Do Playfulness and University Support Facilitate the Adoption of Online Education in a Crisis? COVID-19 as a Case Study Based on the Technology Acceptance Model

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Abstract: A large number of universities worldwide are paying more and more attention to the application and exploration of online education. As the group with the most significant number of online education users, their participation attitude and participation intention directly determine the teaching performance of online education. This research will incorporate playfulness teaching and scenario variables that reflect the universities’ ability to respond to emergencies. Based on the technology acceptance model, this research proposes an integrated research model of online education participation intention to investigate university students’ online education participation intention to reveal the key factors and mechanisms that affect online education participation intention. A structural equation model of participation intention is constructed, and 342 valid samples are obtained by questionnaire survey. The empirical results of PLS-SEM show that: (1) students’ participation attitude positively affects their participation intention; (2) the perceived ease of use and usefulness positively affect their participation attitude, and the perceived usefulness and ease of use affect their participation intention through the complete mediation of participation attitude; (3) the perceived playfulness does not have a significant impact on participation attitude but has a positive impact on participation intention; (4) the innovative discovery university support positively moderates the relationship between participation attitude and intention during such emergencies. The research found that improving students’ attitudes toward participation, perceived ease of use, usefulness, playfulness, and strengthening university support are all helpful to optimize students’ participation intention in online education. At the same time, it also explored operability suggestions for improving the quality of online education and optimizing future education.

Keywords: playful teaching; online education; participation intention; PLS-SEM; technology acceptance model; online learning; university support

1. Introduction

The COVID-19 pandemic has deeply affected education, as over 1.59 billion students could not go back to school [1]. To cope with school closures and maintain education from home, several universities worldwide have shifted from face-to-face to remote teaching. Hodges et al. [2] defined remote teaching as “a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses, and that will return to that format once the crisis or emergency has abated”. However, the lack of quality teaching resources [3] and social interaction and innovative learning strategies [4–6] has raised significant challenges in conducting online education, which made the students reluctant about taking online...
courses in this exceptional pandemic and during the post-pandemic period and negatively affected their perception of online education.

On the other hand, many studies have pointed out the importance of integrating playful teaching, as it arouses students’ attitudes and increases their engagement in online learning, thereby positively affecting their learning experience and outcomes [7]. Other studies have shown that university support, in the form of policies, training, etc., could promote the adoption of online learning, especially in emergencies [8,9]. While massive research studies have been published during the COVID-19 pandemic, most of them focused on the advantages and challenges of remote/online education [5,6,10,11] without paying too much attention to what facilitates the adoption of online education in crises which could enhance the adoption of online education in the future and also in emergencies where no other options could be found. Remarkably, this study uses the Technology Acceptance Model (TAM) to investigate the impact of university students’ participation intention (PI) in online education during the COVID-19 pandemic.

1.1. Literature Review

Providing online learning was one of the solutions to maintain education from home during the COVID-19 pandemic [12], as online learning is not limited by time and space [13], allowing students and teachers to participate anywhere at any time [6]. Notably, teachers and students can share their points of view and communicate online through text, pictures, videos, etc. [14]. Additionally, students can view courses in advance and practice knowledge points they have not mastered through online learning [5].

Although online learning could be a good solution in crises, Huang et al. [6] pointed out that teachers and students can face several challenges in this first-ever application of pure long-term online learning (without face-to-face learning or blended learning), including students’ boredom, social isolation and a lack of engaging pedagogies. Several researchers have suggested implementing the playfulness concept when providing online learning experiences [15]. Playfulness is defined as the subjective level of enjoyment felt by the learner [16], which consists of five components: creativity, curiosity, humor, pleasure, and initiative [17], and includes many fun activities, like teasing, imitating, and sharing [18]. Playfulness provides students with a sense of security and a creative atmosphere. Many teachers consider it a core educational process, given the positive effects of playfulness on teaching effectiveness [19]. For instance, playful learning can make the learning experience more fun and engaging [20], resulting in better learning outcomes [21]. Playful activities are also incorporated into early childhood education to motivate kids to learn and enhance their interest in a particular subject [18]. Furthermore, perceptual playfulness can also help increase the willingness to use instructional management systems [7]. However, current empirical studies on perceived playfulness and university support in online learning in a crisis are scarce.

In addition to an excellent online learning experience design, several research studies have pointed out that university support to adopt online learning is crucial for a successful shift from offline to online learning, especially in crises [3]. For example, Ali [22] and Demuyakor [23] pointed out that providing information and communication technology support can provide a good foundation for a successful online learning process and reduce teachers’ workload. Robust digital learning systems can also enhance universities’ teaching and learning practices, especially in emergencies like the COVID-19 pandemic [11]. Aguilera-Hermida [9] argued that students are actively involved in online learning when supported by technology and resources to make the online learning activities run more smoothly. University support can make online learning more enjoyable for college students by providing, for instance, stable Internet connections, technical support, and adapted learning tools [24], which have a positive effect on the students’ adoption of online learning [25].
1.2. Research Gap

As discussed above, although several studies have pointed out the importance of playfulness and university support in typical situations (i.e., not in crises or emergencies), no research study, to the best of our knowledge, discussed these two elements, namely playfulness and university support, in emergencies and how they could be helpful for teachers to shift from face-to-face to online learning rapidly. In this context, several organizations and scholars have pointed out the need to investigate the design of future education in times of uncertainties and emergencies [1,3,6,24]. In line with this, this study aims to investigate how playfulness and university support could facilitate students’ adoption of online learning during the COVID-19 pandemic.

Adedoyin and Soykan [26], Ali [22], Bao [3], Dai D and Lin [12], Dhawan [27], and Zhou et al. [5] analyzed the necessity, application strategies, and opportunities faced by online learning during the COVID-19 pandemic through a review of previous literature. Several scholars have focused on the importance of online learning during COVID-19 and investigated college students’ views, use, performance, and attitude during online learning during COVID-19 without a theoretical framework [9,23,24,28]. It can be concluded from the above research that, despite the vast body of research investigating students’ adoption of online learning during the COVID-19, few studies used theoretical frameworks to discuss their results [9,23,24,28], which makes their conclusions and insights more limited (i.e., specific to their context) and hard to be reproduced. Therefore, this study uses the Technology Acceptance Model (TAM) to explore the factors affecting students’ participation intention in online education. TAM was proposed by Davis et al. [29] and is widely used in research on various online education platforms, shopping websites, and business offices. According to a large number of literature searches and content analyses, TAM is also used in a large number of empirical studies to explore users’ participation intention [30–32].

