Research on the Application of Experiential Pedagogy Based on Multimodal Learning Analysis – The Example of "Human Resource Management in the Public Sector" Course

Minna Zhang[1] and Zhen Ji[2,*]

[1] School of Information, Yunnan Minzu University, Kunming, China
[2] School of Information, Yunnan Normal University, Kunming, China
Email: 1257049829@163.com (M.Z.); 286342633@qq.com (Z.J.)
*Corresponding author

Abstract—**The application of technology-enabled education and teaching methods in Public Sector Human Resource Management in colleges and universities, this paper takes the course of Public Sector Human Resource Management in colleges and universities as an example, takes multimodal learning analysis as the starting point, explores how to integrate experiential teaching methods into the course teaching, emphasizes students' sense of experience and acquisition, provides an analysis of the concept, characteristics, functions, historical development of public sector human resource management and The course focuses on the concepts, characteristics, functions, historical development and management procedures of human resources management in the public sector from the perspectives of classroom teaching resources construction and students' learning effect analysis, highlighting the construction of the institutional level of human resources management in the public sector and the content of human resources management with Chinese characteristics, focusing on the knowledge and skills training of the operational level of human resources management, integrating with multimodal learning analysis techniques, monitoring and evaluating the effectiveness of experiential teaching and learning, and providing a teaching design for the current public sector human resources management course in colleges and universities. The course is designed to provide reference for the teaching design of the current Public Sector Human Resource Management course.**

Keywords—**experiential pedagogy, application, active learning, multimodal learning analysis**

I. INTRODUCTION

In September 2018, the Ministry of Education issued a notice on the implementation of the spirit of the National Conference on Undergraduate Education in the New Era (hereinafter referred to as the Notice), which requires universities to eliminate water courses and create golden courses. 2022 The State Council issued the "Fourteenth Five-Year Plan" for the development of the digital economy, which proposes to further promote intelligent Education. The rich teaching methods such as PBL, OBE, PPP, five-step teaching method, debate teaching, experiential teaching, and pair of classrooms have been well integrated with the classroom and effectively used in various courses in colleges and universities, which enriches the classroom teaching, improves the head-raising rate of the classroom, and reshapes the teaching ecology. With the maturity and wide application of new generation information technology, experiential teaching has been expanded and innovated, and with the support of virtual simulation technology, a real experiential teaching situation has been created, which opens a new "private customization" teaching mode with "Internet+" technology. Based on the "Internet+" technology, the teaching mode changes such as online and offline hybrid teaching, flipped classroom, etc. The offline experiential teaching and online independent learning of theoretical knowledge have achieved a good teaching effect and the students' classroom evaluation is high.

II. CORE ESSENTIALS

A. Experiential Teaching Method

Experiential teaching first arose in the British seamen training during World War II, the British Atlantic commercial ships were repeatedly attacked by the Germans, many young seamen were buried at the bottom of the sea due to lack of survival experience, Kurt Hahn (Oxford University, UK) and others founded an outdoor training institution, specializing in training young seamen to survive at sea, and achieved remarkable results, which also became the origin of experiential teaching abroad. The application field of experiential teaching is wide, including military, teaching, industry and commerce, etc. It is also applied to survival training, psychological training, personality training, management training, and other fields, with a wide range of targets, including soldiers, students, workers, office workers, etc. Experiential teaching was first applied to school teaching in the United States, first in universities and then in

primary and secondary schools. In American school education, experiential teaching has become one of the mainstream teaching methods [1]. The core of experiential teaching method is to focus on the initiative and participation of learners, which can help learners to achieve episodic memory, emotional memory, and semantic memory, and is conducive to the internalization and retention of learning contents. In colleges and universities, experiential teaching method is more applied in new engineering courses, and it is also better combined in new liberal arts courses, mostly based on creating teaching situations.

