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Study of The Technical Index of Online Learning Behavior Analysis of Nursing Majors on The Superstar Platform Based on The Kirkpatrick Evaluation Model

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Abstract: *Objective*: To analyze the technical indexes of students' online learning behavior analysis based on Kirkman's evaluation model, sort out the basic indexes of online learning behavior, and extract scientific and efficient evaluation indexes of online learning effect through statistical analysis. *Methods:* The online learning behavior data of Physiology of nursing students from 2021–2023 and the first semester of 22 nursing classes (3 and 4) were collected and analyzed. The preset learning behavior indexes were analyzed by multi-dimensional analysis and a correlation analysis was conducted between the indexes and the final examination scores to screen for the dominant important indexes for online learning effect evaluation. *Results:* The study found that the demand for online learning of nursing students from 2021–2023 increased and the effect was statistically significant. Compared with the stage assessment results, the online learning effect was statistically significant. *Conclusion:* The main indicators for evaluating and classifying online learning behaviors were summarized. These two indicators can help teachers predict which part of students need learning intervention, optimize the teaching process, and help students improve their learning behavior and academic performance.

Keywords: Kirkpatrick assessment model; Superstar platform; Online learning behavior; Analyzing technical indicators; Research

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1. Introduction

In 2015, the Ministry of Education issued the "Opinions on Strengthening the Construction, Application, and Management of Open Online Courses in Colleges and Universities" to promote the wide application of open online courses [1]. However, the COVID-19 pandemic since 2020 has given rise to a new model of higher vocational education, which is a hybrid online and offline teaching model. During severe COVID-19, it is necessary to implement a fully online course. Therefore, it is crucial to objectively, fairly, and effectively evaluate the effect of online learning.

2. Research design

Kirkpatrick's four-level training evaluation model was first proposed by scholar Don Kirkpatrick in 1959 [2]. This model is the most widely used training evaluation model globally to evaluate the training effect in various industries. Recently, some scholars have introduced it into the evaluation of academic performance, which provides a new idea for learning evaluation [3]. This study constructs an online learning analysis model that meets the requirements of higher vocational medical education based on the Kirkpatrick evaluation model with 4 levels of evaluation systems: cognitive layer, behavioral layer, and effect layer, focusing on the evaluation of the online learning behavior layer.

The advantage of the online platform is that teachers can design statistical tools and generate statistical data automatically [4]. The evaluation of the behavior layer is mainly based on the online learning behavior data of the superstar platform: login time and times, video visits and viewing ratio, interaction, posting, and other platform data. The Chaoxing Learning platform was used to conduct the intelligent evaluation and management of students' learning behavior in the online physiology course.

Professor Peng's Orientation Courses for Catering Personnel (OCCP) online learning behavior classification model covers 4 behavioral aspects: operation behavior, cognitive behavior, assisting behavior, and problem-solving behavior [5]. When combined with the function of the Chaoxing platform, the student's online learning behavior indicators are divided into three levels: low, intermediate, and high learning behavior. The corresponding learning behavior indicators are shown in **Table 1** [6,7].

Table 1. Classification table of online learning behavior

First-level indicators	Secondary indicators	Description of specific indicators
Low-level learning behavior	Chapter learning	Number of courses studied
	Sign in	Number of checkups
	Reading	Reading time
	Mission point	Number of task points studied; percentage completed
	Video	Number of videos watched, duration
Intermediate learning behavior	Online assessment completed	Times and scores
	Homework done	Times and grades
Advanced learning behavior	Communication discussion	Number of responses for thematic discussion
	Display work	Number of uploads and presentations of mind maps, homework reports, experimental phenomena, and experimental reports

3. Methods

The data were exported from the Chaoxing learning platform. In addition to the routine data such as check-in and notification browsing, the data of multiple dimensions such as task completion, course learning progress, video viewing time, discussion participation, homework, and interaction participation were analyzed. This study was divided into two aspects. First, the specific data on the online learning behavior of Physiology of nursing freshmen from 22 classes in the first semester of the Chaoxing Xuexitong platform were collected. Second, the parallel classes of classes 3 and 4 in the 22 nursing classes were selected as the research objects. According to **Table 1**, the specific data of the online learning behavior of Physiology in the first semester on the Chaoxing

Learning platform of students in the two classes were statistically analyzed. Statistical analysis was carried out using Excel and the SPSS 18 software.

