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Online Learning Satisfaction Among the Zhumadian Vocational and Technical College Students

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Abstract: The Covid-19 pandemic has affected education at all levels in a variety of ways. Teachers and students around the world face this challenge together. As a result, online learning during the influenza pandemic has become a trend research topic. With its flexible, convenient, interactive, time-free and resource-rich characteristics, online learning has brought revolutionary new ways of learning. In this research, 62 college students from Zhumadian Vocational and Technical College, different genders and different places of origin, were selected as research subjects. Overall, the students surveyed were between 4 points and 4.5 points (Total score 5 points) satisfied with their online learning. It can be seen that during the epidemic period, the overall satisfaction of students in Zhumadian Vocational and Technical College with online teaching is relatively high, and there are still individual problems in the online learning of college students in Zhumadian Vocational and Technical College, which directly affect their satisfaction with online learning, such as insufficient online teaching interaction. Based on the above conclusions, this study puts forward relevant suggestions from the school level, the level of the online learning platform and the level of learners respectively, in order to play a certain role in improving the satisfaction of college students in online learning.

Keywords: College students, online learning, online learning satisfaction, Covid-19, countermeasures

1. Introduction

In the internet era, information technology has gradually penetrated into all fields, including education. Online education is the product of the integration of information technology and education, through which higher quality teaching can be achieved. The Covid-19 pandemic at the end of 2019 has changed the way people work and live in all aspects, with factories, shops, schools and entire countries shutting down and offline activities suddenly hitting a pause button. At the same time, online trade, online consultation, online learning emerged. Under the call of the Ministry of Education, online learning has become the wind of the times. In fact, online learning has long existed. Pure online MOOC, Khan Academy and Net-Ease Cloud Classroom are in the ascendant hybrid learning platforms combining online and offline, superstar learning Tong and Erya have also entered the campus.

The epidemic is both an opportunity and a challenge for online learning. It is not only a comprehensive test for China's education system, but also will objectively promote the development of online education (Wang & Fu, 2020). Colleges and universities provide online courses for students, whose essence is to provide services. From the perspective of customer satisfaction model, students as customers buy online courses provided by schools, so the relationship between students and schools can also be regarded as the business relationship between customers and institutions (Han, 2006). According to the customer satisfaction theory, when a customer is satisfied with the product, the customer's loyalty to the product will increase significantly (Dai et al., 2020). The "effect law" proposed by Thorndike also indicates that when learners achieve satisfactory learning results, the possibility of learners to continue their current learning will be effectively improved (Wang & Li, 2022). Learning satisfaction is a subjective evaluation affected by multiple factors, which is also an effective entry point to effectively improve students' online learning effect (Wang et al., 2014).

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On March 5, 2015, Premier Li Keqiang of the state council put forward the "Internet plus" action plan for the first time in the government work report. Its main purpose is to promote the deep integration between emerging information technology and various industries. This report provides policy guidance for the development of "Internet plus education". In April 2018, the Ministry of Education pointed out in the "Education Informatization 2.0 Action Plan" that MOOCs services should be improved, massive open online courses should be provided to achieve high-quality personalized learning experience and meet the personalized needs of learners, teachers and managers. Field of education, therefore, is also the same as other industries, are actively effective integration with the Internet, "Internet +" education idea, education mode, education content and education structure has brought new challenges to education field, the depth of the Internet and education integration has become an irreversible trend.

In February 2020, in response to the impact of Covid-19 on the education system, the Ministry of Education issued the guidelines on the organization and management of online teaching in colleges and universities during the epidemic prevention and control period, requiring colleges and universities across the country to make full use of online resources and realize the task of "ceasing teaching, ceasing teaching". Therefore, it is imperative to carry out the "Internet + education" online teaching reform exploration under the dual background of accelerating education modernization and meeting realistic demands. Online learning, as an emerging teaching mode deeply integrated with the Internet and education, develops rapidly under the guidance of national policies. It not only breaks the limitations of distance and time on education, but also makes the education process more interesting with its diversified interaction levels and ways. This kind of two-way interactive form of education has attracted much attention since it was popularized and practiced. In the context of Covid-19, online teaching has attracted much attention, not only as an emergency measure, but also as an important part of the future education system after the epidemic. Therefore, a careful examination of students' learning satisfaction in online teaching can provide reference for future online learning.

