The Effectiveness of Blended Teaching in Financial Management Course Based on Experiential Practice

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Abstract—Adopting blended teaching in financial management course based on experiential practice is conductive to the exploration of new learning methods of the said course, so that students could have a deeper understanding of the financial management knowledge, and the teaching effect of the course could be better. This paper targets at studying the effectiveness of blended teaching in financial management course based on experiential practice. At first, influencing factors of the effectiveness of blended teaching in the said course were analyzed, and the evaluation flow was given. Then, based on the Least Squares Support Vector Machine (LSSVM), this paper built a prediction model for the evaluation of the effectiveness of blended teaching in financial management course, and constructed a Transfer Learning SVM (TL-SVM) for formulating similar teaching design schemes based on federated learning, and used it to finish the learning of the similar implementation laws of multi-type teaching design schemes and the special implementation features of each single teaching design scheme. The proposed method can well cope with small sample size cases in which the evaluation data of the effectiveness of some teaching design schemes are limited, and the validity of the model was verified via experimental results.

Keywords—experiential practice, financial management, blended teaching, effectiveness, Support Vector Machine (SVM), transfer learning

1 Introduction

Experiential practice can trigger learning interest in students via the development and implementation of practice activities and enhance their ability to use the professional knowledge they learnt in real scenarios, it is an exploration and trial of the core qualities and ideas of modern education [1–6]. Adopting blended teaching in financial management course based on experiential practice is conductive to the probe of new learning methods of the said course, so that students could have a deeper understanding of the financial management knowledge, and the teaching effect of the course could be better [7–12].

Conventional activities of blended teaching include links such as online preview before class, online and offline learning during class, and online review and test after class [13–16]. Introducing the link of online and offline experiential practice based on the above mentioned conventional links can facilitate the cultivation of students' comprehensive ability and the enhancement of effectiveness of teacher-student communication.

For scientists, engineers, and technicians, practice plays a vital role in their training courses. With the help of practice, learners apply the knowledge they learnt in the real world so as to judge its operability. Due to the existence of some constraints, the number of learners is always limited, and the existing facilities of schools and research institutions only have a limited capacity to support effective learning. In this context, distance education has become a key to overcome these obstacles in the future. Mourad Gourmaj et al. [17] proposed a solution based on students' personal learning environments, which were defined in the study as the educational platforms that help learners control and manage their own learning process, thereby achieving the special learning goals via remote experiments. To respond to these criteria, they built an architecture based on learning management systems Moodle and e-portfolio Mahara, the remote lab management system iLab, and other tools and plug-ins to realize a learning-by-doing environment. Motivating and attracting technology-savvy students and improving their learning quality via conventional teaching methods is a challenging research topic. Through experiential learning, learners can analyze alternative scenarios and paths when making specific decisions for projects and enhance their management skills and decision-making ability. Lee [18] introduced a computer-based simulation game called the Scrum-X to teach an agile project management methodology to graduates and professionals with IT background. Bi et al. [19] built a model to study the impact of virtual simulation experiment on the innovation and entrepreneurship capabilities. Based on the data of three semesters in a University, the authors analyzed the internal mechanism of such impact, and verified the mediating effect of knowledge acquisition on the innovation and entrepreneurship capabilities during the virtual simulation experiment. Bai et al. [20] discussed the implementation of blended learning in financial econometrics courses based on questionnaire data and logit model.

After reviewing existing relevant literatures, it's found that most world field scholars tend to focus on the research of teaching principles and strategies, few of them have concerned about the curriculum standards of a certain course, or the practice-based teaching for specific course goals. As a result, the current studies on the understanding of blended teaching mode based on experiential practice are insufficient, so researchers couldn't give the corresponding evaluations on the implementation effect. This paper took the blended teaching of financial management course as the research direction, and emphasized on improving the effectiveness of this course via introducing blended teaching into the course teaching based on experiential practice. Main research content of this paper includes: 1) Analyze the influencing factors of the effectiveness of blended teaching in the financial management course; 2) Give the evaluation flow of the effectiveness of blended teaching in the financial management course based on experiential practice; 3) Build a prediction model for the effectiveness of blended teaching in financial management course based on LSSVM; 4) Build a TL-SVM for formulating similar teaching design schemes based on federated learning, and use it to finish the learning of the similar implementation laws of multi-type teaching design schemes and the special implementation features of each single teaching design scheme. The proposed method can well cope with small sample size cases in which the evaluation data of the effectiveness of some teaching design schemes are limited. At last, this paper verified the validity of the model via experimental results.

