Open Model of Management Laboratory from the Perspective of Students

Rui-Jun ZHANGa,*, Ye LIUb, Yong-HongYANGc, Zhong-HuaYANgd
and Jiang-Hua DAIe

School of Management, Wuhan University of Science and Technology, Wuhan 430081, P.R. China

azrjdoctor@26.com, b2583075098@qq.com, c1021270319@qq.com, dyzh100@263.net,
wustdjh@126.com

Keywords: Management subject, Open laboratory, Students’ perspective, Cloud technology, Questionnaire

Abstract. The extensive use of mobile terminals leads to fundamental changes in the scene experience of management students’ practice. On the other hand, the traditional experiment mode in computer laboratory has been difficult to meet the personalized needs of cultivating students’ practical ability. By way of questionnaires, this article makes a survey on 120 senior students who are from school of Management in Wuhan University of Science and Technology, in which four aspects were involved: experiment teaching, competition training, project practice and laboratory opening. On the basis of analysis results, a 4-dimension open management practice teaching system of <time, space, content, layer> was established based on cloud technology. A layer-dipped way was utilized in the system by the way of course experiment - competition simulation - project practice. Eventually a school-enterprise cooperation innovation cloud platform was formed which can achieve resource sharing and enhance the practical ability of management-major students.

Introduction

The traditional laboratory management model of management subject has many problems[1], such as excessive concentration of resources, high construction costs, high rate of idle equipment, great limits in open time and space, which make it difficult to meet the practice teaching needs of flexible deployment, on-time response, quick construction of various information system and practice scenes. In recent years, with the popularity of mobile terminals such as mobile phones, traditional closed teaching model of laboratory is extending to open terminals such as computer, mobile phones and tablet. Especially the smart phone and pad gradually make mobile access and fragmented learning as a new trend. Therefore, the corresponding practice teaching open model will be further extensive and in-depth.

Some scholars have researched the management laboratory construction and open model[2]: the literature[3] analyzed the problems existed in open laboratory, such as insufficient funds, lack of effective management system, imperfect mechanism of talent, etc; On the basis of exploring some open practice project, Li, et al established three main body and eight layer quality evaluation system[4]. The literature [5] brought forth three-line parallel driven laboratory open model; Jia, et a divided laboratory open model into appointment-experiment, scientific research project, extracurricular experiment base, school-enterprise cooperation and so on [6]. The above research prefers to qualitative description, and is less to give focused proposals based on research data. This article presents an analysis of questionnaires of management laboratory open model from several aspects such as course practice, competition and project, and proposes a 4-dimension open management practice teaching system of <time, space, content, layer>.

Survey Method and Object

Questionnaires were designed to investigate college students’ opinion for opening laboratory, in which 18 questions were set by combining with the self-experience and practical activity of students. The questionnaires were distributed to the senior students in school of management, Wuhan
University of Science and Technology. The number of distributed questionnaires was 120, and 115 of them were returned. So, the return rate was 95.83%, in which the number of effective questionnaire was 110. The method of secret survey and questionnaire checking were adopted to ensure the stability and effectiveness of the questionnaire. Statistical analysis was carried out by questionnaire analysis software such as questionnaire star, SPSS, and the results were further analyzed. Target group was accurate positioned to ensure reliability and validity of the results of the survey. At the same time, interviews with individual students were held in order to obtain some constructive views on some issues.

**Questionnaire Analysis of Open Model of Management Laboratory**

Questionnaire can be divided into four aspects which include the experimental teaching, professional competition, practical activities and laboratory opening. Only the main issues were listed due to the limited space.

**Experimental Teaching**

This part mainly investigates the overall effect of the students’ experiment, curriculum design and some suggestions of improvement.

The survey results showed that good effect on experiment was 27.27%, the average was 64.55%, the percent of not good and not clear were 7.27% and 0.91% respectively.

Students also cited the current problems in experiment teaching, sorted in descending order as follows: the single teaching form (55.45%), insufficient attention to the opening of the laboratory(52.73%), insufficient of laboratory communication (48.18%), the low attendance of experiment course(46.36%), lack of specialized practice guidance teachers (40%), the incomplete laboratory management system (31.82%).

To the multiple-choice question, *How to improve the effect of experiment course?* the results of the survey is shown in figure 1.