B. Multimodal Learning Analysis

Multimodal learning analysis is the process of collecting and analyzing learners' learning data in order to improve the learning environment and enhance learning effectiveness. In the data collection and measurement process of learning analytics, data obtained from one modality is called unimodal data, and the most common data are learning log data from learning platforms and self-statement questionnaire scales [2]. Multimodal data is the fusion of data from multiple modalities, such as learning behavior data (learning logs, click streams), psychological data (emotions, etc.), physiological data (EEG signals, skin electricity, etc.), and so on. The object of multimodal learning analysis is the multimodal data in the learning process, and its concept and framework were first formally introduced in the 14th International Conference on Multimodal Interaction [3], which relies on the development of several disciplinary fields, such as education, computer science, brain science, etc. Blikstein and Worsley [4] classified multimodal learning analysis into nine categories: ① text analysis; ② discourse analysis; ③ handwriting analysis; ④ sketch analysis; ⑤ action and gesture analysis; ⑥ affective state analysis; ⑦ neurophysiological marker analysis; ⑧ eye gaze analysis; ⑨ multimodal integration and multimodal interface analysis. Kaiquan *et al.* [5] grouped the data involved in these nine categories into four categories based on data characteristics: episodic data, physiological data, psychological data, and basic data. Multimodal learning analysis in this study refers to a learning analysis method that reveals learners' learning process by collecting data from two or more modalities of learners.

III. MODEL CONSTRUCTION

The complexity of educational problems and teaching contexts poses a great challenge for the application of intelligent education in teaching activities. Therefore, based on the idea of data science, this study disassembles the elements of people, machines, objects, environment and activities related to educational situations, and uses intelligent sensing devices to achieve intelligent monitoring and precise analysis of the representation forms of related elements from the perspectives of teaching behavior and learning behavior, teaching equipment and teaching services, teaching content and teaching resources, physical environment and social environment, teaching activities and learning interactions. For example, the physical environment of the learning scene is monitored by using temperature, humidity, and light sensors; the behavioral and physiological information data of students and teachers are collected by using cameras, eye-tracking devices, EEG, and functional near-infrared brain imaging; the relative position, motion status, and geographic location of students are collected by using proximity sensors, acceleration sensors, and GPS sensors, etc. [6]. The multimodal data fusion approach is used to achieve intelligent mining and analysis of the potential features of educational situations [7]. The information complementation mechanism between multimodal data is used to accurately characterize the potential features of educational context elements, and to achieve data-driven interpretation of educational phenomena and restoration of educational processes [8]. On this basis, we can accurately characterize "student and teacher contexts, equipment and service contexts, content and resource contexts, spatio-temporal and social contexts, and activity and interaction contexts".
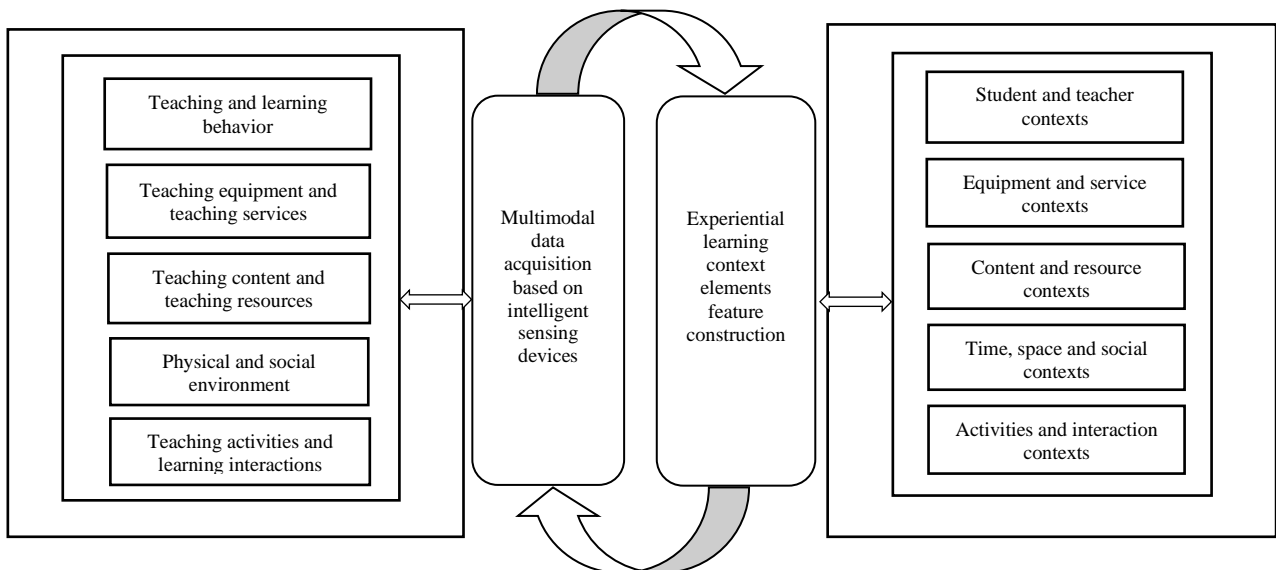

Fig. 1. Model of experiential pedagogy application based on multimodal learning analysis.