2 Influencing factors of the effectiveness of blended teaching in financial management course

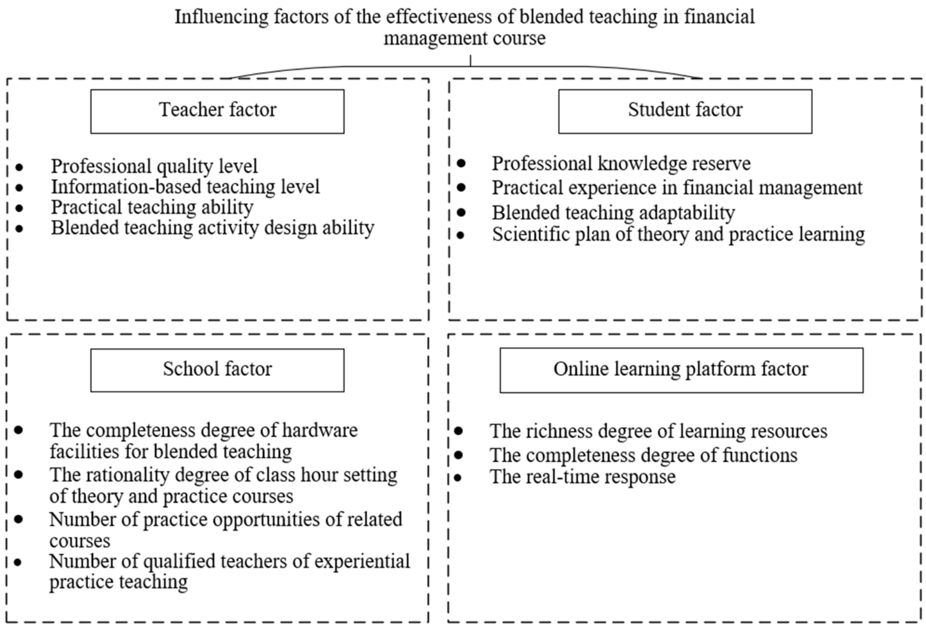

Fig. 1. Influencing factors of the effectiveness of blended teaching in financial management course

Influencing factors of the effectiveness of blended teaching in financial management course have four aspects: teacher factor, student factor, school factor, and online learning platform factor. Specifically, the teacher factor includes: 1) professional quality level, 2) information-based teaching level, 3) practical teaching ability, 4) blended teaching activity design ability; the student factor includes: 1) professional knowledge reserve, 2) practical experience in financial management, 3) blended teaching adaptability, 4) scientific plan of theory and practice learning; the school factor includes: 1) the completeness degree of hardware facilities for blended teaching; 2) the rationality degree of class hour setting of theory and practice courses; 3) number of practice opportunities of related courses; 4) number of qualified teachers of experiential practice teaching; the online learning platform factor includes: 1) the richness degree of learning resources, 2) the completeness degree of functions, 3) the real-time response. Figure 1 gives a summary of the influencing factors.

Among the many influencing factors, teachers are the guiders of blended teaching in the financial management course and the implementers of experiential practice, they play an irreplaceable and decisive role in the improvement of the effectiveness of the course. Students are the subjects of blended teaching, and they also assume an important role. Moreover, the schools and the online learning platforms have a joint effect, so the evaluation of the effectiveness of blended teaching in financial management course should start from each influence dimension, and the improvement of the effectiveness of blended teaching in financial management course is affected by the synergy of all kinds of factors (teacher, student, school, and online learning platform factors). On this basis, targeted improvement strategies could be formulated for improving the effectiveness of blended teaching in the financial management course.

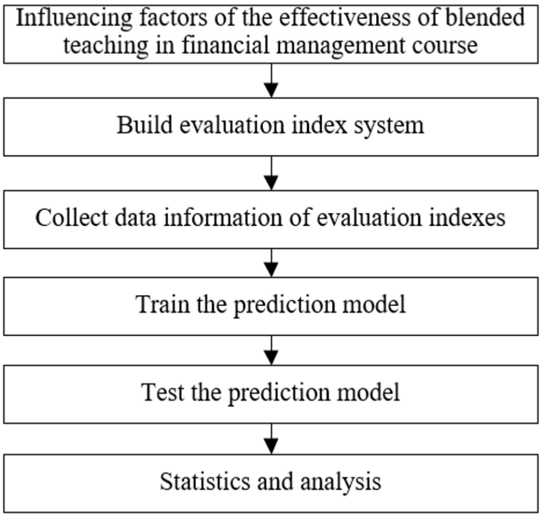

Fig. 2. Evaluation flow of the effectiveness of blended teaching in financial management course based on experiential practice

Since many influencing factors have been involved, and the states of the participants are complex and ever-changing, it's quite difficult to master all real-time information of all these factors. There're certain limitations when using the conventional regression models or time-series analysis models to evaluate the effectiveness of blended teaching in financial management course, such as the difficulty in determining the parameters of the evaluation model, and the low data accuracy.

