Research Article

Construction of College Chinese Writing Practice Teaching Platform under the Background of Information Technology

Jingli Wu

Xinxiang Vocational and Technical College, Henan 453000, Xinxiang, China

Correspondence should be addressed to Jingli Wu; 2016123465@jou.edu.cn

Received 4 May 2022; Revised 17 May 2022; Accepted 27 May 2022; Published 28 June 2022

Academic Editor: Amit Gupta

Copyright © 2022 Jingli Wu. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Writing has always been one of the difficulties in teaching Chinese as a foreign language. With the advent of the information society, modern information technology, represented by networking, digitalization, multimedia, and intelligence, has become a creative tool to expand human capabilities, changing people’s traditional way of life, study, and work. Guided by the theory of integration of information technology and curriculum, combined with the characteristics of Chinese writing, this paper puts forward that the goal of integration of information technology and Chinese writing is to change the traditional teaching structure, create an ideal environment for students to learn Chinese and improve their Chinese information literacy. A practical teaching platform for college Chinese writing is constructed, which is designed from the user role and based on user access control. Each user has different operation rights, module rights, and management rights. According to a small amount of online information and the results of a previous course, we can make a good prediction. The results show that this method is effective, and we can predict students’ academic performance through their online behavior.

1. Introduction

Writing teaching is a very important but often neglected link in all aspects of Chinese teaching, listening, speaking, reading, and writing, and it is also a generally weak link in students’ abilities. Many students do not pay attention to or have no interest in writing, and they are afraid of difficulties when facing Chinese writing [1]. On the one hand, teachers are difficult to teach, although most international students can accomplish various writing tasks well in classroom teaching; on the other hand, students are hard to learn, and they feel at a loss in free writing, unable to apply the writing knowledge and methods learned in the classroom to personal writing, lacking a sense of learning gain, and losing their writing enthusiasm over time [2]. In this process, the teacher’s effort and effectiveness are almost 50:1, and the result of getting twice the result with half the effort makes the students’ ability not significantly improved in the writing course of more than 30 hours per semester. How to improve college students’ Chinese writing levels has always been the goal explored by most Chinese teachers [3, 4]. With the advent of the information society, modern information technology, represented by networking, digitalization, multimedia, and intelligence, has become a creative tool to expand human ability, changing people’s traditional way of life, study, and work and influencing the contents and methods of education. Under the trend of integration of information technology and curriculum, how to integrate information technology with Chinese writing has become the research direction, and it will be of great significance.

At present, the teaching of Chinese as a foreign language is undergoing rapid changes and progress. Today, when the cause of teaching Chinese as a foreign language is flourishing, more emphasis is placed on the comprehensive improvement of language skills of language learners, and the classes set for improving language skills are also colorful [5]. Literature [6] points out that among the language skills of “listening, speaking, reading and writing” in teaching Chinese as a foreign language, most people think that writing is the most difficult because the writing ability reflects the
language learners’ comprehensive ability to use the language. Literature [7] mentions that writing, as a basic skill of a language, has a very important position. In the process of writing, language learners need to organize language and structure, which not only consolidates the basic knowledge of Chinese but also improves the other three skills. It is not difficult to find that experts and scholars have given the writing class a high position and put forward the importance of the writing class. At the same time, they also mentioned that the difficulty of the writing class is very great. Literature [8] systematically and comprehensively designed the curriculum for advanced classes, including predesign analysis, overall design arrangement, and sample class design. In the process of writing, teachers guide students to complete the writing process of preparation before writing, conception, outline writing, first draft writing, revision, discussion after revision, revision, and final draft through diversified writing activities. Therefore, rethinking the traditional writing teaching methods and means, changing teachers’ one-way teaching into writing teaching with the active participation of teachers and students, strengthening comprehensive training between language skills, and improving students’ writing interest and level are new topics in the reform of Chinese writing course for foreigners [9].

