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*Retraction*

# Retracted: Influence of Educational Informatization Based on Machine Learning on Teaching Mode

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## References

[1] L. Ma and J. Li, "Influence of Educational Informatization Based on Machine Learning on Teaching Mode," *International Transactions on Electrical Energy Systems*, vol. 2022, Article ID 6180113, 7 pages, 2022.

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*Research Article*

# Influence of Educational Informatization Based on Machine Learning on Teaching Mode

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In recent years, with the rapid progress of educational information techniques, the application of computer teaching methods in school education has also shown a constantly changing trend. How to change the traditional classroom structure, improve the teachers' information literacy, build a new information-based teaching format, and promote the integration of information technique and pedagogy have become an important topic of the current educational research study. Machine learning is a key technology in artificial intelligence and is widely used in various fields. The core of educational informatization is to carry out personalized learning, and the main auxiliary technology of personalized learning is machine learning. So, this article studied the influence of machine learning-based educational informatization on the teaching mode. Through the investigation and research methods, this article found that the educational informatization teaching mode based on machine learning is helpful to improve students' autonomous learning ability, comprehensive ability, and learning effect. In the information-based teaching mode, the learning effect reached a maximum of about 90, with an average increase of 12, which showed that the educational information-based teaching mode based on machine learning is feasible.

## 1. Introduction

In the wake of the go-ahead of the message age and technique, machine learning has also been applied in various fields. Humans' understanding of teaching mode has measured up a split-new height within a definite space of continuous go-ahead education, and more attention is paid to the effective request of the educational message teaching pattern, thereby promoting the development of the scientific teaching pattern. Numerous research reports showed that message-based teaching pattern based on machine learning is of great implication to classroom teaching. Therefore, the discussion on the message teaching pattern based on machine learning has become a top priority.

Now more and more educators are committed to the related research on the teaching mode of educational informatization [1]. Miao analyzed the teaching effect of the informatization teaching mode and proposed and constructed the informatization teaching mode based on the network course [2]. Xu introduced the concept, characteristics, and teaching process of the information-based teaching mode and analyzed the teaching consequences [3–7]. The abovementioned research studies described the relevant content of the educational informatization teaching pattern, and the influence of the informatization teaching pattern on education is far-reaching.

Because machine learning has been applied in different fields; many scholars have also studied it. Segovia studied the work of machine learning on methods for dealing with datasets containing large amounts of irrelevant information, especially the problem of selecting relevant features and selecting relevant examples [8]. Ha studied the progress made in both empirical and theoretical work in machine learning and proposed a general framework for different approaches [9]. Cai used machine learning algorithms to train classifiers and to decode stimuli, mental states, behaviors, and other variables of interest from data, so as to show that the data contain information about them [10]. Park proposed a new

heuristic for machine learning feature detection [11]. Hiroi employed three machine learning methods including Naive Bayes, maximum entropy classification, and support vector machines and found that the performance of the three machine learning methods on sentiment classification is inferior to the classification of traditional topics [12]. Kumar believed that automated data is provided by machine learning [13]. Saltepe provided a comprehensive and independent introduction to the field of machine learning that combined breadth and in-depth coverage. He provided necessary background material on topics such as probability, optimization, and linear algebra and discussed recent developments in the field [14]. The application of machine learning to education is to better help learners, teachers, etc., to better carry out learning, teaching, and other work.

In order to better promote the development of education, this article studied the impact of educational informatization based on machine learning on the teaching mode. Through research, it has been found that students preferred the informatization teaching mode, and the educational informatization teaching mode based on machine learning can help improve the comprehensive ability and learning effect of students.

## 2. Information-Based Teaching Mode Based on Machine Learning

*2.1. An Overview of Machine Learning.* Machine learning is a section of artificial intelligence [15–17]. Machine learning is a science in the field of artificial intelligence, and its main research is how to use artificial intelligence to improve the performance of specific algorithms in powerful learning. Computers learn patterns and techniques from data to apply to the task of making predictions on new data.