Figure 2 shows the evaluation flow of the effectiveness of blended teaching in financial management course based on experiential practice. This paper adopted the LSSVM and skipped the evolution simulation of the specific teaching links of blended teaching in the financial management course based on experiential practice, and the time-series history evaluation information of the influencing factors was adopted for the prediction and analysis of the effectiveness of blended teaching. For different teaching design schemes and different classes, the model has certain robustness and can output higher-precision prediction results.

3 Prediction of the effectiveness of blended teaching in financial management course

LSSVM can be used to simplify quadratic programming problems so that the execution of the model could be accelerated greatly. Assuming: $\{a_i, b_i\}$ represents the training set of the evaluation data of influencing factors, $i = 1, 2, \ldots, m$; $a_i \in S_m$ represents the input evaluation data of influencing factors; b_i represents the output evaluation results of the effectiveness of blended teaching; $\{a_i, b_i\}$ was fitted based on high-dimensional space regression function. Assuming: $\chi(\cdot)$ represents the kernel function of space mapping; θ^T represents the weight vector; υ represents the threshold of constant term, then a function shown as Formula 1 could be attained:

$$b(a) = \theta^T \chi(a) + \upsilon \tag{1}$$

For constrained optimization problems, assuming: α represents the regularization parameter; δ_l represents the error term, then Formula 2 gives the expression of the regression analysis of LSSVM:

$$\begin{aligned} &\min_{\theta,\upsilon,\delta} J(\theta,\upsilon,\delta) = \frac{1}{2}\|\theta\|^2 + \frac{1}{2}\alpha\sum_{l=1}^{m}\delta_l^2 \\ &s.t.\ \ b_l = \theta^T \chi(a) + \upsilon + \delta_l, l = 1, 2, \ldots m \end{aligned} \tag{2}$$

The constrained optimization problem expressed by the above formula was converted and solved. Assuming $a_k \beta_l$ represents the Lagrangian vector multiplier, then there is:

$$SQ(\theta,\chi,\delta,\beta) = \frac{1}{2}\|\theta\|^2 + \frac{1}{2}\alpha\sum_{l=1}^{m}\delta_l^2 - \sum_{l=1}^{m}\beta_l[\theta^T\chi(a_l) + \upsilon + \delta_l - b_l] \tag{3}$$

Take the partial derivative of the above formula:

$$\begin{cases} \dfrac{\partial SQ}{\partial \theta} = \theta - \sum\limits_{l=1}^{m}\beta_l \chi\left(a_l\right) = 0 \\ \dfrac{\partial SQ}{\partial \upsilon} = \sum\limits_{l=1}^{m}\beta_l = 0 \\ \dfrac{\partial SQ}{\partial \delta_l} = \beta_l - \alpha\delta_l = 0 \\ \dfrac{\partial SQ}{\partial \beta_l} = \theta^T\chi\left(a_l\right) + \upsilon + \delta_l - b_l = 0 \end{cases} \tag{4}$$

In order to eliminate variables θ and δ_l, the above formulas were re-arranged, assuming Ψ represents the kernel matrix consisted by the kernel function SU; E represents the unit matrix, then a matrix about β and υ could be attained:

$$\begin{bmatrix} 0 & b^T \\ b & \Psi + E/D \end{bmatrix} \begin{bmatrix} \upsilon \\ \beta \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \tag{5}$$

$$\Psi_{ij} = b_i b_j < a_i^T, a_j >= b_i b_j SU(a_i^T, a_j); i, j = 1, 2, \ldots, m \tag{6}$$

β and υ were solved by the least squares operation, and Formula 7 gives the fitting function of LSSVM:

$$b(a) = \sum_{l=1}^{m} \beta_l SU(a_l, a) + \upsilon \tag{7}$$

The ability of LSSVM to process the evaluation index data of different dimensions is greatly affected by the kernel function. There are two types of kernel functions adopted in this paper, one type is the linear kernel function and the other type is the RBF radial basis kernel function. Formula 8 gives the expression of the linear kernel function:

$$SU(a, a_i) = \sum_{j=1}^{n} \left\langle a_j a_{ij} \right\rangle \tag{8}$$

Formula 9 gives the expression of the output prediction results of LSSVM under the condition of linear kernel function:

$$b = \phi + \sum_{j=1}^{m} \theta \left\langle a, a_i \right\rangle = \phi + \sum_{i=1}^{m} \theta_i a a_i^T = \phi + \sum_{j=1}^{m} \theta_i \left(\sum_{j=1}^{n} \left\langle a_j a_{ij} \right\rangle \right) \tag{9}$$

