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Evaluation of blended business Japanese teaching effectiveness based on big data and the Nivre dependency algorithm

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Abstract In the era of big data and digital information, blended learning has emerged as a prominent instructional paradigm. With the growing demand for business Japanese education in China, both the scale and scope of instruction are rapidly evolving. This trend has prompted increasing attention to the integration of online learning environments with traditional teaching models, particularly in terms of learning assessment. This study focuses on developing a scientifically grounded evaluation index system tailored to blended learning in business Japanese, employing algorithmic optimization and experimental validation as its core methodologies. Centered around high school learners, the research draws from educational psychology and learning theory to propose strategic guidance from institutional, instructional, and individual perspectives. Empirical analysis and model testing support the proposed system, with the optimized Nivre-based evaluation framework demonstrating strong adaptability to contemporary educational demands. The model achieves an accuracy exceeding 92% across various test datasets, verified through correlation analysis and reliability-validity metrics, indicating its robustness and applicability. The study provides a valuable reference for advancing blended teaching practices and enhancing the effectiveness of business Japanese education at the secondary level.

Index Terms blended learning, business japanese education, evaluation index system, algorithm optimization

I. Introduction

As China's teaching model continues to evolve, blended learning has progressively come into the public's consciousness and gained greater support and attention from educators [1], [2]. To assist students benefit more as stakeholders in mixed evaluation, we must implement the blended learning index evaluation method. Such an indicator system can improve the evaluation as an important part of blended learning, make the evaluation indicator system of blended learning a tool for evaluating blended learning, and make evaluation a link of learning. Through continuous assessment, teachers can adjust and improve blended learning [3].

In recent years, scholars and monographs have studied business Japanese. In the early stage, business Japanese was only studied. In the late stage, many experts and scholars began to study the use of business Japanese in business Japanese from the perspective of its humanistic value, as well as its misuse and solutions. However, there are few in teaching, especially in college education [4], [5]. With five years of experience teaching business Japanese at colleges and universities, the author has some thoughts on the subject. This essay seeks to examine the part human values play in college and university business Japanese instruction as well as the common errors made by pupils. By introducing various elements, like solutions, into the teaching process, teachers can gain a better understanding of how to address students' challenging and incorrect use of business Japanese. This will help college students use business Japanese more accurately and increase their chances of success in future business Japanese negotiations. For the benefit of most business Japanese learners, there are more suggestions for business Japanese learning [6].

The unity of instrumentality and humanity is the basic feature of business Japanese learning [7]. This shows that humanism is important of business Japanese learning. The concept of "business Japanese core literacy" is also based on the humanistic value of business Japanese. Based on this, we can see that the business Japanese discipline is shifting from emphasizing the instrumental nature to emphasizing the humanistic nature, which provides theoretical support and research direction for the development of humanistic education in business Japanese learning [8]. According to the survey data of the Japanese Cultural Agency, the total number of business Japanese learners in Japan was 163670 in 2007, the highest in history. In 2006, the total number of business Japanese learners in colleges and universities in mainland China exceeded 410000 [5], much higher than that in Japan. From the perspective of the scale of business Japanese higher education, China's mainland region undoubtedly occupies the first place in the world. With Taiwan included, China's business Japanese higher education can be described as the most important part of the world's business Japanese higher education [9], [10].

Therefore, the research on business Japanese education for adult college students should naturally become the focus of the research on business Japanese education in China, and every aspect of running a school should also receive the primary attention, which also reflects the above characteristics of foreign language higher education in China and reflects the subjectivity and dominance of business Japanese higher education in the national business Japanese education [11]. Based on the analysis and summary of previous studies, the author finds that the theoretical research on task-based learning is far more than the empirical research on learning, and the relevant empirical research focuses on primary school, middle school, and college English learning [12], [13]. However, there is very little research on the relevant aspects of business Japanese. Although some people have proposed research on business Japanese conversation, listening, reading and other learning, no one has proposed the use of task-based learning in business Japanese grammar teaching, let alone doing experimental research in person.

Although college business Japanese and college English learning are different languages, they have similarities, but they are not identical. Therefore, it is hoped that the study of this topic can provide some experience for the introduction of task-based learning into the study of business Japanese grammar [14]. To improve the quality and effect of business Japanese grammar learning and provide some clues or directions for the reform of business Japanese major learning.

In conclusion, research on mixed learning evaluation is still in its early stages of investigation [15]. In mixed learning study, creating the mixed learning assessment index system is a crucial investigation. The development of the mixed learning evaluation index system can help mixed learning progress, allow mixed learning evaluation to keep up with mixed learning practice and development, and serve as a useful reference for relevant research in this field. This paper applies the new learning mode to business Japanese learning, explores the influence of the mixed teaching mode on the business Japanese learning motivation of college business Japanese majors through practice, and examines whether this mode can improve the business Japanese ability of college business Japanese majors.