From an algorithmic point of view, traditional machine learning algorithms can be mainly divided into two categories, namely, supervised learning and unsupervised learning. The specific meanings are as follows:

(1) Urge learning: assuming that there are several data inputs and corresponding outputs; the goal is to learn a mapping effect so that the performance can predict the export of new data samples. The classic problems are classification problems and regression problems.

(2) Unsupervised learning: assuming that only some data are input without any relevant supervision and guidance; the purpose is to develop the hidden performance and data hidden in the data. The classic problems are clustering problems and data dimensionality reduction problems.

The computer learns from the data and gradually explores the laws and patterns in order to perform prediction tasks on the new data, as shown in Figure 1.

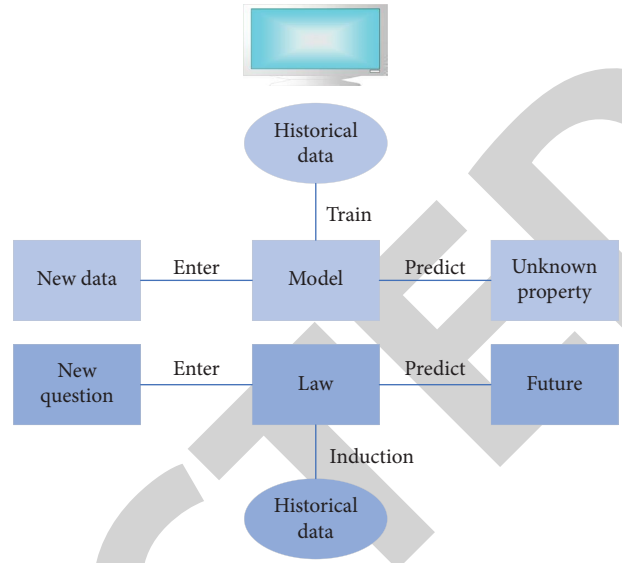


Figure 1: Machine learning algorithms.

*2.2. Data Mining Based on Machine Learning.* The machine learning model has successfully combined the knowledge of probability theory and has obtained good results. Data mining technology belongs to the probability distribution process of random variables and is a category attribute of machine learning. Data mining is an integration and classification tool for applied cognitive analysis, so data mining techniques can be classified as technical optimization problems.

Generally speaking, the types of tasks can be divided into narrative data mining and forecasting data excavation. The type of description depends on the general features stored in the database. The types of predictions are mainly in view of the interpretation of the data collected to aid guesswork. The first task of data excavation is to identify the info patterns that need to be extracted (belonging to mining tasks). In the actual application process, the knowledge model meets the requirements of its users, and they must have the opportunity to extract each other. It is especially important that the functions of the data mining software should be enriched, and the types of samples extracted should be more extensive.

Based on the function of data excavation, it can be divided into the following aspects:

(1) Concept description: the summary method has a rich basic data. The summary set description should be as simple and clear as possible. It describes a concept that can be obtained by using the extracted conceptual data structure and data distribution (or a combination of the above methods).

(2) Association analysis: studying and extracting unusual grouping rules in data; the rules are used to represent the relationship between data or attributes of objects. At present, the research on data mining association rules has achieved results, and there are many kinds of algorithms, and their efficiency levels are high, and their scope of application is also expanding.

(3) Classification and prediction: it is a specific knowledge analysis mode for classification and prediction. Obviously, the role of a classifier is to

extract mathematical models that can describe and classify data, thereby deriving data types that are currently unrecognized by machines. Classification is generally used to infer data that is currently unknown.

The steps of data excavation can be classified into problem identification, data collection and prioritization, data excavation algorithm performance, and result assessment. The data mining process is shown in Figure 2.

By using known data, it becomes clear which data are included in knowledge analysis. Depending on the data, for a given mining target, the appropriate dataset is selected from the data source. The data mining process is to solve the problem of knowledge extraction and the issue of data format differences in the operation terrace.