In the context of COVID-19, Almaiah et al. [8] determined the factors influencing the adoption of online learning through an interview method, Al Kurdi et al. [13] studied the usage behavior of college students using the SEM method, Thongsri et al. [25] studied the determinants of online learning adoption based on a hybrid SEM. However, none of the above empirical studies focused on students’ intention to participate, and neither did they include perceived playfulness. Playfulness [33,34] and university support [35–37] are important for optimizing online education’s effects. Departing from the current research, this study will also consider the mediating effect of the online learning participation attitude (PA) and the moderating effect of university support to obtain more research findings and practical enlightenment to improve the effectiveness of online education.

2. Hypothesis

This study focuses on the influencing factors of university students’ participation intention in online education by using TAM as the research framework, introducing university supports, constructing research models, exploring the effects of perceived usefulness, ease of use, and playfulness on online education participation attitudes, and then discussing how participation attitudes influence the participation intention in online education while verifying the mediation role of participation attitude and the regulatory influence of university support.

In the model of this study, an attitude refers to the individual’s subjective judgment of specific behavior. Attitude is an important variable, that drives behavioral intentions [29]. A good attitude is an essential factor for an individual to develop a particular behavioral participation intention [38]. Huang et al. [39] conducted research on mobile learning behavior based on the TAM model and confirmed that behavior attitude significantly affects behavior intention. Teo and Zhou [40] believe that attitude is the most potent predictor of using new technologies. In a MOOC study with Chinese subjects as sample, it was found that the subjects’ attitudes towards MOOC and perceived behavior control had a significant impact on their participation intention to continue using it [41]. Baydas [42] collected data from 276 pre-service teachers, analyzed them through structural equation models.
and found that pre-service teachers’ learning attitude and cognitive needs significantly impact their participation intention in online learning. The positive influence of behavior attitude on behavior intention has been verified in many studies [43–45]. Based on the above analysis, participation intention reflects the participation intention of university students to participate in online education and is a necessary condition for university students to take action. Therefore, the hypotheses proposed in this study are as follows:

**Hypothesis 1.** Participation attitude has a positive effect on university students’ participation intention in online education.

In this study, Perceived Usefulness (PU) refers to the subjective judgment that university students’ participation in online educational activities will enhance or improve university students’ learning effects, make learning more effective, and gain more knowledge. Perceived Ease of Use (PEU) refers to university students’ perception of whether the online education platform is easy to use or of the effort required [46]. Huang et al. [47] found that usefulness has a positive effect on the participation intention to use in a study on mobile learning with undergraduates. Wu and Zhang’s [48] research found that the perceived ease of use has a crucial impact on users’ attitudes and perceived usefulness of online learning systems. Safsouf et al. [34] concluded that the perceived ease of use and usefulness have a significant impact on behavior intention, and this conclusion is similar to the results of related TAM studies. Rafique et al. [49] found through research that perceived usefulness positively affects the behavioral participation intention to learn online. Based on the above analysis, the hypotheses proposed in this study are as follows:

**Hypothesis 2.** Perceived Usefulness has a positive effect on participation attitude.

**Hypothesis 3.** Perceived Ease of Use has a positive effect on perceived usefulness.

**Hypothesis 4.** Perceived Usefulness has a positive effect on university students’ participation intention in online education.

This study identified Perceived Playfulness (PP) as the pleasure and interest of university students participating in online education. According to the self-determination theory, internal motivation refers to individual participating in, and accomplishing something related to his inner interests and beliefs [50]. At present, PP has been widely introduced into online education research. If users are truly interested in learning a given content or have a firm belief in their ability to complete a given course, their participation intention will also increase. The design of a digital learning system requires more playfulness integration [51]. Huang et al. [39] confirmed that perceptual playfulness significantly affects attitudes in mobile learning research. Teo and Noyes [52] conducted research based on TAM and found that perceived playfulness is an essential predictor of perceived ease of use, usefulness, and behavioral participation intention. Alraimi et al. [33] believe that playfulness is intrinsically motivating and significantly impacts users’ behavioral intentions. Sarrab et al. [15] investigated the acceptance factors of mobile learning based on TAM and found that ease of use, practicality, and playfulness greatly impact learners’ participation in online learning. Safsouf et al. [34] found that the PP of online learners indirectly affects usefulness, behavior, and attitudes through PEU. Based on the above analysis, the hypotheses proposed in this study are as follows:

**Hypothesis 5.** Perceived playfulness has a positive effect on perceived usefulness.

**Hypothesis 6.** Perceived playfulness has a positive effect on participation attitude.

**Hypothesis 7.** Perceived playfulness has a positive effect on participation intention.
This study’s University Support (US) refers to the relevant supporting policies and management systems for online education in the colleges and universities to which the students belong. Davis and Murrell [53] believe that the support provided by colleges and universities can enhance students’ participation intention. Venkatesh and Bala [35] believe that the external social environment will affect the individual’s participation intention to use the information system. Schierz et al. [54] pointed out that the effects of the outside world and the influence of other people will cause changes in individual thoughts, attitudes, or behaviors. Lakhal et al. [36] found that external promotion conditions and social influence are also important driving forces for behavioral intentions. Tosuntas et al. [37] found that the school’s external support positively affects the participation intention to use. Against the background of the credit system, students may have different learning attitudes when participating in online education. Students’ perception of the degree of support for online education by colleges and universities may also affect their attitudes toward participation in online education. The publicity of online education policies will affect university students’ views and behavioral wishes on implementing “stop classes without suspension.” “University support” will examine the system introduced by colleges and universities to develop online education from three aspects: credit certification, promotion, and support and guarantee. Based on the above analysis, the hypotheses proposed in this study are as follows:

Hypothesis 8. University support has a positive moderation effect on the participation attitude of university students in online education to their participation intention.

Hypothesis 9. University Support has a positive effect on perceived ease of use.

Hypothesis 10. University Support has a positive effect on perceived usefulness.