II. Nivre algorithm optimization

Nivre algorithm is a dependency analysis algorithm based on transformation. Nivre algorithm is applied to the dependency analysis of business Japanese [16]. In addition, Nivre algorithm has also been applied to Chinese for dependency analysis. Nivre algorithm has a concise theoretical basis, which is relatively simple to implement and can be applied to most languages for dependency analysis. Lagrangian functional the saddle point of Lagrangian function can give the solution of the optimization problem, as shown in Eq. (1):

$$L(w,b,\alpha)=\frac{1}{2}(w\cdot w)-\sum_{i=1}^{l}\alpha_i\left\{\left[(x_i\cdot w)-b\right]y_i-1\right\}. \tag{1}$$

The conversion process is shown in Eq. (2):

$$\begin{aligned}L(w,b,\alpha)=&\frac{1}{2}\langle w\cdot w\rangle-\sum_{i=1}^{1}\alpha_i\left[y_i\left(\langle w\cdot x_i\rangle+b\right)-1\right]\\=&\frac{1}{2}\sum_{i,j=1}^{1}y_iy_j\alpha_i\alpha_j\left\langle x_i\cdot x_j\right\rangle-\sum_{i,j=1}^{1}y_iy_j\alpha_i\alpha_j\left\langle x_i,x_j\right\rangle+\sum_{i=1}^{1}\alpha_i\\=&\sum_{i=1}^{1}\alpha_i-\frac{1}{2}\sum_{i,j=1}^{1}y_iy_j\alpha_i\alpha_j\left\langle x_i\cdot x_i\right\rangle.\end{aligned} \tag{2}$$

Then, we find the optimal hyperplane of the mixed evaluation system, as shown in Eq. (3):

$$b^*=-\frac{\max_{y_i=-1}\left(\langle w^*\cdot w\rangle\right)+\min_{y_i=1}\left(\langle w^*\cdot w\rangle\right)}{2}. \tag{3}$$

The total computational complexity of the task is, as shown in Eq. (4):

$$\Phi_{\Sigma comp}=\sum_{q=1}^{p}\Phi_{comp}=\sum_{q=1}^{p}O\left(k_q\right). \tag{4}$$

The total communication complexity of the task is, as shown in Eq. (5):

$$\Phi_{\Sigma comm}=\sum_{q=1}^{p}\Phi_{comm}=\sum_{q=1}^{p}O\left(\max\left(n_q,n_{q+1}\right)\right). \tag{5}$$

The odd even form is one of the important properties of the linear learner. The decision rule is the inner product of the test node and the training node, as shown in Eq. (6):

$$f(x)=\sum_{i=1}^{l}\alpha_iy_i\left\langle\Phi\left(x_i\right)\cdot\Phi(x)\right\rangle+b. \tag{6}$$

The probability can be expressed as Eq. (7):

$$P(TS) = p_{\lambda_1 \ldots, \lambda_m}(TS) = \frac{\exp \sum_{m=1}^{M} \lambda_m \phi_M(T, S)}{\sum_T \exp \sum_{m=1}^{M} \lambda_m \phi_M(T', S)}. \tag{7}$$

The best translation T of a given source language S can be expressed by Eq. (8):

$$T = \arg\max_T P(TS) = \arg\max_T \sum_{m=1}^{M} \lambda_m \phi_M(T, S). \tag{8}$$

After the $n-\ gram$ matching number is obtained, its accuracy rate $precision$ can be obtained according to the formula, as shown in Eq. (9):

$$precision_{\ n} = \frac{\sum_{n-\ grameC}\ Count_{\ clip}\ (n-\ gram\ )}{\sum_{n-\ grame\ C} Count\ (n-\ gram\ )}. \tag{9}$$

The optimal translation corresponding to S is shown in Eq. (10):

$$T = \arg\max_T \{P(ST)\} = \arg\max_T \left\{ \sum_{m=1}^{M} \lambda_m h_m(T, S) \right\}. \tag{10}$$

The core and mathematical content of the model are shown in Eq. (11):

$$P(TS) \approx P_{\lambda_1 \ldots \lambda_{k'}}(TS) = \frac{\exp \sum_{m=1}^{M} \lambda_m h_m(T, S)}{\sum_{T'} \exp \sum_{m=1}^{M} \lambda_m h_m(T', S)}. \tag{11}$$

III. Methods

III. A. Data selection and model construction

The hybrid teaching effectiveness assessment system in higher education institutions integrates two primary dimensions: expert-based evaluation and student-centered evaluation, as illustrated in Table 1. Specifically, the framework comprises five core indicators reflecting expert judgments and seven indicators derived from students' learning feedback [17], [18]. This dual-perspective structure ensures a more comprehensive, objective, and multidimensional analysis of hybrid teaching performance, balancing professional insight with learner experience.

Table 1: An indicator system for assessing how well mixed business Japanese instruction works in colleges and institutions

Expert evaluation index	Student evaluation index
Teaching objectives	Learning objectives
content of courses	Learning content
learning resource	learning resource
Online learning	E-learning
Classroom obstruction	Classroom learning
-	learning effect
-	Learning satisfaction

On the evaluation subject, the model includes expert peer evaluation, teaching management personnel evaluation, teacher self-evaluation and student evaluation, as shown in Figure 1, which can be used by various personnel.

