Research of CS1 Course Based on Internet+

Ping ZHANG\(^a\) and Jian-Zhong WANG\(^b\)
College of Fundamental Education Sichuan Normal University, Chengdu, China
\(^a\)835148187@qq.com, \(^b\)767263842@qq.com

**Keywords:** Internet+; CS1; Half flipped classroom; Micro-class; MOOC; Hybrid teaching.

**Abstract.** The Internet+ promotes the teaching of universities to enter a new era. In the era of Internet+, with Integration of Internet and Education, the technological support of smart campus, and the expansion of network teaching resources, CS1’s teaching mode and teaching methods are undergoing positive changes. It brings a series of opportunities and challenges to CS1. This paper explores CS1’s teaching based on internet+ and half flipped classroom. The results show that the multi-dimensional online and offline combination of hybrid teaching effect is better.

**Introduction**

President Xi announced to the world at the second world Internet Conference that China will vigorously implement the strategy of Internet+ action plan in the 13th Five-Year [1]. With the implementation of Internet+, more and more Internet companies and institutions have developed digital teaching resources according to market demand. Many schools use teaching resources and teaching service platforms to explore new networked teaching modes. For example MOOC, flipped classroom, rain classroom and other information-based forms etc.. It makes teachers teaching methods, students learning methods and learning content become more diverse. Internet+ has also brought profound influence and change to the educational elements such as CS1’s educational resources, learning mode and teaching mode, and CS1’s teaching has entered a new era.

**Challenges Faced by CS1 in the Era of Internet+**

The main body of education in Colleges and universities is teachers and students. CS1’s teachers generally have good network information literacy and learning ability, and most of them are familiar with the application of the Internet. The CS1 teaching object of our school is non-computer majors. Nowadays, these students have been exposed to and used digital products since childhood. They have the ability to use the Internet and possess the skills of Internet learning, and their digital life is the basis for adapting to the teaching of Internet+. Nowadays, Internet+ education has penetrated into the CS1 course, and the rapid change of computer technology has led to the renewal of teaching contents and teaching methods of CS1 courses in China. What challenges will Internet+ CS1 bring us?

**Education Infrastructure Needs to be Improved**

Internet+ has put forward higher requirements for the hardware environment of teaching. For example, the WIFI is full coverage campus. However, the focus of education in China is still biased towards the developed areas. For the less developed areas in Western China, the teaching hardware facilities are still weak and need to be improved.

**Insufficient Network Teaching Resources**

Since the Internet+, the education sector has been trying to provide high-quality teaching resources. There have been online and course courses, excellent resource sharing classes, micro lessons, MOOC and other resources. Among them, MOOC is the innovation of Internet+ university curriculum. In the face of this trend of educational innovation, all kinds of universities are first impacted by MOOC, and even famous universities such as Harvard and Yale are carrying out the layout of online education [2]. Peking University, Tsinghua University and other universities have selected excellent MOOC
courses to enter the world stage [3]. With learning resources such as micro-course and MOOC, students can adjust their learning progress according to their own situation, skip the knowledge they have already mastered, repeatedly learn the knowledge they have not mastered enough, and ultimately achieve their learning goals through step-by-step learning. In addition to the network resources of CS1, the CS1 course in our university only has the teaching resources of micro course, CS1 excellent resource sharing course and SPOC course in MOOC. The network teaching platform and network teaching software need to be improved. Our school needs to accelerate the layout of CS1 in the Internet+ curriculum, collect online education data, and improve online learning support service capabilities.

The Reform of Teaching Mode Needs to be Carried out

In the era of Internet+, it not only spawned new teaching ideas, but also changed the traditional classroom teaching methods, and even changed the traditional classroom organization form. Flipping the classroom overturns the traditional order of teaching and learning, while the interactive communication on the Internet breaks the time and space limitations of the traditional classroom. Teachers’ workplace is no longer confined to the school, and teaching activities are no longer confined to the physical space of the campus. In this era, how does CS1’s teaching mode change?

Deepening Teachers' Educational Ideas and Improving Information Utilization Ability

In the era of Internet+, information technology will have an impact on teaching organization, teaching methods and teaching contents. Firstly, under the traditional education mode, teachers are the main body of teaching activities, and knowledge imparting is the focus of teaching. Under the background of Internet+, students have become the main body of learning. Teachers are the instructors and helpers of learning activities, and how teachers use information technology to improve teaching methods. Secondly, some teachers pay attention to the application of IT in form and lack of in-depth research on effective teaching methods, which leads to the ineffective application of information technology. How to improve the application level of information technology of some teachers to renew the teaching contents?