Assuming: $|a–a_i|$ represents the modulus of difference between vector a and vector a_i; ε represents the parameter of the kernel function, then Formula 10 gives the expression of RBF radial basis kernel function:

$$SU(a, a_l) = o^{\left(\frac{\|a-a_l\|^2}{2\varepsilon^2} \right)} \tag{10}$$

Formula 11 gives the expression of the output prediction results of LSSVM under the condition of RBF radial basis kernel function:

$$b = \phi + \sum_{i=1}^{m} \theta_i o^{\frac{\|a-a_l\|^2}{2\varepsilon^2}} = \phi + \sum_{i=1}^{m} \theta_i o^{-\frac{\sum_{j=1}^{n} \left(a_j - a_{ij} \right)^2}{2\varepsilon^2}} \tag{11}$$

4 Optimization of the prediction model

This paper built a TL-SVM model based on federated learning, namely the TL-SVM of similar teaching design schemes based on federated learning. At first, each prediction model was trained based on the evaluation index data involved in each teaching design scheme, then the parameters of each prediction model were shared with other prediction models. After the model parameters of all teaching design schemes were attained, all model parameters were aggregated and used to update the constructed federated learning model. When a new teaching design scheme is added, we only need to introduce the model parameters of this new teaching design scheme when aggregating the model parameters. After that, through the global training and local fine-tuning of the TL-SVM model based on federated learning, the learning of the similar implementation laws of multi-type teaching design schemes and the special implementation features of each single teaching design scheme was finished, this model can effectively deal with small sample size cases in which the evaluation data of the effectiveness of some teaching design schemes are limited.

For each teaching design scheme, the LSSVM prediction model was trained based their respective effectiveness evaluation index data, and the parameter exchange between the LSSVM and the constructed federated model was performed at the communication layer. During the training process of the federated model, the steps of the interaction between each layer are detailed as follows:

As mentioned above, for each teaching design scheme, the LSSVM prediction model was trained based their respective effectiveness evaluation index data, and the gradient of the loss function of the prediction model was calculated and saved. Assuming: A_l represents the input feature matrix of prediction model l; b_l represents the actual effectiveness evaluation vector; q_l represents the weight and activation threshold vector of prediction model l; a_l^i represents the input feature vector corresponding to the i-th evaluation index sample of prediction model l; b_l^i represents the actual effectiveness evaluation value corresponding to the i-th sample of prediction model l; m_l represents the number of samples owned by prediction model l; g(.) represents the predicted value of effectiveness evaluation, then, the loss function SW (.) of prediction model l could be defined as:

$$SW\left(A_l, b_l; q_l\right) = \frac{1}{2}\sum_{i=1}^{m_l}\left(g\left(a_l^i\right) - b_l^i\right)^2 \tag{12}$$

Assuming: h_l represents the gradient of the loss function of prediction model l, then the gradient was attained by taking the partial derivative of the above formula:

$$h_l = \frac{\partial SW\left(A_l, b_l; q_l\right)}{\partial q_l} \tag{13}$$

Then, the gradients of all prediction models were aggregated, and the weights and thresholds of the federated model can be updated based on the average weighted aggregation result of gradients. Assuming: L represents the number of prediction models; m_l represents the number of evaluation index samples of prediction model l; m represents the total number of evaluation index samples of L prediction models; γ represents learning rate; q^p and q^{p+1} respectively represent the weight vector and threshold vector of the model when performing p and p+1 rounds of communication; $q^{p+1}{}_l$ represents the weigh and threshold vector of prediction model l when performing p+1 rounds of communication, then there are:

$$q^{p+1} = q^p - \gamma \sum_{l=1}^{L} \frac{m_l}{m} h_l = q^p - \sum_{l=1}^{L} \frac{m_l}{m} \gamma h_l = q^p - \sum_{l=1}^{L} \frac{m_l}{m} \left(q^p - q_l^{p+1} \right)$$
$$= \sum_{l=1}^{L} \frac{m_l}{m} q_l^{p+1} \tag{14}$$