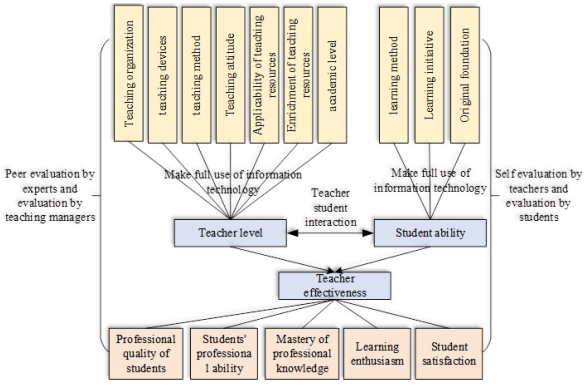

Figure 1: Optimization of mixed teaching evaluation model of business Japanese

In machine learning, how to select features is an important problem, which is the key factor of model quality. One needs to have a deep understanding of the learning model, understand the meaning of each feature based on understanding, and pay attention to the impact of regression phenomena. This method requires more judgment experience. The other method does not require manual participation and uses mathematical knowledge and some methods of artificial intelligence The optimal feature set is automatically obtained from the original input feature set. The dependency axiom applicable to business Japanese is as follows: except for the last section at the end of the sentence, each section has one and only one dependency object. The business Japanese dependency relationship is rear dependency, and dependency relationships cannot cross, that is, the situation shown in Figure 2 cannot occur.

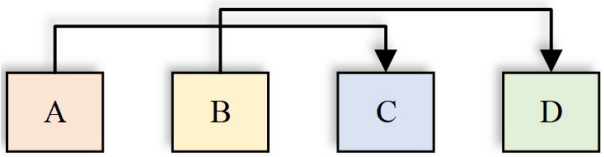

Figure 2: Interdependence of business Japanese

The new curriculum standard of business Japanese attaches great importance to the development of humanistic value, and the cultivation of core quality can not be separated from the cultivation of humanistic education. In business Japanese teaching, humanistic value should run through the whole business Japanese teaching. In the process of preparing lessons, business Japanese teachers should dig deep into teaching resources from the humanistic perspective, enrich humanistic elements in the teaching content, excavate the humanistic spirit in the language, and seize any opportunity suitable for business Japanese to infiltrate humanistic values. The maximum spanning tree algorithm is shown in Figure 3.

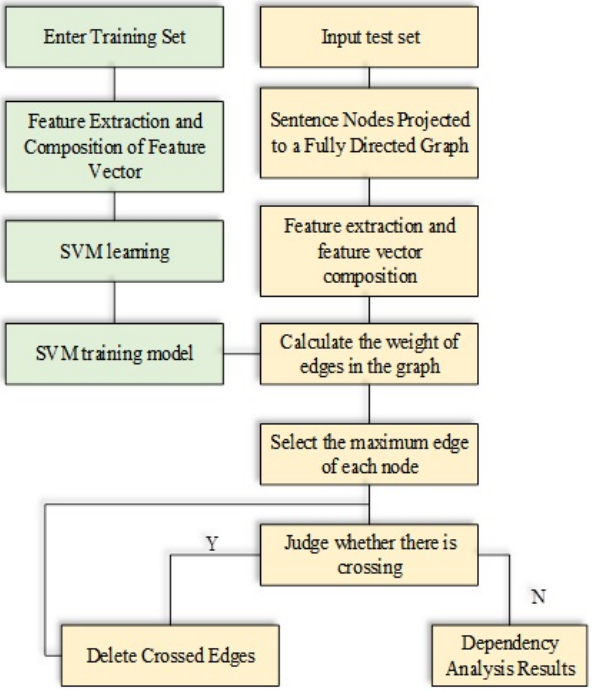

Figure 3: Flow chart of optimization based on maximum spanning tree algorithm

The front-end analysis is equivalent to a comprehensive analysis report on the teaching situation and the starting point of teaching. It determines the learning content and learning objectives by analyzing the characteristics of learners and grasps the external environmental conditions of teaching with the help of the analysis of the environment, thus providing a basis for the follow-up work; Activity and resource design is the link that can best reflect the characteristics of the course. This stage is to decompose the teaching content and teaching objectives, determine the sequence of activities, and form an operable business Japanese teaching program; The evaluation design of business Japanese teaching is based on the objectives of learning activities

and the environment of mixed learning. It evaluates the learning process, learning activities and course knowledge examination. The construction of the mixed teaching mode is shown in Figure 4.

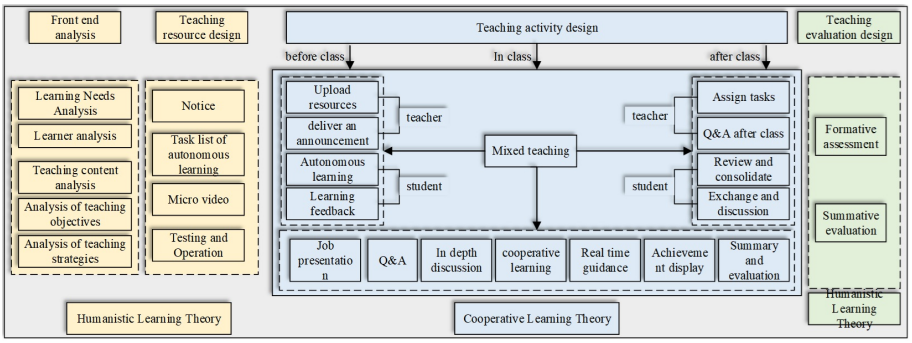

Figure 4: Optimization of mixed teaching model of business Japanese based on excellent course platform

Take the experimental research method, collect experimental data, and analyze the experimental effect, to improve the teaching design, and also find out what problems and limitations need attention when using the excellent course platform to carry out hybrid teaching, so as to provide reference and help for using the platform to carry out hybrid teaching in the future. The experimental idea is shown in Figure 5.

