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Research Article

Markov Model-Based Learning Aid for Students' Civics Course

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Since the 19th National Congress, students' ideological education has become more and more one of the national priorities, so the Civics course has become one of the essential compulsory courses for students at all stages of school and university, and the learning methods of Civics course have also become a hot issue of concern to students, which makes the learning process of supplementary learning methods very important. In this paper, a Markov model was developed to calculate the probability transfer matrix and predict the supplementary learning methods used by students. This paper also establishes a Markov model to predict the frequency of students' online classroom learning at different stages, and it is found that, in the future, more and more students will use the Internet for their Civics course assisted learning; therefore, it is very important to establish a perfect Civics course online assisted learning platform, and this paper also puts forward some suggestions for establishing a Civics course online assisted learning system, which provides some methods for subsequent students' Civics course learning. This paper also proposes some suggestions for establishing a web-assisted learning system for Civics courses and provides some methods for subsequent student learning in Civics courses.

1. Introduction

Since the 19th National Congress, students' ideological education work has become more and more important to the Party Central Committee, and higher requirements have been put forward for this purpose. Therefore, learning the Civics course well is very important for implementing and enforcing the Party's educational philosophy and policy, cultivating high-level and high-quality talents who can develop comprehensively for the country, developing socialism with Chinese characteristics, and guiding the ideology of China and other fields. Under such conditions, the study of Civics course becomes an essential task for students at all stages in the learning process. The study of Civics course is not the same as other subjects, so how to learn Civics well also becomes a concern for students, which makes the auxiliary methods in the learning process very important [1].

Markov model (Markov Model) is a statistical model that is widely used in the fields of recognition and identification, such as the labeling of different lexical properties, sound and text conversion, probabilistic grammar, etc. It can also be applied to make predictions about engineering, weather, etc. In the definition of Markovianity, "now" refers to a certain definite moment, but in practical problems, the concept of "now" in Markovianity is usually generalized, i.e., the stopping moment [2]. For example, if the Brownian motion is in the plane from the center of the circle, if we want to study the conditional independence of the event at the moment t_0 when the circle is first reached and the subsequent events, we set t_0 as the stopping moment and consider t_0 as the "now." If the "now" is extended to the "now" in the case of stopping time, under the condition that the "now" is known. This property is called strong Markovianity. The Markov process with this property is called strong Markov process. For quite some time, many people thought that Markov processes are necessarily strong Markov processes. It was J. L. Dubb who first suggested that a rigorous proof was needed for strong Markovianity. It was not until 1956 that an example of a Markov process that was not a strong Markov process was found.

The use of Markovian models to study learning assistance methods for students' Civics courses is a better research method. A learning aid method is a type of learning method [3]. Broadly speaking, learning methods refer to the motivation students have and the approach they take in learning, which determines the effectiveness and quality of their learning; a large aspect of learning methods is classroom instruction, or course experience. In Western academia, research on students' experiences and approaches to learning is part of the Tradition of the Students' Approaches to Learning (SAL), which has been developing for more than 40 years. In 1976, Swedish scholars used phenomenological descriptions to identify two types of approaches to learning, namely, deep and shallow learning approaches, thus laying the foundation for the birth of the SAL research tradition [4]. The deep learning approach points to a focus on the meaning of the text and is a learning approach that aims at deep understanding. The shallow learning approach points to the memorization of text in order to be able to answer questions rather than to comprehend it. A large number of subsequent studies have supported the idea that whether students adopt a deep learning approach is influenced by a combination of individual student characteristics (e.g., prior learning experiences, existing conceptions), teacher teaching methods, instructional evaluations, and students' perceptions and experiences of the learning environment, but of the many influencing factors, the actual lesson experience students have in the classroom is the one with the greatest intensity [5].

However, with the rapid development of modern technology, students' learning forms have gradually become diversified, and students are exposed to more and more supplementary learning tools in addition to traditional classroom learning. At the same time, China's higher education is developing from elite education to mass education, universities and schools are expanding their enrollment, and the examination and test modes of Civics and Political Science classes are becoming diversified [6]. This has the consequence that teachers leave soon after class and cannot communicate much with students, and students have to rely on rote memorization when they review what they have learned. And the consequence of this approach for students is a superficial understanding of the content and meaning of educational courses. It creates a "test-taking" mentality in students' learning [7]. Therefore, how to make efficient use of extracurricular time, strengthen teachers' perception of ideological and political course itself, deepen students' knowledge of ideological and political course and understanding of the significance of ideological and political course, and study students' auxiliary learning methods in ideological and political course learning have become a new focus.