Students' Ability to Distinguish and Accept Knowledge is Challenged

CS1 is facing college freshmen with different basic computer literacy. Students from Xinjiang and Tibet and some colleges of Arts and sports have weak computer foundation. It is difficult for students to carry out interactive classroom teaching effectively. It is necessary to explore how to improve the classroom effect and efficiency in the teaching process.

In traditional education, the knowledge learnt by students is relatively fixed, the amount of information is less, and the complexity of knowledge is not high. What students need to do is to grasp these fixed knowledge and rethink, dig and practice. In the era of Internet+, knowledge is constantly integrated, updated and expanded, and the trend of complexity and fragmentation is increasing exponentially. This will be a challenge for students who have adapted to traditional learning methods. How do students combine fragmented knowledge into their own knowledge system to improve the depth of learning? How to urge students who lack initiative and initiative to learn? Under the environment of Internet+ learning, these aspects are all urgent problems.

CS1's Response to Challenges in the Context of Internet+ Era

Facing the opportunities and challenges of the Internet+ era, how should CS1 courses in Colleges and universities seize opportunities and meet challenges? According to the teaching objectives of computer courses in universities and the requirements of the Ministry of Education's Ten-Year Development Plan of Education Informatization (2011-2020), "taking innovation of educational ideas as the guide, building of high-quality educational resources and information-based learning environment, taking innovation of learning methods and educational modes as the core"[4], and in April 2018, In order to promote the development of Internet+ education, the Ministry of Education makes the 2 action plan of education informatization [5] and the reform demand of local colleges and
universities, CS1 teaching reform has entered a new stage. With the Computational Thinking in 2010, the MOOC in 2013, the flipped classroom in 2016 to the teaching practice of new subjects in 2018, and the emergence of new technologies such as big data, cloud computing, Internet of Things, artificial intelligence etc., online open courses rely on the Internet to accelerate the dissemination of high-quality content, and CS1 teaching reform has entered a new stage of hybrid teaching combining online and offline.

Technical Support of Intelligent Campus and Improvement of Education Infrastructure

With the deepening of Internet+, the network hardware facilities in schools are constantly upgrading, which has promoted the development of network applications. Good hardware and application technology also provide technical support for Internet+ CS1. The school has built a unified infrastructure platform, a unified data sharing platform and a comprehensive information service platform. For example, multimedia classrooms, 22 network computer rooms and 4 smart classrooms for CS1 practice, fully covered network environment. In the network computer room, teachers can use the same screen software for broadcasting teaching and management. Students can access the course resources of CS1 through the Internet and learn online anytime and anywhere.

Optimizing the Allocation of Teaching Resources and Expanding the Network of Teaching Resources

In the era of Internet+, the Internet has provided technical support for the integration of high-quality educational resources in CS1 courses, which can urge us to use the best teaching resources to improve the teaching quality of CS1 courses. In the process of developing teaching resources, the school starts the project of sharing high quality resources and builds an open learning platform, which expands teaching resources for the further realization of Internet+ CS1. At present, CS1 online education mainly includes learning video, question bank and integrated platform. Schools use information technology to help teachers establish CS1 wide coverage, multi-type, multi-level, open and convenient teaching resources system. In the early stage, we recorded the lecture video of CS1, constructed the SPOC course of MOOC as a supplement to classroom teaching, and constructed the question bank of CS1 and homework submission system, etc. In terms of self-development motivation of quality improvement, our school encourages students to learn online courses, and after school credit certification, we can give corresponding credits.

Change the Original Teaching Methods and Carry out Online and Offline Mixed Teaching

In the environment of Internet+, internet teaching resources, platforms, systems, software or videos will promote revolutionary changes in traditional teaching, and realize the transformation from the third centers, which are centered on textbooks, teachers and classrooms to the new three centers, which are centered on students' development, learning and learning effects. In CS1 course, teachers introduced MOOC high-quality curriculum on the basis of traditional teaching, and carried out the practice of flipping the classroom, found that the lack of traditional teaching, teaching effect is not good. After summing up the experience, we improved it and explored the mixed teaching mode. In addition to introducing high-quality MOOC courses, SPOC courses are rebuilt according to local conditions. Rain classroom settings are introduced, and the flipped classroom is changed to semi-flipped classroom. The hybrid teaching based on Internet+ breaks through the framework of traditional teaching methods, creating an interactive learning environment with information sharing, mutual communication, interaction and cooperation, so as to realize online teaching, online management and online interactive interaction, overcome the limitation of time and space, and enable students to achieve the desired learning effect in the process of interaction, so that teaching efficiency can be greatly improved. Higher, richer teaching content, strengthened interaction between teachers and students, students, highlighting the process of assessment, thereby improving the quality of teaching and learning effect. The mixed teaching model is shown in Fig. 1.
Figure 1. The Mixed Teaching Model.

