Study of the Impact of Online Courses on MEM Students’ Creativity

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Abstract. With the rapid development of online courses in colleges and universities, we should query the positive and negative effects of online courses on students’ creativities while upholding optimistic attitude. In order to avoid subjective judgment, this paper selects students who choose “Project Management” as an elective course to do the analysis by doing contrast experiment of traditional MEM students and online MEM student and found that there is no significant difference between online learners and ordinary learners. Although there exists a “lag phenomenon” in the early stage of online course learners, in general, no significant difference of creativities affect online course students and regular class learners.

Introduction

With the rapid development of opened online courses represented by MOOCs and Micro courses, the ministry of education and other major colleges and universities pay continuously attention to online courses. In the works of the ministry of education in 2016, it clearly make the requirement of strengthen the construction, application and management of online courses. The original intention of the online course is to let the quality resources sharing, make teaching resources more refined and specified. Meanwhile, the online courses support the services of online learning at any time, students’ interaction, online evaluation and credit certification so as to provide more independency for learners[1]. In today’s Internet era, learning has the characteristics of socialization, fragmentation, personalization, relevance and cognitive distribution. Gao Di[2] pointed out that online courses greatly enhanced the attraction of curriculum with its multiple different teaching ideas, free and flexible way of learning, comprehensive data support and evaluation method of human and computer interaction which makes it becomes a powerful lever to promote the reform of higher education and realize global sharing of educational resources.

To the aspect of students’ creativities, Zheng Xudong[3] stressed that online learning is fully mobilized the enthusiasm of students in learning, created a learning experience for students, and thus stimulated students’ interest in learning, improved the effect in classroom teaching, and also enriched students’ learning life. Moreover, Wang Zhe[4] believes that online learning is not only provides large quantity of free resources from the world’s top universities, but also enables clients to participate in the whole process of teaching interactive feedback so as to fully stimulate creativity in such good learning environment. However, many scholars put forward opposite argument. Tu Cuiping[5] present an idea of the current online courses is just a kind of old behaviorism teaching method of “curriculum centered” rather than “learner centered”; the teaching mode that lack of innovation will make online learning students fall asleep easily. Zhao Jing[6] proposed that the online courses takes network as carrier which can distract students’ attention and lead to lack experience of learning, also unable to establish the true relationship between teachers and students and significantly impact students’ creativities. Li Yayuan[7] pointed out that online course is a kind of informal learning without external constraints, which unable to fully stimulate students’ internal initiative and creativity; Ni Chuanbin[8] thought that the excessive use of online courses will cause the learners to rely on it and hinder the depth study and self creation.
Whether online courses affect the creativity of MEM learners has recently become the focus of academic research. Although doubts exist in this question, most scholars put forward their views from the perspective of subjective cognition instead of empirical research. This paper takes MEM students as research object who choose the elective course of “Project Management”, by using comparative experiments and statistical analysis method to do study of online courses and students’ creativities, so as to make up for the lack of empirical research.

The Connotation of Creativity and Hypothesis Put Forwarding

The Connotation of Creativity

Creativity is a kind of comprehensive ability of human beings, which is composed of knowledge, intelligence, ability and excellent personality. Recently, the research on psychological creativity involves propose, process and result of creation. The connotation of creativity may have a little difference due to different research paradigm, however, in the aspects of core composition, the creation table of Torrance agreed by scholars. It includes the following four categories.

- **Fluency**, ability of generating lots of ideas
- **Flexibility**, ability of changing thinking direction
- **Originality**, ability of breaking habits and traditions
- **Elaboration**, ability of thinking in a more refined and detailed view

The relevant study about learners’ creativities also involves much content that is the same as creativity in psychology. Such as, the ability to form new ideas, flexibility in using multiple methods to solve the same problem, the ability to provide insights into existing problems, the ability to break the conventional knowledge structure, ability to discover new relationships based on existing ideas between different concepts.

Based on the above four categories, this paper also divided the learners’ creativity into the following categories for empirical study; Firstly, generative ability; the ability to break through existing concepts to activate a number of unrelated concepts, including fluency, flexibility and elaboration. Secondly, innovation ability, the ability to produce new ideas, includes originality.

