

Effect analysis of SPOC hybrid teaching based on deep learning in graphic creative course teaching

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ABSTRACT

As a local applied undergraduate institution, the SPOC blended teaching approach needs to be carried out with the help of deep learning in classroom teaching. Through teaching preparation, knowledge construction, deepening migration, and teaching evaluation for design, combined with teaching practice research, we carry out learning in terms of online and offline teaching methods and learning practicality, the relevance of learning content, video-based learning, and knowledge systematization, respectively. Through the regression analysis, we found that for the graphic creativity course with strong practicality, we need to make full use of the respective advantages of online and offline to cultivate students' practical ability, innovation consciousness, innovation spirit, and other comprehensive abilities, and finally complete the purpose of systematic learning for students.

Keywords: Deep learning, SPOC blended teaching, Graphic creativity, Evaluation of reflection

1 Introduction

With the continuous development of online technologies, deep learning as a goal to be pursued in education and teaching has become a current research hotspot. Deep learning can critically learn new ideas and facts, transfer existing knowledge to new contexts, make decisions and solve problems learning. The emergence of MOOC has accelerated the pace of educational models, and major local institutions are actively building their own online learning platforms. The blended teaching model based on SPOC is carrying out teaching and learning towards professionalization [1], which largely avoids the problems of insufficient student participation, emphasis on resource construction rather than instructional design, and lack of targeted instruction. SPOC is a form of teaching and learning that integrates a physical classroom with an online platform. It is itself a blended learning approach, which is more in line with the form and concept of university teaching [2]. Exploring the promotion of deep learning in a blended teaching mode from the perspective of instructional design is a current hot topic in education and teaching research[3]. It is a kind of mixed learning method itself, which is more in line with the form and concept of college teaching[4]. From the perspective of teaching design, it is a hot topic of current education and teaching research to explore the promotion of deep learning under the mixed teaching mode. we take must help to push the boundaries of the field and explore novel ways to align design education, research, and practice[5]. The key to art design education is to stimulate the creative thinking of designers and to strengthen the creative thinking and methods[6]. In order to improve all aspects of learners' abilities and achieve the educational and pedagogical goals of deep learning, instructional design oriented to deep learning is needed.

2 DEEP LEARNING

Deep learning, as opposed to shallow learning with isolated memorization and non-critical acceptance, originated from the experimental pedagogy research of Ference Marton and Roger Saljo, American scholars working in Sweden[7]. Deep learning refers to innovative ways of delivering rich core learning content to students and encouraging them to apply the knowledge and skills learned in their lives and social practices, emphasizing active learning and the ability to apply what they have learned flexibly and proficiently to solve real-world problems. Innovative approaches mainly involve students more actively in the teaching process, such as project-based, problem-driven, and inquiry-based teaching methods, and give play to the leading role of teachers and the main role of students in innovation and entrepreneurship education. Using innovative approaches to deliver learning content

to students in specific situations requires designing scenarios, designing tasks that stimulate learning interest, and designing processes that guide students to explore learning. It can be seen that deep learning, by mobilizing learners' motivation, focusing on the inner connection of knowledge, and emphasizing knowledge application, cultivates students' lifelong learning ability, knowledge application ability, and knowledge innovation ability in the process of learners' independent inquiry, which is suitable for the need of cultivating innovative talents in today's knowledge era. The literature aims to improve the ability of independent learning, inquiry learning, and collaborative learning, and take art design as an example to design various aspects of teaching to mobilize students' initiative, play the main role of students, and cultivate students' abilities in various aspects. Combining deep learning theory, blended teaching characteristics, the orientation of our university's applied undergraduate program, the teaching objectives of the art design, and the teaching design in the literature. This paper conducts the exploration of blended teaching based on deep learning and takes art design as an example to design four aspects: teaching preparation, knowledge construction, deepening migration, and evaluation and reflection.

21st century design requires a broad knowledge of many topics[8], In order to improve the ability of independent learning, inquiry learning and collaborative learning as the goal, it takes art design as an example to design each link of teaching to mobilize students' initiative, play the main role of students and cultivate students' ability in all aspects. Combined with the theory of deep learning, the characteristics of SPOC hybrid teaching and the teaching objectives of art design, This paper explores hybrid teaching based on deep learning and takes art design as an example. Finally, the students found that the learning designs were relevant for their pedagogical/didactical reflections and future use in schools with their own pupils[9], a new idea of hybrid teaching suitable for SPOC of graphic creative design course is formed through evaluation and reflection.