![Figure 1. Suggestions for improvement of experiment course effect.](image)

For curriculum design process, a survey of 21 courses design effect was conducted, which covered 8 majors, such as information management, accounting, business administration, e-commerce and so on. The result is good(36.36%), general(54.55%), not good(8.18%) and not clear(0.91%). For suggestions to improve the effect of course design, the results of the survey is shown in figure 2.

![Figure 2. Suggestions to improve the effect of course design.](image)
From the above statistical data, we can draw that it gradually becomes a trend to increase the intensity of laboratory opening, strengthen the management of teachers, and increase the experimental guidance methods (such as remote guidance, cloud technology).

**Professional Competition**

This part mainly investigates students’ participation in competition (shown in table 1) and students' attitude to the contest.

As can be seen from table 1, students’ participation in the contests is major-related. When asked, *Whether the contest participation can improve their own abilities?* 69.09% of the students answered *yes*, 23.64% of the students answered *don't know*, only 7.27% of the students answered *no*, which make it clear that students accept professional competition.

<table>
<thead>
<tr>
<th>project of competition</th>
<th>number of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network virtual operation competition</td>
<td>43</td>
</tr>
<tr>
<td>Sand table simulation contest</td>
<td>40</td>
</tr>
<tr>
<td>Entrepreneurship simulation contest</td>
<td>26</td>
</tr>
<tr>
<td>Challenge cup</td>
<td>29</td>
</tr>
<tr>
<td>Management decision simulation contest</td>
<td>33</td>
</tr>
<tr>
<td>Enterprises’ competition simulation contest</td>
<td>18</td>
</tr>
<tr>
<td>The e-commerce challenge</td>
<td>37</td>
</tr>
<tr>
<td>Accounting skills contest</td>
<td>30</td>
</tr>
<tr>
<td>Sand table simulation contest of human resources management</td>
<td>21</td>
</tr>
<tr>
<td>Marketing planning challenge</td>
<td>23</td>
</tr>
<tr>
<td>others</td>
<td>17</td>
</tr>
<tr>
<td>Effective number of answers</td>
<td>110</td>
</tr>
</tbody>
</table>

**Practice Activity**

This part mainly investigates the situation of the students' participation in cognition practice, production practice, graduation practice and project practice.

When asked, *Whether the professional practice can improve their own comprehensive abilities?* 75.45% of the students answered *yes*, 20.91% of them answered *don't know*, only 3.64% of them answered *no*.

For the performance evaluation of professional practice, 40% of the students remarked *good*, 51.82% of them remarked *general*, and 5.45% and 2.73% students remarked *bad* and *not clear* respectively.

**Laboratory Opening**

This part mainly focuses on the problems existing in the laboratory opening, the opening model and the effect.

On the issue of *Can more open laboratory provide students with more opportunities to practice?* 74.55% of the students thought *yes*, 23.64% and 1.82% of the students thought *not clear* and *no* respectively.

For the open model of laboratory, the students provided several open models based on their own experience respectively, which can be listed in descending order as follows: the phone APP (59.09%), online booking (50.91%), open experiment (29.09%), cloud platform (20.91%). It is visible that students have certain expectation on laboratory opening, but the lack of the understanding of new technologies such as cloud platform.

For the effect of the open laboratory, most of the students hold a positive attitude. They listed its benefits, in descending order as follows: saving time, more efficient (67.27%), time freedom
(62.73%), more higher resource utilization rate(54.55%), more wider experimental research subjects(27.27%).

For open scientific research project, the students also showed great interest, 74.55% students want to join the open projects led by the tutors, such as national natural science foundation sponsored by governments and enterprises entrusted projects; 25.45% students want to join the open projects led by themselves, such as college students business plan, enterprise entrusts community projects.

**Result Analysis**

According to the above survey, the following conclusions can be drawn by combining with the interview results: there is a strong vision for students to improve their own ability, hope schools and colleges to build more platforms which can hold more open experiments, more professional contests and more projects to improve their core competitiveness.

**Management Laboratory Open System**

In order to solve the above problems, we designed and constructed a management laboratory open system based on the cloud technology. This system adopts a layer-dipped way of course experiment-competition simulation-project practice, and opens from four dimensions as time, space, content and layer, as shown in figure 3.

![Figure 3. Management laboratory open system based on the cloud technology.](image)

**Construction of Cloud Platform**

Management practice teaching has features such as diversified scenes and strong competition, which needs to deploy flexibly, respond on time and integrate quickly corresponding software and hardware resources. Therefore, we build a unified virtualized cloud platform in four layers: hardware layer, software platform layer, fundamental application layer and multiple access layer.