Therefore, this study constructs an experiential pedagogy application model based on multimodal learning analysis as shown in Fig. 1, aiming to use intelligent sensing devices to intelligently perceive and accurately characterize the "human-computer-object-environment-activity" and other elements in the complete educational context. The aim is to use intelligent sensing devices to intelligently perceive and accurately characterize the existence state and evolution mode of elements such as "human-machine-object-environment-activity" in the complete educational context. It realizes all-time, multi-dimensional and fine-grained data modeling, and conducts in-depth mining and analysis of potential features of relevant elements in order to achieve accurate portrayal of the complete educational context, and to explore deep-rooted educational laws from the perspective of context perception.

IV. TEACHING PRACTICE

According to the content of the textbook "Human Resource Management in the Public Sector" and the development of students' existing knowledge and cognitive rules, a total of 100 undergraduate students, including 25 male students and 75 female students, majoring in administration in the 2020 class of the School of Politics and Public Administration (People's College of Armed Forces) of Yunnan University for Nationalities were used as teaching objects. One teaching class was randomly selected as the experimental group to carry out the experiential teaching method based on multimodal learning analysis, and the other class was the control group to carry out the traditional classroom teaching with lecture method as the teaching content in Chapter 8, Human Resource Recruitment and Selection. Intelligent recording system, eye-tracking device, EEG, functional near-infrared brain imaging and other equipment were used for information data collection.

A. Experiential Teaching Method

In the teaching of the chapter content of "Human Resource Management in the Public Sector" – <Human Resource Recruitment and Selection>, a leaderless group mock interview experiential teaching is used, in which students are the main characters of the interview, the leaders of the discussion as well as the learners, and the teacher plays a supporting role as the guide, planner, and designer. Based on the application model of experiential teaching method based on multimodal learning analysis, the teaching case is deeply analyzed and applied in practice from the following five aspects.

(1) Teaching behaviors and learning behaviors.

Before carrying out the activity of leaderless group mock interview, teachers trained students from the experimental group 20 level administration 1 class from dress, instrument, grooming, grooming and other interview etiquette, and continuously consolidated and deepened in the experiential teaching, teachers summarized the questions after the leaderless group interview simulation, summarized and summarized the

interview points, minefields and misunderstandings to be avoided, analysis of questions and solution methods, etc. Through the learning and simulation experience of one before and one after, students master interview skills and etiquette in theory and practice. In the leaderless group mock interview, attention is also paid to guiding students to respect group members, pay attention to politeness, and reflect gentlemanly manners. In addition, during the interview process, students are helped to overcome their nervousness, read the questions carefully in the limited time, use the analytical method, analyze the types of questions and requirements, and learn to use various argumentative techniques, factual method, example method, data method, etc. The control group, 20 Administration 2, was trained in interview etiquette, and then taught the leaderless group interview process.

(2) Teaching equipment and teaching services.

During the teaching activities of the leaderless group mock interview in the experimental group of Class 20, Administration 1, and the control group of Class 20, Administration 2, during the teaching process of the leaderless group interview, intelligent recording system, eye-tracking instrument, EEG, and functional near-infrared brain imaging were used to collect data on students' behavioral and physiological information; proximity sensors, acceleration sensors, GPS sensors, etc., were used to collect data on students' movement condition and verbal information, etc. The information complementary mechanism between multimodal data is used to accurately characterize the potential features in the interview activities and to achieve data-driven interpretation of educational phenomena and restoration of educational processes. Teachers, as instructors, planners, and designers of instructional activities, provide instructional services mainly by invoking HRM solutions to observe students' discussion behaviors and record them.

(3) Teaching content and teaching resources.

The experimental group and the control group were taught Chapter 8 <Human Resource Recruitment and Selection> of Public Sector Human Resource Management, specifically the meaning and methods of personnel recruitment and selection, the meaning and types of interview, the meaning and characteristics of structured and unstructured interview, the meaning, characteristics, comparative similarities and differences between leaderless group interview and led group interview, the etiquette of leaderless group interview, mastering interview The characteristics and solutions of open-ended, multiple-choice, dilemma, and resource competition interview questions.