Essentially, the integration of information technology and Chinese writing plays a significant role in reforming the whole teaching structure, teaching methods, and learning methods. The effective integration of information technology and Chinese writing is the key to realizing the informationization of Chinese as a foreign language education and the only way to realize the informationization of Chinese as a foreign language education [10]. The learning environment of independent exploration, multi-interaction, cooperative learning, and resource sharing created by information technology has brought innovation to Chinese learners’ learning style and improved their information literacy while learning Chinese. Both emphasize the interactive relationship between social culture and language. Both emphasize the function of context and the dynamic characteristics of discourse. This idea of genre theory is of great reference value to the improvement of the teaching mode of Chinese writing as a foreign language. In view of this, this paper tries to build a practical teaching platform for college Chinese writing based on previous studies and genre theory.

2. Related Work

Chinese writing teaching with multimedia and network technology as its core just reflects this teaching process, and its advantage lies in that it can effectively utilize existing resources, and students can construct their original knowledge through free exploration and free learning. Literature [11] points out that “information technology can create a student-centered, teacher-led learning environment that is connected with a wide range of communities.” Literature [12] provides students with a brand-new learning and communication platform and resources and fully enables students to learn to use new means and technologies to acquire knowledge and cooperate fully in various disciplines. Literature [13] holds that learning is not the transfer of knowledge from teachers to students but the process of students constructing their own knowledge. Students are not passive information absorbers but active constructors of meaning, which cannot be replaced by others. Literature [14] holds that teachers are organizers and guides of the teaching process and helpers and promoters of meaning construction, while students are subjects of information processing and emotional experience and active constructors of knowledge meaning. Literature [15] holds that the so-called integration of information technology and subject courses is to create a new teaching environment by effectively integrating information technology into the teaching process of various subjects and to realize a teaching and learning method characterized by “autonomy, inquiry and cooperation,” which not only can play the leading role of teachers but also can fully reflect the dominant position of students. Literature [16] holds that the integration model can be divided into two categories: first, classroom instruction integration; second, autonomous learning integration; and it can be specifically divided into network teaching, individual learning, and online discussion. The integration strategies include knowledge cutting-in strategies, multiple perception strategies, practice strengthening strategies, cooperative learning strategies, and so on. Of course, the integration strategy will be more specific and targeted in terms of disciplines and even classes. Through application examples, this paper makes a comparative analysis of the teaching modes before and after multimedia enters the newspaper class [17]. The results show that multimedia plays a more important role in newspaper reading class than in other classes, which not only can help teachers complete a lot of teaching contents but also can change the boring atmosphere in the previous class.

With the rapid development of modern information technology, the application of computer and network technology in Chinese learning is becoming more and more extensive and in-depth. Especially, the connection between the Internet and campus network provides abundant resources for the education of major schools, which makes online Chinese learning based on network truly become a reality. The traditional classroom Chinese teaching can no longer meet the increasing requirements of Chinese learning, while the networked online Chinese learning system provides a large number of constantly updated resources, breaks through the geographical and time constraints, and provides students and teachers with in-class or out-of-class online learning platforms. Using the K-means algorithm, the clustering analysis results with a high degree of related attributes of course scores can be achieved well [18]. In the application of association rules, literature [19] uses association rules to analyze the key factors that affect students' performance in universities for nationalities and finds out useful rules, which can provide a reference for decision-makers to determine the future direction of teaching management. In the application of DT (decision tree), literature [20] is based on the DT model, mining the student attributes that affect the teaching effect of computer courses. Mining the data of online tools used to support collaborative learning can effectively help improve the effect of team
learning [21]. Literature [22] invented a data-driven technology to identify high-risk students at the early stage of online courses, and they found that time characteristics are the key characteristics to predicting students’ academic performance. The Internet has played a decisive role in this generation of students, involving personal life and study life. According to the data of students’ campus cards, literature [23, 24] measured students’ campus life behavior based on entropy and defined two advanced behavior characteristics: orderliness and diligence.

3. Research Method

3.1. The Integration Model of Information Technology and Chinese Writing. Teachers can use multimedia to present teaching contents and use media information such as pictures or sounds to create a preset Chinese environment for students, in which students can train their skills. Promote students’ construction, understanding, maintenance, and transfer of Chinese knowledge and skills. Students’ dominant position is reflected in actively establishing the relationship between the old and new language points, acquiring the meaning of the new language points, assimilating the new language points into the original knowledge structure, and mastering the corresponding Chinese learning strategies.