3 SPOC HYBRID TEACHING BASED ON DEEP LEARNING

Under the guidance of Deep learning, combined with SPOC blended teaching design, task-driven teaching idea and inquiry learning approach, this study designs blended teaching based on SPOC deep learning, as shown in Figure 1.

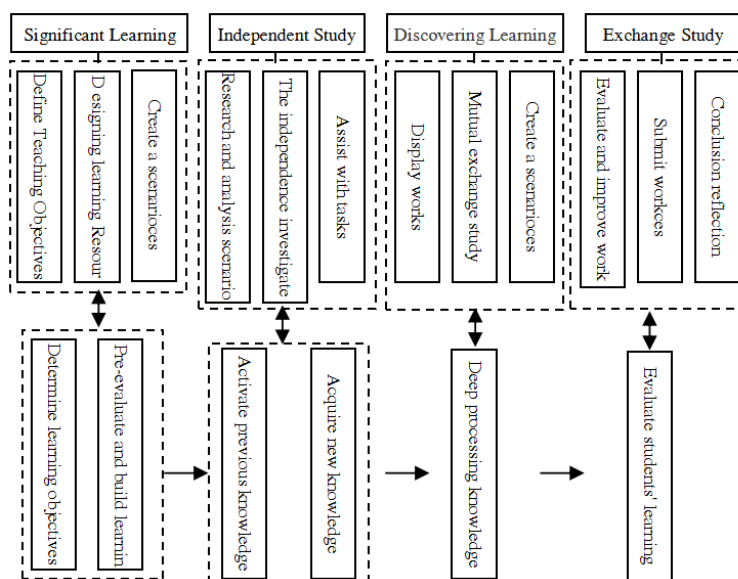


Figure 1. Hybrid instructional design for deep learning.

SPOC Hybrid Teaching

Small Private Online Course (SPOC) is a system of small private online courses for students, first introduced by Armando Fox, a professor at the University of California, Berkeley. He defined SPOC as a small, private online course. The promotion of this concept has provided a better platform for the development of a hybrid teaching mode in universities. Combining the domestic and international understanding of SPOC hybrid teaching, the SPOC course process is summarized in the form of Figure 2 for representation.

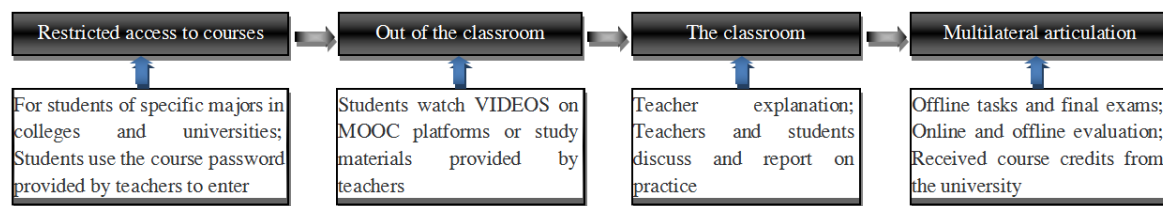


Figure 2. SPOC course process.

Instructional Preparation

Based on the institution's orientation, talent training objectives and pre-assessment of students and courses to determine course teaching objectives and teaching content, students are pre-assessed with the aim of understanding students' learning background, including learning styles, interests, and knowledge bases. Under the requirement of restricted access, all kinds of online course platforms are used to get involved in the study of theoretical courses, employ mutual assessments by peers, where students must score and comment on works, in order to develop their “independent” and critical thinking[10]. universities offer specialized courses for their students enrolled in a particular major and use various online course platforms to intervene in theoretical courses. Students participate in interactive discussions and practical activities in offline classes to complete the consolidation of the course.

Instructors record student learning data and interaction in the classroom as well as final exams based on the online platform to assess student performance. The platform also provides lecturers with the opportunity to fully understand the characteristics of students' learning and the effect of their learning progress, creating an online and offline flipped and hybrid teaching system. From a practical point of view, the SPOC hybrid teaching model is divided into four stages: front-end analysis, resource design, learning environment and activity design, and evaluation design. As shown in Table 1.