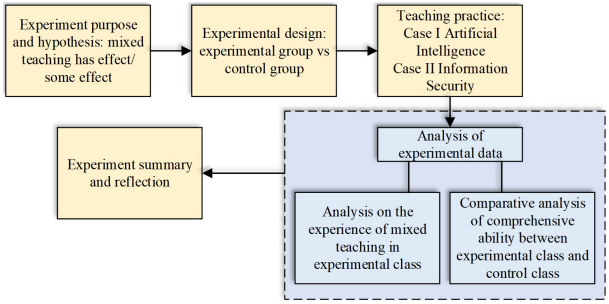

Figure 5: Practical thinking of mixed empirical learning of business Japanese

Linear model is used in most statistical machine business Japanese learning and is the most effective business Japanese learning model at present. Figure 6 shows the learning process of statistical machine business Japanese learning system based on logarithmic linear model.

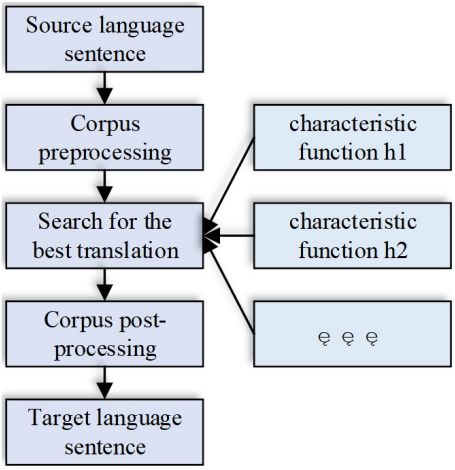

Figure 6: Logarithmic linear model optimization

Use each document section as the basic node to generate the model file to calculate the score value of each edge through the model file. Suppose the generated directed graph is shown in Figure 7:

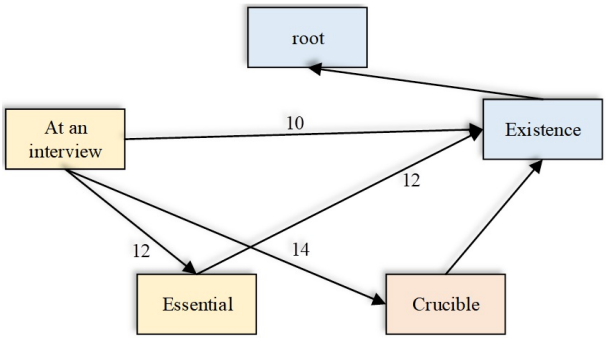

Figure 7: Optimization of business Japanese learning model

A good command of business Japanese honorific is equal to a weapon of victory in business negotiations. The improvement of business Japanese communication ability and business ability urges college Japanese learners to take advantage of the business Japanese workplace. Honorific is a part of business Japanese teaching, and a part of measuring whether to be a qualified college business Japanese professional. Therefore, the importance of honorific expressions must not be ignored in business Japanese teaching. Table 2 shows the feature extraction of the training corpus by mapping words to each node in the figure.

Table 2: Features used by Nivre algorithm

Feature Location	features
Section t and Section n	Subject itself, subject part of speech, subject part of speech classification, flexible type 1, flexible type 2. Language type word itself, language type part of speech, language type part of speech classification, flexible type 1, flexible type 2. Whether there are brackets, quotation marks, whether there are auxiliary words, and the position in the sentence (beginning, middle, end)
Between section t and section n	The distance between sections, whether there are brackets between sections, quotation marks, and whether there are auxiliary words between sections.
Between section t-1 and section n-1	Subject itself, subject part of speech, subject part of speech classification, flexible type 1, flexible type 2. Type words themselves, type parts of speech, type parts of speech classification, flexible type 1, flexible type 2.

III. B. Research assumptions and optimization path

To directly use the classification results, we propose an elimination algorithm for business Japanese dependency analysis, combining the characteristics of non-overlapping business Japanese dependencies. The central idea of elimination algorithm is that each section of the input sentence has n candidate sections, and all candidate sections are compared in pairs to eliminate sections with small dependency probability Through layer-by-layer comparison, the unique superior text section is found and determined as the dependent object of the judgment text section. Repeat the above steps, and the final dependency is shown in Figure 8.