Hypothesis 11. University Support has a positive effect on perceived playfulness.

Hypothesis 12. The different genders have different perceptual playfulness.

Hypothesis 13. The different genders have different participation intentions.

The 13 hypotheses proposed in this study are shown in Figure 1.

Figure 1. Research hypotheses.
3. Method

3.1. Study Context

During the playful teaching process, several activities, such as group discussions, voting, group presentations, and program practice, were carried out. Using such fun teaching activities can help students acquire new knowledge and new abilities and skills [21]. They can also strengthen the interaction and communication between teachers and students [16], and further motivate the students to join the course in a pleasant atmosphere [32]. For instance, for each finished course activity, students earn different badges and points. The teacher further used the leaderboard to rank students based on their earned course points. This created a fun and competitive learning environment where students are motivated to study more so they can be on top of the leaderboard. The teacher also used different digital tools to enable collaborative learning, where students work in teams to finish different learning activities.

3.2. Measures

The research model has 6 latent variables, and the measurement items are all derived or adapted from the existing literature to ensure content validity. The measurement items of perceived ease of use and usefulness are adapted from Davis [29], perceived playfulness is adapted from the study of Alraimi et al. [33], participation attitude is adapted from Venkatesh et al. [55], participation intention is adapted from the research of Bhattacharjee [56], and the University support comes from Lakhal et al. [36]. Each latent variable contains 3–4 measurement items. The measurement items are measured with a 7-level Likert scale, with 1–7 expressing strong disagreement to strong agreement.

3.3. Participants

After the initial completion of the questionnaire, the latter was published on the questionnaire star platform, 30 university students were invited to conduct a pre-survey through the QQ group, and the fuzzy items were carefully adjusted based on the feedback to ensure the validity of the questionnaire. After a pre-investigation, a formal large-scale survey will be carried out. The final questionnaire contains two parts: the first part refers to the class teacher’s student class QQ group, the course’s WeChat group, and the Chaoxing platform. This study followed the “Ethical Guidelines for Educational Research” from the British Educational Research Association [57], and obtained full ethical approval from the educational institution before starting the data collection work. All the invited students had the possibility to drop-out of this experiment at any time. In addition, each participant understood the purpose of this research in advance. A total of 398 students were invited to participate in this survey. After data cleaning, the number of valid questionnaires was 342, and the effective rate of this questionnaire survey was 85.9%. Table 1 contains the basic information of the sample.

Table 1. Basic information statistics of the survey samples.

| Information          | Item                        | Quantity | Percentage |
|----------------------|-----------------------------|----------|------------|
| Gender               | Male                        | 167      | 48.8%      |
|                      | Female                      | 175      | 51.2%      |
| Age                  | <18                         | 10       | 2.9%       |
|                      | 18–20                       | 249      | 72.8%      |
|                      | 21–23                       | 74       | 21.6%      |
|                      | >24                         | 9        | 2.6%       |
| Educational background | Higher vocational college student | 148 | 43.3% |
|                      | Undergraduate student      | 133      | 38.9%      |
|                      | Master student              | 51       | 14.9%      |
|                      | Doctoral student            | 10       | 2.9%       |
4. Results

In this study, the partial least squares structural equation modeling software SmartPLS 3 was used to analyze the data [58].

4.1. Model Validation

The validity of the measurement model was measured using content validity, convergence validity, and discriminative validity [59]. The measured items are all from, or adapted from, the existing literature, and a pre-investigation has been carried out. It can be considered that the content validity of the scale is good. The average variance extracted (AVE) in Table 2 is the average extraction variance. If AVE is higher than 0.5, the convergence validity of the latent variables is ideal [59]. From Table 2, we can see that the measurement model has an acceptable convergence validity. Table 3 shows that the square root of the AVE of the latent variable is larger than the correlation coefficient between the latent variable and other latent variables, so the discriminative validity of the measurement model is appropriate. If the combined reliability (CR) and internal consistency coefficient (Cronbach’s Alpha) of the latent variables exceed 0.7, the reliability of the measurement model is good [59]. It can be concluded from Table 2 that both CR and Cronbach’s Alpha values are higher than the critical value, which proves that the reliability of the measurement model is good.

Table 2. AVE, CR, and Cronbach’s Alpha.

| Constructs                  | Items | Cronbach's Alpha | CR  | AVE  |
|-----------------------------|-------|------------------|-----|------|
| Perceived usefulness        | 4     | 0.875            | 0.914 | 0.728 |
| Perceived ease of use       | 4     | 0.887            | 0.922 | 0.747 |
| Perceived playfulness       | 4     | 0.864            | 0.908 | 0.711 |
| Participation attitude      | 3     | 0.872            | 0.922 | 0.797 |
| Participation intention     | 3     | 0.859            | 0.914 | 0.781 |
| University support          | 3     | 0.827            | 0.896 | 0.742 |

Table 3. Fornell–Larcker test of discriminant validity.

|       | PA    | PI   | PEU  | PU   | US    | PP    |
|-------|-------|------|------|------|-------|-------|
| PA    | 0.892 |      |      |      |       |       |
| PI    | 0.549 | 0.883|      |      |       |       |
| PEU   | 0.640 | 0.375| 0.864|      |       |       |
| PU    | 0.682 | 0.463| 0.639| 0.853|       |       |
| US    | 0.384 | 0.438| 0.337| 0.387| 0.861 |       |
| PP    | 0.248 | 0.477| 0.237| 0.317| 0.171 | 0.843 |

Note: The value in bold on the diagonal is the square root of AVE.