*2.3. Data Mining Process of Machine Learning in Smart Learning.* Smart education is the development of extensive integration of information technology and advanced educational concepts. Smart education has the characteristics of adaptive mode, cognitive perception, active work promotion, resource planning and organization, collaboration, and adaptability to differences. Today's smart education is in view of students' big data, and artificial intelligence needs to be used to deeply mine these data to discover potential knowledge and strategies. The application of data mining technology in the field of education has also opened the curtain for the application of machine learning in the field of education. Machine learning is mainly used to develop and mine data science, however, it is also used to create a better learning environment through machine learning, create favorable conditions for teachers to conduct effective training, and allow students to personalize their learning. Therefore, the correct and effective use of machine learning is an effective way to realize wisdom education. Educational data is discovered and interpreted through big data excavation, and the specific process is shown in Figure 3.

In the wisdom education system under the big data surroundings, there would be much big data info. However, not all the information is useful. At this time, it is essential to filter the data to find the target data. Target data cannot be directly used for data mining and processing and also need to be prechecked and transformed into data that can be measured by data models to measure and inform power. Simultaneously, the transformed data demand has to be tested to ensure that the data are authentic and reliable.

*2.4. Teaching Mode of Education Informatization.* Education informatization is the process of collecting information as a basic element of the education system and making extensive use of information technology in the field of education to promote educational innovation. In the procedure of educational informatization, it is essential to pay attention to the detailed analysis of the educational system from the perspective of information, and based on this, it is important to effectively apply these information techniques to education. The main features of the educational message include multimedia teaching materials, resource globalization, and management automation. There are many teaching modes of educational informatization, among which the most representative ones are the learning mode of throwing mistakes, the mode of scaffolding teaching, and the mode of multimedia network teaching. The teaching mode of educational informatization is shown in Figure 4.

## 3. Educational Informatization Algorithm Based on Machine Learning

Machine learning-based educational informatization algorithms must select appropriate knowledge analysis tools or algorithms to mine the largest amount of data, and data mining operations must be meticulous, including automatic prediction of data, opinion, and bias detection. Then, the appropriate knowledge analysis algorithm is used to establish the data mining method pattern. The main knowledge analysis algorithms include Naive Bayes and support vector machine.

*3.1. Naive Bayes Algorithm.* The Naive Bayes algorithm is a classification model mainly based on the Bayes' theorem, first proposed by Maron, and it is one of the most commonly used classification methods in statistics. "Naive" refers to the assumption that the contribution of feature items to determining which category the text belongs to is independent of each other, that is, the feature items in the text are independent of each other. The basic idea is that each database sample without a class label is represented by a feature vector $Y = \{x_1, x_2, \ldots, x_m\}$. $x_m$ is an attribute, and the unknown samples are assigned and calculated by Naive Bayes classification, which is represented by the formula

$$F(A) = \max\{q(f_1|A), q(f_2|A), \ldots, q(f_n|A)\}. \quad (1)$$

According to the Bayes' theorem, we get

$$q(f|A) = \frac{q(A|f)q(f)}{q(A)}. \quad (2)$$

If an unknown data sample $A$ is given, and all classes are constant, and properties are relatively independent, then the characteristic class is expressed as