Improve Teachers’ IT Application Ability and Change CS1 Teaching Content and Practice

In the Internet+ era, network information literacy is not only the requirement of the times for teachers, but also the quality that teachers must have when they adapt to younger teaching objects. Teachers' role is more to provide resources, stimulate students' interest in learning, interact with students through Internet mobile terminals, adjust teaching progress according to students' specific learning situation, discuss topics together in the process of teaching, and give timely guidance to students. Teachers need to update teaching content and make full use of the Internet to integrate various kinds of contest questions of CS1, so as to carry out practical and innovative training for students. Teachers should also strengthen the guidance of students' fragmentation learning methods, so that students can make full use of teaching resources on the Internet to improve them. At the same time, we should establish an effective mechanism to promote the continuous improvement of professional teaching according to feedback. CS1 teachers not only need to expand their knowledge and enrich their teaching content through the Internet, but also need to improve their teaching methods and contents by means of network information technology, so as to improve their research level and teaching ability. In order to improve teachers' information technology application ability and classroom teaching effect, schools often organize intelligent classroom teaching training to improve teachers' information technology application level and information literacy.

Strengthen Students' Learning Initiative

Teaching and learning are not limited by time and space, and bring great convenience to students in the era of Internet+. But if all learning is fragmented, the systematic coherence of knowledge in the process of learning will be broken, which may affect students' understanding and acceptance, and then affect students’ interest in continuous learning. Similarly, if a problem is considered for too short a period of time, it may also lead to a lack of comprehensive consideration, resulting in the problem solving is not smooth enough, with adverse effects. The traditional systematic education mode plays a very important role in people's thinking and willpower. Therefore, teaching generally combines the advantages of the two, using online network and offline classroom. To a large extent, some students lack initiative and enthusiasm in learning. They can establish a multi-dimensional and procedural
competency evaluation system based on the network, conduct procedural assessment, prompt and supervise students’ learning in time by sending prompt information and statistical information.

Demonstration of Teaching Experiments

Before the Internet+, the CS1 was mainly carried out in traditional teaching. After the emergence of MOOC in 2013, the MOOC experimental class of CS1 was set up. The students in this class take CS1 courses offered by MOOC for network learning. They use process control to participate in CS1 tests and final examinations. By giving credits, they find that the effect is not very good. After the appearance of flipped classroom in 2016, the practice of arousing students’ enthusiasm in flipped classroom has been carried out, and some experience has been gained, but students spend a lot of time learning before class. Latter, combined with the experience of the previous practice and the advantages of various aspects, we explored the online and offline hybrid teaching mode combining traditional and MOOC. After several years of research and 11552 hours of experiments, the classes of three different teaching modes are compared. The overall rough results are shown in Table 1.

Table 1. Experimental Comparison of Three Different Teaching Modes in Classes.

<table>
<thead>
<tr>
<th></th>
<th>Traditional class</th>
<th>MOOC experimental class</th>
<th>Mixed Teaching Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study before class</td>
<td>insufficient</td>
<td>medium</td>
<td>good</td>
</tr>
<tr>
<td>Classroom learning</td>
<td>good</td>
<td>insufficient</td>
<td>good</td>
</tr>
<tr>
<td>Study after class</td>
<td>insufficient</td>
<td>medium</td>
<td>good</td>
</tr>
<tr>
<td>homework</td>
<td>good</td>
<td>good</td>
<td>good</td>
</tr>
<tr>
<td>Active learning</td>
<td>insufficient</td>
<td>medium</td>
<td>good</td>
</tr>
<tr>
<td>learning effect</td>
<td>medium</td>
<td>medium</td>
<td>good</td>
</tr>
</tbody>
</table>

Through comparison, it is found that students in traditional classes are lack of initiative in learning, and the effect is general. Because students in MOOC experimental class lack face-to-face teaching or discussion from teachers, students with strong learning initiative have good learning effect, whereas students with strong learning initiative are not so good. Because the mixed class combines online and offline teaching, students' learning initiative and learning effect are better.

Conclusion

With the gradual integration of Internet+ education, it brings a series of challenges to the CS1 curriculum. Aiming at the challenges, we need the combination of online and offline teaching, using the Internet+ multiple intelligent classroom interactive teaching methods, enhancing classroom participation and conducting the whole process of assessment, so as to promote the healthy development of Internet+ CS1.

Acknowledgement

This research was financially supported by the Department of Education Project of Sichuan Province No.16ZA0048.

References

[3] https://www.icourse163.org/university/view/all.htm#