Analysis for the Learning Effect of Learning Behavior in Ideological and Political MOOCs

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Full Research Paper

Analysis for the Learning Effect of Learning Behavior in Ideological and Political MOOCs

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Abstract: How to effectively apply MOOCs to the teaching of ideological and political theory courses in colleges and universities, improve the teaching quality of ideological and political theory courses and promote the realization of their teaching value, has undoubtedly become an important topic for scholars to study and discuss. In this paper, clustering algorithm is used to classify the learning behaviors of learners in ideological and political MOOCs, which are divided into four categories: "interactive learners", "active learners", "ordinary learners" and "marginal learners". It also analyzes the learning effects of these four types of learners and finds that: The "active learners" who perform better in all learning behaviors have the best learning effect, but there is little gap with "ordinary learners". "Interactive learners" do not achieve ideal results except for their outstanding performance in interaction. "Marginal learners" have the worst performance because of their insufficient investment in various learning behaviors.

Keywords: MOOCs, Ideological and political theory courses, Learning behavior, Learning effect

1. INTRODUCTION

As the product of "Internet Plus Education", MOOCs has changed the traditional higher education concept. The teaching consciousness has changed from conservative and closed to open and free; The means of education has changed from face-to-face and teacher-centered approach to network communication and student-centered autonomous learning; The role of teachers has been transformed from classroom leader and knowledge imparter to course facilitator and mentor. The geographical boundaries of universities are also constantly becoming virtual, shifting from a purely physical campus to a community combining virtual and reality.

As a new teaching model, MOOCs has been widely applied in the teaching of higher education in China. In particular, the COVID-19 has accelerated the popularity of MOOCs in colleges and universities. In the tide of information technology, the ideological and political theory courses, as a course system to help student youth establish correct outlook on life, world views and values, have also conformed to the development of the times, and widely applied MOOCs to their teaching.

How to effectively apply MOOCs to the teaching of ideological and political theory courses in colleges and universities, improve the teaching quality of ideological and political theory courses and promote the realization of their teaching value, has undoubtedly become an important topic for scholars to study and discuss. With the expansion of MOOCs education scale and the continuous growth of the number of participants, researchers have gradually paid attention to analyzing learning logs to help improve teaching strategies, so as to improve students’ learning effectiveness. Therefore, by analyzing students’ learning behaviors in ideological and political MOOCs, this research helps teachers of ideological and political theory courses to better organize the curriculum and improve curriculum design, at the same time, it also formulates reasonable learning strategies for students to achieve the purpose of improving learning effect.

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2. ELEMENTS OF MOOCS LEARNING BEHAVIOR

Behavioral science defines human behavior as positive or antagonistic behavior generated by motivation and stimulated by demand goals \[1\]. There are two kinds of behaviors, one is the explicit behavior that can be directly observed, and the other is the implicit behavior that cannot be observed. Behavioral science research focuses more on explicit behavior activities, i.e., behaviors that can be observed with the naked eyes and can be counted as the frequency or duration of occurrence within a certain period of time \[2\].

Learning behavior refers to all learning-related activities of learners driven by learning motivation that occur before specific learning goals are achieved under a certain learning scenario. Learning behavior is an important part of the learning process \[3\]. Theoretical studies on behavioral analysis and evidence-based studies have fully demonstrated that behavioral intervention in the learning process can significantly improve the efficiency and outcomes of learning \[4\].

At present, many scholars have put forward different views on the classification of learning behaviors. McKinney divided learners' learning behaviors into six types: task interaction, attendance, difficulty in depth, self-examination, gamification, and autonomous behavior \[5\]. Kerr observed learning behaviors from three aspects: preparation for class, appropriate interaction with teachers, and demonstrating interest in academic performance. Miserandino believed that behavioral engagement includes seven behaviors such as participation, persistence, and discussion \[6\]. In addition, Angelino and Natvig summed up learning behaviors as learners' active participation, online interactive learning, collaborative learning and other dimensions \[7\]. Dixson proposed such dimensions as autonomous learning, teacher-student interaction frequency, collaboration between students, and learning task duration, etc. \[8\]. Schaufeli proposed that the learning behavior engagement scale should also include two dimensions of vitality and concentration \[9\].