It can be seen from Table 4 that the correlation coefficients (factor loading) between each measured variable and its latent variables are more significant than the correlation coefficients with other latent variables (cross-factor loading), which proves that the measurement model has good convergence validity and discrimination validity. Hair et al. [58] believe that the value of HTMT (heterotrait–monotrait ratio of correlations) can judge the discriminative validity. If the HTMT value is lower than 0.9, the discriminative validity is better. Through SmartPLS 3, the maximum HTMT value of this study is 0.778 (PU and PA), which once again shows that the validity of the discrimination between the latent variables is good.
Table 4. Cross loading.

|       | PA    | PI    | PEU   | PU    | US    | PP    |
|-------|-------|-------|-------|-------|-------|-------|
| PA1   | 0.881 | 0.462 | 0.591 | 0.617 | 0.331 | 0.225 |
| PA2   | 0.913 | 0.497 | 0.543 | 0.596 | 0.353 | 0.233 |
| PA3   | 0.883 | 0.511 | 0.577 | 0.612 | 0.343 | 0.206 |
| P1    | 0.485 | 0.881 | 0.32  | 0.403 | 0.356 | 0.438 |
| P2    | 0.460 | 0.856 | 0.278 | 0.397 | 0.358 | 0.390 |
| P3    | 0.510 | 0.912 | 0.283 | 0.427 | 0.443 | 0.436 |
| PEU1  | 0.561 | 0.334 | 0.860 | 0.572 | 0.339 | 0.222 |
| PEU2  | 0.540 | 0.370 | 0.909 | 0.547 | 0.280 | 0.202 |
| PEU3  | 0.526 | 0.292 | 0.845 | 0.537 | 0.275 | 0.212 |
| PEU4  | 0.581 | 0.300 | 0.841 | 0.549 | 0.268 | 0.181 |
| PU1   | 0.576 | 0.408 | 0.535 | 0.832 | 0.325 | 0.233 |
| PU2   | 0.521 | 0.301 | 0.540 | 0.817 | 0.331 | 0.256 |
| PU3   | 0.651 | 0.433 | 0.574 | 0.914 | 0.348 | 0.283 |
| PU4   | 0.571 | 0.428 | 0.531 | 0.847 | 0.318 | 0.307 |
| US1   | 0.312 | 0.330 | 0.275 | 0.310 | 0.821 | 0.128 |
| US2   | 0.329 | 0.403 | 0.273 | 0.352 | 0.886 | 0.160 |
| US3   | 0.349 | 0.394 | 0.322 | 0.336 | 0.876 | 0.153 |
| PP1   | 0.221 | 0.426 | 0.235 | 0.248 | 0.101 | 0.851 |
| PP2   | 0.162 | 0.372 | 0.175 | 0.246 | 0.159 | 0.863 |
| PP3   | 0.179 | 0.404 | 0.121 | 0.268 | 0.155 | 0.824 |
| PP4   | 0.264 | 0.403 | 0.256 | 0.302 | 0.166 | 0.834 |

The questionnaires in this study were all conducted using a single online survey method, and all data were collected through the self-report study method of respondents, which may have standard method deviations [60]. Based on previous research results, this research reduced the standard method deviations from two aspects: program control and statistical control. In statistical control, Harman’s single factor test method was used. Using the principal component analysis method in the IBM SPSS analysis software, the variance explained by the most prominent factor after the calculation is less than 40%, and none of the factors explains most of the variance, so the standard method deviation will not have a significant impact on the research.

Hair et al. [58] pointed out that if the variance expansion factor value in the research model is greater than 5, there is a problem of collinearity. The VIF value of each variable obtained by SmartPLS 3 calculation is shown in Table 5. The VIF value did not exceed the critical level value of 5. Therefore, it is believed that the model in this study does not have multicollinearity, and the model estimation result is relatively stable.

Table 5. VIF value.

|       | PA    | PI    | PU    |
|-------|-------|-------|-------|
| PA    | 1.934 |       |       |
| PEU   | 1.694 | 1.000 |       |
| PU    | 1.777 | 2.034 |       |
| US    | 1.217 | 1.217 |       |
| PP    | 1.114 | 1.125 |       |

4.2. Hypothesis Results

To validate our hypotheses (see Section 2), we used SmartPLS 3 to test the structural model and bootstrapping to select 5000 samples with re-sampling to analyze the significance of the path coefficient. The PLS structural equation model of the factors affecting the participation intention in online education of university students is shown in Figure 2.
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Table 5. VIF value.

| NO  | PA   | PI   | PU   | US  | PP  |
|-----|------|------|------|-----|-----|
| 1   | 1.934|      |      |     |     |
| 2   | 1.694| 1.000|      |     |     |
| 3   | 1.777| 2.034|      |     |     |
| 4   | 1.217|      |      |     |     |
| 5   | 1.114| 1.125|      |     |     |

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The R-squared (explained variance) of online education participation intention is 0.541, indicating that the prediction effect of the research model is good [58]. It can be seen from Figure 2 that the perceived usefulness in the research model has no significant impact on the intention of participation, and perceived usefulness has no significant impact on participation attitude. The path coefficient of perceived ease of use on perceived usefulness is 0.542, showing a strong influence; the path coefficient from participation attitude to participation intention is 0.377. Behavior attitude is the critical factor that affects participation intention, which is also the same as that of related studies [41, 43–45]. Table 6 summarizes the final results of the hypotheses.

Table 6. Hypothesis results.

| NO | Hypothesis                          | Result  |
|----|------------------------------------|---------|
| H1 | Participation attitude → Participation intention | Support |
| H2 | Perceived Usefulness → Participation Attitude | Support |
| H3 | Perceived Ease of Use → Perceived Usefulness | Support |
| H4 | Perceived Usefulness → Participation intention | Rejected |
| H5 | Perceived playfulness → Perceived Usefulness | Support |
| H6 | Perceived playfulness → Participation attitude | Rejected |
| H7 | Perceived playfulness → Participation intention | Support |
| H8 | University support has a positive moderation effect | Support |
| H9 | University Support → Perceived Ease of Use | Support |
| H10| University Support → Perceived Usefulness | Support |
| H11| University Support → Perceived playfulness | Support |
| H12| The different genders have different Perceptual playfulness | Rejected |
| H13| The different genders have different Participation Intention | Rejected |

### 4.3. Mediation of Participation Attitude

The mediation effect detection of the participation attitude adopts the bootstrapping method suggested by Hair et al. [58]. The calculation results with the sample size set to 5000 are shown in Table 7.
Table 7. Test results of mediation effect.