The teaching resources mainly combined with the hot and difficult issues of civil service examinations and established a test bank for leaderless group discussion. The experimental group was grouped into roles by drawing numbers, and each student fully participated in the leaderless group mock interview for situational role experience.

(4) Physical and social environments.

In the classroom of the intelligent recording system, a real leadership-free group interview situation was set up.

The teacher carefully designed the whole process of the leadership-free group interview, prepared the questions in advance, and organized the students to arrange the seats for the leadership-free group discussion in advance, arranged in a "V" shape and facing the judges' table, with audience seats in the back row. According to the class size for grouping and drawing numbers, students through the lottery randomly grouped, according to the grouping of questions and discussion, each link strictly limits the discussion and speaking time, the judges to score. Senior corporate HR can also be invited to deliver presentations to students before the experimental group teaching activities, training, so that students can experience different roles of leaderless interview teaching activities from the judges' perspective.

(5) Teaching activities and learning interactions.

In the mock interview of the experimental group, the students who participated in the interview were seated in a "V-shaped" seat according to the number drawn for the mock interview, while the rest of the students watched and studied at their seats. Each session was strictly limited in terms of discussion and speaking time. After the interview, the video of the interview process in the recording system will be watched back, and the interview scores will be fed back to the students, guiding them to make personal reflections and summaries from the aspects of expression ability, teamwork ability, organization ability, and presentation ability, and to make up for and improve their own shortcomings. After the interactive process of self-assessment, mutual assessment, personal summary and teacher's summary, effective teaching was achieved. In the control group, the teacher's classroom lectures were the main focus, and the interactive feedback of classroom teaching was realized through practice tests after the classroom learning.

B. Results and Analysis

1) Classification of indicators and scoring criteria

Based on the multimodal learning analysis model, the non-verbal external and implicit behaviors of students during the leaderless group interview were collected through the recording system, eyetracker, and EEG, and the interview data indicators were classified and interpreted as shown in Table I.

Based on the multimodal learning analysis model, after collecting interview data from students during the leaderless group interview process through recording systems, eyetracker, and EEG, the teacher conducts the interview scoring for the students, with the criteria shown in Table II.

After collecting data through the intelligent recording system, eye-tracking device and EEG device, combined with the comprehensive performance of students during the whole process of mock interview, the interview scores of students in the experimental group are shown in Table III.

TABLE I. DATA CATEGORIES AND EXPLANATIONS FOR THE LEADERLESS GROUP INTERVIEW

Data Classification	Data Description	Data Interpretation	Data collection means and equipment
Characteristic data	Personal information such as gender, age, ethnicity, professional background, etc.	[Statistical Information].	Student Management System
Non-verbal episodic behavior	Hand gestures, body posture, facial expressions, interview etiquette and other body movements that can be directly observed by the naked eye	[Interview ability] Good at using voice, intonation, gaze and gestures, and mastering interview etiquette.	Intelligent recording system, wearable devices (positioning, gyroscope)
Verbal Behavior	Presentation and content of mock interviews	[Ability to analyze test questions] To master the skills of making questions, to understand and analyze questions quickly, to master the skills of answering questions, and to conceive according to the requirements of the questions. Communication skills in the leaderless group interview, to achieve accurate and concise language expression, fluent and clear, can well express their own meaning.	Intelligent recording system, directional microphone
Facial expressions	Confidence, nervousness, happiness, sadness, anger, fear, surprise, disgust, etc.	[Mental adjustment ability] Expression management ability, emotional control ability, etc.	Intelligent Recording System
eye movement traces	Area of interest, number of gaze, gaze duration, eye beat and eye movement trajectory map	[Learning ability] Teaching information processing, teaching visual behavior pattern, attention distribution, etc.; [Mental state] Learning interest, attention state, etc.	Intelligent recording system, eye-tracking device
Physiological signals	Brain waves and event-related potentials, skin electricity, muscle electricity, heart electricity, pulse	[cognitive states] recognition, judgment, memory, decision making, etc.; [non-cognitive states] anxiety level, emotional arousal, emotional valence, willpower, etc.; [metacognitive states] self-reflection, self-regulation, etc.	EEG, IoT sensing technology
Leadership	Navigating and leading the group discussion process	[Leadership] Communication, coordination, decision making, command, judgment, etc.	Intelligent Recording System