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement</td>
<td>Total number of platform logins</td>
</tr>
<tr>
<td></td>
<td>Duration of access to course resources</td>
</tr>
<tr>
<td></td>
<td>Number of visits to course resources</td>
</tr>
<tr>
<td>Interaction</td>
<td>Total number of threads posted</td>
</tr>
<tr>
<td></td>
<td>Total number of replies to posts by teachers and peers</td>
</tr>
<tr>
<td></td>
<td>Number of review discussion posts</td>
</tr>
<tr>
<td>Persistence</td>
<td>Number of repeated viewing of course resources</td>
</tr>
<tr>
<td></td>
<td>Number of times the same assignment was submitted multiple times</td>
</tr>
<tr>
<td></td>
<td>Number of repeated submission tests</td>
</tr>
</tbody>
</table>

To sum up, based on the comparative analysis of different learning analysis models and relevant research results at home and abroad, this paper classifies the learning behaviors of ideological and political MOOCs into three categories: engagement, interaction and persistence, as shown in Table 1. Engagement behavior refers to the time and energy learners spend in the course; Interactive behavior refers to discussing problems encountered between learners, cooperative learning, and answering questions between learners and teachers; Persistence behavior refers to students' reactions and performances when they encounter difficulties and setbacks, the tendency to overcome difficulties and fear, and continue tasks when they encounter difficult tasks.
3. ACQUISITION OF LEARNING BEHAVIOR DATA OF IDEOLOGICAL AND POLITICAL MOOCS

3.1 Research data sources

This study takes the learners of "XuetangX" MOOCs course "Ideological and Moral Cultivation and Legal Foundation" in a university as a sample. The goal of this course is to cultivate noble ideological and moral sentiment, strengthen socialist legal concept and legal consciousness, and train students to become qualified builders and successors of socialist cause by taking the socialist core value system and socialist core value education as the main line.

3.2 Collation of learning behavior variables

By accessing the platform logs, data tables saved in the background database and discussion posts contributed by learners in the forum module, we obtained the data of operation behavior, activity behavior, and various grade data achieved in the course. In addition, the relevant behavior indicators were summarized and counted through the Excel. Finally, they were uniformly imported into SPSS for further statistical work.

3.3 Data processing

The research selected 358 learners who took the above course as a sample. In order to make the research data more convincing and the research results more scientific, a comparative analysis was conducted on the data in the log according to the behavioral indicators determined by the learning behavior analysis framework shown in Table 1. In addition, learners with incomplete behavioral data were eliminated, some of them have behavior log data without grade data, while others have 0 score in various assessments, but there is a behavioral log in the course platform. The final valid sample obtained is 297 learners.

4. CLASSIFICATION OF LEARNING BEHAVIOR PATTERNS OF IDEOLOGICAL AND POLITICAL MOOCS

In order to further explore the learning behavior patterns of learners, this research used cluster analysis to classify the learning patterns of learners. Clustering is an unsupervised learning method \[10\] and a statistical data analysis technique commonly used in many fields. The principle of clustering is to classify data into different classes, objects in the same class have great similarity, and objects between different classes have great dissimilarity \[11\].

In order to make the data more scientific and reliable, the data should be standardized before clustering. Data standardization mainly solves the problems of different dimensions and different orders of magnitude among various behavioral data. When the level of behavioral data varies greatly, if the original data is directly used for analysis, the role of the data with higher numerical value in cluster analysis will be highlighted, and the role of indicators with lower numerical value will be weakened. To this end, this study used zero-mean normalization to map the data uniformly to the \([0,1]\) interval.

Cluster analysis was performed on the standardized data by SPSS. Cluster analysis methods mainly include Hierarchical Clustering and K-means Clustering. This research used hierarchical clustering to determine the number of clusters, and then used K-means clustering to classify the learners of ideological and political MOOCs.