Chinese writing teaching should not only pay attention to the teaching of language knowledge but also pay attention to the comprehensive training of the four skills of listening, speaking, reading, and writing, which is the core course in the Chinese writing system. In class, teachers should explain new words, grammar, and texts. Every link should be combined with practice, with more explanations and practice and mutual connection. Ask questions according to the content of the text, and the students answer the questions of the teacher. Some texts will involve several topics. Teachers should properly handle or adapt the texts to facilitate students’ retelling. Teachers can create situations by using keywords, pictures, animations, and so on. Students can flexibly use sentences in the texts and retell the texts in the situations.

Teachers should not be limited to teaching materials but integrate listening materials into teaching materials. You can design the topic of real communication, such as giving a piece of material and telling it to others after listening. This communicative task-based listening training can make up for the defects of some teaching materials and also exercise students’ listening and coping abilities in the process of communication. Teachers can record or collect some communication materials before class and practice with students in class. If conditions permit, teachers can make their own recorded or collected listening resources into audio task-based assignments for students and ask students to complete their own tasks, record difficult problems in the listening process, and give feedback to teachers, who can answer and help them.

The browser/server structure of the college Chinese writing practice teaching platform is the B/S structure, and the user interface is presented through the browser by the Web program. Combined with the IIS server configuration that comes with Windows, the program is written by ASP combined with database language. The system consists of three levels: client browser, Web browser, and database server. The structural principle of the system is shown in Figure 1.

From a URL request from the client to page feedback from the server to the browser, the process is as follows:

1. The user enters a URL address in the client browser to establish a connection with the server
2. The server finds the corresponding file on the hard disk according to the address requested by the user
3. The server side operates and interprets the file
4. Return the interpreted document to the client browser
5. End this connection

The functional module design of the college Chinese writing practice teaching platform is mainly divided into three parts: student users, foreign teacher users, and administrator users. The specific functional modules are shown in Figure 2.

The modules that students can use include the homepage of the practice platform, the latest notice, the in-service foreign teacher information module, the course reservation module, the personal course management module, the electronic magazine browsing module, and the interactive BBS module. The modules that foreign teachers can use include their own classroom student information browsing, the student evaluation module of their courses, and the homepage of the practice platform.

System administrators can add background management roles, change passwords, edit and view the homepage information, edit and view the latest notices, edit the information of available courses, and upload the description documents of each course and the information documents of foreign teachers. The teaching administrator class edits and views the feedback information of foreign teachers and students and can modify the password of foreign teachers and the scope of authority.

Teachers arrange courses on the server, compile lesson plans, and dynamically update them. The teacher can call up the learning activity tracking database of the teaching class.
Practical teaching platform.

Figure 2: The function of the college Chinese writing practice teaching platform.

3.2. Analysis of Students’ Chinese Writing Achievements.

Like other language acquisition behaviors, writing learning is social rather than isolated. Traditional writing is often an individual activity of students, and teachers are the only readers. This kind of writing can hardly help students acquire writing skills. Social interaction in the group can provide a good environment for students to write effectively and happily. This kind of social interaction has two important aspects: one is that students have a dialogue with each other, and the other is that students regard each other as editors [11]. Students’ self-assessment, teachers’ comments, and other forms can be used to evaluate the fluency of expression, the accuracy, and complexity of language and improve the language in various forms.

The data used in this paper comes from the open source data set of the third-party platform, which is mainly used to openly study students’ personal development, supervision, and management of schools and other projects. The content of this data set includes the behavior data of students using campus smart cards to swipe their cards in two academic years of a university and the score ranking data in the teaching management system.

In order to better protect students’ privacy, the scores are converted into rankings and normalized, and DM (data mining) algorithm is used for learning.

$$c_t = \sum_{i=1}^{t} \alpha_t h_i,$$

where the context vector $c_t$ can be calculated by the weighting factor $\alpha_t$ and the hidden states $h_i$ to $h_t$, $(1 \leq i \leq t)$. The formula for the attention mechanism function is as follows:

$$\alpha_t = \sigma(W_a[h_t; h_t]),$$

where $\sigma$ is the sigmoid function, which transforms $h_t$ into potential space through matrix. This function does not directly add all the hidden states learned by the RNN network to represent the behavior sequence of students.