Hypothesis Put Forwarding

The author believes that online courses will combine the Internet technology and teaching, it needs learners to own a certain kind of knowledge of network and computer processing ability. Firstly, online courses teaching have the feature of fluency, that is, the ability of conceiving ideas. Secondly, its features of flexibility can help learners to change their abilities of thinking direction largely. Thirdly, the use of PPT, animation and video can provide learners with large quantity of pictures that can help them thinking from more refined, detailed perspective thinking to stimulate their inner creativity. Finally, there still exist many similarities between online courses and traditional courses; “course centered” can help students pay more attention to the courses and also can stimulate their interest in exploration, cultivate creative potentials. The above reasons are all completely in conformity with the core connotation. Based on this, the paper puts forward the hypothesis, that is, the influence of different teaching methods on students’ creativity has no significant difference if the online course is reasonable.

An Empirical Analysis of the Impact of Online Courses on MEM Students’ Creativity

Teaching Experiment Design

“Project management” is an important basic course for MEM students of engineering management; furthermore, it also be used as an elective course for students from other majors in our school. The online course of author’s research group, “Project management”, has been set up in early 2016 and
now in the implementation process, which is also own corresponding online courses teaching video and initially formed the online teaching model. Therefore, the research group chooses MEM students who select their elective course of “project management” as the object to test the connection between empirical online courses and students’ creativity. In order to better quantify the creative ability of learners, the research group conducted a comparative experiment. They choose a regular class and an online course class to carry out teaching of “project management” at the same time. Teaching program and time of teaching the course of “project management” are the same between two classes. Online courses learners use online video of micro class to study while regular class using the book of “project management” to learn.

**Initial Conditions Setting**

MEM learners’ creativity inevitably influenced by the factors such as teachers’ level, students’ basis, and computer level. In the experiment, we should try hard to eliminate the influence of factors such as students’ basis and teachers’ difference to test the impact of the using of Internet video on the learners’ creativities. Therefore, we select students from the same major and initially begin to learn the project management course to participate in this comparative teaching experiment. The average age of the subjects was 27 years old, the average age in online class was 27.45 years old, and 27.25 years old in regular class. According to the average of score of GPA, online class got 3.82, while regular class got 3.65. Similarly, average score of learners in different classes tested the computer level. Finally, for avoiding the difference between teachers, select two teachers with the similar results of years’ evaluation. Detailed information is as follows.

<table>
<thead>
<tr>
<th></th>
<th>Online class</th>
<th>Regular class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21.45</td>
<td>21.15</td>
</tr>
<tr>
<td>Students’ basis (Average score of GPA)</td>
<td>3.82</td>
<td>3.65</td>
</tr>
<tr>
<td>Computer level (Average score of computer test)</td>
<td>78.7</td>
<td>75.3</td>
</tr>
<tr>
<td>Teachers’ level (Teachers’ achievements)</td>
<td>92.4</td>
<td>92.6</td>
</tr>
</tbody>
</table>

**Experiment Methods**

To the teaching content, the students are required to complete a certain amount of test questionnaires within prescribed time to determine the influence of the learners’ ability of generation and innovation through students’ answer. By using this method, the same test questionnaire used to test the two classes for understanding the change of learners’ creativity. The content of the experiment is limited to the following two parts of “project management”, that is, project cost management and project quality management. In order to determine scores of generation ability and innovation ability in two classes, the Classroom Response System and supporting software used to track the testing process. The hardware of CRS is composed of a wireless master base station and a plurality of handheld keyboards and based on unidirectional wireless communication network. The combination of CRS, computer and projector can connect the lecture, quiz, test, score, and teaching analysis with other aspects. Firstly, teachers will prepare test questionnaire before class and design the answering time according to the difficulty of subjects. Then after teachers of regular class finished one part of content and displayed one part of teaching video, the related test will be shown in the screen of two classes at the same time, and computer starts timing. Students should answer question by using keyboard in their hands within promised time. After the CRS receiving signals, the corresponding supporting software will record answers of each student and take relevant data for teachers. After finishing one class, CRS supporting software can save the date of content of the test questions, the number, and the answer of each student, including the results of questions, time used for each question. After a period of accumulation, teachers can grasp the data of each student, and get the files of students, as well as know the relevant data of two classes.
Data Analysis and Discussion

(1) Scores of creativity. This experiment tested the creativity of students’ cost management and quality management; the effective samples of the regular class and online course class are 67 and 64 respectively; the average score and standard deviation of cost management test are 70.32±19.61 and 65.45±15.10 respectively; the average score of quality management test are 64.95±11.09 and 65.27±10.39 respectively. Detailed information is as follows.