During the epidemic period, Zhumadian Vocational and Technical College implemented the measures of "suspension of classes without suspension, suspension of classes without suspension" in accordance with the guidance of the superior, and made full use of online course teaching resources - dingding and smart Classroom online learning software for online teaching, to ensure the teaching progress and quality of the school during the epidemic prevention and control. Through this software, intelligent classroom all the students can see teacher upload courseware, video, lesson plans, etc. All the study materials, and the teacher can through this platform to interact with students, answering questions and homework tasks, etc., through the "nail" software, teachers and students can see each other in real time in the form of video, and then in class activities.

At present, domestic and foreign researchers mainly study the influencing factors of online learning satisfaction and the conceptual model of satisfaction (Li et al., 2016) put forward the structural model of learning gain, and pointed out that learning motivation, learning atmosphere and interactive behavior are the most direct factors affecting learning gain and satisfaction, while learning style, lecturer, course assistant, platform function design and demand for students are the most basic factors (Zhao & Yuan, 2010) concluded that students' adaptability to online learning, cognitive usefulness, timeliness of teachers' feedback on homework and tests, extensive cognitive ease of use, and applicability to online courses are all important factors influencing learning satisfaction of hybrid course learning. The second part is the research on the influencing factors of online learning satisfaction (Webster & Hackley, 1997) believe that students' satisfaction is affected by four aspects: the characteristics of technology, teachers, students and courses (Bray et al., 2008) a Japanese researcher, found that there are four important aspects affecting students' satisfaction with distance learning: the interaction between students and teachers, the interaction between students and learning content, the interaction between students and students, and the interaction between learners and learning interfaces.

The research on the influencing factors of online learning student satisfaction mainly reflects the differences between Chinese and Western scholars in their research priorities. Western scholars carry out relevant research earlier and have more experience (Guan, 2021). In the research process, they tend to create new research perspectives and introduce new research methods, and their research conclusions are more novel. For example, Japanese scholar (Bray et al., 2008) carried out research from the perspective of interaction, and for the first time included student autonomy in the evaluation index of students' satisfaction with distance learning (Ismuratova et al., 2017) found that teacher attitude, flexibility, course quality, multiple assessment and learners' computer anxiety were all key factors affecting learners' learning satisfaction (Chen & Yao, 2016) further studied the mediating effect of interactive materials by using the method of moderate analysis.

Research shows that interactive teaching materials have a significant impact on the relationship between learning satisfaction, internal motivation and learning satisfaction (Yu et al., 2016) investigated online learners' perceptions of interaction, satisfaction and self-expression, and found that online self-efficacy was positively correlated with these three types of interaction, but the degree of influence varied (Tawfik et al., 2017) explored the nature of student-student interaction by using interaction analysis model and social network analysis, and found that student-student interaction is an important factor affecting learners' satisfaction, but it has a low level and is heavily dependent on a few active members. Using content analysis method and social network analysis method (Satar & Akcan, 2018) found that tutoring skills courses and social presence have a significant impact on online learning satisfaction, which can improve teachers' online participation skills and enhance interaction (Lane et al., 2021) specifically discussed student satisfaction under blended learning mode and found that affective involvement is an important predictor of student

satisfaction in blended learning courses. It is suggested that teachers should maintain personal contact with students, use cooperative active learning strategies, and emphasize the consistency of learning activities and learning objectives to enhance student experience.

Online learning new crown since the outbreak, profoundly changed the Chinese original education ecology, prompted the researchers to learners of online learning satisfaction research enthusiasm, related research achievements in blowout growth, but because researchers often for full-time teachers in colleges and universities or a line of primary and secondary school teachers, the study often use online course or an online platform, Therefore, it is difficult to fully grasp the influencing factors of learner satisfaction in online learning process. In essence, education and teaching are the activities of educating people. It is nonsense to talk about education by ignoring the individual characteristics and physical and mental state of people who are the subject of education. Therefore, this study intends to improve the existing student satisfaction model and conduct sample research by SPSS tool on the basis of fully considering the psychological and physical impact of the epidemic on students. Qualitative and quantitative research paradigms were used to analyze subjective answers and objective choices, in order to obtain students' true evaluation and satisfaction of online learning during the epidemic.

The aims of the study to carry out empirical research, summarizes the characteristics of online learning, during the outbreak and fully considering the outbreak and the characteristics of the respondents on the basis of the model is improved, the satisfaction in the survey is more appropriate, practical.