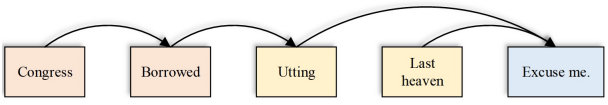

Figure 8: Dependency diagram of business Japanese example sentences

It is difficult to master this "degree" in interpersonal communication with Japanese. This is particularly important for people engaged in business activities. If you do not grasp the skills well, it is easy to cause dissatisfaction among the Japanese, and the sample delivery will directly affect business transactions [19], [20]. It is even more difficult for the inexperienced students because they do not understand Japanese habits and do not master honorific knowledge well, so they often make some typical mistakes. Through the analysis of front-end learning needs, learners, teaching content, teaching objectives, and teaching strategies, and based on consulting many mixed teaching activity design models, this study proposes the following process design model, as shown in Figure 9.

For each text section in the graph, leave the maximum out edge of the node and then judge whether there is crossing in the generated graph. If there is no crossing, the final analytic result will be obtained. If there is a cross, handle it. The elimination algorithm is used for training. Each training sample includes relevant information of three sections. The feature selection is shown in Table 3.

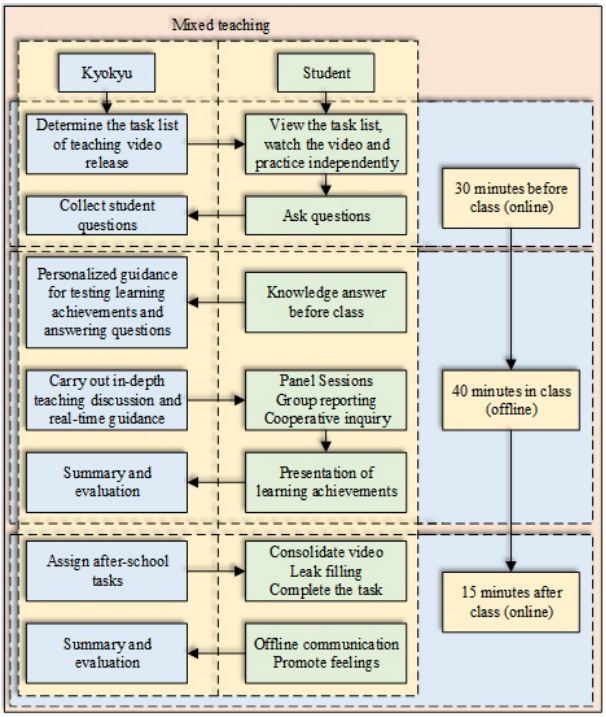

Figure 9: Optimization of mixed instructional design model for business Japanese

Table 3: Features of the algorithm for elimination

Feature Location	features
Section t, Section n and Section m	Subject itself, subject part of speech, subject part of speech classification, flexible type 1, flexible type 2. Type words themselves, type parts of speech, type parts of speech classification, flexible type 1, flexible type 2. Whether there are brackets, quotation marks, whether there are auxiliary words, and the position in the sentence (beginning, middle, end)
Section t and Section n	Distance between texts
Section t and Section m	Distance between texts

However, for business Japanese, traditional classification methods only use a single classification method for classification, but each method always has certain defects. No method can perform classification perfectly, and only consider integrating multiple classification methods to provide more complementary information from different perspectives. Therefore, multi classifier fusion system has better classification performance than a single classifier model [21]. The multi classifier fusion system is divided into three fusion levels from low to high. Its hypothesis model is shown in Figure 10. From left to right, it represents three levels from low to high.

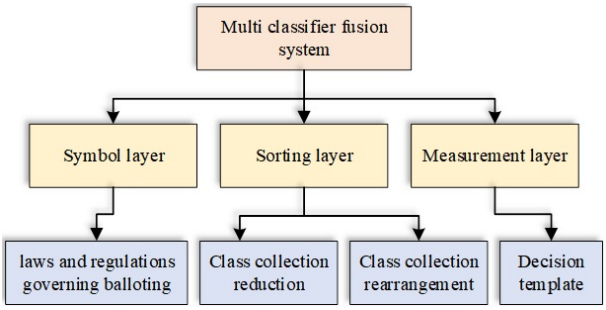

Figure 10: Fusion level of multi classifier system

To sum up, we can put forward the first hypothesis to verify the evaluation and analysis of the dependency relationship in business Japanese learning. In the Japanese learning model of statistical machine business, the assumptions for this paper to deal with temporal problems are shown in Figure 11. The figure is the data processing module, which involves the extraction

of temporal information and is used as a classification training dataset. The middle part is the model fusion module. First, build a temporal classification model, and then integrate the temporal classification model into the statistical machine business Japanese learning model. Finally, after the source language is classified, use the business Japanese learning model that integrates temporal features to decode business Japanese through the decoder.

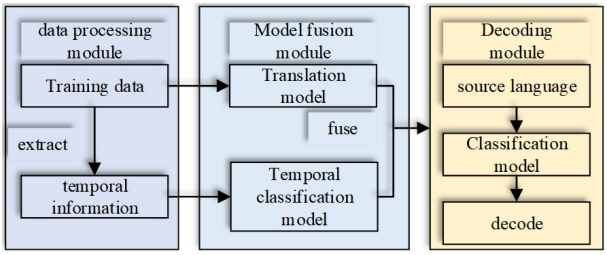

Figure 11: Module design of business Japanese learning system

Based on the above assumptions, due to the vague division of Chinese tenses, the Japanese Chinese bilingual tenses are divided into four categories. We design four types of temporal change rule tables based on the temporal category of business Japanese and use the rule table to mark the tense of the training corpus, Sentences that cannot be classified into tenses or do not have tenses are directly classified into other tenses. Table 4 displays the logarithm statistics of bilingual sentences in each chronicle of the Japanese-Chinese bilingual corpus used in this study.