Before factor analysis, the selected features are tested by KMO and Bartlett’s test, and the KMO test is used to check the correlation and partial correlation between variables as shown in Table 1.

Table 1: Test of KM and Bartlett.

| Test of KM and Bartlett | Approx. chi-square | df | Sig. |
|------------------------|--------------------|----|------|
| Bartlett’s test of sphericity | 46,423.916 | 154 | 0.000 |
| Kaiser–Meyer–Olkin measure of sampling adequacy | 0.730 |

The results show that the approximate chi-square value of Bartlett’s test is 46,423.916, and the adjoint probability value is Sig.< 0.05, which is significant. It shows that the correlation coefficient matrix of the factor is not an identity matrix, and there is a correlation among the variables.

3.3. Achievement Prediction Based on DM. DM is the process of extracting hidden information and knowledge from a large number of incomplete, noisy, fuzzy, and random data that people do not know in advance, but it is potentially useful. Because most clustering analysis algorithms cluster according to the distance between data objects, this algorithm is only suitable for the clustering of spherical classes but cannot be used to analyze the clustering of other shape classes, so a density-based clustering method is proposed. The basic idea is that in a given range, if the density of data points is not less than the set minimum threshold, it will be divided into similar classes.

In many applications, the relationship between attribute sets and class variables is uncertain. That is to say, although
the properties of the test record are the same as some training samples, it is impossible to predict its class label with certainty. In this study, two common classification algorithms, naïve Bayes and LR, are mainly used.

Naïve Bayes (naïve Bayesian classification) is a simple probabilistic classification based on Bayesian theory. It assumes that features are independent of each other; that is, it assumes that every feature of a sample is uncorrelated with each other [17]. This classification method relies on an accurate natural probability model, is famous for its acceptable accuracy and high efficiency, and can achieve very good classification results in the supervised learning sample set.

Given the class label \( C_i \) of tuple \( X \), make the naïve assumption that the attribute values are independent of each other, that is, assume that \( A_1, A_2, \ldots, A_n \) attributes are independent of each other conditionally. In this way, the posterior probability of \( X \) under the condition of \( C_i \) can be converted into

\[
P(X | C_i) = \prod_{k=1}^{n} P(x_k | C_i)
= P(x_1 | C_i) \times P(x_2 | C_i) \times \cdots \times P(x_n | C_i).
\]

We can easily estimate the probability \( P(x_1 | C_i), P(x_2 | C_i), \ldots, P(x_n | C_i) \) from the training tuple, where \( x_k \) represents the value of attribute \( A_k \) of tuple \( X \).

In order to predict the class label of the class to which tuple \( X \) belongs, \( P(X | C_i)P(C_i) \) is calculated for each class \( C_i \). The class label of NBC tuple \( X \) is \( C_i \), if and only if

\[
P(X | C_i)P(C_i) > P(X | C_j)P(C_j), \quad 1 \leq j \leq m
\]

\[
P(X | C_i)P(C_i) > P(X | C_j)P(C_j), \quad 1 \leq j \leq m.
\]

That is, the predicted class mark is the class \( C_i \) that maximizes the \( P(X | C_i)P(C_i) \) value.

NBC has the advantage that it performs well on small-scale data and is suitable for multi-classification tasks and incremental training. The disadvantage is that it is sensitive to the expression form of input data. If the given feature vectors are of different lengths, they need to be normalized to vectors of the same length.

LR (logistic regression) is a generalized nonlinear regression analysis model for classification, which is often used in DM, automatic disease diagnosis, economic prediction, and other fields. Through LR analysis, the weight of the independent variable can be obtained so that you can roughly know which factors are the main factors of the dependent variable. At the same time, according to this weight, the possibility that an instance belongs to a certain category can be calculated with independent variables.

The assumption \( h_{\hat{\theta}} \) of the LR model is

\[
h_{\hat{\theta}}(x) = g(\hat{\theta}^T X),
\]

where \( X \) represents eigenvector, \( g \) represents a logic function, and a commonly used logic function is S-shaped function, and the formula is:

\[
g(z) = \frac{1}{1 + e^{-z}}.
\]

In order to make the algorithm predict and classify well, it is necessary to find the appropriate parameter vector \( \hat{\theta} \) of the model. The selected parameters determine the accuracy of the obtained \( h_{\hat{\theta}}(x) \) relative to the training set, and the difference between the class predicted by the model and the class in the training set is called modeling error. The purpose of determining the parameter \( \hat{\theta} \) is to select the model parameters that can minimize the absolute value of the modeling error.