Table 1. Design of SPOC hybrid teaching mode

Number	Phase name	Details
1	Front-end Analysis	Object analysis, Objective analysis, Content analysis
2	Resource Design	Resource selection, Course length, Extended learning
3	Learning Environment And Activity Design	Online platform, Offline classroom, Practice teaching
4	Evaluation Design	Data platform, The interactive situation, Test scores

Knowledge Construction

It is necessary to point out as advantages the highest levels of academic performance, motivation to learn, interest in the subject and participation in the content[11]. Through a task-driven approach, based on students' existing knowledge, students are allowed to take the initiative to identify and acquire understanding knowledge under the guidance of the lecturer, integrate the knowledge into the corresponding knowledge system, further use it to solve problems and complete the meaningful construction of knowledge. This stage can be divided into four parts. 1) View the task, either as a single student or in groups, so that students can actively study and analyze the task, analyze the problems that need to be solved to complete the task, etc. Learning with tasks and problems makes the learning process meaningful and mobilizes students' initiative. 2) Resource learning, students learn with tasks on videos and other materials. Solve the problems encountered in learning through group communication, online communication, online QandA, etc. 3) Online test, through the online test to find out the missing or inappropriate knowledge, to further strengthen the learning process and consolidate the acquired knowledge. 4) Knowledge application, on the basis of the previous three links, through the form of group work to complete the corresponding tasks, progress to consolidate the acquired knowledge, and acquire the knowledge missed in the previous. Let students learn by doing, learn by doing, deepen their understanding in doing, and complete the knowledge construction in doing.

Deepening Migration

Under the guidance of the instructor, students process the raw information into complete and meaningful knowledge. Students are not only able to elaborate and understand the knowledge, but more importantly, they are able to apply what they have learned in different practical scenarios to solve problems. Each atmosphere provoked in the spectator an aesthetic experience through their perception and interaction[12]. This process involves groups presenting their completed work so that students can experience success and look for deficiencies or problems in each group's design work during the presentation process. The solutions are given through intra-group communication and internet search, and then exchanged among groups to compare the advantages and disadvantages of various solutions. On this basis, the instructor gives new application sites or adds new requirements to change the scenario, so that students can continue to improve and further deepen what they have learned. It makes students subtly flow to the design and improve their awareness and interest in design[13].

4 DEEP LEARNING-BASED SPOC BLENDED TEACHING DESIGN - AN EXAMPLE OF THE GRAPHIC CREATIVITY COURSE

Design Ideology

Self-directed inquiry, learning and communication, and summarizing and reflecting are three important types of teaching and learning activities that support deep learning. The teaching of each session is designed around these three types of teaching activities, mainly including the process of scenario introduction, task-driven, independent inquiry, communication and discussion, teamwork, and evaluation and reflection. The general design ideas of SPOC blended teaching based on deep learning include: 1) introducing the knowledge-generating scenarios into teaching, so that students can acquire knowledge in the process of interacting with the scenarios. 2) helping students establish an overall cognition of knowledge structure and knowledge system based on their existing knowledge and experience, helping students develop the conceptual framework of professional knowledge, and acquiring a closely related, meaningful and flexible 3) Helps students to expand their cognition, and can give expression to misunderstandings and give timely corrections.

Research Methodology

The combination of current teaching methods was conducted through two separate phases. In the first phase, the web pegging platform was tested on 91 students on the effectiveness of the SPOC blended teaching model. The second phase began offline to its 91 students to test the effectiveness of offline teaching. A total of 4 credit hours (200 minutes) were selected from the imagination theory part of the graphic creativity course, both online and offline. Finally, questionnaires were distributed and students were asked to evaluate the teaching in terms of the learning content, learning style, improvement measures, course grading mechanism, and final learning effect involved. The test is conducted in two phases with 91 students in conjunction with the current teaching methodology. In the first stage, a simple test was conducted on the implementation process online and offline under the SPOC blended teaching model. The second stage tested the effectiveness of teaching and learning. It provides a useful reference for improving a reasonable SPOC teaching system. Relevant conclusions were drawn through regression analysis of the results. Using the whole group sampling method, a total of 91 students from freshmen and sophomores in local universities were selected for sample collection, and 91 valid questionnaires were collected and collated. 为完善 SPOC 教学体系提供了有益的参考。在样本选取上, 男女比例、年龄段, Among them, 31 (34.1%) were male students and 60 (65.9%) were female students. 45 (49.4%) were freshmen and 47 (50.6%) were sophomores, and the ages of all subjects were between 18 and 20 years old. Finally, 91 valid questionnaires are collected and collated.