Table 4: Japanese-Chinese bilingual parallel corpus temporal distribution

tense	Now?	present progressive	past	Past continuous tense	Other tenses	All tenses
Sentence logarithm	242,605	19,843	38,612	1,864	197,427	500,347
Proportion (%)	48.49	3.98	7.73	0.38	39.41	100

Based on this, we summed up the second core hypothesis, which is the mixed learning evaluation system model of humanistic value in business Japanese learning. As illustrated in Figure 12, this model covers the five main components of teaching design: analysis, design, development, implementation, and evaluation.

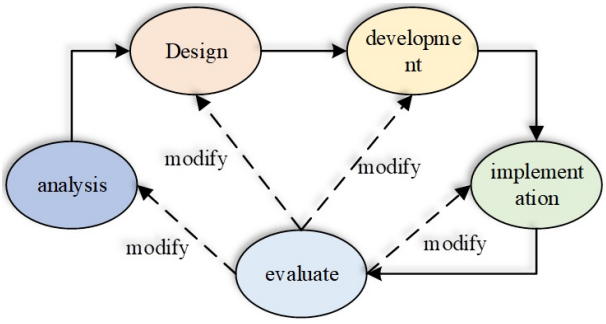

Figure 12: Optimizing the humanistic value model of the mixed learning assessment system for corporate Japanese learning

In this process, the maximum spanning tree algorithm of the mixed learning evaluation system of business Japanese uses the score of each edge trained by SVM to select the dependency relationship, but the score assignment of each edge is not necessarily reasonable How to combine the analytical results of Nivre algorithm to correct the score value of the maximum spanning tree edge and improve the analytical accuracy is the main problem to be discussed in the experimental process. In the whole model optimization process, the analysis flow chart is shown in Figure 13.

The business Japanese learning of the source language is the model decoding procedure shown in Figure 14. Send the source language sentences with known tenses to the decoder after performing syntactic analysis on the business Japanese word segmentation corpus and determining the sentences' tense [22]. In order to achieve the best business Japanese learning outcomes, the decoder automatically chooses the best matching business Japanese learning rules from the business Japanese learning model with temporal characteristics based on the tense of the source language test sentences.

IV. Case study

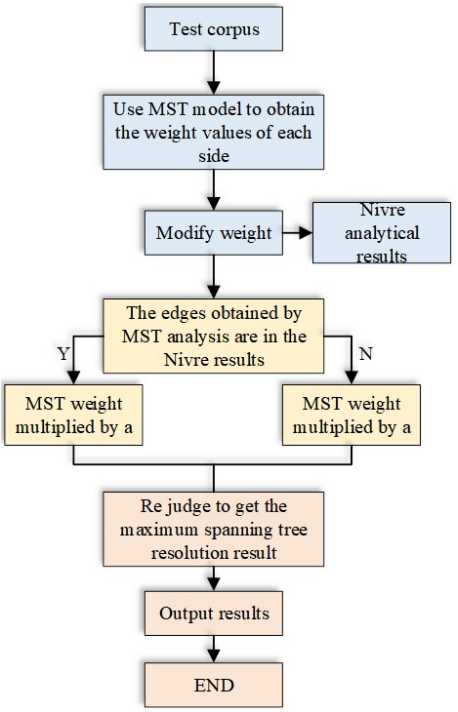

Figure 13: Flow chart of oral dependency analysis based on existence impact factors

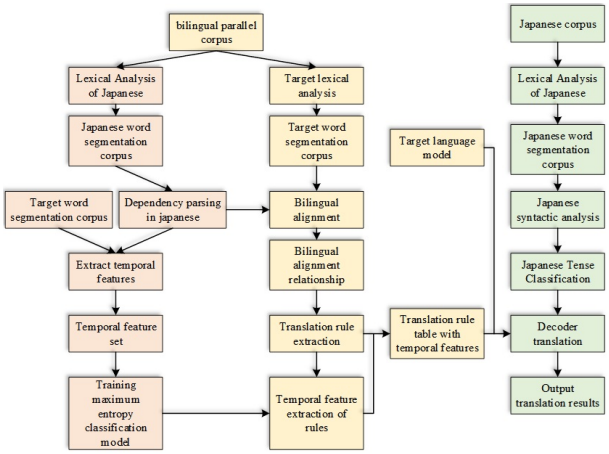

Figure 14: Framework of business Japanese learning system

IV. A. Dependency of the evaluation system for business japanese blended learning

The graph-based method and the transformation-based method are two main types of dependency resolution. The maximum spanning tree algorithm is the representative method of the graph-based algorithm. The algorithm is the main representative method of the transformation-based method. The algorithm applies greedy algorithm to the definition of features in local analysis, which is determined by analysis decision, so we can extract a lot of useful information from the intermediate results. The maximum spanning tree algorithm can generate the entire dependency resolution result only after the entire sentence parsing is completed. The dependency resolution is based on the entire sentence and cannot output intermediate results. Where w represents that the vector is the characteristic score of model learning. The flow chart of using MST_{Nivre} model to analyze business Japanese dependency is shown in Figure 15.