LR’s cost function is

\[
J(\hat{\theta}) = \frac{1}{m} \sum_{i=1}^{m} \cos t(h_{\hat{\theta}}(x^{(i)}), y^{(i)}),
\]

where

\[
\cos t(h_{\hat{\theta}}(x), y) = \begin{cases} 
-\log(h_{\hat{\theta}}(x)), & y = 1, \\
-\log(1 - h_{\hat{\theta}}(x)), & y = 0.
\end{cases}
\]

The \( \cos t(h_{\hat{\theta}}(x), y) \) feature is characterized by the following:

When the actual \( y = 1, h_{\hat{\theta}}(x) = 1 \), the error is 0, and when \( y = 1, h_{\hat{\theta}}(x) \neq 1 \), the error increases with the decrease of \( h_{\hat{\theta}}(x) \).

The error is 0 when \( y = 0, h_{\hat{\theta}}(x) = 0 \) is actual, and it becomes larger when \( h_{\hat{\theta}}(x) \) is larger when \( y = 0, h_{\hat{\theta}}(x) \neq 0 \) is actual.

4. Results and Discussion

While students often improve their fluency, the accuracy of language expression is still low. Writing is essentially an act of self-control. If there is no specific requirement, foreign language learners are likely to use only their familiar language forms to express their thoughts and at most improve their proficiency in foreign language use. When writing, you can choose some words related to the writing theme and ask students to choose at least a certain number in writing. Only deliberately noticed language points are more likely to be remembered and used, and intentional attention is very important for foreign language development.

The principal component analysis is used to investigate the correlation between multiple variables and the prediction function, and seven factors affecting students’ grades are analyzed, as shown in Figures 3 and 4.

Campus card swiping is a spontaneous behavior of students, and it is also an important factor to reflect students’ academic performance. Due to the individual differences of each student and the diversity and complexity of environmental factors, the model cannot be generalized and explained only by extracting the characteristics of campus credit card swiping behavior. Behavioral indicators that affect academic rankings can be discussed in conjunction with the categorization of student achievement, and the DM algorithm is used to explore the practical value of these behavioral data in management, teaching, and learning.

Based on the traditional behavior characteristics, the experiment builds Bayesian, DT, LR, RF (random forest),
and SVM (support vector machine) multi-classification prediction models and uses three evaluation methods, namely accuracy, recall, and F1-score, to evaluate the performance prediction models. The experimental results are shown in Figure 5.

The optimization of the algorithm can only improve the final experimental results to a certain extent, and the core that really determines the quality of the model lies in the original data. People’s empirical understanding of campus behavior needs to be biased. Therefore, combining the principles of psychology, statistics, and pedagogy, further empirical analysis or more experimental data are needed to extract the effective features.

Generally speaking, the research in this chapter is feasible to predict students’ performance ranking by using students’ behavior data. Compared with other classification algorithms, SVM and LR have stronger learning abilities for the extracted traditional behavior characteristics, and the accuracy of the trained classification prediction model is relatively higher. Based on the above analysis, it reflects the importance of data analysis and feature extraction and points out the direction to further improve the accuracy of performance prediction.

Figure 6 lists the sensitivity, specificity, and accuracy obtained by using the LR algorithm to predict whether Chinese writing will pass or not on six different data sets and using the leave-out-of-one cross-validation method to evaluate the model.
As shown in Figure 6, the accuracy rate is about 85% for all data sets, with little fluctuation. Except for data set 55, which is relatively low in sensitivity, the other five groups of data all exceed 90%. For six groups of data sets, the difference in specificity is the most obvious.

Figure 7 lists the sensitivity, specificity, and accuracy obtained by using naive Bayes classifier to predict whether students’ Chinese writing course will pass the experiment on six different data sets and by using the leave-out-of-one cross-validation model.