Data processing

All data collected will eventually be processed using Microsoft Excel 2010 and statistically analyzed using SPSS 22.0 software with chi-square test for significance of the variables between treatments.

Research Results

Descriptive Analysis of Factors Influencing the Effectiveness of SPOC Teaching

The online and offline effects were scored by 91 students surveyed on a percentage scale and statistically analyzed from several impact aspects in the survey report. The overall effect was between 70 and 80, in the good stage, as shown in Table 2. SPOC teaching was able to plan rationally in the learning activities and make full use of online and offline teaching activities to complete the learning tasks. To reduce the risk of common method bias, this study followed the previous proposal to design a set of SPOC hybrid teaching model scheme [14] and made appropriate changes based on it. The regression analysis revealed that the order of learning effect impact was learning practicability > relevance of learning content > video-based learning > systematic learning of knowledge. Meanwhile, according to the data analysis, the effect of online teaching is lower than that of offline teaching. In the practice of graphic creativity, it needs to be transferred from online to offline, and a large number of practical exercises need to be practiced in offline classes to improve and perfect.

Table 2. SPOC Teaching Effectiveness and Impact Factor Descriptive Statistics.

Factors of classroom evaluation	Number	Maximum	Std. Deviation	Minimum	Maximum
Video-based Learning	91	6.7942	77.958	61.4	94.6
Learning Practicability	91	5.7973	80.869	64.2	95.4
systematicity of knowledge	91	5.6595	79.951	65.2	93.9
Learning relevance	91	4.5665	80.643	70.1	90.1

Regression Analysis of Factors Influencing the Effectiveness of SPOC Teaching

By classifying students according to online and offline and influencing factors, the following results were obtained from a general linear regression of the final learning effects in terms of influencing factors such as practicality, video, systematicity, and relevance (Table 3).

Table 3. Results of Lecture Regression Analysis.

Factors of classroom evaluation	Class final evaluation results
Video-based Learning	0.208* (6.7942)
Learning Practicability	0.367** (5.7973)
systematicity of knowledge	0.219* (5.6595)
Learning relevance	0.322**(4.5665)

Note: ** $p < 0.05$, * $p < 0.1$, Std. Deviation in parentheses.

Through a survey of students, we listed several elements that students thought would ultimately affect the effectiveness of teaching and learning, and we quantified them. Among them, 32% of the students thought the practical effect of engaging in offline teaching was more prominent in the SPOC teaching mode. 31% of the students thought the relevance of the learning content was the most important feature of the SPOC teaching mode and an important factor in considering the effect. 10% of the students were concerned about the systematic arrangement of the knowledge learned in the learning activities, and 27% of the students had higher requirements for the quality of the screen of online learning resources. 27% of the students have higher requirements for the quality of online learning resources.

Analysis of the Difference Between Online and Offline SPOC Teaching Models

Learning practicability ($F=4.035$, $p=0.048 < 0.05$) differed significantly between online and offline, as shown in Table 4. This indicates that there are differences in the requirements for learning practicability, regardless of the grade level. The role of practicality should be emphasized at any stage of teaching. According to the results of the questionnaire, intensive offline teaching practical activities play an important role in the improvement of students' cognitive skills.

Table 4. Evaluation Differences Between Online and Offline Teaching and Learning Practicability.

Learning practicality	Sum of Squares	df	Mean Square	F	Sig.
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Between Groups	180.183	1	180.183	4.035	.048
Within Groups	3974.298	89	44.655		
Total	4154.481	90			

Note : Bartlett variance homogeneity test $P=0.687>0.05$, indicating homogeneity of data variance.

Video-based learning ($F=3.94$, $p=0.0051<0.05$) differed significantly between online and offline, as shown in Table 5. as the number of sensory pictures quality requirements was still distributed between grades. The majority of students for the graphics creativity class through the offline video playback is much higher than the online video learning.