Step 1: Hierarchical clustering

Hierarchical clustering can build a clustering binary dendrogram based on the distance matrix between different objects, by continuously merging the objects with the smallest distance into the same cluster. In this paper, the maximum distance connection algorithm was used to identify special trends as much as possible. The classification results are shown in Figure 1. In the figure, we draw a broken line graph with "Number of Categories" as the abscissa and "Aggregation Coefficient" as the ordinate. When the number of categories is 4,
the downward trend of the broken line slows down, so the number of categories is set to 4.

![Graph showing hierarchical clustering results](image)

**Figure 1. Hierarchical clustering results**

Step 2: Use K-means clustering to classify learners

K-means clustering first randomly selects data from the data objects as the initial cluster center, repeatedly calculates the distance between each data object and these center objects, re-divides the corresponding object according to the minimum distance, then recalculates the mean value of each cluster, and finally calculates the standard measure function. When certain conditions are met, such as the function converges, the algorithm terminates. Finally, the study obtains type 1 (N=28), type 2 (N=76), type 3 (N=106) and type 4 (N=87), and each learner is marked as the corresponding type to calculate the mean values of the three behaviors of engagement, interaction, and persistence, as shown in Table 2.

**Table 2. Cluster analysis of learners’ learning behaviors**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Element</th>
<th>type 1</th>
<th>type 2</th>
<th>type 3</th>
<th>type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement</td>
<td>Total number of platform logins</td>
<td>37.4</td>
<td>78.7</td>
<td>42.1</td>
<td>14.6</td>
</tr>
<tr>
<td></td>
<td>Duration of access to course resources</td>
<td>1408.7</td>
<td>2165.8</td>
<td>1465.2</td>
<td>219.2</td>
</tr>
<tr>
<td></td>
<td>Number of visits to course resources</td>
<td>487.2</td>
<td>1187.1</td>
<td>684.9</td>
<td>34.3</td>
</tr>
<tr>
<td>Interaction</td>
<td>Total number of threads posted</td>
<td>42.8</td>
<td>10.6</td>
<td>7.2</td>
<td>2.27</td>
</tr>
<tr>
<td></td>
<td>Total number of replies to posts by teachers and peers</td>
<td>127.2</td>
<td>35.9</td>
<td>37.4</td>
<td>12.7</td>
</tr>
<tr>
<td></td>
<td>Number of review discussion posts</td>
<td>199.5</td>
<td>49.2</td>
<td>48.4</td>
<td>27.9</td>
</tr>
<tr>
<td>Persistence</td>
<td>Number of repeated viewing of course resources</td>
<td>39.1</td>
<td>107.6</td>
<td>68.3</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Number of times the same assignment was submitted multiple times</td>
<td>4.1</td>
<td>16.2</td>
<td>5.6</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Number of repeated submission tests</td>
<td>2.4</td>
<td>21.7</td>
<td>8.6</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Step 3: Explain the classification of learning behaviors

Through the cluster analysis of learning behaviors, it is found that there are significant differences in the mean values of learning behavior elements among different learners.

First of all, from the perspective of the three learning behaviors of engagement, interaction and persistence, the learning behaviors of type 4 are significantly less than those of the other three types of learners. Therefore, learners of type 4 are marked as "marginal learners", who do not spend energy on learning.
However, type 2's engagement and persistence behavior are dominant, so type 2 is marked as "active learners", and this type of learners devotes more energy to learning.

In terms of interaction behavior, type 1 is significantly more than other types, but the engagement behavior and persistence behavior are not as good as type 2 and type 3, so type 1 learners are marked as "interactive learners".

Type 3 is neither the best nor the worst in terms of various behaviors, so it is marked as "ordinary learners".

"Ordinary learners" account for the highest proportion of 35.7%, "marginal learners" account for 29.3%, accounting for nearly 30%, while the proportion of "interactive learners" is the lowest at 9.4%.