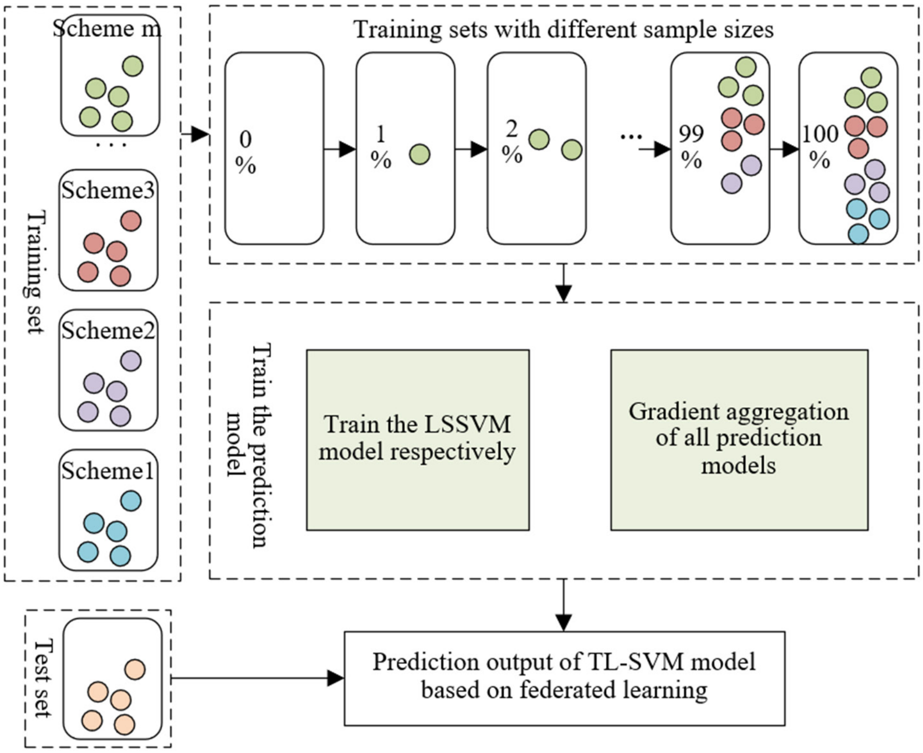

Fig. 3. Training and evaluation flow of the optimization model of s typical case

To ensure the independence of prediction model parameters corresponding to each teaching design scheme, this paper adopted a safe aggregation method to aggregate the parameters of the LSSVM model corresponding to each teaching design scheme. The algorithm will introduce pairwise perturbations to all prediction model parameters. Specifically, at first, prediction model v randomly selects a vector $\xi_{v,u}$ for prediction model u, prediction model u also randomly selects a vector $\xi_{v,u}$ for prediction model v, v and u exchange vectors $\xi_{v,u}$ and $\xi_{u,v}$. Then, the perturbation vectors $t_{v,u} = \xi_{v,u} - \xi_{u,v}$ and $t_{u,v} = \xi_{u,v} - \xi_{v,u}$ are calculated. Assuming: m_v represents the evaluation index sample size; m represents the total evaluation index sample size of L teaching design schemes; after aggregation calculation was completed, all prediction model parameters were summed to get parameter q^{p+1} of the constructed federated model:

$$\left[\frac{m_v}{m}q_v^{p+1}\right]=\frac{m_v}{m}q_v^{p+1}+\sum_{u\in L,u\neq v}t_{v,u} \tag{15}$$

$$q^{p+1}=\sum_{v\in L}\left[\frac{m_v}{m}q_v^{p+1}\right]=\sum_{v\in L}\left(\frac{m_v}{m}q_v^{p+1}+\sum_{u\in L,u\neq v}t_{v,u}\right)=\sum_{v\in L}\frac{m_v}{m}q_v^{p+1}+\sum_{v\in L}\sum_{u\in L,u\neq v}t_{v,u}$$
$$=\sum_{v\in L}\frac{m_v}{m}q_v^{p+1}+\sum_{v\in L}\sum_{u\in L,u\neq v}\xi_{v,u}-\sum_{v\in L}\sum_{u\in L,v\neq u}\delta_{v,u}=\sum_{v\in L}\frac{m_v}{m}q_v^{p+1} \tag{16}$$

Figure 3 gives the training and evaluation flow of the optimization model of a typical case. The target teaching design scheme corresponding to this case is a newly-created teaching design scheme that has integrated with experiential practice. The data density of the evaluation indexes was high, but the execution time of the new teaching design scheme was short, resulting in that the volume of collected evaluation index data was small. For target teaching design scheme that hasn't been executed yet, there's no evaluation index data. In this case, the model cannot be trained, and the federated model cannot be fine-tuned.