2. Literature Review

2.1 Characteristics of Home Learning During Epidemic Period

Home based learning is online learning carried out by various educational institutions at all levels under the policy of "no school suspension" of the Ministry of education during the epidemic period. It is an emergency plan adopted by the Ministry of education of the People's Republic of China in 2020 to ensure the life, health and safety of teachers and students and prevent and control the national epidemic. As a special product of large-scale public health emergencies, to study it, we must first understand its particularity.

Different from the traditional face-to-face classroom, home learning has the following changes: a) the learning environment has changed from the school classroom to the family life or environment; b) the teacher-student relationship has changed from a strong zero distance relationship to a weak long-distance relationship; c) the teaching organization structure has changed from the centralized organization in the same site to the distributed organization in different sites; d) the management mode has changed from the hierarchical management mode of head teachers, class cadres and group leaders to the flat management mode of head teachers and teachers; and e) the status of information technology has changed from teaching aids to essential basic resources (Zhu, 2020). In this scenario, the role of teachers is no longer the lecturer of knowledge, but the facilitator and collaborator of learners' learning. Teachers and learners are the main body of teaching. They use online teaching platforms and tools to process online learning resources and construct knowledge. This puts forward new requirements for teachers' teaching design ability and teachers' and students' information literacy. Home based learning focuses on learner autonomy, and its teaching methods and curriculum design are very different from face-to-face classroom (Xie, 2020).

We should not only pay attention to the mental health of learners, pay attention to the interaction between learners, respect the learning rules of learners in different stages, grades and groups, but also pay attention to the arrangement of course content and activity organization, so as to improve the efficiency of learners' home-based learning and ensure the effect of learners' home-based learning. At the same time, home learning also has the common characteristics of online learning, that is, the separation of teaching and learning, the separation of time and space, and the separation of teachers and students. The increase of interaction distance is a great change in the form and frequency of interaction between teachers and learners. On the other hand, home-based learning has its unique characteristics compared with the various online teaching forms that originally existed in China. Home based learning is carried out when teaching time and space and teaching behavior are completely physically isolated. Such online teaching is a "new" online teaching for teachers and learners, so it is necessary to carry out new thinking in combination with the new situation (Liu & Sun, 2020).

Different from the learning on online learning platforms such as MOOC of Chinese universities, in home learning, teachers and students are online at the same time and interact in real time to construct knowledge on the online platform. Moreover, the whole process of home learning needs the joint participation of all parties, including schools, families and learners, to create and maintain an effective learning environment and atmosphere, so as to ensure the learning effect. In the past, the participants in online learning were only teachers and learners, and they did not necessarily participate in the same stage at the same time. Teachers took more ways such as recording and broadcasting lessons and answering questions after class.

2.2 Online Learning for College Students

Sun et al. (2018) developed a comprehensive model for online learning through research. This model has six dimensions. With the help of this model, researchers investigated the key factors affecting college students' online

learning satisfaction. As for basic research, its focus is on the connotation and composition of online learning, which is mainly reflected in the following two aspects: on the one hand, it is the connotation and elements of online learning. For example, from the perspective of the connotation of online learning, the significance and methods of research, Zhongzhixian puts forward five elements that affect online learning: teachers, learners, online courses, related technologies and learning activities, and online learning interaction and online learning subjects are analyzed in depth (Liu et al., 2020). Second, the environmental construction of online learning.

Yu (2018) pointed out that the online learning environment should include five elements, namely, resource environment, participation experience environment, reflection environment, support environment and social environment, based on the analysis of domestic and foreign research. Secondly, about technology research, it mainly includes the design and development of online learning related systems, providing learners with technical support services such as testing, learning interaction and monitoring in the process of online learning, learning platform construction of online courses and application software development.

In general, the emphasis on the dominant position of learners and teachers in the process of online learning has become an increasingly important focus in applied research. Researchers mainly study from the aspects of curriculum resources, learning activities, learning interaction, learning environment and so on. The last part is the research on evaluation and management, which mainly includes the research on evaluation system, quality standard and management system. Wang (2019) explored the applicability of the University of Michigan quality curriculum instructional design evaluation framework (mvu--oid) to the evaluation of online courses in China based on the evaluation method of the national quality curriculum "principles and methods of instructional design" of South China Normal University.

2.3 Online Learning Satisfaction

When it comes to online learning satisfaction, we have to mention learning satisfaction. The United States first began to study learning satisfaction. The U.S. education commission tried to use the Cooperative Institutional Research Program (CIRP) measurement tool to investigate the satisfaction of college freshmen. At present, the research on online learning satisfaction is still a new thing. Among them, conceptual model research and empirical research are the two core contents of online learning satisfaction research at home and abroad, focusing on the creation of online learning environment, learners' learning preparation, learning interaction and learning service support.

