

An evaluation of curriculum teaching based on the virtual classroom

Shaofei Wu

Wuhan Institute of Technology
Wuhan, People's Republic of China

ABSTRACT: Virtual classroom teaching has become a trend at universities, as a way to expand student knowledge and improve practical skills. On-line resources, on-line training, remote study and an open curriculum must be considered integral to virtual classroom teaching. However, as the application of the virtual classroom expands, the teaching that is applied needs to be evaluated. In this article, the author has considered the life cycle of a virtual classroom curriculum, including design, implementation, evaluation and adjustment. A reference evaluation index system was developed comprising 50 evaluation indexes, which was demonstrated through an analysis of the course, Psychological Health.

INTRODUCTION

The virtual classroom, also known as a virtual learning environment (VLE) or learning management system (LMS), generally, refers to education resource availability and learning activities via e-learning platforms [1]. University teaching is transitioning, from the traditional mode to applying emerging media, so as to provide a new approach - the virtual classroom for students.

The most representative overseas virtual classroom projects are the edX project at Harvard University and MIT, as well as the virtual campus project of the Polytechnic University of Valencia (UPV) or the University of Salamanca [2]. The operation of a virtual campus includes individual learning and mixed project interactive learning. To establish this new mode, it is necessary to set up a comprehensive and co-operative framework inside the campus, and to apply systematically the new teaching approach to students who are learning, with multimedia support to assist their mastery of the new environment. The virtual classrooms in China contain on-line resources, on-line training, remote learning, and an open curriculum plan, among other activities [3][4].

During the implementation of virtual classroom teaching, traditional classroom teaching and digital teaching are applied in an overlapped and mutually complementary way. This plays an important role in promoting knowledge dissemination and technological awareness. The virtual classroom, generally, is appreciated by students, as a result of the abundant resources and free time it allows, as well as autonomous study, intuitive knowledge and selective contents; it also has a great impact on higher education:

- The virtual classroom impacts greatly on the effect of traditional classroom teaching. Learning in a virtual classroom changes the way students receive information, which gradually eliminates the intensive, systematic and face-to-face nature of the traditional classroom.
- The quantity of knowledge in a virtual classroom is very large, requiring students to distinguish the relevant from the irrelevant, and not just blindly accept information.
- A virtual classroom requires high student ability for autonomous learning. If a student lacks a good autonomous learning ability, the introduction of a virtual classroom may weaken the effect of the teaching. If the virtual classroom is introduced into a compulsory course, the university should prudently consider the problems, such as how to design the curriculum, and how the teachers master and evaluate the progress and learning of the class.

Wuhan Institute of Technology provides on-line classroom resources, such as technology entertainment design (TED), curriculum resources and course resources within the campus network. A virtual classroom pilot project was introduced at the beginning of 2011. The courses involved were Chinese Language and Psychological Health Education.

The on-line curriculum resources include design of the syllabus, arrangement of teaching content, requirements for class hours, homework requirements, assessment and credit allocation. With the virtual classroom, problems that need to be addressed include how to evaluate the reasonableness of the curriculum, how to define when students reach the expected learning goals, how to assess students and how to confirm the credits students get.

MODELLING

The evaluation of virtual classrooms, such as Web-based studying and on-line training, has been studied in China and elsewhere for a long time. The main model that has emerged is the Kirkpatrick model [5]. This focuses on key points of the evaluation and specific aspects, such as teaching, resources and platform.

The work presented in this article included the Kirkpatrick model and an evaluation method is proposed for a virtual classroom curriculum, with the life cycle of a curriculum development as the research object. The main elements in the entire life cycle are design, implementation, assessment and adjustment, which are used as evaluation indexes. The evaluation index system was used to evaluate the Psychological Health course. The course was surveyed by questionnaire to identify existing deficiencies.

The aim of the model outlined in this article was to cover the evaluation of the entire life cycle of the course, from demonstration to confirmation, from syllabus design to content preparation, from chapter division to schedule arrangement, from teaching exchange to performance assessment and from effect evaluation to programme adjustment. The aim was to confirm the elements contained in the life cycle of the course, using the virtual classroom, as shown in Table 1.

Table 1: Elements of the virtual classroom life cycle.

Elements	Description
Course objectives	Set teaching objectives, content and requirements
Learning environment	Define the class hours for students' study via the virtual classroom
Prerequisites	Set necessary skills for students to start the course
Teaching approach	Confirm resources and materials used in teaching
Methods	Confirm skills involved in teaching
Activities	Mission and activities during teaching process

Given the elements of the virtual classroom life cycle in Table 1, the life cycle stages for the virtual classroom teaching are identified in Table 2.