As shown in Figure 7, the accuracy and sensitivity are stable at around 85% and 90% in all data sets, respectively, but the difference of specificity is obvious. Here are two interesting results about the specificity: the specificity increases by at least 4% when an extra item is added to the data set, and when the features were transformed to be closer to a Gaussian distribution, the specificity increases by about 10%.

The performance test is to judge whether the system function meets the performance indicators it should achieve, such as concurrency, load, and so on, when the system function is already available. The performance test of the college Chinese writing practice teaching platform adopts the automatic test tool Load Runner v9.0, and the virtual users are generated by the load operation controller of the automatic test tool to test the load pressure.

This section takes the download of teaching resources as an example and tests the number of concurrent users to meet the system requirements and what improvements should be made in the server hardware configuration under the conditions of 4M and 10M bandwidth networks, respectively.

Figure 8 shows the test results of downloading teaching resources under 4M broadband. From this figure, it can be seen that the transaction response time increases in direct proportion to the number of virtual users. When the number of users reaches 155, the transaction execution fails, prompting the download timeout.

Looking at the CPU utilization rate at this time, as shown in Figure 8, it can be found that it does not consistently reach 100%; when the transaction is completed, its utilization rate dropped to a relatively low level. Therefore, a conclusion can be drawn. In order to achieve the expected concurrency of 200 users, the bandwidth at this time will become the bottleneck of downloading resources.

Figure 9 shows the test results of downloading teaching resources under 10M broadband. From this figure, it can be seen that the transaction response time increases in direct proportion to the number of virtual users. When the number of users reaches 220, the transaction execution fails, prompting the download timeout.

Observing the CPU utilization rate at this time, as shown in Figure 9, it can be found that the CPU utilization at this time has reached 100%, so a conclusion can be drawn. In order to achieve the expected concurrency of 200 users, the server hardware configuration at this time becomes the bottleneck of downloading resources.
Through the above tests, it can be concluded that the function of downloading resources in the online classroom needs to provide 10 M network bandwidth to ensure that 200 students can download teaching resources at the same time, and at the same time, the existing server configuration should be upgraded in hardware. System testing is an important work to ensure the quality of software. In the life cycle of software development, testing plays a very important role.

5. Conclusion

This topic is based on solving the limitations of a class setting, lagging content of teaching materials, role change of teaching and learning in teaching methods, cultivation of students’ autonomous learning ability, individualization, informationization, and innovation of network teaching of Chinese writing class, and so on. Put forward the practical teaching platform of college Chinese writing, realize the digital learning of Chinese, and the goal of integrating information technology with Chinese as a foreign language is to change the traditional teaching structure, create an ideal environment for students to learn Chinese, and improve their Chinese information literacy. In the system of teaching management, users can operate on any networked computer, and the statistical function of the management system can check the situation of students’ booking for class in real time. Through the statistical analysis, the correlation between traditional features and grades ranking is explored. Finally, the features with high correlation are selected as the main behavioral features of students, and a classification prediction experiment is carried out by using the DM algorithm to design a grades prediction model. It is concluded that naive Bayes classification algorithm is more applicable in this study, and its performance can be applied to practical systems.

Data Availability

The figures and tables used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares that there are no conflicts of interest.

References

[1] K. Y. Chen, “Time and landscape at the beginning of Chinese writing,” Journal of Chinese Linguistics, vol. 48, no. 2, pp. 323–341, 2020.

[2] S. C. Tsai, “Implementing interactive courseware into EFL business writing: computational assessment and learning satisfaction,” Interactive Learning Environments, vol. 27, no. 1-4, pp. 46–61, 2019.

[3] J. Liao, “Do L2 lexical and syntactic accuracy develop in parallel? Accuracy development in L2 Chinese writing,” System, vol. 94, Article ID 103235, 2020.

[4] Y. Yang, Z. Zuo, F. Tam et al., “Brain activation and functional connectivity during Chinese writing: an fMRI study,” Journal of Neurolinguistics, vol. 51, pp. 199–211, 2019.

[5] J. Liao, “The impact of face-to-face oral discussion and online text-chat on L2 Chinese writing,” Journal of Second Language Writing, vol. 41, pp. 27–40, 2018.