In China, conceptual model research and empirical research are also the two core topics of researchers' online learning satisfaction research, but they are mainly empirical research. In terms of conceptual model research, Bai et al. (2019) proposed a conceptual model of online learning satisfaction based on relevant literature. The model believes that learners' online learning satisfaction is affected by eight variables such as system quality and content quality. In empirical research. Firstly, it is found that auxiliary materials and learning service support are important factors affecting learning satisfaction in online course learning. The second is to build a distance teaching evaluation and quality monitoring system. Pukkaew (2013) established a teaching evaluation model under the network environment through research, and proposed a series of learner evaluation indicators, including the degree of learning interaction, the utilization of learning resources, etc.

Thirdly, the research on online learning efficacy is carried out. Online learning efficacy refers to whether learners believe that online learning can enhance learning effect and complete their studies. On the basis of referring to relevant research. The survey results show that college students generally believe that online learning and traditional face-to-face learning can obtain the same amount of learning content, and more than half of the students believe that learning through these two methods can achieve good learning results. Finally, it constructs the online learning satisfaction model in China. ShaoGang et al. (2020) constructed the model framework, index system and calculation method of online learner satisfaction evaluation in China based on the customer satisfaction model of the United States.

From the above research review, we can see that the current research on online learning satisfaction in China focuses on the construction of conceptual models and empirical research, trying to find a scientific and reasonable satisfaction measurement model and measure college students' online learning satisfaction, which to some extent ignores the dominant position of college students as learners. In terms of satisfaction model, this study mainly constructs the model with the help of relevant research, and does not discuss the establishment of the model in depth, but focuses on the discussion of college students' online learning satisfaction; secondly, in terms of research objectives, this study puts the online learning satisfaction of learners, that is, college students, in the first place. Instead of making a specific distinction between the online courses and learning platforms that college students have learned, it divides college students into internal segments, and strives to understand the online learning satisfaction of college students at different levels, different majors, different grades and different genders, understand the online learning needs of different types of college students. In terms of research methods, this study combines questionnaires and interviews to obtain more scientific research conclusions, so as to better guide practice.

3. Methodology

This questionnaire contains two parts, the first part investigates the background information of the questionnaire,

whether these subjective factors affect their satisfaction to some extent based on the demographic information (including gender, place of origin and grade level), and then analyzes the tendency of these subjective factors on their answers to the questions. The second part is the main part of this questionnaire, which contains 27 questions. These objective questions are based on the model of the student satisfaction inventory to investigate the satisfaction level of teaching and learning in the epidemic period of Zhumadian Vocational Technology College. The Likert scale was used to assign a corresponding value to each question, which was graded from low to high, with a minimum score of 1 and a maximum score of 5. The satisfaction scale is divided into very dissatisfied (1 point), not very satisfied (2 points), not sure (3 points), more satisfied (4 points), and very satisfied (5 points). Then, SPSS was used to make a systematic analysis of the questionnaire data, in order to fully grasp the satisfaction of students' online learning during the epidemic, and put forward reasonable and feasible suggestions for improving the online education and teaching effect of colleges and universities on the basis of existing theories and practices.

4. Results

4.1 Population Variable Frequency Analysis

The software uses SPSS version 26 to implement the frequency analysis process. Based on the Table 1, the numerical characteristics of the demographic variables can be seen, reflecting the distribution of the respondents of this survey. Where the mean value represents the concentration trend. The standard deviation represents the fluctuation, which can be seen by frequency analysis of each variable according to the results. According to the results of the analysis of each variable, it can be seen that the distribution of each variable basically meets the requirements of the sample survey. In which the gender survey results, the proportion of men accounted for 48% and women accounted for 52%, the proportion of men and women is not very different, and it can be seen that the survey results have some reference significance**.**

Table 1: Demographic characteristics of participants

Variables	Option	Frequency	Percent	Mean	Std. deviation
Gender	Male	30	48%	1.52	0.50
	Female	32	52%		
Place	Urban	30	48%	1.52	0.50
	Rural	32	52%		
Grade	Freshman	10	16%	2.45	0.94
	Sophomore	23	37%		
	Junior	20	32%		
	Senior	9	15%		

4.2 Confidence Analysis

The software uses SPSS version 26 to implement the reliability analysis process. Reliability analysis was conducted to determine the Cronbach's alpha which reflected the reliability of the research instrument. In specific, six constructs were involved in the reliability analysis, namely, the feasibility of instructor, technology, setup, interaction, outcome and overall satisfaction.