Table 2: Stages of the life cycle of virtual classroom teaching.

Stage	Evaluation contents
Course demonstration stage	<ul style="list-style-type: none"> Requirements for students, such as learning demand, habits of students and foundations of future student groups Confirm target audience of virtual classroom, i.e. future student groups and course foundation, learning objectives and quality assurance Human and material resources, cost budget
Course planning stage	<ul style="list-style-type: none"> Course outline planning Content planning Teaching and learning methods Schedule planning
Course design stage	<ul style="list-style-type: none"> E-learning platform used for virtual course curriculum development (resource integration/internal information system implementation, autonomous development) Preparation of course textbooks (contents, structure, availability, accessibility) Design activities (navigation, unidirectional learning, interaction, feedback, assessment and additional functions)
Course development stage	<ul style="list-style-type: none"> Teaching design and participants Teaching methods (on-line guidance, task-based feedback, co-ordination) Teaching (motive, promotion, feedback, participation and use ratio) Communication, co-ordination and interaction Evaluation (differences between content structure, methods and objectives)
Students' learning stage	<ul style="list-style-type: none"> Study guide and platform of resources Learning motivation Platform performance monitoring Diversified selection

Stage	Evaluation contents
Teacher feedback stage	<ul style="list-style-type: none"> • Virtual teaching technology training • Teaching content training, on-line teaching method and incentive skills • Availability of supporting resources (software, hardware and technicians) • Timeliness of feedback • Using opinions from teachers

Evaluation of the content in Table 2 shall be carried out by measurable indexes and by data collection tools. In the case analysed in this article, stakeholder evaluation was used. Stakeholders include teachers participating in course planning and design, teachers and managers participating in virtual course teaching support, and students participating in course learning. Relevant data were collected by questionnaire, so as to evaluate virtual classroom teaching of the course. The evaluation reference questionnaire indexes are shown in Table 3.

Table 3: Evaluation questionnaire.

Primary index	Secondary index
Expected effect	1. Whether the course setting complies with training objectives
	2. Whether the prerequisites for course selection are clear
Objective setting	3. Whether the course learning objectives are clear
	4. Consistency between course objectives and the major direction of students
Course planning	5. The expected teaching resources included are available
	6. The course planning clearly and accurately reflects the teaching objectives
	7. The teaching content is consistent with the planning
	8. Teaching schedule is balanced
Guide for virtual classroom learning	9. Whether the guide is completed, including content such as learning theme, learning activities, schedule, and test and assessment
	10. Whether the guide is clear and understandable
Teaching process	11. Communicate with teachers smoothly, effectively
	12. The channel for acquiring resources is always smooth and effective
Teaching approach	13. Whether the virtual classroom teaching methods are diversified
	14. Whether the progress of students can be monitored
	15. Whether there is proper form to provide teacher's information (e-mail, bulletin board, etc)
	16. Whether the problems generated during the learning of students can be solved
	17. Whether the teaching methods are consistent with the teaching content
Teaching-assisted practices	18. Whether the teaching-assisted activity indications are clear
	19. Whether the teaching-assisted activity allows enough execution time
	20. Whether the teaching-assisted activity is arranged during virtual classroom teaching
	21. Whether the demand level of virtual classroom teaching for the assisted activities is high enough
	22. Whether the difficulty of activities is consistent with students' current theoretical understanding
	23. Whether the theoretical study conducted and practical activities arranged are properly connected
Virtual classroom electronic supporting platform	24. Whether the management of the electronic supporting platform is convenient
	25. Whether the operation of the virtual classroom achieves the expected effect
	26. Whether the technical support for the virtual classroom are publicised
	27. Whether the response time of the virtual classroom is adequate
	28. Whether, in operation, the virtual classroom detects problems
	29. Whether the communication tools (e-mail or self-platform) operate normally
	30. Whether the support of virtual classroom-assisted activities (submission, feedback) are satisfactory
	31. Whether the inspection and evaluation tests of the virtual classroom are supported in a timely way
	32. Whether the resources (available laboratory, available time period, etc) are sufficient
	Learning evaluation
34. Whether the evaluation process is fair	
35. Whether the assessment and tests are consistent with the objectives of the course	
Theoretical resources	36. Whether the theoretical materials are sufficient
	37. Whether the theoretical materials are acceptably difficult

