Research on the Impact of Barrage Video on the Continuance Intention of E-Learning Platform

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Abstract. Traditional e-learning platforms have problems such as low completion rate of courses, high platform dropout rate, and a lack of willingness of learners to continue to use. And barrage videos provide a new form of interaction for e-learning platforms. This paper, based on Expectation Confirmation Model of Information Systems Continuance (ECM), proposes the theoretical model of the impact of barrage video on the willingness to use e-learning platform, which adds to two variables of perceived pleasure and perceived presence and is verified by data crawler of learning video barrage. The results show that the barrage video positively affects the online learner's perceived pleasure, perceived presence and perceived usefulness, thereby increasing learner satisfaction and product willingness to continue to use.

Introduction

With the development of Internet technology and the popularity of lifelong learning concepts, a large number of e-learning platforms have emerged in recent years, such as NetEase Cloud Classroom, School Online, and China University MOOC. And watching learning videos is one of the most common ways of learning on the platform. However, the data shows that these e-learning platforms have problems such as low completion rate of courses, high platform dropout rate, and a lack of willingness of learners to continue to use. There are three main reasons: (a) The pleasure of e-learning is not enough, and boring learning process leads learners to give up; (b) The sense of presence in the learning process is insufficient, and the virtual learning method is isolated from the real world, giving learners loneliness; (c) The usefulness of e-learning results can’t be significantly positive feedback, so that the learner is difficult to perceive the learning effect.

Therefore, many researchers have begun to pay attention to the application of various innovative forms to increase the willingness to use the e-learning platform. This research focuses on the impact of barrage videos on the continuance intention of the e-learning platform. Nowadays, barrage video is a very popular video form and its unique presentation mode achieves a high degree of fusion between audience comments and video content. The successful application and great influence of the barrage video in the online media field has greatly touched people's thinking and exploration of barrage in the e-learning field. More and more e-learning platforms, such as Tencent Classroom and Taobao Classmates, have begun to use barrage video. In the two months of the trial, Taobao Classmates reached 150,000 barrages, and the proportion of user interaction per class accounted for 15% to 72%. To a certain extent, these phenomena indicate that the barrage video really brings fresh blood to the e-learning platform, making up for the lack of traditional e-learning methods.

In terms of academics, most experts are concerned about the application of barrage videos in the field of media, however there are few researchers at home and abroad involved in educational fields, because most scholars believe that the barrage video is more entertaining than educational. Therefore, in view of these insufficiency, this paper analyzes the data crawler of the learning video barrage on the bilibili website (a barrage video platform), and based on the ECM theoretical model, studies the impact of the barrage video on the willingness of continuous use of the e-learning platform, in order to explore the excellent design of barrage video which can improve online learners’ learning experience.
Theoretical Model and Research Hypothesis

Theoretical Model

Expectation Confirmation Model (ECM) proposed by the famous American scholar Bhattacherjee\(^1\) (2001) is a classical theoretical model used to study the willingness of continuous use of information systems (see Figure 1). From the existing research, a large number of researchers in the e-learning field use the ECM model as the theoretical basis to construct new research models by expanding different influencing factors, and explore related continuous learning desires. Therefore, it is expected that Expectation Confirmation Model has a better explanatory power for the continuance intention of new technologies.

![Figure 1](image1.png)

**Figure 1.** Expectation Confirmation Model (ECM).

Research Hypothesis

Combining the special situation of barrage video and e-learning, the study proposes the conceptual model of the impact of barrage video on the continuance intention of e-learning platform (see Figure 2), based on the ECM model and adds to two variables of perceived pleasure and perceived presence. The model is divided into three parts: system factors, experience factors, and outcome factors. (a) The system factor is the barrage video, including its content quality and form; (b) The experience factors include perceived pleasure, perceived presence and perceived usefulness; (c) The outcome factors include the degree of expectation confirmation, learner satisfaction and continuance intention of the platform.