The results in Table 2 indicated that the reliability coefficients for the feasibility of instructor, technology, setup, interaction, outcome and overall satisfaction were recorded as 0.822, 0.754, 0.805, 0.809, 0.739 and 0.750 respectively. Furthermore, the overall alpha value was 0.741. These reliability coefficients were above 0.7 which means the questionnaire items could be used for data collection.

Table 2: Reliability analysis results

Construct	Number of item	Cronbach's alpha
Instructor	6	0.822
Technology	4	0.754
Setup	4	0.805
Interaction	5	0.809
Outcome	4	0.739
Overall satisfaction	4	0.750
Overall		0.741

4.3 Validity Analysis

The validity analysis of this questionnaire was conducted using SPSS version 26, exploratory factor analysis to implement the testing process. The frequency analysis process was realized. According to the Table 3, exploratory factor analysis results, the coefficient of the KMO spherical test result is 0.635, the coefficient of the KMO test value ranges from 0 ~ 1, and the closer to 1 indicates the better validity of the questionnaire. According to the spherical significance test also shows that the significance of the test is infinitely close to zero and the original hypothesis is rejected, so the questionnaire has good validity.

Table 3: KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy	**0.531**	
Bartlett's test of sphericity	Approx. chi-square	1079.042
	df	351
	Sig.	0

4.4 Analysis on Online Teaching Satisfaction

This questionnaire was implemented using SPSS version 26 to analyze the process. The mean scores of each question item showed that most of the questions had mean scores between 4 and 4.5. This indicates that the overall satisfaction of the students of Zhumadian vocational and technical college with online teaching during the epidemic is high. The highest satisfaction level is overall satisfaction, and there are four items with the highest satisfaction score of over 4.3, three of which are overall satisfaction. This indicates that teachers need to give students interaction in the teaching process. Table 4 described of statistical of satisfaction degree score of each item.

Table 4: Statistical table of satisfaction degree score of each item

Construct	**Topic request**	**Mean**	**Std.**
Instructor	1. There was clear communication of class assignments	4.08	0.855
	2. Assignments were given on time	4.19	0.721
	3. Feedbacks were given on time	4.23	0.688
	4. I felt a part of the class/belonged to the online session	4.02	0.689
	5. I am satisfied with faculty accessibility	4.16	0.772
	6. I am satisfied with faculty availability	4.31	0.801
Technology	1. I am satisfied with online discussion forums	4.06	0.721
	2. I am satisfied with online communication including email and announcements	4.19	0.721
	3. Blackboard LMS is user-friendly	4.19	0.827
	4. I am satisfied with the download duration of learning resources	4.24	0.824
Setup	1. I am satisfied with the number of online sessions	4.08	0.731
	2. Online courses offered flexible timing	4.24	0.783
	3. I enjoyed working on projects during online learning	4.27	0.772
	4. I am satisfied with the self-directed responsibilities assigned to me	4.1	0.670
Interaction	1. I am satisfied with the quality of interaction between me and the faculty	4.03	0.809
	2. I am satisfied with the quality of interaction between me and the peers	4.24	0.824
	3. I am satisfied with collaborative activities during online learning	4.00	0.701
	4. I can relate my level of understanding to other students	4.13	0.735
	5. I am comfortable with participating in online sessions	4.16	0.814
Outcome	1. I am satisfied with the level of required effort in online course	4.08	0.816
	2. I am satisfied with my performance in online course	4.27	0.833
	3. I will be satisfied with my final grade	4.03	0.677
	4. I am able to apply what I learned in this online course	4.21	0.727

Table 4: Statistical table of satisfaction degree score of each item (Continued)

Construct	Topic request	Mean	Std.
Satisfaction	1. I will recommend this online learning experience to others	4.34	0.723
	2. I am more satisfied with online learning compared to face-to-face sessions	4.37	0.730
	3. My satisfaction level encourages me to register in other available online courses, such as online summer courses	4.11	0.630
	4. Overall, I am satisfied with this course	4.39	0.610

4.5 Difference Analysis

Students with different individual characteristics are somewhat different in their satisfaction with online teaching in the epidemic state. In this paper, combining the students' own characteristics of Zhumadian Vocational and Technical College and the content of this study's investigation, we analyze the students' gender, place of origin, grade, as independent variables, and the satisfaction with online teaching as dependent variables.