5 Experimental results and analysis

Table 1. Summary of statistical information of model input samples

Feature	Teacher Factor	Student Factor	School Factor	Online Learning Platform Factor
Minimum	23.52	25.62	11.37	31.39
Mean	55.09	45.27	14.63	34.51
Median	58.52	48.24	14.38	39.27
Maximum	73.14	65.68	27.51	47.15

In this paper, four influencing factors, including teacher factor, student factor, school factor and online learning platform factor, were selected as the input of prediction models. Table 1 gives a summary of the statistical information of the model input samples. Limited by the difficulty of data collection of the effectiveness evaluation indexes, this paper can hardly build a sample set with a wide dimension to verify the universality and effectiveness of the proposed model in cases with multiple teaching design schemes and small sample size.

Figure 4 shows the errors before and after introducing the federated model. According to the figure, when the dimension of the evaluation index data of the effectiveness of target teaching design scheme is higher than that of other teaching design schemes in the TL-SVM model, in cases of small sample size, the prediction accuracy of the model after introducing the federated model is still higher than that of the original model. Under the conditions of different sample proportions, the prediction stability of the model is higher, indicating that the TL-SVM model after introducing federated learning still has certain universality and effectiveness in cases with inconsistent dimensions of evaluation index data of the effectiveness of teaching design schemes.

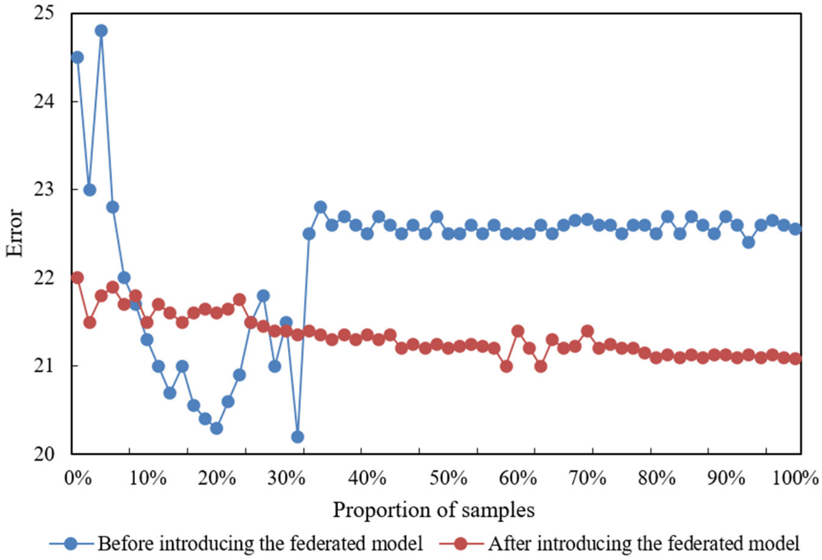

Fig. 4. Errors before and after introducing the federated model

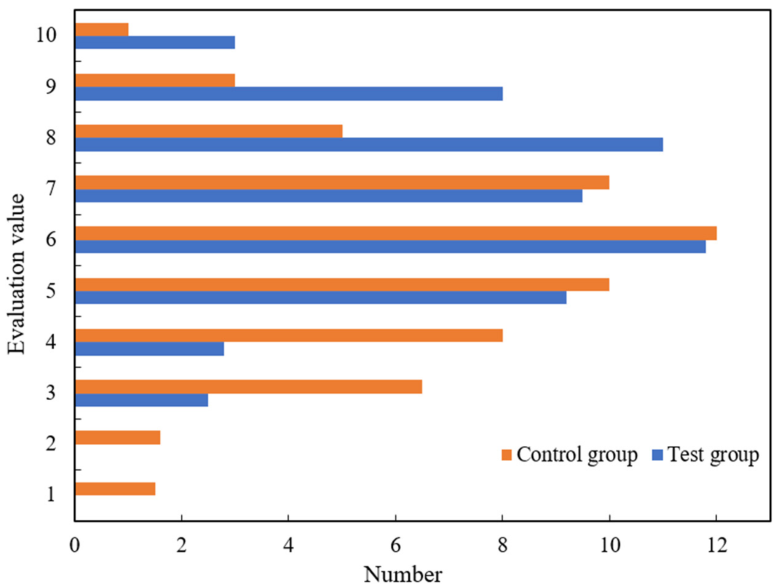

Fig. 5. Distribution of post-measured scores of different groups

After the one-semester experiment of blended teaching in the financial management course based on experiential practice, experimental data were attained, Table 2 and Figure 5 give the distribution of post-measured scores of the effectiveness of blended teaching, the p value is less than 0.01, indicating that the effectiveness of blended teaching in the said course has been significantly improved.