| Path | Effect | 95% Confidence Intervals | p Value | Significance | Kind of Mediation |
|------|--------|--------------------------|---------|--------------|-------------------|
| PU→PA→PI | Direct effect | [−0.022, 0.191] | 0.140 | No | |
| | Indirect effect | [0.125, 0.254] | 0.000 | Yes | Full mediation |
| | Total effect | [0.165, 0.371] | 0.000 | Yes | |
| PEU→PA→PI | Direct effect | [−0.182, 0.029] | 0.166 | No | |
| | Indirect effect | [0.092, 0.198] | 0.000 | Yes | Full mediation |
| | Total effect | [0.151, 0.321] | 0.000 | Yes | |
| PP→PA→PI | Direct effect | [−0.022, 0.040] | 0.561 | No | |
| | Indirect effect | [0.249, 0.390] | 0.000 | Yes | |
| PEU→PU→PA | Direct effect | [0.257, 0.426] | 0.000 | Yes | |
| | Indirect effect | [0.226, 0.359] | 0.000 | Yes | Partial mediation |
| | Total effect | [0.571, 0.687] | 0.000 | Yes | |

In the mediation effect analysis, (1) if the indirect effect is not significant, it means that there is no mediation; (2) if the indirect effect is significant, but the direct effect is not significant, it indicates that the mediation effect is complete mediation; (3) if the indirect effect is not significant, and the direct effect is also significant, it indicates that the mediation effect is a partial mediation [56]. It can be seen from Table 7 that PA (participation attitude) has a full mediating effect on the relationship between PU (perceived usefulness) and PI (participation intention); PA (participation attitude) has a full mediating effect on the relationship between PEU (perceived ease of use) and PI (participation intention); PA (participation attitude) has no mediation between PP (participation playfulness) and PI (participation intention); PU (perceived usefulness) has a partial intermediary relationship between PEU (perceived ease of use) and PA (participation attitude). To sum up, perceived usefulness and perceived ease of use affect university students’ online education participation intention through the complete mediation of participation attitude, and perceived ease of use affects university students’ online education participation attitude through the mediation of perceived usefulness.

4.4. Moderation of University Support

In this study, the SmartPLS 3 analysis software was used to test the regulation effect, establishing a mechanism in SmartPLS 3 to ensure a model for the moderation of participation attitude and participation intention. The test results of the regulation effect are shown in Table 8.

Table 8. Test results of Moderation effect.

| Path | Path Coefficient | No Moderation | Include Moderation | Hypothesis Test Result |
|------|-----------------|---------------|--------------------|-----------------------|
| | | T-Value | Significance | T-Value | Significance | |
| PA→PI | 0.416 | 6.546 | *** | 0.377 | 7.200 | *** |
| US→PI | | | | 0.232 | 5.535 | *** |
| PA*US→PI | | | | 0.264 | 6.002 | *** |
| R² | 0.428 | | | 0.541 | | |
| f² | | | | 0.147 | | |

Note: *** p < 0.001.

It can be seen from Table 8 that the path coefficient β value of the mediation terms PA*US→PI is 0.264, indicating that the university support * participation attitude has a positive effect on the participation intention. When taking university support as a reference point, the value of the relationship between participation attitude → participation intention is 0.377. However, when university support increases, the value of the relationship between...
participation attitude and participation intention will be affected by the moderation effect. It can be concluded that when the university support is high, the explanatory power of the participation attitude to the participation intention will be strengthened.

The above conclusions must be established on the premise that the moderation effect is significant. Table 8 shows that in the presence of moderation variables, the path coefficient of participation attitude $\rightarrow$ participation intention is 0.377, and the $T$-value is 7.200; the path coefficient of the moderation term (PA*US) to participation intention is 0.264, and the $T$-value of 6.002 is greater than the critical value of 1.96, which proves to be significant. Therefore, university support has a significant positive mediation effect on the relationship between participation attitude and participation intention, and the hypothesis test results are verified.

Adding the moderation variables of the university support, the value of $R^2$ increased from 0.428 to 0.541, indicating that the participation intention is affected by the moderation of the university support. $f^2$ can be used to explain the influence of exogenous variables on endogenous variables. It can be seen from Table 8 that the $f^2$ value of the mediation effect is 0.147 > 0.02, indicating that the university support has a weak mediation effect on the relationship between participation attitude and participation intention [58].

5. Discussion and Implications

5.1. Direct Influence Factors

Based on the technology acceptance model, this research explores the influencing factors of university students’ participation intention in online education. Using SmartPLS 3 to calculate PLS-SEM to get the calculation results, it is found that the direct factors that affect the participation intention in online education are participation attitude and perceived playfulness.

5.1.1. Participation Attitude

The analysis results show that participation attitude is one of the critical factors affecting participation intention. Participation attitude fully mediates the influence of perceived ease of use and perceived usefulness on participation intention. The behavioral intention of university students toward online education, a course teaching method, is to form a personal participation attitude under the comprehensive influence of other factors and affect university students’ participation intention in online education. It is also in line with the research results of previous scholars [43,45]. When university students judge their participation attitude, the latter is derived from internal and external factors, ultimately driving university students’ participation in online education.

Implications: Participation attitude significantly affects participation intention. Therefore, while promoting online education in colleges and universities under the background of “suspending classes and not stopping school,” attention should be paid to student participation attitudes to improve students’ positive attitudes, thereby enhancing university students’ participation intention. The two dimensions of internal factors and external factors are jointly driven to produce changes in students’ attitudes, and more attention is paid to the role of internal factors to stimulate the subjective initiative of university students. At the same time, it is necessary to carry out online education guarantee work to eliminate students’ troubles and worries about the development of online education. The support work also requires teachers, universities, and authorities involved in online education to pay attention to the inner psychological changes of university students in order to enhance their intention to participate and do an excellent job in online education. The combination of internal and external factors forms a participation attitude, which also references the classified management of the online education work carried out by colleges, universities, and competent departments in the later period.
5.1.2. Perceived Playfulness

Through empirical analysis, it is concluded that perceived playfulness is not significant to university students’ participation attitudes but has a significant impact on participation intention in online education, indicating that perceived playfulness is one of the critical factors affecting participation intention \[33,39,61\]. Although perceived playfulness does not directly affect behavior attitude \[16\], it directly affects students’ intention to participate, and playfulness in online learning can also stimulate students’ learning enthusiasm. The research results show that the perceived playfulness in online education conforms to the intrinsic motivation of university students, so their participation intention is also positively affected by the perceived playfulness.