Table 5. Evaluation Differences Between Online and Offline Teaching and Learning Practicability.

Video-based Learning	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	406.968	1	406.968	13.836	.000
Within Groups	2617.846	89	29.414		
Total	3024.814	90			

Note : Bartlett variance homogeneity test $P=0.144>0.05$, indicating homogeneity of data variance.

The systematicity of knowledge ($F=.651$, $p=0.422>0.05$) indicates that there is no significant difference between online and offline, see Table 6. It shows that there is no difference in the requirement for systematicity of knowledge regardless of the grade level, and the completeness of knowledge content and backward and forward linkage should be emphasized at any stage of teaching. According to the results of the questionnaire, there is no excessive difference between the knowledge systematicity of online teaching and offline teaching, which is also recognized by students of different grades.

Table 6. Evaluation Differences Between Online And Offline Teaching And The Systematicity Of Knowledge.

Systematicity Of Knowledge	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19.221	1	19.221	.651	.422
Within Groups	2628.543	89	29.534		
Total	2647.764	90			

Learning relevance ($F=10.260$, $p=0.02<0.05$), indicating that online and offline are significantly different, see Table 7. combined with the graphic creativity course, for students who have participated in SPOC learning offline, targeted learning to them can give them the most profound impression. And the online course provided the learning resources for the course. We can also see from the results of the one-way ANOVA that the advantages of targeted SPOC learning have been well reflected in the offline learning of students in different grades. Therefore, there is still much room for improvement in the course system of the online part of the SPOC hybrid teaching model.

Table 7. Differences of online and offline teaching and learning targeted evaluation.

Learning relevance	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	193.991	1	193.991	10.260	.002
Within Groups	1682.752	89	18.907		
Total	1876.743	90			

Note : Bartlett variance homogeneity test $P=0.747>0.05$, indicating homogeneity of data variance.

5 EVALUATION REFLECTION

Evaluation can identify the existing problems and facilitate further improvement of teaching methods in the later teaching process. Under the SPOC blended teaching mode based on deep learning, as a graphics creativity course, real-time feedback on existing problems through evaluation can continuously correct learning and promote more in-depth learning. Under the guidance of the instructor, students summarize and reflect on the whole project completion process, and the instructor summarizes and reflects on the whole teaching process to identify problems in time to improve teaching and improve teaching effectiveness.

Optimizing Online Learning and Learning Practicability Together

Patton has argued that art educators can invigorate their studio practices through the creative activity that are socially responsive and physically engaging[15]. The SPOC blended teaching mode based on deep learning needs to engage in practical learning on top of online teaching. It uses network teaching methods flexibly, uploads courses to the Internet, and shares resources, which provides a broad space for students to learn by themselves[16]. As a graphic creativity course most of the time requires students' hands-on design and production. Design thinking can be improved by online teaching and optimizing teaching resources. For example, introducing online teaching activities in MOOC paradigm allows students to expand their eyes and broaden their horizons, so that design thinking will be greatly enhanced in offline course practice.

Combination Of Centralized Offline Learning And Video-based Learning

Visual instruction is an effective pedagogy to improve student learning and performance[17]. Under the SPOC blended teaching mode based on deep learning, planned offline concentrated video-based learning can be carried out in combination with students' learning level and learning characteristics. The participants across all data sets noticed the online classes felt more informal than formal as a social encounter[18]. Graphic creativity class is a practical course, only when students have a new understanding of design thinking, they will show it in design creativity. The lack of effective monitoring means in the online course makes some students do not listen carefully to the lectures, resulting in poor homework completion. The offline focused video learning, through the classroom organization of students to show their work, exchange and discussion, mutual evaluation and other ways to allow students to learn the knowledge can be in-depth understanding and master. This behavior can effectively control the link of deepening, transferring and improving the knowledge learned by each student, so as to achieve the effect of deep learning.

Combining Online and Offline to Further Improve the Systematicity of Knowledge

Under the SPOC blended teaching mode based on deep learning, there is no obvious difference in the knowledge systematization between online and offline. But the combination of the two can further improve the systematicity of knowledge. Both online and offline teaching can present knowledge systematically, but the advantages of both are different. Online can show systematically the knowledge teaching, in classroom teaching, teachers must combine theoretical knowledge with practical operation closely[19]. Online can organize and collect the same course resources of graphic creativity to enrich classroom learning knowledge. The offline teaching advantage of the teaching process can be combined with different grade level situation flexible arrangement of teaching key points, so the organic combination of the two online and offline, can improve the systematic learning of knowledge.

