EFFECT OF THE PROGRAM OF AEROSPACE DESIGN UNITED COURSES WEBSITE FOR UNDERGRADUATE AIRCRAFT DESIGN EDUCATION

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Abstract. **The Program of Aerospace Design United Courses (PADUC) website is a part of PADUC launched by Beihang University. Its development is divided into two stages. The first stage is to initiate “Virtual Design Workshop” (VIDEW) based on “Beihang-Purdue Joint Aircraft Design Courses Program” by Beihang University. The second stage is to establish the PADUC website. This site includes a Student Group and a Teacher Group. Its main modules are Personal Center, Curriculum Center, Design Center, Question & Answer, Experience Sharing, and Data Center. As a bridge between the member universities and students, the site provides a learning and exchange platform for students, teachers and experts using the website. It also creates conditions for the users to acquire knowledge and inspiration, and offers a platform of support for PADUC.**

1 INTRODUCTION

Aircraft Conceptual Design of Beihang University (BUAA) is a professional course for students majoring in aircraft design. It won the titles of ‘Beijing Excellent Course’ in 2006 and ‘National Excellent Course’ in 2008. As a compulsory course for an aircraft design major, the course introduces the general design of aircraft, especially the conceptual design process, to enable students to master the basic concepts, the main ideas and basic theories & methods. It also helps students to understand the general design methods and technology of modern aircraft. By paying attention to comprehensive conceptual design as a guide, this curriculum encourages students to cultivate their innovative ability and team spirit. Thus, it inspires students to utilize learned knowledge to actively solve problems in the design team. It also lays the foundation for future practical work.

Aerospace design is a systematic project that requires teamwork. Not only is teamwork essential to the industrial sector, but teamwork and exchanges between colleges both play critical roles in promoting each other. During 2011 and 2013, Beihang University launched ‘Beihang-Purdue Aircraft Design Joint Courses Program’ [1], based on the National Excellence Course Aircraft Conceptual Design. This program explored several joint teaching approaches, including joint student design teams, and face to face and remote lectures. A website called ‘Virtual Design Workshop (VIDEW, [http://aero.buaa.edu.cn](http://aero.buaa.edu.cn))’ [2, 3] which is similar to ‘Second
Life’ [4, 5], was developed to provide a network platform to accumulate and share students’ aircraft design concepts.

On the basis of preliminary exploration of VIDEW, Beihang University launched the ‘Program of Aerospace and Design United Courses’ (PADUC) in early 2014. Now PADUC has acquired the full support from members, such as Beihang University, Beijing Institute of Technology, Nanjing University of Aeronautics and Astronautics, Shanghai Jiao Tong University and Purdue University. It aims at gathering excellent resources of aerospace design courses from around the world, providing a communication and sharing platform, as well as a professional design support cloud. This program will explore cooperation through ‘in-depth sharing of resources, stimulating innovation, collaborative design communication’. With the contribution of each member course, we believe PADUC can drive the overall improvement and sustainable development of the aerospace design education community.

2 WEBSITE STRUCTURE

The PADUC website contains seven modules. As shown in Figure 1, there are Personal Center, Curriculum Center, Design Center, Question & Answer, Experience Sharing and Data Center. The following is a brief introduction to main modules.

![Figure 1: Seven modules of the PADUC website.](image)

2.1 Design Center

The Design Center module, as shown in Figure 2, includes the design schemes of all the teams since the implementation of PADUC. It provides two key words: 'school' and 'year', to scan the design schemes. In each scheme, it displays the results of each stage, the team members, the course and the parent project information. The design scheme only shows the second and third stages. The result of each stage uploads design pictures, 3D models, the report and videos. The report can be downloaded by teachers.
2.2 Curriculum Center

The Curriculum Center module contains the related courses offered by the PADUC members and the previous projects, as shown in Figure 3. It provides a reference for the students’ team scheme design.

2.3 Question & Answer

As shown in Figure 4, the Question & Answer module provides a communication platform for website users. Users can ask their own questions and reply to others’ questions in this module. The module also sets up a leaderboard in which a corresponding score can be obtained by answering a question. In the final examination assessment, the teacher will add the corresponding score to the students according to the leaderboard. Based on this module, students can not only solve the problem in the limited class time, but also receive answers...
from other students, teachers, and experts after class.