Table 2. Creativity scores of parts of cost management and quality management.

<table>
<thead>
<tr>
<th></th>
<th>Effective sample</th>
<th>Average score</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost management</td>
<td>67</td>
<td>65.45</td>
<td>15.10</td>
</tr>
<tr>
<td>Quality management</td>
<td></td>
<td>65.27</td>
<td>10.39</td>
</tr>
<tr>
<td>Regular course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost management</td>
<td>64</td>
<td>70.32</td>
<td>19.61</td>
</tr>
<tr>
<td>Quality management</td>
<td></td>
<td>64.95</td>
<td>11.09</td>
</tr>
</tbody>
</table>

(2) Statistical analysis. By comparing the results of student performance, we use the method of hypothesis to testing. The original hypothesis is that no significant difference of creativity scores exist in two classes, or makes the other hypothesis of the opposite side. We choose the Z to test the results of cost management and quality management of two classes. The formula of Z is $z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$.

In this formula, $\bar{x}_1$ and $\bar{x}_2$ are represent the average score of regular class and online course class respectively; $s_1^2$ and $s_2^2$ are represent the standard deviation of regular class and online course class respectively; and $n_1$ and $n_2$ are represent the effective samples of regular class and online course class respectively. If the results of test exceeds the certain error limit of statistics, it shows that there exist difference between two classes; while if it not reached the limit, then the difference mainly comes from the sampling error. Regarded $\alpha$ to indicate the level of significance or reliability and using two-side test way. If $\alpha$ equals to 0.05, then the reliability degree is 95% and then $z_{\alpha/2}$ equals to 1.96; while the results of Z is exceed 1.96, it shows that significant difference exist in the two classes, if the results of Z is less than 1.96, then it shows no difference of creativity in two classes.

After testing, the results of Z in cost management and quality management are 1.58 and 1.17 respectively, which means the original hypothesis is correct. It is also can be seen from the meaning of statistics, that is, the influence of students’ creativity has no significant difference between online course class and regular class. Therefore, we can conclude that there is no significant difference about students’ creativity in two classes when learning the course of “Project management”.

(3) Stage difference. However, the test data show that the learning process of two classes is not the same. The average score of cost management in regular class is much higher and the gap between students’ creativity is larger. While the average score of cost management in online course is lower, but the results are relatively the same and gaps between students is smaller than regular class. The results of test shown that with the continuing development of online courses, the difference of average score is reducing and the average score and standard deviation are tend to be the same. For example, in the first test question of cost management and quality management, the scores from online course’ students is 26 and 27 respectively, which is lower than regular class, that is, 80 and 90 respectively. This phenomenon called “early lagging”. At the beginning of learning new content, the scores of online course class are relatively low. This is can be significantly reflected on the results of first test question in cost management, that is, the scores of two classes are very different. Although the score of first question of quality management from online course class is much lower, the difference is significantly smaller than first question of cost management. The reason why this situation occurred is additional difficulties brought to students when learning courses through online video, which
influenced students’ creativity, especially ability of generation. In each part of course, this phenomenon becomes prominent, especially at the beginning of course. Overall, there is no significant difference between students from online course and regular class in their learning process.

Summary
This paper selects students who choose “Project Management” as an elective course to do the analysis by doing contrast experiment of traditional learners and online learners and found that there is no significant difference between online learners and ordinary learners. Although there exists a “lag phenomenon” in the early stage of online course learners, in general, no significant difference of creativities affect online course students and ordinary learners.

Furthermore, we also found the following results by doing experiments.
• Students have an active and positive attitude towards online courses. The data shows that about 64% students are willing to choose online courses, which reflect a positive meaning to self-development when learning online course.
• In the process of teaching, to most students, the online course can stimulate their interest in learning and improve their creativities through video teaching.
• Supplementary books are necessary. It is limited to teach knowledge to students only in the online course, so, it is an effective method to use the related books in traditional curriculum as supplementary guidance. It ensures the quality of online teaching and enhances the students’ ability of self-creation to a certain extent.

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