Deepen the Learning Content and Focus on Having Learning Targeted Content

Deep learning, as the goal pursued in education and teaching, is a current research hotspot, and SPOC hybrid teaching is a new trend in the current development of the Internet. The lecturer summarized the situation for students' completion and set teaching scenarios in categorized groups and set up teaching scenarios for different groups[20]. design majors should serve people, society and regional development. Let each group continue to improve the design project, submit the work of each group as a unit, and finally form a summary report of classroom teaching. For example: let the students beautify their own or family photos, such as slimming and wrinkle removing for the characters in the photos to complete the practice of the course content under the novel corona virus pneumonia[21]. This stage can be organized, coordinated, and guided by the instructor for the process of online presentation of works, intra-group inquiry, and inter-group discussion. This stage aims to cultivate students' ability to identify problems, analyze them and solve corresponding problems, while transferring what they have learned to new scenarios to cultivate students' divergent thinking as well as creative thinking, reflecting the independent and communicative learning of in-depth learning. In the process of inter-group communication, mutual questions are asked through the web APP platform to discover their respective problems. The lecturer organizes the evaluation and scoring, and then summarizes the questions raised by other groups and the problems they found, improves the work, and finally submits the finished work and the class summary report.

6 CONCLUSIONS

SPOC hybrid teaching based on deep learning belongs to a small-scale online and offline teaching method, which overcomes the weaknesses of the current more popular online teaching MOOC platform, achieves systematic and rational arrangement of resources for graphic creativity course classes, and can be well combined with the highly practical graphic creativity course; in the process of promoting the reasonable construction of SPOC teaching, it is necessary to combine the characteristics of the course. Play a good mix of teaching and deep learning, use the multimedia platform for students to do a good job of classroom teaching, post-class guidance, feedback, etc.; through regression analysis can be seen that there is an obvious relationship between learning practicality, the relevance of learning content, and video learning, once again proving the advantages of SPOC mixed teaching in practice class deep learning. Finally, in the deep learning activities, the teacher's role in guiding SPOC blended teaching is also very crucial, guiding students into independent inquiry or collaborative learning activities, and teachers should create an authentic and complete teaching environment as much as possible[22].