Table 2. Distribution of post-measured scores of the effectiveness of blended teaching

Post-Measured Score	**Test Group**			
	Frequency	**Percentage**	**Effective Percentage**	**Cumulative Percentage**
3	2	1	1	1
4	1	0	1	0
5	1	5.5	5.4	5.8
6	3	5.1	5.2	12.7
7	8	16.2	14.9	28.6
8	12	24.7	25.6	51.4
9	10	18.4	14.2	74.6
10	6	22.6	22.5	95.8
11	15	7.4	7.1	125.7
Total	58	102.9	116.2	
Post-Measured Score	**Control Group**			
	Frequency	**Percentage**	**Effective Percentage**	**Cumulative Percentage**
3	3	1.3	1.6	1.4
4	1	1.7	1.1	3.6
5	5	15.6	12.7	16.4
6	2	18.2	16.4	54.9
7	14	17.9	17.5	50.2
8	11	23.5	23.9	74.5
9	7	9.7	9.1	81.9
10	10	15.4	16.2	112.5
11	3	2	1	162.7
Total	55	114.2	126.8	

Table 3. Gender differences in the effectiveness of blended teaching in financial management course based on experiential practice

	Group	**Test Group**		**Control Group**	
	Gender	**Male**	**Female**	**Male**	**Female**
Pre-measured	Number	25	21	23	20
	Average score	6.15	5.58	6.20	5.42
	Standard deviation	1.325	1.697	1.326	1.474
	P	0.025		0.057	
Post-measured	Number	28	26	22	24
	Average score	7.59	7.62	6.15	5.38
	Standard deviation	1.485	1.26	1.59	1.47
	P	0.274		0.062	

Table 3 lists the gender differences in the effectiveness of blended teaching in financial management course based on experiential practice. According to the data in the table, in pre-measurement, there's no significant difference in the learning effect scores of male and female students in test group and control group; but in the post-measurement, for both male and female students in the test group, their average scores show great improvement, but the difference is not that significant; while for students in the control group, the gender difference is significant. Therefore, it can be considered that, carrying out blended teaching in financial management course based on experiential practice can narrow the gender difference in terms of the learning effects of the financial management course.

6 Conclusion

This paper studied the effectiveness of blended teaching in financial management course based on experiential practice. At first, the influencing factors of the effectiveness of blended teaching in the said course were analyzed, and the evaluation flow was given. Secondly, a prediction model was built for blended teaching in the said course based on LSSVM, a TL-SVM for similar teaching design schemes was built based on federated learning, and the learning of the similar implementation laws of multi-type teaching design schemes and the special implementation features of each single teaching design scheme was finished. The proposed method can well cope with small sample size cases in which the evaluation data of the effectiveness of some teaching design schemes are limited. After that, in the experiment, this paper summarized the statistical information of model input samples, and verified the universality and effectiveness of the proposed model when dealing with cases with multi-type teaching design schemes and small sample size; then, the errors before and after introducing the federated model were given, the distribution of the post-measured scores of the effectiveness of blended teaching was compared, and the results proved that carrying out blended teaching in the financial management course based on experiential practice can significantly improve the teaching effect of the said course. Moreover, the distribution of post-measured scores of different groups was compared, and the gender differences in the effectiveness of blended teaching were discussed. At last, the conclusion that carrying out blended teaching in financial management course based on experiential practice can narrow the gender difference in terms of the learning effects of the financial management course was attained.

7 References

[1] Guerra, M., Shealy, T. (2018). Teaching user-centered design for more sustainable infrastructure through role-play and experiential learning. Journal of Professional Issues in Engineering Education and Practice, 144(4): 05018016. https://doi.org/10.1061/(ASCE)EI.1943-5541.0000385

[2] Medini, K. (2018). Teaching customer-centric operations management–evidence from an experiential learning-oriented mass customisation class. European Journal of Engineering Education, 43(1): 65–78. https://doi.org/10.1080/03043797.2017.1310185