5. THE INFLUENCE OF LEARNING BEHAVIOR PATTERN ON LEARNING EFFECT

The scores of the ideological and political MOOCs selected in this study are composed of four parts: assignment (20%), discussion (20%), unit test (20%) and final exam (40%). The scores of all types of learners are shown in Table 3.

<table>
<thead>
<tr>
<th>Learner's scores</th>
<th>Interactive</th>
<th>Active</th>
<th>Ordinary</th>
<th>Marginal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment</td>
<td>10.4</td>
<td>16.7</td>
<td>15.1</td>
<td>10.2</td>
</tr>
<tr>
<td>Discussion</td>
<td>18.4</td>
<td>14.5</td>
<td>13.3</td>
<td>11.4</td>
</tr>
<tr>
<td>Unit test</td>
<td>11.2</td>
<td>18.7</td>
<td>16.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Final exam</td>
<td>30.2</td>
<td>35.2</td>
<td>33.5</td>
<td>29.3</td>
</tr>
</tbody>
</table>

In terms of various learning effects, "interactive learners" perform barely satisfactory except for better performance in discussion, and there is a huge difference between the learning effects of "interactive learners" and "ordinary learners", which also reflects some typical problems of learners of ideological and political MOOCs. When they encounter learning problems, the first thing they want to do is not to study repeatedly in the course, but to seek help in the discussion forum, hoping to solve the problems through discussion. However, they often fail to get good answers in the discussion forum, they lack initiative and exploration in learning.

"Active learners" are excellent in all kinds of learning effects, their participation in various behaviors is relatively high, and they have a firm grasp of curriculum knowledge. In terms of persistence, when such learners encounter learning difficulties, they will not give up easily, but try various methods to overcome the difficulties.

"Ordinary learners" account for the largest proportion of all kinds of learners, and such learners are not the most outstanding in all aspects in the learning process, but they are not far behind "active learners".

"Marginal learners" do not perform well in each kind of behavior, resulting in poor learning outcomes. They may lack learning belief and motivation, which is mainly manifested in the low frequency of learning course resources, seldom participating in discussions and communication in the discussion forum, and always giving up quickly when encountering difficulties.

6. CONCLUSIONS

Using a clustering algorithm, this paper classifies the learning behaviors of learners of ideological and political MOOCs and divides them into four categories: "interactive learners", "active learners", "ordinary learners" and "marginal learners". We also analyze the learning effects of these four types of learners and find that the "active learners" who performed better in all learning behaviors achieve the best learning effects, but the gap with "ordinary learners" is not large. "Interactive learners" are not ideal except for their outstanding interactive performance. "Marginal learners" have the worst performance because of their lack of investment in
various learning behaviors.

According to the analysis and discussion in this article, it also reveals the problems faced by learners of ideological and political MOOCs in the learning process to a certain extent. The successful solution of the problems requires the joint participation of different stakeholders such as MOOCs learners, teachers, instructional designers and instructional administrators. Therefore, this study puts forward suggestions on optimizing ideological and political MOOCs from the perspective of different stakeholders.

6.1 Learners need to develop good study habits

MOOCs learners should establish a correct learning concept, clarify learning objectives, improve self-supervision and self-management ability, strengthen communication and discussion awareness, and be able to encourage themselves and persevere through difficulties when encountering difficulties, and realize the importance of learning.

6.2 Teachers need to improve their comprehensive quality and professional ability

Teachers should improve their comprehensive quality requirements and professional capabilities, provide more effective personalized services for learners' autonomous learning, improve learners' learning effectiveness, and stimulate learners' interest in learning. In addition, teachers should have good teaching guidance ability, not only to show learners the basic ability of teaching, but also pay attention to the learning progress of learners at all times.

6.3 Instructional designers and administrators need to provide personalized learning support services

The instructional designers and administrators of ideological and political MOOCs can take some measures to optimize the presentation of learning activities, provide learners with more personalized learning support and services, and then improve the learning effectiveness of learners. For different types of learners, it is necessary to guide them to carry out course learning activities smoothly, enhance the behavioral input of each type, and fully mobilize the enthusiasm of MOOCs learners.

REFERENCES