$$F(A) = \text{amg}_{f\in F} \max q(f) * \prod_{i=1}^{m} q. \quad (3)$$

If $q(f)$ is the parameter attribute estimation, then its calculation formula is

$$q(f) = \frac{M(f)}{M},$$
$$M(f) = \sum_{i=1}^{M} \delta(f_h, f), \quad (4)$$

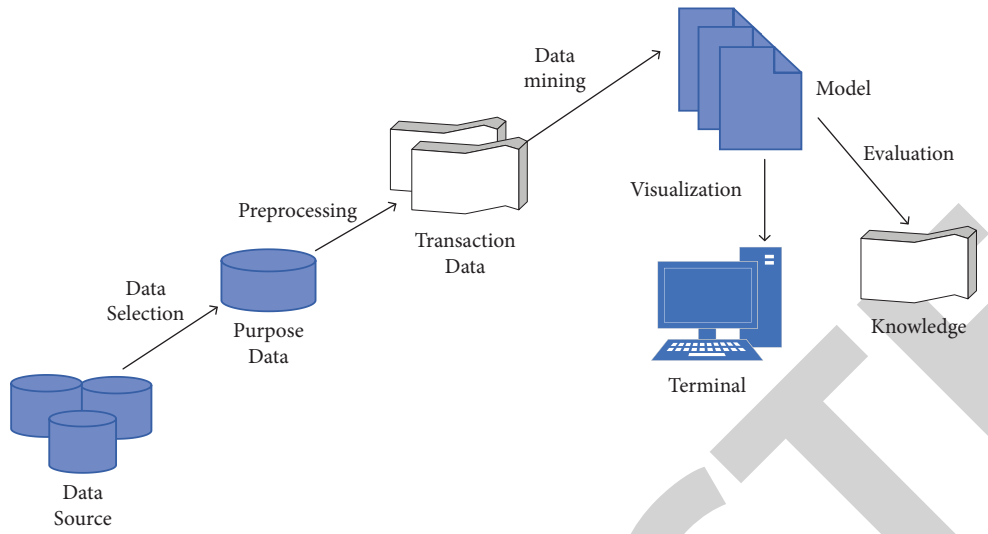


Figure 2: Data mining process.


Figure 3: Data mining process of machine learning in smart learning.

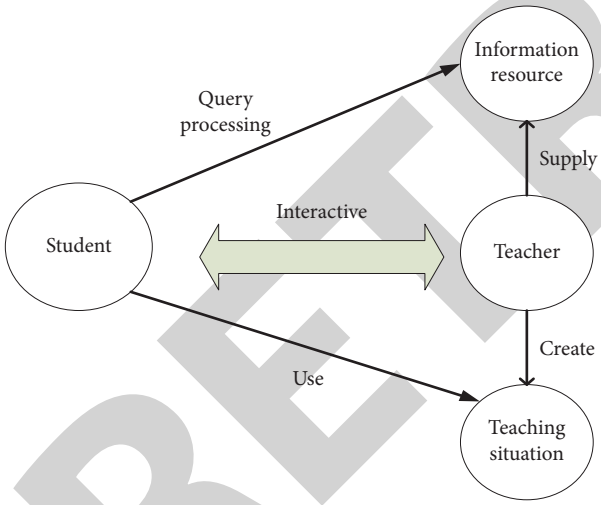


Figure 4: Teaching mode of educational informatization.

$q(x_i,f)$ is the conditional probability. When the attribute of $x_i$ is variable, then the calculation formula of the conditional probability is

$$q(x_i,f)=\frac{M(x_i|f)}{M(f)},$$
$$M(x_i,f)=\sum_{i=1}^{M}(\delta x_i,x)\delta(f_h,f), \tag{5}$$

$M(f)$ is the number of samples belonging to the class. $M$ is the sum number of data samples, and $\delta$ defines a new binary function. If the parameters are the same, it is 1, and if the parameters are different, it is 0. When the characteristic attribute is a continuous value, usually assuming that its value is normally distributed, which is expressed by the formula

$$g(a,\beta,\partial)=\frac{1}{\sqrt{2\varpi}}o^{(a-1)/2x^2},$$
$$q(x_i|f)=g(x_i,\beta_i,\partial_i). \tag{6}$$

Since the mean and standard deviation of the distribution of each category of items in the research sample have been calculated, then the required estimates can be obtained by substituting the above formula.

Bayesian network is based on probability estimation, which can effectively deal with uncertainty and volatility, while fully considering the correlation between attributes. Bayesian models are generally limited by their number of nodes and the complexity of relationships between nodes, and it is difficult to classify high-dimensional datasets with many feature items.