![Figure 2](image2.png)

**Figure 2.** The conceptual model of the impact of barrage video on the continuance intention of e-learning platform.

In the conceptual model, the relationship between experience factors and outcome factors is based on the ECM model and related expansion studies, and the relationship between system factors and experience factors remains to be verified. The study proposes relevant hypotheses and analyze barrage crawler data to verify the correctness of the relationship and to refine the conceptual model. The specific discussion and hypothesis are as follows:

**Perceived Pleasure**

Perceived pleasure is the subjective pleasure that learners feel when they use the e-learning platform. It is manifested as the learner's feelings of joy and enjoyment of the learning process. This study adds
perceived pleasure variable to the ECM model because many researchers have confirmed a positive correlation between perceived pleasure and continuous learning willingness. Lee[32] (2010) found that the perceived pleasure of learners significantly influences the learner's attitude and willingness to continue learning.

Barrage video is a new form of learning compared to traditional e-learning, and learners express their opinions through free comments. The barrage video has been favored by the young people, as an expression of entertaining, colloquial language and enriched with interesting forms of expression. Therefore, this study proposes the hypothesis that the barrage video positively affects the online learner's perceived pleasure (H1).

**Perceived Presence**

The concept of presence originates from the far-reaching presence created by Minsk (1980). Ijsselsteijn[33] divided the presence into space presence and social presence. The space presence reflects the immersive feeling of the user, and the social presence reflects the feelings shared with others. The theory of presence is widely used in virtual reality experience and e-learning. Zhao Hongxia et al.[41] (2015) verified that online interaction has a significant positive effect on the formation of presence.

The traditional way of e-learning is easy to let people feel loneliness and unreal because of separation of learners, teachers and other learning peers. But with barrage videos, learners can send and present information such as opinions and emotions when watching videos, effectively alleviating loneliness when learners watch videos alone, introducing language and behavior similar to real classroom lessons to learners, and bringing a sense of class in a physics classroom rather than a virtual classroom. Therefore, this study proposes the hypothesis that the barrage video positively affects the online learner's perceived presence (H2).

**Perceived Usefulness**

Perceived usefulness refers to the degree to which the learner recognizes that the e-learning platform can promote learning effectiveness. This is reflected in the learner's belief that the platform can increase learning ability and help students with learning. There has been a perceived usefulness variable in the ECM model and its positive correlation with the outcome factor. Some research scholars such as Zhang Wei[51] (2016) also verified that learners’ perceived usefulness has a positive effect on their attitude toward using MOOCs.

The usefulness of traditional e-learning results can’t be significantly positive feedback, and learners can hardly perceive learning effects. Barrage video, through timely feedback, allows learners to perceive good learning results, thereby promoting learner satisfaction and continuous learning willingness. Therefore, this study proposes the hypothesis that barrage video positively affects the perceived usefulness of online learners (H3).

**Data Analysis**

**Data Sources and Processing**

The barrage data for this study was sourced from the series “Learn mathematics in Wanmen Middle School High School Mathematics” series on the bilibili barrage video website. Wanmen is China's first online university and online high school. The courses are original and the content of teaching resources is of good quality. Through barrage crawler technology, a total of 3,125 barrage data for 15 hours of series of learning videos were excavated. From the barrage curve (see Figure 3), it can be seen that the number of barrage is not uniform throughout the entire series of courses. When the learners just entered the course, a large amount of barrage data was generated due to the novelty of the learning style. After the third lesson, the learners entered a plateau.
After barrage crawler, 3125 barrage contents were encoded by content analysis method to qualitatively process the data. The learner's speech expression in the barrage is regarded as a manifestation of perception. The detailed content analysis framework is shown in Table 1.

Table 1. Barrage content analysis framework.