Implications: In teaching design and online teaching, college teachers need to pay attention to the user experience of students and make full use of the characteristics of online teaching and the advantages of interactive tools to make online education learning activities full of fun and joy. Many college teachers and students are changing from traditional face-to-face classrooms to online education for the first time. Colleges and universities should do an excellent job promoting and guaranteeing online education policies to create a good teaching environment for online education. Relevant government authorities should combine the particularities of college student groups and the current situation of network resource shortages facing the development of large-scale online education, give preference to policy formulation and resource allocation, and help colleges and universities to develop online education.

5.2. Indirect Influencing Factors

The results of the PLS structural equation model of university students’ participation intention in online education show that perceived usefulness and perceived ease of use positively affect the participation attitude of the intermediary variable in a significant way, and then the participation attitude of university students affects the participation intention of university students.

5.2.1. Perceived Usefulness

Although university students’ perceived usefulness does not significantly impact the participation intention, it significantly affects the attitude of participation and then indirectly affects the participation intention in online education. At the same time, perceived usefulness partly mediates the impact of perceived ease of use on the attitude of participation. Therefore, perceived usefulness is also an essential factor influencing behavior intention \[29,47,49\]. For the development of online education courses, it is necessary to work hard and improve the content quality of the courses, so that university students can perceive those online courses as conducive to improving their learning efficiency, enhancing learning effects, and learning more knowledge, making learning more enjoyable and relaxing. This is more conducive to improving the participation attitude of university students and affects the participation intention in online education.

Implications: In the teaching design and teaching process, pay attention to the effect of curriculum content on improving university students’ learning efficiency and learning effect. In terms of course construction, students’ feedback on courses is accepted, and the content optimization of online courses is continuously promoted to improve the learning efficiency and effectiveness of university students. Providing high-quality courses, improving the positioning, goals, academic analysis, and teaching methods of the courses, will help improve the perceived usefulness of university students. Colleges and universities should pay attention to the operability and convenience of the software when selecting online education platform softwares and pay attention to the course content’s effectiveness in the arrangement of course content.
5.2.2. Perceived Ease of Use

Perceived ease of use significantly affects the participation attitude of university students, which is also in line with the relevant research results of previous scholars [34,45,48]. Perceived ease of use significantly affects participation attitude and indirectly affects the participation intention in online education, so the perceived ease of use is also one of the essential factors affecting the participation intention. When the learning method of online education meets the inherent expectations of university students for time-saving, simplicity, and ease of use, the subjective perception judges that the ease of use of online education is high, and by influencing the participation attitude and perceived usefulness, it finally drives individual students’ willingness to participate.

Implications: When developing the ease of use of the online education platform, pay attention to the feedback of university students in software development and curriculum design, and develop a software platform that is humane and conforms to the operating habits of the student group, which is also conducive to improving the intention of participating in online education. Optimize the teaching methods and learning experience of online courses. New multimedia technology and 5G technology bring more possibilities for holographic projection teaching and VR teaching. Colleges and software service providers should pay attention to the advantages brought by new technologies to improve online education—ease of use.

5.3. University Support

As a moderating variable from participation attitude to participation intention, university support has passed the significance test. It can be seen that university support is also one of the critical factors affecting university students’ participation intention in online education. The research results are similar to the research conclusions drawn by previous scholars [36,55,62]. University support significantly positively regulates participation attitude to participation intention, indicating that when the level of mechanical protection external factors is high, the relationship between participation attitude and participation intention of university students has also been positively adjusted. It shows that when external factors meet the user’s internal psychological needs and expectations, they can affect the individual’s behavior, attitude and intention.

Implications: Strengthen online education policies and service support to increase university students’ participation intention. Online education implemented in the context of post-epidemic prevention and control must first change the concept that online education is only used as an auxiliary teaching method and develop a supporting system for credit recognition to enhance teachers’ and students’ attention to online education [63]. As many teachers and students use online education for the first time to teach and learn, colleges and universities need to strongly recommend and publicize supporting guidelines to ensure the implementation of the policies. For the initial implementation of large-scale online education, colleges and universities must also ensure the corresponding technical support. Universities can ensure the smooth progress of online education methods through policy formulation, credit recognition, publicity work, and resource support.

5.4. Limitations and Future Research

This research has contributed theoretical value and practical value and has achieved specific results. However, it also has some deficiencies. First of all, the data in this survey come from the collection of online questionnaires. These questionnaire data are all responses from university students at a certain point in time. Therefore, there will be a certain degree of one-sidedness in the number and representativeness of the questionnaires. Under the development trend of digitalization, it is possible to consider tracking the behavior trajectory of users of online education platforms to obtain larger data samples and more comprehensive data to analyze user behaviors in online education. Secondly, this research mainly focuses on the intention of university students to participate in online education, and the follow-up can focus on user participation behavior research. By tracking
the users’ entire behavioral flow from browsing, registration to use, reuse, or loss, we continue to study user behavior to understand the users’ entire life cycle behavior more accurately and obtain supplementary conclusions. Furthermore, future research directions could focus on the self-regulated learning strategies to finish a given course. This could help to provide personalized learning support for students when needed. Future directions could also focus on investigating how online fatigue impacted students’ online behavior within a given course.

6. Conclusions

This paper constructs a model of factors affecting online education participation intention based on the perspective of university students in the post-COVID-19 pandemic. New viewpoints affecting the participation intention in online education are proposed based on the technology acceptance model. After that, the scale design and questionnaire survey have been carried out, the data has been empirically analyzed with the help of the SmartPLS 3 software, and the partial least squares structural equation model was used for testing. The research results of this article provide an essential reference and basis for teachers, universities, and government authorities to carry out online education work from the perspective of university students in the context of emergencies.