*3.2. Support Vector Machine Theory.* Support vector machine (SVM) is a new technology in the field of data mining classification. It is a small statistical model based on the principle of structural risk reduction and the VC theory. SVM has good learning and generalization capabilities and it is a machine learning algorithm based on big data.

In a two-dimensional line space, the general form of the linear discriminant function is $g(a)=v\cdot a+y$, then the class label prediction of the sample can be expressed as

$$b = v \cdot q + y (q + y > 0),$$
$$b = -v \cdot q + y (q + y < -1). \tag{7}$$

The above formula can be unified and generalized into a more compact formula as shown:

$$b_i [(v \cdot a_i) + y] - 1 = 0,\ i = 1, 2, 3, \ldots, n. \tag{8}$$

The support vector machine requires the largest classification interval, which is actually equivalent to minimizing the objective function, and it is expressed as

$$f(v) = \frac{\|v\|^2}{2}. \tag{9}$$

The learning task of SVM can also formally describe the constrained optimization problem.

$$\min_v \frac{\|v\|^2}{2} = b_i (v \cdot a_i) - 1. \tag{10}$$

Since the objective function is quadratic and the constraints on parameters $w$ and $b$ are linear, so this problem is a convex programming problem and can be solved by transforming it into a Lagrangian problem. The optimal solution of equation (9) is the saddle point of the Lagrangian function, which can be defined as follows:

$$K_q (v, y, b) = \frac{\|v\|^2}{2} - \sum_{i=1}^{k} b_i (b_i (v \cdot a_i + y) - 1). \tag{11}$$

Among them, $b_i$ is the Lagrange multiplier, since the gradient of $v$ at the saddle point is 0, so we get

$$\frac{\partial K}{\partial V} = v - \sum_{i=1}^{k} b_i a_i,$$
$$\frac{\partial K_q}{\partial y} = \sum_{i=1}^{k} b_i a_i. \tag{12}$$

One way to solve inequality constraints is to convert them into a set of equality constraint bases. Ensuring that the Lagrangian multipliers are not negative and that after their transformation, the optimal solution still satisfies the formula, we get

$$b_i (b_i (v \cdot a_i + y) - 1) = 0. \tag{13}$$

It can be seen from the abovementioned formula that only after the training instance satisfies the optimal solution, the Lagrangian multiplier is 0, that is, only the coefficient $b_i$ of the support vector is not zero, so it can be expressed as

$$v = \sum_{CW} b_i a_i. \tag{14}$$

Advantages of support vector machine (SVM): a support classifier is a new algorithm based on machine learning, which has good learning ability and general ability, and even if the discriminant function is obtained from a limited dataset, it can still produce a small error on the test set. SVM is essentially a convex quadratic optimization problem, and the optimal solution found can be guaranteed to be the global optimal solution. In terms of text, most of them are multidimensional and sparse text objects. Support vector technology has a strong mathematical theoretical foundation, which can be used for high-dimensional data, and it can also be used to solve nonlinear problems as well. It can be seen that the support vector machine algorithm has strong application potential in text classification.

## 4. Experimental Results of the Influence of Educational Informatization on Teaching Mode Based on Machine Learning

At present, many schools have introduced the teaching mode of education informatization, and they are loved by students and have good results. However, the information-based teaching model is still in its infancy. This study adopted the survey and research method to analyze and study the educational information-based teaching model.

*4.1. Recognition Contrast.* In order to more clearly and objectively comprehend the practical effects of the information-based teaching pattern in schools, a random survey of 100 people in a school is conducted to focus on their recognition of the information-based teaching pattern. The recognition degree is divided into very like, relatively like, general, dislike, and very dislike, as shown in Figure 5.