Figure 4: The Question & Answer.

2.4 Data Center

Various data, such as pictures, videos, models, literatures and software, can be uploaded or downloaded in the Data Center. Here students can obtain various types of professional information, and share their own resources. The module is shown in Figure 5.

Figure 5: The Data Center.

2.5 User Groups

This site includes a Student Group and a Teacher Group, corresponding to different permissions for each module. Students register and use the Student Group, teachers and experts register and use the Teacher Group.

- Student Group

Student Group can use all the modules in the site. In Design Center, students can build a new design scheme, or participate in an existing team by ‘Join in Team’. Students can also upload stage results to their Design Center for teachers to check.
Teacher Group can also use all the modules, however, the difference is that Teacher Group can download the stage result reports of team members and grade the scheme in Design Center.

3 THE SIGNIFICANCE OF PADUC WEBSITE

The first page must contain the Title, Author(s), Affiliation(s), and Key words. The Introduction must begin immediately below, following the format of this template.

3.1 Significance to Students

PADUC website can be regarded as an offline classroom, which is to supplement the teachers' classroom teaching. When students have a problem, they can ask the teacher in the classroom, but also can publish their questions on the website at any time, to be answered by teachers, experts and other students. Therefore, the website effectively expands the time dimension of students' learning, which is not only limited to classroom time. As the objects of discussion and knowledge sharing are not limited to students and teachers in their own school, but all the members' students, teachers and invited experts, the site effectively helps students to expand their breadth of knowledge. After receiving the design topic, with the previous schemes as a reference, students can have a better understanding of their tasks at each stage. Meanwhile, students can have better judgments on their final achievements. Even better, this website can connect students in different schools to carry out collaborative design. No matter which school students are from, by using the PADUC website, they can complete collaborative design as well as get guidance from their respective teachers. Consequently, the website can enhance communication between students from different schools, and strengthen the teamwork ability of students in the Internet era.

3.2 Significance to Teachers

Prior to the establishment of the site, the scale of students in the ‘Aircraft Conceptual Design’ course was so large (more than 200 students a semester) that the review of the team design was facing great difficulties. As the large number of students, even if taking the form of group review, it also took up a few times of the classroom time. In addition, due to limited teachers, each review group could only be responsible to several teachers. Nevertheless, every teacher has their own professional direction, so students could gain less professional review direction. Now with the PADUC website, it is not necessary to organize students to review ‘Aircraft Conceptual Design’ in class. All teachers can conduct a review of the students’ work before the prescribed deadline. The advantage is that students can get more opinions from more teachers to recognize the shortcomings of their work and teachers can work flexibly and relieve some work pressure. By browsing the Question & Answer module, teachers can also understand the teaching effect, in order to arrange their next teaching content.
3.3 Significance to Experts

Experts with a wealth of practical experience can assist students to learn more about industrial development and practice methods. In the evaluation stage of the students’ design scheme, the experts can present the evaluation from the achievability aspect. At the same time they can give professional solutions to students’ questions. Although students did not receive systematic design training, the practical application value of their designs may be relatively small. However, because of their extremely rich imagination and creativity, their designs present more innovativeness and diversity. In the assessment of the design, and exchange with teachers and students, experts are more likely to break with traditional thinking habits in order to get new design inspiration.

3.4 Significance to ‘Aircraft Conceptual Design’

The PADUC website currently has five domestic and foreign college allies. By combining with the domestic and foreign colleges in the aerospace courses, members can absorb the teaching advantages each other. Meanwhile, some of the outstanding, cutting-edge design concepts and means can be applied in industry. The universities can learn from each other in the exchange to promote the overall improvement of aerospace design education level.

4 SUMMARY

The PADUC website development is divided into two stages. The first stage is to initiate “Virtual Design Workshop” (VIDEW) based on “Beihang-Purdue Joint Aircraft Design Courses Program”. It has given teachers and students of both sides unique and valuable experiences. The second stage is to establish the PADUC website. As a bridge between the member universities and students, the site provides a learning and exchange platform for students, teachers and experts using the website. We do hope that more colleges and universities could join PADUC website, so that lessons learned and experiences gained in separate courses could benefit the improvement of the entire aircraft design education community.

REFERENCES