4.5.1 Differences in Satisfaction on Each Dimension by Gender

The difference test was implemented by independent samples t-test, software using SPSS version 26 to analyze the analysis process. Based on the Table 5, comparing independent samples t-test for the differences in satisfaction on each dimension by gender. Instructor satisfaction, mean 4.61 for male students, standard deviation 0.22, mean 3.75 for female students, standard deviation 0.43, mean higher for male students than for female students, p-value 0.000, $p < 0.05$, very significant, indicating that there is a very significant difference in the evaluation of instructor satisfaction by gender. The mean value of technology satisfaction for male students is 4.65 with a standard deviation of 0.22, while the mean value for female students is 3.73 with a standard deviation of 0.62. The mean value for male students is higher than that for female students, with a p-value of 0.000, $p < 0.05$, which is very significant, indicating that there is a very significant difference in the evaluation of technology satisfaction by gender.

Table 5: Gender differences in satisfaction in each dimension

Construct	Option	N	Mean	Std. deviation	t	Sig. (2-tailed)
Instructor	Male	30	4.61	0.22	9.954	0.000
	Female	32	3.75	0.43		
Technology	Male	30	4.65	0.22	10.236	0.000
	Female	32	3.73	0.46		
Setup	Male	30	4.16	0.62	-0.194	0.847
	Female	32	4.18	0.56		
Interaction	Male	30	4.07	0.63	-0.599	0.552
	Female	32	4.16	0.55		
Outcome	Male	30	4.15	0.56	0.011	0.992
	Female	32	4.15	0.60		
satisfaction	Male	30	4.32	0.48	0.211	0.833
	Female	32	4.28	0.55		

The mean value of 4.16 and standard deviation of 0.62 for male students and 4.18 and standard deviation of 0.56 for female students, with a p value of 0.847 and $p > 0.05$, are not significant, indicating that there is no significant difference between genders on the satisfaction of setup. The mean value of interaction satisfaction for male students was 4.07 with a standard deviation of 0.63, while the mean value for female students was 4.16 with a standard deviation of 0.55, with a p value of 0.552, $p > 0.05$, which was not significant. The mean value of outcome satisfaction for male students is 4.15, standard deviation 0.56, and the mean value for female students is 4.15, standard deviation 0.60, p value is 0.992, $p > 0.05$, which is not significant, and there is no significant difference between genders on satisfaction.

The mean value of satisfaction for male students is 4.32, standard deviation 0.48, and the mean value for female students is 4.28, standard deviation 0.55, p value is 0.833, $p > 0.05$, which is not significant, and there is no significant difference between genders on satisfaction. In the above, among the four dimensions of setup, interaction, outcome, and satisfaction, there is no significant difference between gender on them. There is a significant difference and a very significant difference between gender differences on instructor and technology. There are also more male teachers than female teachers in the faculty of Zhumadian vocational and technical college. In the usual lectures, students have more

contact with male teachers, and male students are more willing to talk and communicate with female teachers than female students, which leads to the situation that male students are more satisfied than female students in terms of satisfaction with instructor. Moreover, in terms of technology satisfaction, male students prefer to study some technical problems and use all available resources to improve and inquire related information. This is the reason why male students are more satisfied with technology than female students.

4.5.2 Differences in Satisfaction of Each Dimension in Terms of Place of Residence

The difference test was implemented by independent samples t-test, software using SPSS version 26 to analyze the analysis process. According to the Table 6, comparing the differences in satisfaction of each dimension by place of residence by independent samples t-test. Instructor satisfaction, urban mean 4.17, standard deviation 0.46, rural mean 4.16, standard deviation 0.63, p-value 0.909, $p > 0.05$, indicating that there is no significant difference in the evaluation of instructor satisfaction by place of residence. For technology satisfaction, the mean value of urban is 4.19 with a standard deviation of 0.54, and the mean value of rural is 4.16 with a standard deviation of 0.64, with a p-value of 0.815, $p > 0.05$, indicating that there is no significant difference in the evaluation of technology satisfaction by place of residence. The mean value of urban 4.21, standard deviation 0.58, and the mean value of rural 4.14, standard deviation 0.60, p value 0.654, $p > 0.05$ are not significant, and there is no significant difference between different places of residence on the satisfaction of setup. The mean value of urban is 4.60, standard deviation 0.23, and the mean value of rural is 3.66, standard deviation 0.43. The mean value of urban is significantly higher than the mean value of rural, with a p value of 0.000, $p < 0.05$, which is significant, and there is a significant difference between different places of residence on Interaction satisfaction. The mean value of urban is 3.98 with standard deviation of 0.60 and the mean value of rural is 4.30 with standard deviation of 0.51. The mean value of urban is significantly lower than the mean value of rural, with a p value of 0.000 and $p < 0.05$, which is significant, and there is a significant difference between different places of residence on the satisfaction of outcome.