TABLE II. SCORING CRITERIA FOR MOCK INTERVIEWS WITH LEADERLESS GROUPS

Scoring Criteria	Content	Jury 1	Jury 2
(I) communication skills (10 points)	The language expression is accurate and concise, fluent and clear, and can express their own meaning well, good at using voice, intonation, gaze and gestures.		
(II) Analytical ability (10 points)	Comprehensive and thorough analysis of issues, clarity of viewpoints, novel perspectives, and the ability to summarize different opinions.		
(C) interpersonal cooperation skills (10 points)	Ability to respect others, to listen well to others, and to bring the opinions of the crowd into agreement.		
(iv) Planning ability (10 points)	Clear and thoughtful problem solving, logical and time-sensitive, and accurate in grasping the main points of problem solving.		
(E) Self-confidence (10 points)	Able to speak actively, dare to express different opinions, good at proposing new insights and solutions, and persuasive in emphasizing their views.		
organizational coordination skills (10 points)	Good at removing tension and creating an atmosphere where everyone wants to speak, effective at persuading others, and good at mediating contentious issues.		
(vii) Listen carefully to others and give feedback (5 points)	Listen to others while taking notes on their main points, listen up and give feedback when appropriate.		
Support for others' correct opinions (5 points)	Support other team members when appropriate, and affirm the correct views of others.		
(ix) Presenting one's point of view at the right time and trying to get the support of the group members (5 points)	Present your views and opinions clearly and concisely in a team and rationally justify the strengths and weaknesses of your views with a view to gaining the support of others.		
(x) creative improvement points to others' programs (5 points)	Some of the previous arguments can be added to and improved upon, and the depth and breadth of certain issues can be expanded to explore more deep-seated elements.		
Trying to steer the discussion in the right direction in the midst of confusion (5 points)	Sometimes group discussions are very chaotic, with no center, no purpose, and no concept of time. This is the time to politely guide the group in an orderly and rational direction. This includes prompting everyone for "time," the most important issues to be addressed, and whether or not to move on to the next stage of the discussion. Even if the guidance is ultimately unsuccessful, the examiner will appreciate that you have the sense to do so.		
Compromise when necessary for the group to reach a conclusion by the deadline (5 points)	Group discussions usually have a clear goal, such as what scenario, what problem to encounter, what resources to use, what solution to propose, and what conclusion to reach - a team project with a specific task and time limit. So in any case, as long as there is a glimmer of possibility try to reach a common conclusion before the final deadline for the team members to agree. There is no perfect conclusion, so compromise becomes a necessary tool to reach a conclusion. The essence of compromise is the "big picture", and in tight deadlines, the courage to compromise is also appreciated by the examiner.		
Have a sense of time (5 points)	Teams at work are very time conscious and it is important to be able to give plans by deadlines. It's a plus to be able to demonstrate a sense of time in your own presentation of ideas, listening to others' ideas, or in discussions.		
Ability to lead the entire discussion (5 points)	Often this is a double-edged sword. The leader needs to have everyone's support, and if everyone is against it or no one cooperates, volunteering to take on the role of leader can be a failure. Leadership can also manifest itself through a more invisible way of driving.		

TABLE III. SCORING RESULTS OF LEADERLESS GROUP MOCK INTERVIEWS BASED ON MULTIMODAL LEARNING DATA

Items	Content									
Group A	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Score	81	84	94	78	90	97	86	69	86	65
Group B	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Score	78	83	87	75	76	91	80	79	76	90
Group C	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
Score	78	80	78	79	74	90	89	98	85	91
Group D	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Score	83	79	72	82	78	97	85	84	98	80
Group E	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Score	85	75	95	84	73	78	86	90	92	88

C. Analysis of Data on Students' Evaluation of Teaching Effectiveness

At the end of the teaching activities, questionnaires were distributed to a total of 100 students in the experimental and control groups who participated in this teaching to evaluate the experiential teaching method and the traditional teaching method respectively. Ninety-nine questionnaires were collected, with a recovery rate of 99% and an effective rate of 100%. SPSS10.0 statistical analysis software was used to test the reliability of the questionnaires, as well as the results of the x2 test and percentage analysis.

