipped learning can make the study efficient and highly effective while minimizing the students' time spent [12]. Typically, the flipped learning materials should be selected or recorded with great care by the instructor. They should not be too complex or too long. Usually, every flipped learning material took no longer than 10~15 min. The modules are designed to focus on the main points of the content, reducing the learning time compared to traditional lectures.

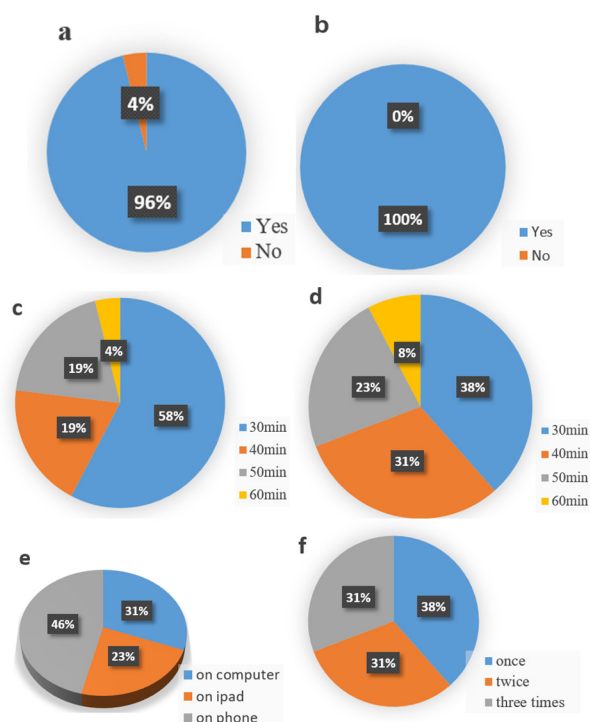


Figure 5. Poll results of students' responses to blended learning

- If you want to consolidate your knowledge by working on assignments outside class hours?
- Are the flipped learning materials necessary for you to understand the key knowledge of the lectures?
- How long did you finish your pretest averagely?
- How long did you finish your post-class test averagely?
- Where did you watch the video or flipped learning materials?
- How many times did you watch teaching materials on averagely?

6. Conclusion

This paper explained the importance of blended teaching of Textile Chemistry course for engineering students of non-chemistry subjects based on the learning characteristics in the post-epidemic era and the course. Then, the network teaching resources of Textile Chemistry were designed and constructed to meet the learning needs of different students. The blended teaching was implemented in the 2023 fiber fashion experimental class, and its teaching results were evaluated. The questionnaire results found that the teaching effect of the course has greatly improved.

Acknowledgments

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