[3] Lu, B., Zheng, F. (2022). Influence of experiential teaching and itinerary assessment on the improvement of key competencies of students. International Journal of Emerging Technologies in Learning, 17(2): 173–188. https://doi.org/10.3991/ijet.v17i02.29007
[4] May, M.D. (2022). Physical and virtual game based experiential learning for supply chain and operations management teaching practice and effectiveness. In 2022 IEEE Global Engineering Education Conference (EDUCON), Tunis, Tunisia, pp. 1113–1120. https://doi.org/10.1109/EDUCON52537.2022.9766394
[5] Beausoleil-Morrison, I. (2019). Learning the fundamentals of building performance simulation through an experiential teaching approach. Journal of Building Performance Simulation, 12(3): 308–325. https://doi.org/10.1080/19401493.2018.1479773
[6] Shi, H., Meng, X., Du, J., Wang, L. (2022). Design and realization of experiential teaching based on knowledge feature transformation of course teaching. International Journal of Emerging Technologies in Learning, 17(7): 226–239. https://doi.org/10.3991/ijet.v17i07.30403
[7] Mao, Q. (2021). Analysis and research on experiential teaching mode of international trade specialty based on simulation experiment. In 2021 2nd International Conference on Computers, Information Processing and Advanced Education, Ottawa ON, Canada, pp. 1369–1374. https://doi.org/10.1145/3456887.3457526
[8] Zhang, M. (2021). Exploration of computer aided graphic design teaching under the experiential teaching mode. Computer-Aided Design and Applications, 18(S2): 1–11. https://doi.org/10.14733/cadaps.2021.S2.1-11
[9] Butler, J., Yuill, D.P. (2021). Experiential learning for teaching heating, ventilation, and air-conditioning engineering. In 2021 IEEE Frontiers in Education Conference (FIE), Lincoln, NE, USA, pp. 1–5. https://doi.org/10.1109/FIE49875.2021.9637231
[10] Espinosa, H.G., Fickenscher, T., Littman, N., Thiel, D.V. (2020). Teaching wireless communications courses: An experiential learning approach. In 2020 14th European Conference on Antennas and Propagation (EuCAP), Copenhagen, Denmark, pp. 1–5. https://doi.org/10.23919/EuCAP48036.2020.9135204
[11] Wang, B., Li, S. (2021). Research of combining blockchain in the course reform of cryptography by experiential teaching. In 2021 9th International Conference on Information and Education Technology (ICIET), Okayama, Japan, pp. 133–138. https://doi.org/10.1109/ICIET51873.2021.9419595
[12] Singh, A. (2017). A new approach to teaching biomechanics through active, adaptive, and experiential learning. Journal of Biomechanical Engineering, 139(7): 071001. https://doi.org/10.1115/1.4036604
[13] He, G.Y. (2020). Blended teaching mode of art course based on objective achievement scale. International Journal of Emerging Technologies in Learning, 15(13): 289–302. https://doi.org/10.3991/ijet.v15i13.14987
[14] Zhang, J., Zhang, M., & Tang, J. (2022). Exploration and practice on blended teaching of mathematical analysis with information technology. In International Conference on Cognitive based Information Processing and Applications (CIPA 2021), Singapore, pp. 814–821. https://doi.org/10.1007/978-981-16-5857-0_104
[15] Wang, Y. (2022). Evaluation of the information-based teaching design abilities of educators in blended teaching. International Journal of Emerging Technologies in Learning, 17(5): 196–210. https://doi.org/10.3991/ijet.v17i05.29849
[16] Gao, Y. (2020). Blended teaching strategies for art design major courses in colleges. International Journal of Emerging Technologies in Learning, 15(24): 145–158. https://doi.org/10.3991/ijet.v15i24.19033

[17] Gourmaj, M., Naddami, A., Fahli, A., Nehari, D. (2017). Teaching power electronics and digital electronics using personal learning environments: From traditional learning to remote experiential learning. International Journal of Online Engineering, 13(8): 244–255. https://doi.org/10.3991/ijoe.v13i08.6840
[18] Lee, W.L. (2016). SCRUM-X: An interactive and experiential learning platform for teaching scrum. The 7th International Conference on Education, Training and Informatics (ICETI 2016), Orlando, Florida, USA.
[19] Bi, J., Yu, X., Ge, P., Xia, Z. (2021). Research on blended teaching effect of innovation and entrepreneurship simulation experiment. In 2021 International Conference on Education, Information Management and Service Science (EIMSS), Xi'an, China, pp. 346–350. https://doi.org/10.1109/EIMSS53851.2021.00081
[20] Bai, L.R., Li, Y.M., Liu, Z. (2021). An empirical study on the teaching effect of blended learning mode in financial econometrics course based on logit model. In 2021 2nd International Conference on Big Data and Informatization Education (ICBDIE), Hangzhou, China, pp. 305–308. https://doi.org/10.1109/ICBDIE52740.2021.00075

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