The difference between traditional teaching methods and experiential teaching methods is that: traditional teaching methods and methods are mainly based on

teachers' lectures and students' passive learning. Experiential teaching refers to the creation of actual or repeatedly experienced situations and opportunities to present or reproduce and restore, according to students' cognitive characteristics and rules. Teaching content It is a teaching concept and form of teaching that enables students to understand and construct knowledge, develop ability, generate emotion and produce meaning in the process of experiencing. Experiential teaching changes the traditional indoctrination teaching method, changes passive learning into active learning, ignites students' enthusiasm for learning, cultivates students' emotions, carries out active construction of knowledge, and exercises and improves their abilities.

TABLE IV. STUDENTS' EVALUATION OF THE EFFECTIVENESS OF "EXPERIENTIAL" AND TRADITIONAL TEACHING METHODS

Projects	Very satisfied %		Basic Satisfaction%		General %		Not so satisfied %		Totally dissatisfied %		x2 standard value	p
	Experience	Traditional	Experience	Traditional	Experience	Traditional	Experience	Traditional	Experience	Traditional		
Student Engagement	28.9	0	63.2	42.9	7.9	57.1	0	0	0	0	29.6472	0.000
Enlightenment	30.3	0	14.5	40.3	55.3	59.7	0	0	0	0	43.0982	0.000
Learning Initiative	30.3	0	52.6	70.1	17.1	29.0	0	0	0	0	53.2942	0.000
Cooperative and exploratory	30.3	0	56.6	20.8	13.2	79.2	0	0	0	0	23.0982	0.000
Teacher and student interaction	71.1	0	17.1	36.4	11.8	63.6	0	0	0	0	3.0982	0.212
Sense of contextual experience	30.3	13.0	48.7	18.2	19.7	68.8	0	0	0	0	11.3332	0.003

Table IV shows that among the six specific elements of the above mentioned aspects, all of them were significantly different ($p < 0.01$) except for one item of teacher-student interaction ($p > 0.05$). The percentage analysis showed that the proportion of students who were satisfied ("very satisfied" and "basically satisfied") with the "experiential" teaching method and the proportion of students who were satisfied with the "experiential" teaching method and the proportion of students who were satisfied with the "very satisfied" and "basically satisfied" options. In particular, the proportion of "very satisfied" is higher than that of traditional teaching methods in general, while the proportion of options that students evaluate as fair is lower than that of traditional teaching methods in general. The above statistics show that students' evaluation of "experiential" teaching methods is generally higher than that of traditional teaching methods in the above aspects

TABLE V. STUDENTS' EVALUATION OF "EXPERIENTIAL" VERSUS TRADITIONAL TEACHING METHODS AND APPROACHES IN LEADERSHIPLESS GROUP INTERVIEW TRAINING

Projects	Very satisfied %		Basic Satisfaction%		General %		Not so satisfied %		Totally dissatisfied %		x2 standard value	p
	Experience	Traditional	Experience	Traditional	Experience	Traditional	Experience	Traditional	Experience	Traditional		
Awareness of Leadershipless Group Interview	29.1	0	63.0	42.9	7.9	57.1	0	0	0	0	29.6472	0.000
Communication skills	39.5	0	46.1	87.0	14.5	13.0	0	0	0	0	77.2942	0.000
Analytical skills	30.3	0	52.6	70.1	17.1	29.0	0	0	0	0	53.2942	0.000
Interpersonal cooperation skills	30.3	0	56.6	20.8	13.2	79.2	0	0	0	0	23.0982	0.000
Organizational and coordination skills	39.5	0	44.7	79.2	15.8	20.8	0	0	0	0	56.9802	0.000
Expression skills	38.2	0	52.6	13.0	9.2	86.0	0	1.0	0	0	35.7323	0.000
Leadership	52.6	0	28.9	0	18.4	79.2	0	20.8	0	0	55.2353	0.000
Logical thinking skills	30.3	0	55.3	13	14.4	75	0	0	0	0	29.0923	0.000
Interview Etiquette	30.3	0	55.3	27.0	14.5	70	0	3.0	0	0	29.0923	0.000

Table V shows that there was a significant difference ($p < 0.01$) in each of the above aspects. Thus, overall, students' evaluations of "experiential" and traditional teaching methods were completely different in terms of leaderless group interview training; and the percentage analysis of the survey results showed that students' evaluations were satisfactory after "experiential" teaching ($p < 0.01$). "The percentages of "very satisfied" and "basically satisfied" were higher than those of traditional teaching methods. The proportion of options that students rated as average was lower than that of traditional teaching methods; the proportion of options that students rated as "not very satisfied" was lower than that of traditional teaching methods in general. The statistics show that students' evaluation of the "experiential" teaching method is better than that of the traditional teaching method in the training of leaderless group interview.