References

1. Yang, Z., and Liu, Y. 2022. Research on SPOC Blended Teaching Mode of Financial Management Course. *Journal of Hubei University of Economics*. 19(1), 154-157..
2. Gao, Y.2020. Blended Teaching Strategies for Art Design Major courses in Colleges. *Int. J. Emerg. Technol. Learn*, 15(24), 145-158. [https://doi: 10.3991/ijet.v15i24.19033](https://doi.org/10.3991/ijet.v15i24.19033).
3. Private, S., and Course, O. 2013. From MOOC to SPOC: Lessons from MOOC at Tsinghua and UC Berkeley. [https://doi: 10.3969/j.issn.1009-5195.2014.04.002](https://doi.org/10.3969/j.issn.1009-5195.2014.04.002).
4. Yang, L., and Zhang, L.2016. Study on the Application Mode of SPOC in Traditional College Teaching. *Modern Educational Technology*, 26(5), 56-62.
5. Voûte, E., Stappers, P. J., Giaccardi, E., Mooij, S., and Boeijen, van A. 2020. Innovating a Large Design Education Program at a University of Technology. *She Ji*, 6(1), 50-66 . [https://doi: 10.1016/j.sheji.2019.12.001](https://doi.org/10.1016/j.sheji.2019.12.001).
6. Liu, X., Nagai, Y. Yabuuchi, K., and Cui, X. 2021. Use interactive media to enhance creativity of designers by stimulating the senses in the context of art design education. *Proc. Des. Soc.*, 1(8), 3319-3328. [https://doi: 10.1017/pds.2021.593](https://doi.org/10.1017/pds.2021.593).
7. Nickelsen, L. 2013. Towards a Blended Learning Model Based on DeepLearning Theory. *Practice and Research*. [https://doi: 10.13541/j.cnki.chinade.2013.04.008](https://doi.org/10.13541/j.cnki.chinade.2013.04.008).
8. He, L., and Li, J. 2005. Promote students' deep learning. *Modern Teaching*, 5, 29-30.
9. Meyer, M. W., and Norman, D. 2020. Changing Design Education for the 21st Century. *She Ji* 6(1), 13-49. [https://doi: 10.1016/j.sheji.2019.12.002](https://doi.org/10.1016/j.sheji.2019.12.002).
10. Lai, Y. C., and Peng, L. H. 2020. Effective teaching and activities of excellent teachers for the sustainable development of higher design education. *Sustain.*, 12(1). [https://doi: 10.3390/su12010028](https://doi.org/10.3390/su12010028).
11. González-Zamar, M. D., and Abad-Segura, E. 2020. Implications of virtual reality in arts education:Research analysis in the context of higher education. *Educ. Sci.*, 10(9),1-19. [https://doi: 10.3390/educsci10090225](https://doi.org/10.3390/educsci10090225).
12. Mesías-Lema, J. M., López-Ganet, T., and Calviño-Santos, G. T. 2020. Atmospheres: Shattering the Architecture to Generate Another Educational Discourse in Art Education. *International Journal of Education and the Arts*, 21(6). <https://doi.org/10.26209/ijea21n6>.
13. Hsieh, Y. Y., Chen, C. C., and Chen, W. Y. 2021. Form Development from 2D to 3D: The Basic Design Courses for Higher Education. *J. Art Des. Educ.*, no. Sala 2017. [https://doi: 10.1111/jade.12377](https://doi.org/10.1111/jade.12377).
14. Yao, L., and Zhou, G. 2018. The design and teaching effect analysis of SPOC mixed teaching mode in colleges and universities. *Education Research Monthly*, (12). [https://doi: 10.16477/j.cnki.issn1674-2311.2018.12.011](https://doi.org/10.16477/j.cnki.issn1674-2311.2018.12.011).
15. Sweeny. 2020. Investigate the misuse of technology as a gesture of freedom: Glitch Dysfunction in New Media Art and Art Education. *Vis. Arts Res.*(15pages), 46(2). [https://doi: 10.5406/visuartsrese.46.2.0015](https://doi.org/10.5406/visuartsrese.46.2.0015).
16. Zhang, B. and Rui, Z. 2021. Application analysis of computer graphics and image aided design in art design teaching. *Comput. Aided. Des. Appl.*, 18(s4), 13-24. [https://doi: 10.14733/CADAPS.2021.S4.13-24](https://doi.org/10.14733/CADAPS.2021.S4.13-24).
17. Lau, S. K., Joshi, N., and Pang, M. F. 2021. Visual Instruction to Enhance Teaching of Technical Subject to Design Students. *Int. J. Art Des. Educ.*, 40(1), 165-183. [https://doi: 10.1111/jade.12343](https://doi.org/10.1111/jade.12343).

18. Marshalsey, L., and Sclater, M.2020. Together but Apart: Creating and Supporting Online Learning Communities in an Era of Distributed Studio Education. *Int. J. Art Des. Educ.*, 39(4), 826-840. <https://doi:10.1111/jade.12331>.
19. Hao, H. 2021. Application of Case based Teaching Method in Computer Aided Design Teaching of Art and Design. *J. Phys. Conf. Ser.*, 1744(3), 1-5. <https://doi:10.1088/1742-6596/1744/3/032095>.
20. Zhu, G., and Xu, P. 2021. Discussion on studio Teaching of Art Design under the Background of Digital Innovative Design Technology". *E3S Web Conf.*, 236, 4-7. <https://doi:10.1051/e3sconf/202123605068>.
21. Xiong, L. 2021. Dilemma and Countermeasures of Art Design Education in Colleges and Universities .*Proceedings of the 6th International Conference on Arts. Design and Contemporary Education*(4 pages) Red Square in Moscow Russia:ICADCE. <https://doi:10.2991/assehr.k.210106.063>.
22. Yang, W., and He, F. 2008. New requirements of teacher skills in blended teaching. *Distance Education in China.* 6, 63-66. <https://doi:10.13541/j.cnki.chinade.2008.06.003>.