Based on Markov model, this paper analyzes and studies the auxiliary methods for students' ideological and political course learning in view of the current situation and problems encountered in students' learning, which is conducive to higher efficiency and more fruitful learning of ideological and political course in the future. According to the analysis results, the frequency of assisted learning methods used by college and primary and secondary school students in the future is predicted, which provides some reference suggestions for the assisted learning of ideological and political courses in the future.

2. Literature Review

This paper mainly studies the auxiliary methods of students' ideological and political course learning through the establishment of Markov model, so it first introduces some common research problems based on Markov model [8].

Technology of asphalt pavement based on Markov model to predict the process is as follows: to Xinjiang Ili region G3016 line on the highway engineering, use grey prediction model to analyze the change of the pavement performance and then according to the Markov models get road state transition probability matrix and the state transition probability in the future, again carry on with the forecast, and predict the technical condition of road surface. The prediction method of grey system can achieve ideal prediction effect when the historical data is less, and compared with other prediction methods, this method is closer to the actual situation [9]. In the process of investigation and analysis of road conditions, some relevant data of road use and performance are sometimes difficult to investigate or lack investigation, so the analysis method based on Markov model is very effective. According to the above method, the road performance of this section can be predicted and relatively accurate data can be obtained. The measured value of road performance in 2013 is 96.86 and predicted value is 98.14; the measured value of road performance in 2015 is 88.61 and predicted value is 87.15; the measured value of road performance in 2017 is 82.24 and the predicted value is 83.01; the measured value is 79.61 in 2018 and the predicted value is 78.84. It can be found that the error between the predicted value and the actual value is about 0.99, which meets the expectation of the predicted value [10]. It can be concluded that the establishment of Markov model to predict the road performance is a good method [11].

The monitoring of air quality based on Markov model is also an important work. Air quality is an important indicator of environmental monitoring. The quality of air has far-reaching significance and influence on human survival and development, food, clothing, shelter and transportation, and harmonious coexistence of nature. If we can accurately predict the level of air quality in an area, we can do a good job of protection and relevant countermeasures in advance and minimize the harm and adverse impact of air quality deterioration on life [12]. 730 air quality grade data pieces of Taiyuan city from April 1, 2019, to March 31, 2021, are selected and modeled by Markov model. The transition probability matrix and its corresponding probability matrix are calculated and its marginal probability is obtained. After data collection and model calculation and analysis, the air quality level on April 15, 2021, is used as the initial state to predict the air conditions for the next five days. The predicted states of air quality in the five days after April 15 are 4, 2, 2, 2, and 2, respectively, which means that the probability of air quality grade being moderate pollution, good, good,

good, and good is the highest, while the actual air quality grade is good, good, good, moderate pollution, and good, and the prediction accuracy is 80% [13]. By forecasting the weather of the whole year in 2020 and comparing with the actual situation, it can be obtained that the forecast days of the air quality of the year 2020 in six grades (excellent, good, mild pollution, moderate pollution, severe pollution, and severe pollution) are, respectively, 56 days, 218 days, 65 days, 18 days, 5 days, and 3 days. The actual days are 54 days, 223 days, 65 days, 15 days, 8 days, and 0 days, respectively, and the relative error is 4.38%, indicating that the prediction effect of Markov model is relatively accurate [14].

Markov model can also be used to analyze the industrial structure of energy. With the passage of time and the development of science and technology, the industrial structure of energy is also constantly changing; the analysis of the rule of the change of energy industrial structure found that this change can be described by Markov chain. Therefore, the establishment of Markov model to analyze the development and change trend of energy industry structure in several decades can better understand the law of energy industry change and then carry out analysis and suggestions. In the U.S., for example, in the National Energy Data System (SEDS) agenda, datasets from four states - California, Arizona, New Mexico, and Texas - from 1960 to 2009 were collected and organized, the data were preprocessed, useless data were removed, and valid data were extracted for analysis [15]. Firstly, the energy consumption of the four states was analyzed and plotted, and the following conclusions were drawn: the proportion of fossil fuels used in the four states was basically 50%~60%, but the use of fossil fuels in Arizona showed a downward trend in the past 50 years, while the other three showed an upward trend. The share of clean renewable energy used in all four states has declined over the past 50 years, with Arizona experiencing a slower decline in the share of clean renewable energy and the remaining three states experiencing a faster decline in the share of clean renewable energy. The use of thermal power, motor gasoline, and other energy sources in these four states has largely maintained a steady upward trend over a 50-year period [16]. The reasons for the above situation were thus analyzed. Arizona has few fossil fuel resources but is rich in solar resources due to the semiarid climate of most of the state, with long hours of sunlight, and is in a highland region with abundant wind resources and abundant geothermal resources. In addition, the type of industry in the state is a small industrial sector with low per capita energy consumption. In contrast, the other three states have abundant fossil fuel resources, such as natural gas and crude oil. However, because of California's mild climate and less frequent use of heating equipment in the winter, per capita energy consumption is lower. While renewable clean energy has been declining in the other three states over the past 50 years, they all have abundant renewable energy resources that can still be developed and used vigorously today [17].