In the teaching of leadershipless group mock interview, students change from passive participation of "indoctrination" to active participation, passive learning to active learning, and their logical thinking, dialectical thinking, debating ability, language expression ability, group cooperation ability, leadership and organization ability, and psychological quality are all well exercised and improved. Through such experiential teaching method, students' language expression ability is exercised, students' interest is cultivated, students' learning enthusiasm is stimulated, learners' authentic learning experience is increased, learners' practical ability is enhanced, students' public spirit is cultivated, teachers' teaching effect is enhanced, and teaching ecology is reshaped.

V. Conclusion

Experiential teaching is a kind of teaching mode that focuses on students as the center, teachers as the guide and supporter, and focuses on the generation of students' learning experience, aiming to cultivate students' emotion, knowledge construction and ability development. Experiential teaching greatly stimulates students' interest and motivation in learning, and changes passive learning into active learning, which is a kind of subversion and reshaping of traditional learning. The model of experiential teaching based on multimodal learning analysis proposed in this study illustrates the application of experiential teaching in the teaching activities of Public Sector Human Resource Management in colleges and universities from the perspective of combining theory and practice, and uses multimodal learning analysis to dismantle the teaching sessions in order to make students gain a better learning experience and realize the cultivation of students' core competencies. Through multimodal learning analysis, the experiential teaching method is more effective than the traditional teaching method, and can better achieve the teaching objectives and training objectives. However, the effective application of this model depends on the testing of more relevant studies. For example, more specific and detailed evaluation scales should be designed to help teachers better test the effectiveness of teaching and learning. At the same time, we still need to explore and conduct empirical research on how to provide technological assistance, especially cutting-edge technologies such as virtual reality and artificial intelligence, to carry out teaching activities without affecting students' learning activities as much as possible. At the same time, schools and enterprises can cooperate to develop advanced teaching products and instruments through enterprises, which can be used to monitor and evaluate teaching results, form student portraits, make precise learning interventions, build smart classrooms, and play the role of technology-enabled education.

Conflict of Interest

This article is original and the authors have no conflict of interest.

Author Contributions

The division of work in this paper is mainly as follows: Minna Zhang is conducted the research and teaching practice, Zhen Ji is responsible for the analysis of data. Ms. Zhang writes the paper, and Mr. Ji is responsible for guiding and revising the manuscript. All authors had approved the final version.

Acknowledgment

References

[1] S. Chunrong, S. Guoming, and C. Yunbing, *New Curriculum and Experiential Teaching*, Zhejiang University of Commerce and Industry Press, 2018, pp. 3–5.

[2] M. Gao and S. Wang, "Current status and insights of multimodal learning analytics research – A study based on the International Conference on Learning Analytics and Knowledge," *Open Learning Research*, vol. 1, pp. 45–54, 2022.

[3] Z. Liguo and W. Guohua, "Computational thinking: A key issue of cultivating core literacy of information technology," *e-Education Research*, vol. 39, pp. 115–121, April 2018.

[4] P. Blikstein and M. Worsley, "Multimodal learning analytics and education data mining: Using computational technologies to measure complex learning task," *Journal of Learning Analytics*, vol. 2, pp. 220–238, 2016.

[5] C. Kaiquan, Z. Chunxue, and W. Yueyue, "Multimodal learning analysis, adaptive feedback and human-computer collaboration in educational artificial intelligence," *Journal of Distance Education*, pp. 24–34, 2019.

[6] R. A. W. Tortorella and S. Graf, "Considering learning styles and context-awareness for mobile adaptive learning," *Education and Information Technologies*, vol. 1, pp. 297–315, 2022.

[7] Y. Zhou, Y. Chen, J. Yang, and J. Cao, "Multimodal data fusion and deep learning: A comprehensive review," *Information Fusion*, vol. 3, pp. 104–126.

[8] L. Huang and T. Zhao, "Multimodal data analysis: A survey," *International Journal of Computational Intelligence Systems*, vol. 2, pp. 737–756, 2012.