In the honorific system of business Japanese, students have a strong sense of internal and external awareness. Sometimes, students can't distinguish between internal and external relations, so they often misuse self-modesty where they should use honorific and use honorific where they should use self-modesty, honorific is used for the behavior of the other party, while self-modesty is the opposite. It is used for the behavior of the speaker himself or his side. If it is misused as honorific, it becomes

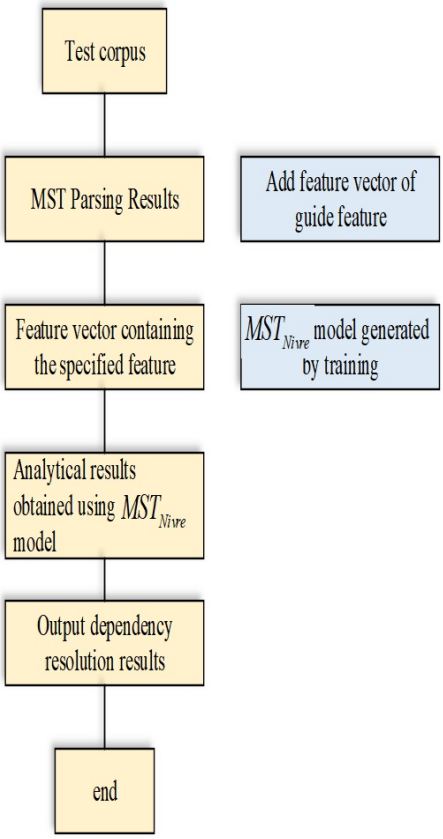

Figure 15: Flow chart of oral dependency optimization of the MST_{Nivre} model

an act of respecting oneself or one's own side while belittling the other side. It is dangerous to have such a situation in business conversation. It may be that improper use of honorific expressions often leads to misunderstanding of the other party in the business negotiation, causing the other party to lose credit to you, thus causing failure in business activities and loss of the company's interests. First, Nivre algorithm and maximum spanning tree algorithm are used for dependency analysis, and then the chunking step by step application algorithm and elimination algorithm are used for dependency analysis, as shown in Table 5.

Table 5: Analysis results of the dependencies of four basswood algorithms

algorithm	Dependency accuracy (%)	Sentence accuracy (%)
Nivre model	88.96	48.04
MST model	89.49	48.23
Chunking step by step application model	89.29	47.89
Elimination model	90.04	48.71

Starting from the teaching of business Japanese, this paper explores the humanistic value of business Japanese, and helps students form healthy, beautiful emotions and a progressive attitude towards life in the process of business Japanese. However, in the face of the pressure of college entrance examination, heavy homework tasks, the impact of the Internet information age and other practical tests, the humanistic value of business Japanese has always been unable to be fully implemented, which deserves our attention and consideration. From the experimental results of the elimination algorithm are the best. The results of the Nivre algorithm are relatively low among the four algorithms, and the algorithm and chunking algorithm are in the middle. It shows that, in terms of performance, the elimination algorithm is superior, but in terms of the accuracy of Japanese sentence recognition, the optimization algorithm is superior, so we can integrate the ideas of the above algorithms to reconstruct.

IV. B. Hypothesis 2 validation: comprehensiveness and accuracy of multiple dependency algorithm analysis models

As seen in Figure 16, the eight linkages of mixed teaching produce a cycle structure of continuous improvement when we run the mixed learning evaluation system model of humanistic value in business Japanese learning based on the data set.

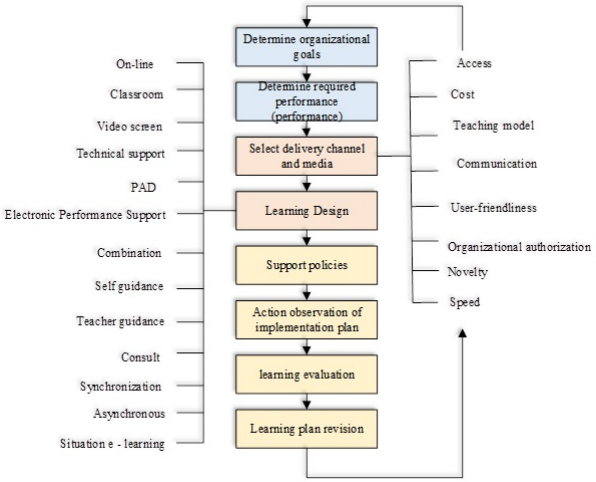

Figure 16: Eight links of mixed teaching in the model

The model's validity, accuracy, and reliability are then confirmed. The development and test sets of the Japanese Chinese business learning experiment are processed, and sentences with multiple stops in each line are converted to sentences with only one stop in each line. Two groups of test sets of 1219 and 1234 lines, respectively, are obtained and used for the maximum classification test. The classification effect of the above maximum classification model is then confirmed, and they are referred to as Test Set 1 and Test Set 2, respectively. This research has conducted two sets of comparative tests for the classification of tenses in Chinese and Japanese. Only the temporal aspects of the source language are added in one set of tests, whereas bilingual temporal features are added simultaneously in the other set of studies. For Japanese Chinese bilinguals, only source-side features are utilized for classification, and the accuracy rate of chronicles is quite high. The accuracy of temporal categorization is displayed in Table 6. The classification results will remain unaffected by the addition of target side features. Thus, just the business Japanese tense elements of the source language are chosen for this Japanese-Chinese experiment.