Primary index	Secondary index
	38. Whether the theoretical materials are distributed during learning
	39. Whether the form of theoretical teaching materials is proper
	40. Whether theoretical learning module structures are coherent
	41. Whether there are enough booklist materials or Web links during learning
	42. Whether the theoretical learning materials are reviewed and up-to-date
Practice resources	43. Whether the practical resources (software and items) are reliable and sufficient
	44. Whether the technical support that the practical resources depend on is sufficient
Information transfer	45. Before learning: whether students knew the course plan, objectives, requirements and assessment methods
	46. Whether the information communication and transfer methods are familiar and publicised
	47. Whether the technical support is sufficient to solve problems generated during teaching
	48. Whether the teachers can provide feedback to improve learning
Response time	49. Whether the response time of the teaching is acceptable
	50. Whether the response time of technology support is acceptable

During curriculum evaluation, key indexes from the reference questionnaire were revised in the preparation of the questionnaire. The range of each evaluation index is 0 to 10 (0 represents completely dissatisfied, to 10, which represents complete satisfaction).

EVALUATION - A CASE STUDY

The virtual classroom course, Psychological Health - which is run at Wuhan Institute of Technology - was evaluated, to discover the effects of the teaching and how improvements may be made. The Psychological Health course is for freshmen who have studied psychological health through traditional teaching and already have basic knowledge of psychology. The aim of the course is to expand psychological knowledge via the diversified virtual classroom resources and, in addition, make a Web-based *one-to-one* and *one-to-many* class possible. This compensates for insufficient feedback in traditional classroom teaching and should assist students to cope with the course. The evaluation method checks the completion of on-line homework, which is assessed and scored by teachers.

The psychological health virtual classroom requires the bidirectional participation of teachers and students. The teaching evaluation indexes contain 13 categories, including expected effect, setting objectives, course planning, virtual course learning guide, teaching process, teaching method, teaching-assisted practices, virtual course electronic supporting platform, learning evaluation, theoretical practice resources, information transfer and response time. A questionnaire survey of eight teachers and 150 students was carried out at the end of the semester. The range of responses was from 0 to 10, as discussed above. The evaluation results are shown in Table 4.

Table 4: Results of the Psychological Health virtual classroom evaluation.

Evaluation indexes	Scores (0-10)
Expected effect	9
Setting objectives	9
Course planning	7
Virtual course learning guide	6
Teaching process	7
Teaching method	6
Teaching-assisted practices	4
Virtual course electronic support platform	4
Learning evaluation	7
Theoretical practice resources	9
Information transfer	5
Response time	5

The specific investigation indexes selected will be different for various courses, reflecting variations in course background, learning requirements, teaching methods and evaluation methods. Therefore, when evaluating specific courses, the survey objects and content should take account of the curriculum, and the index system should be selected accordingly.

CONCLUSIONS

Virtual classroom is the supplementation and extension of traditional classroom teaching. Nowadays, with the maturing of the evaluation system of traditional classroom teaching, the evaluation of virtual classroom teaching is an important

activity. The evaluation process should be centred on the full life cycle, with proper evaluation indexes selected, and feedback of the actual status and defects of course teaching, all of which play an important role in education and teaching at universities using the new media technologies.

In addition, the application of a whole-process questionnaire, based on structural indexes, helps to design and implement further Web site electronic systems. This allows a systematic and qualitative evaluation of students during learning and teachers during teaching in the virtual classroom teaching process. It also provides a timely feedback mechanism for course teaching. This is also the direction of further research.

ACKNOWLEDGMENT

The work is supported by the Doctoral Fund of Wuhan Institute of Technology (201210304007).

REFERENCES

1. Shyr, W-J., The application of the case teaching method to a mechatronics course. *World Trans. on Engng. and Technol. Educ.*, 6, 2, 309-312 (2007).
2. Panchenko, D., The Sherrington-Kirkpatrick model: an overview. *J. of Statistical Physics.* 149, 2, 362-383 (2012).
3. Mohtar, A., Nedic, Z. and Machotka, J., Digitally controlled resistors for the remote laboratory *NetLab*. *World Trans. on Engng. and Technol. Educ.*, 6, 1, 67-70 (2007).
4. Aziz, E-S.S., Esche, S.K. and Chassapis, C., A scalable platform for remote and virtual laboratories. *World Trans. on Engng. and Technol. Educ.*, 5, 3, 445-448 (2006).
5. Tian, Y., Liu, H. and Yin, J., Evaluation of simulation-based training for aircraft carrier marshalling with learning cubic and Kirkpatrick's models. *Chinese J. of Aeronautics*, 6, 1, 174-180 (2015).