4. Results

4.1. Data and analysis of the first semester of Chaoxing Xuexitong platform for nursing freshmen over three semesters

4.1.1. Analysis of the basic situation of online learning of physiology online course over three semesters

Table 2 shows the comparison of the basic situation of nursing online learning of Physiology over three semesters from 2021–2023.

Table 2. Comparison of the basic situation of nursing online learning over three semesters of physiology online course

Data item physiology online course		First semester 2020–2021	First semester 2021–2022	First semester 2022–2023
Number of courses enrolled in the current term	Number of courses selected (people)	296	706	1007
Quizzes and assignments	Total number of times (times)	133	181	280
	Number of participants (people)	296	625	788
Interactive communication situations	Total number of posts (posts)	699	1783	1662
	Number of posts by teachers (posts)	157	247	396
	Number of participants in the interaction (people)	288	246	620
Assessment (test)	Number of times (times)	8	42	97
	Number of participants (people)	291	525	816
	Number of people who passed the exam (people)	177	300	509

As shown in **Table 2**, the number of courses selected in the three semesters increases every year and the online learning of physiology courses was truly covered in the first semester of 2022–2023. These changes were also in line with the inevitable trend of online teaching from the beginning of the pandemic in 2020, and online teaching will be fully implemented in the pandemic era after 2023. The number of tests and assignments in the three semesters and the number of participants also increased every year, especially the number of participants. The teacher's participation in the construction and implementation of online courses is encouraging and innovative, which increases the student's enthusiasm for completing online tests and examinations.

The total number of posts by teachers and the number of interactions by students throughout the three semesters have increased significantly, which shows that teacher-student interaction is necessary for online courses. However, during the semesters of 2021–2022 and 2022–2023, the number of posts and interactions by teachers increased but the total number of posts decreased. The number of examinations, the number of participants, and the number of passed examinations have increased, especially the number of passed examinations.

From the above data analysis, it can be seen that online teaching is no longer a simple supplement to classroom teaching. From the increase in the number of students enrolled in courses from 267 to 1007, the data on homework, interaction, and assessment have increased significantly. It is a new teaching model that breaks the limitation of time and space, and quietly transforms "teaching" and "earning." This model also realizes the diversification of knowledge acquisition ways and puts forward higher requirements for students' independent

learning ability, exploration, analysis, and summary ability [8]. Both teachers and learners are gradually accepting online learning and assessments. In the teaching process, the student's daily learning behavior and learning process are assessed and evaluated, and the process assessment and summative assessment are combined to improve teaching evaluation, which is helpful to realize scientific teaching and gradually transition from summative assessment to process assessment [9,10].

4.1.2. Analysis of online learning behavior of physiology online course on the Chaoxing Xuetong platform

As shown in **Table 3** and **Table 4**, the 154 video-based task points of offline courses meet the characteristics of current college students' learning needs, but the designers of task points require improvement. The characteristics of tasks were described from different aspects such as task type, task difficulty, task completion time, and task order, where the specific learning tasks were designed according to the characteristics of the tasks [11]. In addition, the curriculum resources need to be rich, especially video and animation resources.

Table 3. Distribution of learning task points in the physiology online course

Classification of task points	Percentage of students completing mission points (%)
Documentation	29.87
Chapter quizzes	7.14
Video	62.99

Table 4. Student task point completion progress

Number of task points completed (n = 154)	The actual number of students completed (n = 94)	Percentage of students who completed (%)
0	3	3.19
< 92	44	46.80
92–122	6	6.38
123–154	41	43.62

As shown in **Table 5**, there are 4 bands in the learning period of the online courses of students in 2 classes. The peak period was between 8.00 p.m. – 12.00 a.m., the secondary peak was 4.00 p.m.– 8.00 p.m., the intermediate period was 8.00 a.m. – 12.00 p.m., and the low period was 12.00 a.m. – 8.00 a.m. The overall distribution was in line with the regular work and rest time of college students.

Table 5. Online course learning time

Daily online course learning segments (points)	Number of online courses (people)	Percentage of online learning students (%)
12.00 a.m. – 4.00 a.m.	2	3.19
4.00 a.m. – 8.00 a.m.	5	5.32
8.00 a.m. – 12.00 p.m.	46	48.94
12.00 p.m. – 4.00 p.m.	68	72.34
4.00 p.m. – 8.00 p.m.	92	97.87
8.00 p.m. – 12.00 a.m.	93	98.94

As shown in **Table 6**, the scores of students in the two classes on the online chapter tests were not ideal. A score of 60–79 is considered mainstream, indicating that students lack the learning initiative to actively and repeatedly review online resources.