Table 6: Accuracy of temporal classification of business Japanese

features	Test Set 1	Test Set 2
Temporal characteristics of source language	98.86%(1206/1219)	98.87%(1221/1235)
Source language temporal feature target language temporal feature	98.94%(1207/1219)	98.71%(1219/1235)

In the experimental verification, the development set and test set of the Japanese English Business Japanese Learning Experiment are used as two sets of test sets of the maximum classification model, and the development set and test set are named Test Set 1 and Test Set 2 respectively. To verify the validity of the definition of Japanese and English temporal features, this paper designs two groups of experiments. Only the temporal features of the source language are added by the first group, whereas both temporal features are added by the second group. Table 7 and Figure 17 display the two experimental groups' temporal classification accuracy. The findings demonstrate that experimental group 2's model's experimental accuracy is greater than experimental group 1's.

Table 7: Accuracy of temporal classification of business Japanese

features	Test Set 1	Test Set 2
Temporal characteristics of source language	75.58%(1059/1401)	74.15%(1039/1401)
Source language temporal feature target language temporal feature	93.29%(1307/1401)	92.65%(1298/1401)

We carried out an empirical analysis. The intelligent push and learning situation analysis function in the mixed learning evaluation system model of humanistic value in business Japanese learning can help students identify and close gaps, gain a better understanding of their own learning situation, and increase learning efficiency. Additionally, the learning platform somewhat lessens the workload for educators. It reduces some of the complicated work of teachers by preparing lessons, organizing questions, correcting, and analyzing answers, and provides convenience for teachers. At the same time, it helps teachers to carry out accurate teaching, record students' learning tracks, and provide data support for teachers to carry out personalized teaching, so that teachers can understand each student's learning situation timelier and thoroughly, to quickly improve student performance. With reference to the above "differentiated teaching mode" and "individualized teaching" teaching mode, a hybrid teaching optimization mode based on adaptive learning platform is finally constructed. Figure 18

shows the total time spent on business Japanese learning in different nodes of the model, and the corresponding percentage of communication sales. The figure of the training time spent on all nodes is nearly half of that on a single node, which shows that using large data sets can accelerate the speed of model convergence.

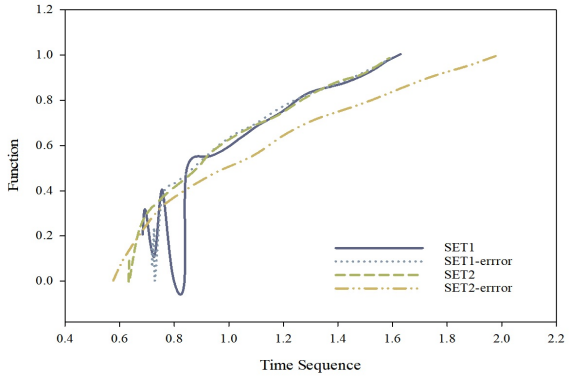

Figure 17: Distribution curve of business Japanese learning efficiency

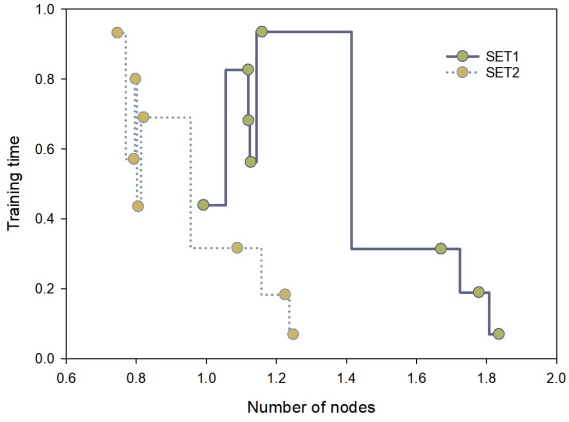

Figure 18: Total time spent by the model on different nodes

In conclusion, both datasets 1 and 2 show test results of over 92% for the mixed learning evaluation system model of humanistic value in business Japanese learning, which is consistent with the anticipated hypotheses. As a result, the model's practical application value can be verified.

V. Conclusion

For the purpose of enhancing and optimizing instruction, this study builds a mixed learning evaluation model based on business Japanese learning, using big data as the primary concept to conduct model building, hypothesis research, and experimental verification. The experimental results support the expected assumptions of the early dependency and coverage system, and the experimental verification demonstrates that the model's accuracy on various test sets is over 92%. This indicates that the experimental model is essentially in line with reality and has significant reference significance and application value for business Japanese learning in the context of big data.

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Data availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of interest

The authors declared that they have no conflicts of interest regarding this work.

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