Table 6: Different dimensions of satisfaction in residential areas

Construct	Option	N	Mean	Std. deviation	t	Sig. (2-tailed)
Instructor	Urban	30	4.17	0.46	0.114	0.909
	Rural	32	4.16	0.63		
Technology	Urban	30	4.19	0.54	0.235	0.815
	Rural	32	4.16	0.64		
Setup	Urban	30	4.21	0.58	0.450	0.654
	Rural	32	4.14	0.60		
Interaction	Urban	30	4.60	0.23	10.963	0.000
	Rural	32	3.66	0.43		
Outcome	Urban	30	3.98	0.60	-2.280	0.026
	Rural	32	4.30	0.51		
Satisfaction	Urban	30	4.41	0.45	1.602	0.114
	Rural	32	4.20	0.55		

The mean of satisfaction was 4.41 with a standard deviation of 0.45 for urban and 4.20 with a standard deviation of 0.55 for rural, with a p-value of 0.114, $p > 0.05$, which was not significant, and there was no significant difference in satisfaction by place of residence. In the above four dimensions, instructor, technology, setup, and satisfaction, there is no significant difference between different places of residence on them. There is a significant difference in interaction and outcome by place of residence. Among the students of Zhumadian Vocational and Technical College, urban students have better network conditions than rural students, which is the reason why urban students are more satisfied than rural students in terms of interaction satisfaction. In addition, urban students are more addicted to the internet because of the developed internet and more games, while rural students are more likely to study and supplement due to the lack of objective conditions, which is why rural students are more satisfied with outcome than urban students.

4.5.3 Differences in Satisfaction of Each Dimension by Grade Level

The samples selected for this survey were freshmen, sophomores, juniors, and seniors, respectively. The questionnaire was analyzed using SPSS26.0 to determine whether there was variability in student satisfaction with online instruction during the epidemic period for students of different grades.

The test of variance was analyzed by one-way ANOVA test method, software using SPSS version 26 to achieve the analytical process. Based on the Table 7, the one-way ANOVA above, it can be seen that teacher-training students of different grades do not have significant differences on the five dimensions of instructor, technology, setup,

interaction, and outcome. There is no significant difference in the five dimensions of instructor, technology, setup, interaction, and outcome ($p > 0.005$); but there is a significant difference in satisfaction ($p < 0.05$). Satisfaction: as shown in the table, there is a significant difference in the evaluation of teaching and training programs among students of different grades. The highest mean value is freshman (4.68); followed by sophomore (4.59); followed by junior (3.98); and the lowest mean value is senior (3.89). After post hoc multiple testing it is clear that. On satisfaction: there is no significant difference between freshman and sophomore ($p > 0.05$); significant difference between junior ($p < 0.05$); and significant difference between junior ($p < 0.05$); significant difference between sophomore and junior ($p < 0.005$), and senior ($p < 0.005$); sophomore and junior ($p < 0.05$); junior and senior ($p > 0.05$); and junior and senior ($p > 0.05$).

Table 7: The difference of each dimension satisfaction in grade

Construct	Option	N	Mean	Std. deviation	F	Sig.	Post hoc tests
Instructor	Freshman	10	4.25	0.58	0.513	0.675	/
	Sophomore	23	4.17	0.49			
	Junior	20	4.21	0.57			
	Senior	9	3.96	0.66			
Technology	Freshman	10	4.08	0.71	0.911	0.441	/
	Sophomore	23	4.24	0.52			
	Junior	20	4.26	0.58			
	Senior	9	3.92	0.64			
Setup	Freshman	10	4.13	0.76	2.604	0.060	/
	Sophomore	23	4.34	0.47			
	Junior	20	4.21	0.59			
	Senior	9	3.72	0.48			
Interaction	Freshman	10	4.02	0.54	0.182	0.908	/
	Sophomore	23	4.11	0.62			
	Junior	20	4.18	0.62			
	Senior	9	4.07	0.57			
Outcome	Freshman	10	4.10	0.69	0.708	0.551	/
	Sophomore	23	4.12	0.57			
	Junior	20	4.29	0.57			
	Senior	9	3.97	0.48			
satisfaction	Freshman	10	4.68	0.31	14.963	0.000	1＞3.1＞4.2＞3.2＞4
	Sophomore	23	4.59	0.33			
	Junior	20	3.98	0.44			
	Senior	9	3.89	0.52			