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References

1. UNESCO. Education: From Disruption to Recovery. 2020. Available online: https://en.unesco.org/covid19/educationresponse (accessed on 15 April 2021).
2. Hodges, C.B.; Fowler, D.J. The COVID-19 Crisis and Faculty Members in Higher Education: From Emergency Remote Teaching to Better Teaching through Reflection. Int. J. Multidiscip. Perspect. High. Educ. 2020, 5, 118–122. [CrossRef]
3. Bao, W. COVID-19 and online teaching in higher education: A case study of Peking University. Human Behavior and Emerging Technologies. Hum. Behav. Emerg. Technol. 2020, 2, 113–115. [CrossRef]
4. Derakhshandeh, Z.; Esmaeili, B. Active-learning in the online environment. J. Educ. Multimed. Hyper Media 2020, 29, 299–311.
5. Zhou, L.; Wu, S.; Zhou, M.; Li, F. ‘School’s Out, But Class ‘On’, The Largest Online Education in the World Today: Taking China’s Practical Exploration During The COVID-19 Epidemic Prevention and Control As an Example. Best Evid. Chin. Educ. 2020, 4, 501–519. [CrossRef]
6. Huang, R.; Tili, A.; Chang, T.W.; Zhang, X.; Nascimbeni, F.; Burgos, D. Disrupted classes, undisrupted learning during COVID-19 outbreak in China: Application of open educational practices and resources. Smart Learn. Environ. 2020, 7, 1–15. [CrossRef]
7. Balkaya, S.; Akkucuk, U. Adoption and use of learning management systems in education: The role of playfulness and self-management. Sustainability 2021, 13, 1127. [CrossRef]
8. Almaiah, M.A.; Al-Khasawneh, A.; Althunibat, A. Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic. Educ. Inf. Technol. 2020, 25, 5261–5280. [CrossRef] [PubMed]
9. Aguilera-Hermida, A.P. College students’ use and acceptance of emergency online learning due to COVID-19. Int. J. Educ. Res. Open 2020, 1, 100011. [CrossRef]
10. Ifijeh, G.; Yusuf, F. Covid-19 pandemic and the future of Nigeria’s university system: The quest for libraries’ relevance. J. Acad. Librariansh. 2020, 46, 102226. [CrossRef] [PubMed]

11. Garcia-Peñalvo, F.J.; Rector, R.R.O.; Rodriguez-Conde, M.J.; Rodriguez-Garcia, N. The institutional decisions to support remote learning and teaching during the COVID-19 pandemic. In Proceedings of the 2020 X International Conference on Virtual Campus (JICV), Tetouan, Morocco, 3–5 December 2020; pp. 1–5. [CrossRef]

12. Dai, D.; Lin, G. Online Home Study Plan for Postponed 2020 Spring Semester during the COVID-19 Epidemic: A Case Study of Tengtangang Middle School in Nanjing, Jiangsu Province, China. Best Evid. Chin. Educ. 2020, 4, 543–547. [CrossRef]

13. Al Kurdi, B.; Alshurideh, M.; Salloum, S.; Obeidat, Z.; Al-dweeri, R. An Empirical Investigation into Examination of Factors Influencing University Students’ Behavior towards E-learning Acceptance Using SEM Approach. Int. Assoc. Online Eng. 2020, 14, 19–41.

14. Lai, C.; Wen, Y.; Gao, T.; Lin, C.H. Mechanisms of the learning impact of teacher-organized online schoolwork sharing among primary school students. J. Educ. Comput. Res. 2020, 58, 978–1002. [CrossRef]

15. Sarrab, M.; Al Shibli, I.; Badursa, N. An empirical study of factors driving the adoption of mobile learning in Omani higher education. Int. Rev. Res. Open Distrib. Learn. 2016, 17, 331–349. [CrossRef]

16. Padilla-Meléndez, A.; del Aguila-Obra, A.R.; Garrido-Moreno, A. Perceived playfulness, gender differences and technology acceptance model in a blended learning scenario. Comput. Educ. 2013, 63, 306–317. [CrossRef]

17. Guitard, P.; Ferland, F.; Dutil, É. Toward a better understanding of playfulness in adults. Occupation. Participat. Health 2005, 25, 9–22. [CrossRef]

18. Synodi, E.; Linardakis, M.; Sadauskiene, R.; Kochanskiene, A.; Rimaviciene, D. Teachers’ Approach to Playfulness in the Process of Education/Learning in Lithuania and Greece. Signum Temporis 2015, 7, 15. [CrossRef]

19. Tanis, D.J. Exploring Play/Playfulness and Learning in the Adult and Higher Education Classroom; The Pennsylvania State University: State College, PA, USA, 2012.

20. dos Reis Lívero, F.A.; da Silva, G.R.; Amaral, E.C.; de Souza, A.N.V.; Baretta, I.P.; Diegues, M.E.M.; Lovato, E.C.W. Playfulness in the classroom: Gamification favor the learning of pharmacology. Educ. Inf. Technol. 2021, 26, 2125–2141. [CrossRef]

21. Huang, R.T.; Jang, S.J.; Machtmes, K.; Deggs, D. Investigating the roles of perceived playfulness, resistance to change and self-management of learning in mobile English learning outcome. Br. J. Educ. Technol. 2012, 43, 1004–1015. [CrossRef]

22. Ali, W. Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. High. Educ. Stud. 2020, 10, 16–25. [CrossRef]

23. Demuyakor, J. Coronavirus (COVID-19) and online learning in higher institutions of education: A survey of the perceptions of Ghanaian international students in China. Online J. Commun. Media Technol. 2020, 10, e202018. [CrossRef]

24. Al-Salman, S.; Haider, A.S. Jordanian University Students’ Views on Emergency Online Learning during COVID-19. Interact. Learn. Environ. 2021, 25, 286–302. [CrossRef]

25. Thongsri, N.; Chootong, C.; Tripak, O.; Piyawanitsatian, P.; Saengae, R. Predicting the determinants of online learning adoption during the COVID-19 outbreak: A two-staged hybrid SEM-neural network approach. Interact. Technol. Smart Educ. 2021. [CrossRef]

26. Adedoyin, O.B.; Soykan, E. Covid-19 pandemic and online learning: The challenges and opportunities. Interact. Learn. Environ. 2020, 1–13. [CrossRef]

27. Dwawan, S. Online learning: A panacea in the time of COVID-19 crisis. J. Educ. Technol. Syst. 2020, 49, 5–22. [CrossRef]

28. Elzainy, A.; El Sadik, A.; Al Abdulumonem, W. Experience of e-learning and online assessment during the COVID-19 pandemic at College of Medicine, Qassim University. J. Inf. Technol. Educ. Res. 2020, 19, 87–112. [CrossRef]

29. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. ACM Comput. Surv. 1989, 21, 319–340. [CrossRef]

30. Alshurideh, M.; Salloum, S.; Obeidat, Z.; Al-dweeri, R. An Empirical Investigation into Examination of Factors Influencing University Students’ Behavior towards E-learning Acceptance Using SEM Approach. Int. Assoc. Online Eng. 2020, 14, 19–41.