From the bar chart in Figure 5, it can be clearly seen that more than 80% of the students agreed with the information-based teaching model and preferred this teaching model. 52.3% of the students preferred the information-based teaching model, accounting for the total number of participants in the survey. Only a small number of students did not like the message-based teaching pattern, which may be due to the low level of understanding of the message-based teaching pattern. These data showed that students generally prefer the message-based teaching pattern and reflected that the feasibility of implementing a message-based teaching pattern in the teaching pattern.

*4.2. Comparison of Different Teaching Modes in terms of Self-Existent Learning Capability.* The common teaching pattern and the message-based teaching pattern were compared, and the tests were repeated 6 times, as shown in Figure 6.

Figure 6 studied the comparison between the ordinary teaching pattern and the information-based teaching pattern on self-existent learning capability. It can be clearly seen from the figure that the information-based teaching pattern cultivates students' self-existent learning capability which is significantly higher than that of the ordinary teaching pattern. The self-existent learning capability of the ordinary teaching pattern fluctuated around 60 times, while the self-existent learning capability under

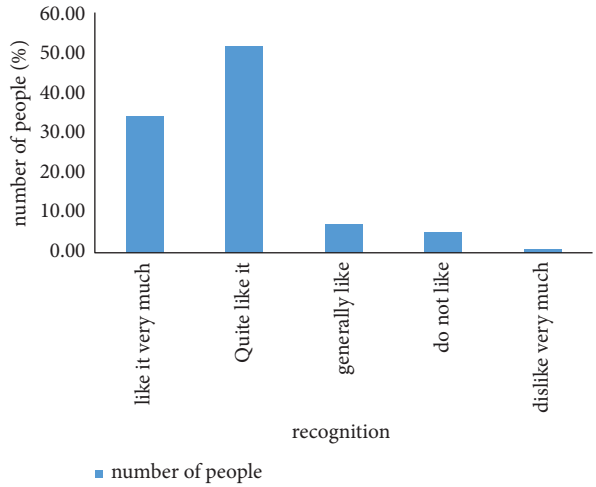


Figure 5: Recognition of the information-based teaching model.

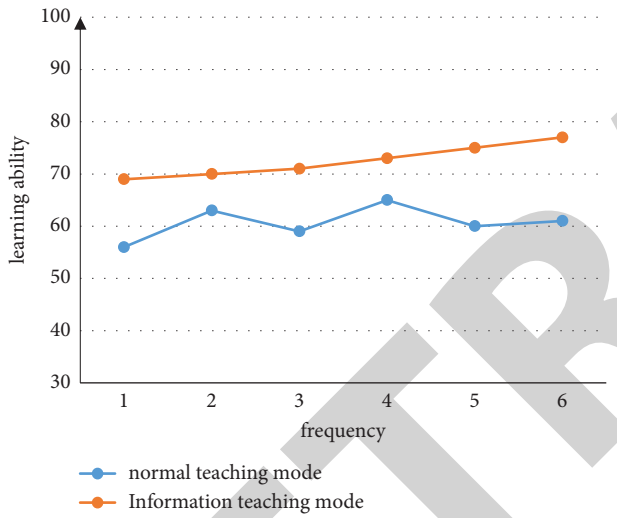


Figure 6: Comparison of different teaching modes in autonomous learning ability.

the information-based teaching pattern was on the rise. The self-existent learning capability under the information-based teaching pattern was around 77, which showed that the information-based teaching mode was more conducive to the cultivation of students' self-existent learning capability.

*4.3. Comparison of Different Teaching Modes in Comprehensive Ability Training.* In the process of students' learning, we should pay attention in guiding students to combine theory with practice and pay attention to the cultivation of students' comprehensive ability. In order to have a clearer understanding of which teaching mode is more suitable for the cultivation of students' comprehensive ability, the common teaching pattern and the message-based teaching pattern were compared, and the tests were repeated 6 times, as shown in Figure 7.