Table 6. Online chapter tests

Section test scores (points)	Chapter test scores distribution number	Proportion (%)
80–100	16	17.02
79–60	64	68.09
< 60	14	14.89

4.2. Comparison of online learning behavior and final examination

The statistics of online learning behaviors on the Chaoxing learning platform are shown in **Table 7**. **Table 8** shows that only the course video progress, homework scores, and stage assessment scores of the online course learning behavior data provided by Chaoxing Learning Pass have statistical significance ($P < 0.01$).

Table 7. Statistics of online learning behaviors on the Chaoxing learning platform

Indicator Data	Mean	Standard deviation
Check-in rate (%)	72.22	8.26
Notify the number of viewers (*n*)	176.5	6.5
Percentage of mission points completed (%)	92.39	27.27
Number of courses studied (times)	350.50	159.48
Chapter Quiz Progress (*n*)	14.50	5.38
Video viewing progress (*n*)	32.23	6.5
Video viewing time (min)	195.55	390.12
Reading time (minutes)	119.75	410.24
Number of discussions (*n*)	12.50	6.21
Display of works (*n*)	93.13	1.41
Homework grade (points)	97.49	3.75
Stage examination results (points)	83.76	15.21

Table 8. Comparison of online learning behavior data and final exam correlations

Data analysis	Check-in rate (%)	Percentage of mission points completed (%)	Number of sessions (times)	Chapter quiz progress (*n*)	Video viewing progress (*n*)	Duration of video viewing (min)	Reading time (minutes)	Number of discussions (*n*)	Homework grades (points)	Stage assessment results (points)
t	0.50	1.07	1.09	1.15	2.311	0.59	1.15	1.17	2.15	6.28
P	0.62	0.29	159.48	0.25	0.031*	0.56	0.26	0.25	0.02*	0.00**

Notes: *$P < 0.05$, **$P < 0.01$

Table 9. Monthly online course session

Monthly online course session (time)	Average number of learners online (people)	Percentage of learners online (%)
12.01–13	165.38	15.03
12.14	1000.00	90.90
12.15–22	301.25	27.39
12.23	650.00	59.09
12.24–31	97.50	8.86

5. Discussion

The reliability of monitoring results is greatly improved by using big data technology to identify user learning behavior [11]. According to the data analysis in **Table 7-8**, the monitoring of students' learning behavior plays a key role in the supervision of teaching quality and students' learning effect. The Chaoxing learning channel has a more comprehensive data analysis function of students' learning situation, which is convenient for teachers to fully grasp the learning behavior of students, and also provides a basis for formative evaluation [12]. The Xuexitong online learning platform records the data of students' online learning, which is convenient for teachers to analyze students' learning behavior. The changes throughout the online course of Physiology may be due to the characteristics of the nursing profession. Physiology was divided into Physiology 1 after the middle of the first semester, and Physiology 2 before the middle of the second semester. **Table 9** shows that there are two learning peaks in the learning period of Physiology 1 in December, namely 12.15 and 12.24. The reason may be that each period is the time of the mid-term and the final examination respectively. Students showed high enthusiasm and active participation in the online course [13–15]. As the course progresses, students frequently visit the learning page to further adapt to online learning. Some students take the initiative to complete the learning tasks and submit homework during class, so they will also take the initiative to visit the learning page at ordinary times instead of focusing on the task before answering questions and dealing with the task point homework. However, a small number of students experienced tiredness, and a reduced learning initiative, hence their completion of the course task point was 0. It was verified that the learning effect was correlated with the video progress, online homework, and online quiz scores. However, check-in, course learning, video viewing time, discussion, reading, and chapter tests were not correlated with the final exam, which may be due to the small proportion of these indicators in the score weight, and the deeper reason needs to be further analyzed through questionnaires and interviews.

6. Conclusion

Through the data mining of learners in the Xuexitong online learning platform, the specific data of nursing students' online learning behavior of Physiology from 2020–2022 were analyzed. The data of students' online course selection, online tests and assignments, the total number of posts, the number of teachers' posts and participants, the number of online examinations, the number of participants, and the number of people who passed were compared. The results showed that online learning is fully covered, and the hybrid teaching mode has become a normal teaching process. Through the statistical analysis of the correlation between the online learning behavior data of 22 nursing classes (3 and 4) and the final examination results, the results showed that

the video viewing progress, homework scores, and stage assessment scores were statistically significant and correlated. This study provides a direction for future online course construction and measurement of students' online learning effects.

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Disclosure statement

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