<table>
<thead>
<tr>
<th>Analysis Dimensions</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Pleasure</td>
<td>Positive Emotion: Feel happy in the learning process</td>
</tr>
<tr>
<td></td>
<td>Negative Emotion (Contrast Variable): Feel unhappy in the learning process</td>
</tr>
<tr>
<td>Perceived Presence</td>
<td>Space Presence: Feeling in a real physics classroom</td>
</tr>
<tr>
<td></td>
<td>Social Presence: Feeling with teachers and learning partners</td>
</tr>
<tr>
<td>Perceived Usefulness</td>
<td>Courses Useful: The course is helpful to learners</td>
</tr>
<tr>
<td></td>
<td>Courses Useless (Contrast Variable): The course does not help learners</td>
</tr>
</tbody>
</table>

**Relationship between Barrage Video and Various Experience Factors**

**Relationship between Barrage Video and Perceived Pleasure**

According to the classification of text granularity, the sentiment analysis of barrage comments belongs to the sentiment analysis process at the sentence level. The emotional words in the sentences are extracted. If a barrage contains emotional words, the barrage is subjective and can be judged tendency.

In the barrage data of this study, the extracted positive emotion words include "2333" (representing a big smile), "hahahaha", ":\(^{\wedge}\wedge:\)" (representing a smiley face), etc. These positive emotional words indicate that the corresponding learner can perceive the fun; the negative emotional words include “yawning” and “hypnosis”, indicating that the user is not perceptually happy. After content analysis, among the 3125 barrage data, there are 512 subjective sentences, including 458 positive emotions, 89.45% of subjective sentences, and 54 negative emotions. The specific data are shown in Table 2. After a two-sample t-test, the two-tailed censored probability (P value) was 0.0031<0.05. The difference was significant, indicating that the positive emotions in the barrage were significantly more than the negative emotions and barrage video to a certain extent allow users to feel the fun. Therefore, barrage video positively affects the online learner's perceived pleasure (H1). In a pleasant and relaxed atmosphere, learning will often achieve a multiplier effect.

Table 2. Number of barrage statistics for positive and negative emotions at each class hour.

<table>
<thead>
<tr>
<th>Class hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive emotion</td>
<td>113</td>
<td>87</td>
<td>92</td>
<td>88</td>
<td>96</td>
<td>104</td>
<td>92</td>
<td>102</td>
<td>111</td>
<td>108</td>
<td>104</td>
<td>93</td>
<td>102</td>
<td>94</td>
<td>105</td>
<td>458</td>
</tr>
<tr>
<td>Negative emotion</td>
<td>15</td>
<td>13</td>
<td>17</td>
<td>24</td>
<td>22</td>
<td>20</td>
<td>18</td>
<td>15</td>
<td>18</td>
<td>21</td>
<td>19</td>
<td>15</td>
<td>13</td>
<td>6</td>
<td>54</td>
<td></td>
</tr>
</tbody>
</table>
presence and interaction are closely related, including interaction with teachers and interaction with other learning peers. For example, the teacher-student interaction key words include “reporter teacher” and the like, including answering questions raised by the teacher in the video, asking the teacher about the content of the lesson or expressing emotions to the teacher, etc. Example sentence “teacher, I don’t draw a circle, drawing Isn't it a square block?” "Thank you teacher, goodbye teacher." The student-student interaction key words include “return to front”, “+1”, etc., including questions raised by previous students, questioning previous students’ opinions or expressing gratitude to peers, etc. Examples of sentences “Reply to the front: thank you for your science.”

As shown in Table 3, there are a total of 351 barrages embodying the space presence, and 1964 barrages of social presence, including 480 teacher-student interaction, and 1,484 student-student interaction. These barrages account for 71.08% of the total number of barrage, which shows that the presence of barrage is very strong, and learners will be immersed in the world created by the barrage video. Therefore, the barrage video positively affects the online learner's perceived presence (H2). While watching the barrage video, even if they learn at different times, they can feel the emotional experience that everyone learns together. In addition, the barrage is equivalent to commenting on the video content at any point of time on the timeline, and is highly targeted, which is one of the reasons for its strong presence.

Table 3. Number of barrage statistics for space and social presence at each class hour.