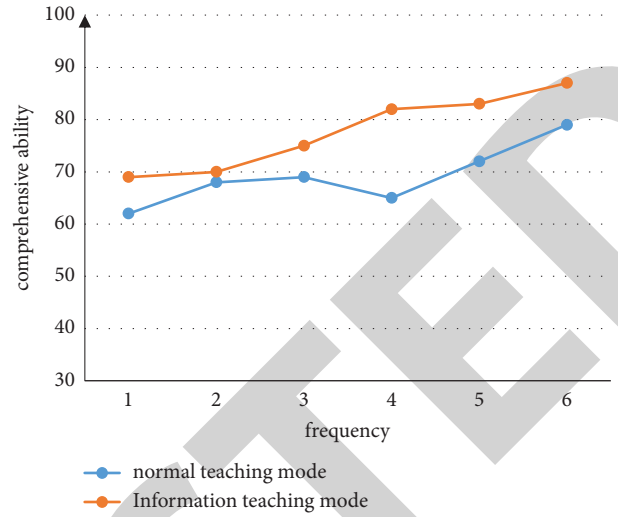


Figure 7: Comparison of different teaching modes in comprehensive ability training.

Table 1: Comparison of different teaching methods in terms of learning effect.

| | Normal teaching mode | Information teaching mode |
|---|---|---|
| 1 | 72 | 83 |
| 2 | 77 | 79 |
| 3 | 75 | 85 |
| 4 | 69 | 87 |
| 5 | 70 | 89 |
| 6 | 78 | 90 |

In Figure 7, under the general teaching mode, the highest comprehensive ability was around 79, and the lowest was around 62. The comprehensive ability under the information-based teaching mode showed a gradual upward trend, and the highest comprehensive ability reached about 87.

*4.4. Comparison of Unequal Teaching Pattern in terms of Learning Effect.* The ultimate purpose of using the information-based teaching mode is to improve the students' learning ability, and the learning effect is the performance of the learning ability. A survey is conducted on the 6 academic achievements of a school, and the learning effect under the two teaching modes is investigated. The specific outcome is shown in Table 1.

To study the learning sequel of the two teaching modes more intuitively, this study drew the survey results into Figure 8.

It can be clearly seen from the line chart in Figure 8 that the teaching influence under the common methods was about 78, and the learning influence under the message-based teaching pattern was about 90. On the whole, the learning influence under the message-based teaching pattern was higher than the learning influence under the ordinary teaching pattern and the average improvement was 12. It

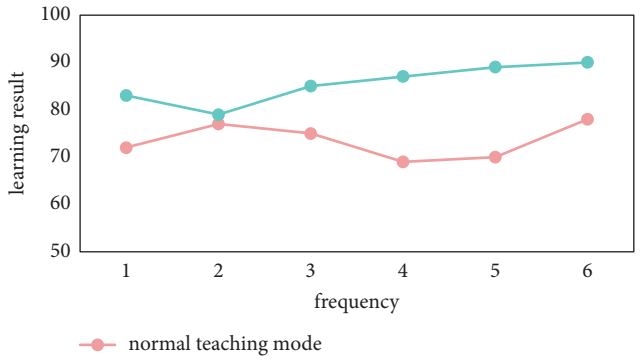


Figure 8: Comparison of different teaching modes in terms of learning effect.

showed that the message-based teaching pattern was relatively successful in view of the teaching pattern of students' learning influence.

## 5. Conclusion

In the era of rapid development of the Internet, teaching methods are facing major changes, and information technology has penetrated almost into all fields of life and education. Under this circumstance, the ordinary teaching mode gradually exposed its limitations, and the emergence and wide application of the information-based teaching mode have become an inevitable trend. The basic auxiliary technologies of personalized learning are machine learning and deep learning. Therefore, it is of great significance to introduce machine learning into the information teaching mode. The introduction of the information-based teaching model is conducive to better playing a positive role in the network environment.

## Data Availability

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

## Conflicts of Interest

The authors declare that they have no conflicts of interest..

## Acknowledgments

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