Note : 1 representative of freshman; 2 representatives of sophomore; 3 representatives of junior; 4 representatives of senior

4.6 Satisfaction Correlation Test Between Each Dimension

The software uses SPSS version 26 to implement the analysis process. From the Table 8, the previous correlation analysis, it can be seen that there is a relatively weak positive correlation between satisfaction and instructor, technology, setup, interaction and outcome; there is a significant positive correlation between instructor and technology, a relatively weak positive correlation with setup, interaction and outcome; there is a relatively weak positive correlation between instructor and technology, a relatively weak negative correlation with setup, and interaction and outcome; technology has a weak positive correlation with setup and outcome and a weak negative correlation with interaction; setup has a weak positive correlation with interaction and outcome; interaction has a weak positive correlation with interaction and outcome. Weak positive correlation between setup and interaction and outcome; weak negative correlation between interaction and outcome.

Table 8: Test the correlation of satisfaction among all dimensions

Variables	Correlation	Satisfaction	Instructor	Technology	Setup	Interaction	Outcome
Satisfaction	Pearson correlation	1					
instructor	Pearson correlation	0.19	1				
Technology	Pearson correlation	0.116	.821**	1			
Setup	Pearson correlation	0.048	-0.068	0.039	1		
Interaction	Pearson correlation	0.065	-0.119	-0.146	0.033	1	
Outcome	Pearson correlation	0.025	0.01	0.065	0.095	-0.156	1

** Correlation is significant at the 0.01 level (2-tailed).

5. Discussion

In the spring semester of 2022, vocational colleges and universities responded to the epidemic through online learning, achieving the overall goal of "not going to school, but still attending classes" set by the Ministry of Education of the People's Republic of China. Education is the process of realizing personal individuation and personal socialization, and online education is based on clarifying the essence of education, using the thinking of the internet to reshape the mode, tools, methods and systems of education (Liu & Sun, 2020). Under the impact of the internet, the traditional way of education is bound to undergo earth-shaking changes, and online education is undoubtedly an important force in the education reform of the information age. But in any case, we must soberly realize that no matter how high the level of technology, education is the core and fundamental, the internet is only a technical means to strengthen and change education, online education will not completely replace the traditional school education, but it will be the trend of future education development. In this context, it is of strong practical significance to study the current satisfaction of college students' online learning (Lane et al., 2021).

This study analyzed the satisfaction status of online learning from the perspective of learners through questionnaire surveys, and overall, all college students achieved a high overall satisfaction rate in online learning, which shows that the vast majority of college students have a relatively acceptable attitude towards online learning. There are gender differences in satisfaction with teachers and technology, differences between residency in terms of interaction and overall satisfaction, and satisfaction differences between grades in overall satisfaction.

Online learning is a trend that will have a huge impact on the transformation of higher education in the future, in colleges and universities, when the new learning paradigm dominates, leaders, teachers and students form a positive interaction, open students' control and ownership of learning (Zhao et al., 2019), realize the organic integration of learning systems inside and outside the school, and support flexible learning and teaching structures will become the technical basis for future higher education reform (Liu et al., 2020). In short, we must start from the actual needs of education reform, seize the opportunity, face the challenges head-on, adhere to education as the main body, and let the internet be used by us.

6. Conclusion

College students' online learning satisfaction is a direct embodiment of the quality and effect of college students' online learning, and is also an important indicator for evaluating the effectiveness of college students' online learning. This study attempts to conduct a comprehensive and comprehensive survey of the current situation of online learning satisfaction of college students on the basis of fully drawing on previous research, and find solutions to the problems existing in the current online learning of college students, so as to improve the satisfaction of college students in online learning. On the other hand, since we want to conduct the study as comprehensively as possible, this results in some aspects of the study not being in-depth enough and due to the relatively small sample size, there is still a certain degree of sampling bias. However, due to its own limited ability and energy, there are deficiencies in the research process and in places, and it needs to be improved.

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