<table>
<thead>
<tr>
<th>Class hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space presence</td>
<td>85</td>
<td>52</td>
<td>41</td>
<td>33</td>
<td>29</td>
<td>23</td>
<td>12</td>
<td>10</td>
<td>9</td>
<td>41</td>
<td>7</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>351</td>
</tr>
<tr>
<td>Social presence</td>
<td>957</td>
<td>265</td>
<td>204</td>
<td>183</td>
<td>94</td>
<td>52</td>
<td>40</td>
<td>26</td>
<td>15</td>
<td>252</td>
<td>57</td>
<td>63</td>
<td>49</td>
<td>40</td>
<td>35</td>
<td>1964</td>
</tr>
</tbody>
</table>

Relationship between Barrage Video and Perceived Usefulness

In order to compare the differences in perceived usefulness and uselessness of the barrage data, the barrage data representing the uselessness of the course was also encoded. Among them, the barrage that can express perceived usefulness includes learners who express the effect of learning and sentences related to the learning content. For example, "This teacher is really good at speaking." The barrage like "hard to understand," shows how learners perceive the course as useless.

The specific data is shown in Table 4. There are 515 barrage of perceived usefulness and 46 barrage of perceived uselessness. The ratio is 11.19. After two-sample t-test, the probability of two-tailed truncation (P value) was 0.0016<0.05, and the difference was significant, indicating that the perceived usefulness of the curtain data was significantly more than the perceived uselessness. Therefore, barrage video positively affects the perceived usefulness of online learners (H3). The barrage video enables the learner to perceive good learning effects through timely feedback presentation, thereby promoting learner satisfaction and continuous learning willingness.

Table 4. Number of barrage statistics for courses useful and useless at each class hour.

<table>
<thead>
<tr>
<th>Class hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses Useful</td>
<td>117</td>
<td>98</td>
<td>35</td>
<td>32</td>
<td>26</td>
<td>28</td>
<td>29</td>
<td>18</td>
<td>20</td>
<td>25</td>
<td>21</td>
<td>21</td>
<td>17</td>
<td>15</td>
<td>8</td>
<td>515</td>
</tr>
<tr>
<td>Courses Useless</td>
<td>13</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>46</td>
</tr>
</tbody>
</table>

Research Conclusion

Theoretical Model

From the barrage data analysis, it can be seen that barrage video positively affects the online learner's experience factors, including perceived pleasure, perceived presence, and perceived usefulness, thereby improving learners’ confirmation and satisfaction and continuance intention. Therefore, based on the special scenarios of barrage video and e-learning, this research adds two new variables of perceived pleasure and perceived presence, and constructs the theoretical model of the impact of barrage video on the continuance intention of e-learning platform (see Figure 4), which provides a theoretical reference for the combination of barrage video and e-learning.
Figure 4. The theoretical model of the impact of barrage video on the continuance intention of e-learning platform.

**Practice Advice**

Based on the above analysis, barrage video and e-learning are not contradictory. The e-learning platform can enhance learners' perceived pleasure, perceived presence, and perceived usefulness by improving the content and performance of the barrage, so that learners can have a better e-learning experience.

First, to enhance the perceived pleasure: The video barrage can preset some interesting barrage with certain classroom function for the learners to send quickly. This can not only reduce the time and effort of sending operations, but also control the quality of the barrage content to a certain extent, and also improve the fun.

Second, to enhance the perceived presence: Add identities to the content of the barrage to clearly reflect the identity of teachers and learners. In the performance of the barrage, different styles are used to distinguish question and answer from each other, and the correspondence between question and answer is reflected to more faithfully restore the classroom teaching scene.

Thirdly, to enhance perceived usefulness: Teachers can use the barrage to highlight important points in teaching with a prominent display style, so that learners can further understand the teaching content and enhance the perception of usefulness. Teachers can also give learners positive feedback through barrage to encourage learners to continue learning.

Barrage video makes up for the insufficiency of the traditional e-learning platform in its unique form. However, the barrage is to serve the e-learning platform. Designers should take care that they cannot be overused. Instead, they must use appropriate and reasonable methods to optimize the barrage video learning experience in order to increase the learner's willingness to continue learning.

**References**