[6] Y. Li, H. Li, and M. Wang, “Orthographic learning via self-teaching in Chinese: the roles of phonological recoding, context, and phonetic and semantic radicals,” Journal of Experimental Child Psychology, vol. 199, Article ID 104913, 2020.

[7] Y. Zheng, S. Yu, and I. Lee, “Implementing collaborative writing in Chinese EFL classrooms: voices from tertiary teachers,” Frontiers in Psychology, vol. 12, Article ID 631561, 2021.

[8] Y. Mori, A. Hasegawa, and J. Mori, “The trends and developments of L2 Japanese research in the 2010s,” Language Teaching, vol. 54, no. 1, pp. 1–38, 2020.

[9] Y. Ye, M. Yan, Y. Ruan, C. McBride, and C. F. Yeung, “Literacy learning in early Chinese-English bilinguals: the role of pure copying skill,” Early Childhood Research Quarterly, vol. 55, pp. 263–274, 2021.

[10] W. Xu and J. Knijnik, “Critical Chinese as an Additional Language education in Australia: a journey to voices, courage and hope,” British Educational Research Journal, vol. 00, pp. 1–15, 2021.

[11] Y. Zhang, H. Peng, and Y. Bian, “Interplay between reading and writing under different teaching models: a study based on Chinese learning by China’s ethnic minorities,” Frontiers in Psychology, vol. 11, p. 2150, 2020.

[12] L. Li, H.-C. Wang, A. Castles, M.-L. Hsieh, and E. Marinus, “Phonetic radicals, not phonological coding systems, support orthographic learning via self-teaching in Chinese,” Cognition, vol. 176, pp. 184–194, 2018.

[13] Y. Zhang, “Adversative versus concessive while-clauses in native and learner English texts: a corpus-based systemic functional description,” Digital Scholarship in the Humanities, vol. 35, no. 3, p. 3, 2019.

[14] Z. Han, “Task-based learning in task-based teaching: training teachers of Chinese as a foreign language,” Annual Review of Applied Linguistics, vol. 38, pp. 162–186, 2018.

[15] J. Liu, G. Shi, J. Zhou, and Q. Yao, “Prediction of college students’ psychological crisis based on data mining,” Mobile Information Systems, vol. 2021, no. 23, Article ID 9979770, 7 pages, 2021.

[16] M. Bhat, M. Zaman, and M. Butt, “An intelligent prediction system for educational data mining based on ensemble and filtering approaches,” Procedia Computer Science, vol. 167, no. 2, pp. 1471–1483, 2020.

[17] F. Yang and F. W. B. Li, “Study on student performance estimation, student progress analysis, and student potential prediction based on data mining,” Computers & Education, vol. 123, pp. 97–108, 2018.

[18] C. Wang, J. Bi, Q. Sai, and Z. Yuan, “Analysis and prediction of carsharing demand based on data mining methods,” Algorithms, vol. 14, no. 6, p. 179, 2021.

[19] T. R. Kumar, P. Yasaswini, G. Rafi, and D. V. Krishna, “Comparative analysis on job prediction of students based on resume using data mining techniques,” International Journal of Engineering & Technology, vol. 7, no. 2.7, p. 1100, 2018.

[20] Z. Xu, H. Yuan, and Q. Liu, “Student performance prediction based on blended learning,” IEEE Transactions on Education, vol. 64, no. 99, pp. 1–8, 2020.

[21] L. Huang, “Design of an IoT DDoS attack prediction system based on data mining technology,” The Journal of Supercomputing, vol. 78, no. 8, pp. 1–23, 2021.
[22] R. Chakravarthy, C. Acharya, A. Savalia et al., “Property prediction of diesel fuel based on the composition analysis data by two-dimensional gas chromatography,” Energy & Fuels, vol. 32, no. 3, pp. 3760–3774, 2018.

[23] X. Wang, Y. Chang, V. Sugumaran, X. Luo, P. Wang, and H. Zhang, “Implicit emotion relationship mining based on optimal and majority synthesis from multimodal data prediction,” IEEE Multimedia, vol. 28, no. 2, pp. 96–105, 2021.

[24] H. Chi, C. C. Chang, and Y. Liu, “An SMVQ compressed data hiding scheme based on multiple linear regression prediction,” Connection Science, vol. 33, no. 3, pp. 495–514, 2020.