31. Nayanajith, G.; Damunupola, K.A.; Ventayen, R.J. Impact of Innovation and Perceived Ease of Use on E-Learning Adoption. Interdiscip. J. Contemp. Res. Bus. 2010, 2, 330–344.

32. Wu, B.; Chen, X. Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. Comput. Hum. Behav. 2017, 67, 221–232. [CrossRef]

33. Alshurideh, M.; Salloum, S.; Obeidat, Z.; Al-dweeri, R. An Empirical Investigation into Examination of Factors Influencing University Students’ Behavior towards E-learning Acceptance Using SEM Approach. Int. Assoc. Online Eng. 2020, 14, 19–41.

34. Safsouf, Y.; Mansouri, K.; Poirier, F. An Analysis to Understand the Online Learners’ Success in Public Higher Education in Morocco. J. Inf. Technol. Educ. Res. 2020, 19, 87–112. [CrossRef]

35. Venkatesh, V.; Bala, H. Student behavioural intentions to use desktop video conferencing in a distance course: Integration of autonomy to the UTAUT model. J. Comput. High. Educ. 2013, 25, 93–121. [CrossRef]

36. Tosuntaş, Ş.B.; Karadağ, E.; Orhan, S. The factors affecting acceptance and use of interactive whiteboard within the scope of FATIH project: A structural equation model based on the Unified Theory of acceptance and use of technology. Comput. Educ. 2015, 81, 169–178. [CrossRef]
38. Agarwal, R.; Prasad, J. Are individual differences germane to the acceptance of new information technologies? *Decis. Sci.* **1999**, *30*, 361–391. [CrossRef]
39. Huang, J.H.; Lin, Y.R.; Chuang, S.T. Elucidating user behavior of mobile learning: A perspective of the extended technology acceptance model. *Electron. Libr.* **2007**, *25*, 585–598. [CrossRef]
40. Teo, T.; Zhou, M. Explaining the intention to use technology among university students: A structural equation modeling approach. *J. Comput. High. Educ.* **2014**, *26*, 124–142. [CrossRef]
41. Zhou, M. Chinese university students’ acceptance of MOOCs: A self-determination perspective. *Comput. Educ.* **2016**, *92*, 194–203. [CrossRef]
42. Baydas, O.; Yilmaz, R.M. Pre-service teachers’ intention to adopt mobile learning: A motivational model. *Br. J. Educ. Technol.* **2018**, *49*, 137–152. [CrossRef]
43. Hsu, C.L.; Lin, J.C.C. Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Inf. Manag.* **2008**, *45*, 65–74. [CrossRef]
44. Lin, H.F. An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust. *Int. J. Inf. Manag.* **2011**, *31*, 252–260. [CrossRef]
45. Robinson, T. Using the Technology Acceptance Model to Examine Technology Acceptance of Online Learning Technologies by Non-Traditional Students. *1 Manag. J. Educ. Technol.* **2019**, *16*, 21.
46. Lee, Y.; Kozar, K.A.; Larsen, K.R. The technology acceptance model: Past, present, and future. *Commun. Assoc. Inf. Syst.* **2003**, *12*, 50. [CrossRef]
47. Huang, R.T.; Hsiao, C.H.; Tang, T.W.; Lien, T.C. Exploring the moderating role of perceived flexibility advantages in mobile learning continuance intention (MLCI). *Int. Rev. Res. Open Distrib. Learn.* **2014**, *15*, 140–157. [CrossRef]
48. Wu, B.; Zhang, C. Empirical study on continuance intentions towards E-Learning 2.0 systems. *Behav. Inf. Technol.* **2014**, *33*, 1027–1038. [CrossRef]
49. Rafique, W.; Dou, W.; Hussain, K.; Ahmed, K. Factors Influencing Programming Expertise in a Web-based E-learning Paradigm. *Online Learn.* **2020**, *24*, 158–177. [CrossRef]
50. Ryan, R.M.; Deci, E.L. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemp. Educ. Psychol.* **2000**, *25*, 54–67. [CrossRef] [PubMed]
51. Kilili, K. Digital game-based learning: Towards an experiential gaming model. *Internet High. Educ.* **2005**, *8*, 13–24. [CrossRef]
52. Teo, T.; Noyes, J. An assessment of the influence of perceived enjoyment and attitude on the intention to use technology among pre-service teachers: A structural equation modeling approach. *Comput. Educ.* **2011**, *57*, 1645–1653. [CrossRef]
53. Davis, T.M.; Murrell, P.H. A structural model of perceived academic, personal, and vocational gains related to college student responsibility. *Res. High. Educ.* **1993**, *34*, 267–289. [CrossRef]
54. Schierz, P.G.; Schilke, O.; Wirtz, B.W. Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electron. Commer. Res. Appl.* **2010**, *9*, 209–216. [CrossRef]
55. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User acceptance of information technology: Toward a unified view. *MIS Q.* **2003**, *27*, 425–478. [CrossRef]
56. Bhattacherjee, A. Understanding information systems continuance: An expectation-confirmation model. *MIS Q.* **2001**, *25*, 351–370. [CrossRef]
57. British Educational Research Association. Available online: https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2011 (accessed on 31 July 2011).
58. Hair, J.F., Jr.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*; SAGE Publications: Thousand Oaks, CA, USA, 2016.
59. Straub, D.; Boudreau, M.C.; Gefen, D. Validation guidelines for IS positivist research. *Commun. Assoc. Inf. Syst.* **2004**, *13*, 24. [CrossRef]
60. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef]
61. Wang, J.Y.; Niu, X.R.; Wan, L. Research on User Behavior of Online Learning Based on Meta-analysis. *J. Mod. Inf.* **2020**, *1*, 58–68.
62. Oye, N.D.; Jahad, N.A.; Rahim, N.A. The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Educ. Inf. Technol.* **2014**, *19*, 251–270. [CrossRef]
63. Wang, S.F.; Huang, R.H. Research on the Mechanism and Promotion Strategy of Online Active Learning Intention. *Open Educ. Res. J.* **2020**, *5*, 99–110.