The hardware layer mainly makes up of servers and network. The former contains various blade servers, such as file servers, application servers, Web servers and son on. The latter mainly offers
network management services such as the fundamental network of system application, network load and flow control.

Considering unity and convenience of the platform, the software platform layer mainly offers services such as identification, data exchanging and resource scheduling.

The fundamental application layer loads various practice platform software, which include various professional open experiment platform such as sandbox simulation, project cost and salary design, competition platform as enterprise management simulation and various project platform entrusted by enterprise.

The multiple access layer provides various terminals’ access such as mobile phone, computer and tablets through campus network under the protection of firewall.

**Open Experiment Platform**

A unified assignable resource pool is formed by integrating the hardware resources such as the existed servers, network and storage devices and software resources such as ERP and Yongyou financial software. The Cytrix virtualized cloud technology is introduced through central and local government co-building project and the powerful HDX underlying communication protocol is adopted in the platform. The front end offers various experiment resources to students through open experiment appointment system, such as experiment outline, experiment project and content, open time, experiment software platform and instructor. Through the workflow of student inquiring and appointment, administrator checking and approving, instructor guidance and score evaluation, the system acquires assignable resource from the pool, runs in the students’ terminal and accomplishes a whole set of students’ customized experiment, course design and innovative experiment. Students can arrange their experiment independently and interactive with the tutor on time during the experiment. The background is equipped with laboratory integrated management system, which mainly achieves the integrated management such as laboratory software and hardware resources, teachers, students, appointment and score. It contains such functions as notice, hardware devices monitoring, software resource scheduling, administrator information, teacher management, student management, experiment course scheduling, score management, appointment management and score retrieving.

**Competition Training and Contest Platform**

The school-enterprise and school-school competition platform is built by linking inward into professional competition server as enterprise contest simulation platform in the laboratory, and outreach to enterprise server such as Yongyou, Alibaba and university server like Wuhan University through cloud technology. A student can enter the event registration platform through terminal like mobile phone APP. This platform offers different levels competition which is relevant to its major to students, such as network virtual operating contest, e-business challenges, management simulation contest, accounting skills competition, challenge cup, comprehensive simulation entrepreneurial competition, marketing challenge, humans resources management model simulation contest and enterprise competitive simulation contest, which are highly professional competition. After finishing the above workflow, the competition instructor will filter students according to the relevant rules and accomplish the final audit process. The passed students will enter the competition training platform to train and get guidance by the instructor through cloud platform or face to face. Students enter the competition platform directly to compete after finishing the training. Accordingly, the relevant contest awards will be added to students’ total credits in the form of innovation credits.

**Project Practice Platform**

Teachers in high school usually engage in some state-level, provincial and ministerial level and school-level scientific research projects, and also entrusted some projects by enterprise. Students carry on some innovation and entrepreneurship training project from governments and project entrusted by enterprise such as web construction. The cloud platform just builds a great communication bridge between project and team, which responds for project publishing, registration and audit of teachers and students. Through the cloud platform, a project team is built and can finish
the whole workflow, such as requirement analysis, system design, system development, project implementation. An instructor or responsible student will fully participate in and supervise the whole process. After finishing and accepting the project, students usually will have appropriate remuneration, their jobs will finally be added to total credits in the form of innovation credits.

Conclusion
The platform built by cloud technology has features such as distributed deployment, virtualization and access model diversification, which can meet management-major students’ needs of fragmented learning and practice and enhance students’ feeling of scene experience. In September, 2016, the economy and management experiment center of Wuhan University of Science and Technology firstly built experiment teaching platform based on cloud technology. It integrates effectively the teaching software from various professional laboratories, competition and project resources and transfer these to the cloud server pool, which effectively accomplished the sharing of resources in campus, inter-campus and school-enterprise. Since the platform was built, the practical ability of students has been greatly improved. The idle rate of software and hardware has been eased effectively. Lab assistants have also been free from devices maintenance and can engage in some creative work such as experiment project development, guidance of competitions and projects.

Acknowledgements
This research is supported by High School Education Research Program, under Grant 2016239, 2014233 from Hubei Province, by Humanities and Social Science Foundation Under Hubei Province Department of Education, under Grant 17D012 from Hubei Province, China.

References