In addition, Markov models allow for design-theoretic analysis of intelligent systems, such as an intelligent Chinese character to Braille conversion system designed for the blind. The principle of conversion from Chinese characters to Braille is "Chinese characters-Pinyin-Braille." By building a Markov model, the steps of this system design can be simply divided into changing Chinese characters into pinyin and then pinyin into Braille. The Markov model can recognize random Chinese text statements and change Chinese characters into pinyin [18]. However, it is not enough to use this method alone. It is necessary to combine the inverse maximum matching word division method for utterance division of Chinese text and to use the phrase dictionary to match phrases or single characters with the Character Set of Chinese Character Codes for Information Exchange. Next, a phonetic code dictionary is used to solve the problem of pinyin to Braille conversion. As we all know, Chinese characters are unique, so Chinese is very prone to ambiguity when translated into other languages. The process of reading Chinese text from pinyin, recognizing words and phrases through pinyin, and converting pinyin or outputting Braille may result in translation errors due to misunderstanding [19]. Therefore, it is necessary to establish a database and a statistical state database to count the correct corresponding word meanings, register the errors in the reading process and conversion process, and correct the errors in the translation process. The application of Markov process in the Braille conversion system can be elaborated as follows: In the input process of random Chinese text, if the Chinese character to be converted is after a previously recognized Chinese character and is related only to that Chinese character, but not to the Chinese character before it, it is represented by a state space M_n. Given that a large number of utterances of Chinese characters have a coherent expressive meaning, the probability of occurrence of individual linguistic symbols in each sentence or utterance is not independent of each other, and the current Chinese character of each random Chinese character text must be related to the previous Chinese character, which can be processed by using Markov chains for utterances.

In addition to making predictions, Markov models can also analyze the performance of safety systems, for example, to measure the working process of safety instruments [20]. By using Markov models in chemical plants, the safety integrity of the whole system can be tested and the structure and processing of the plant can be optimized according to the test structure, thus improving the safety factor and fault tolerance of the whole plant and reducing the risk. For safety instrumentation, there are many factors that affect its safety performance, such as the time of device operation, cycle function testing, etc. Therefore, based on Markov model, it is possible to establish a test method for safety instrument function [21]. The more factors considered, the more channels for different state generation and transfer in Markov model naturally. The calculated results of the safety assessment show that the proportion of dangerous failures in the actuator is 78.6%, in the sensor 18.2%, and in the logic controller 3.2%. The abovementioned percentage of dangerous failures leads to the conclusion that the actuator of

the device has the greatest influence in the protection of the investigated device, followed by the sensor. If we want to improve the safety of the whole device and reduce the risk, the first thing to consider is the optimization of the processing of the actuators of the device.

From the above examples, it can be seen that Markov model has a wide application space in practical species, especially in probability statistics and prediction, with more accurate experimental results. This establishes a solid theoretical foundation for the research in this paper [22].

3. The Establishment of Markov Model and the Analysis of Civics Course-Assisted Learning Method

3.1. Establishment of the Markov Model. Markov model is a kind of stochastic time series analysis method, which predicts the future state of things by studying the initial probability of different states and the transfer probability between states. The most important feature of Markov model is that it has no posteriority; i.e., it is considered that the conditional distribution of the state of the process or system at the moment $t > t_0$ is independent of the state of the process before the moment t_0, if the state at the moment t_0 is known [23]. That is, the future state does not depend on the past but is only related to the current state. This property is very suitable for analyzing data with high volatility and no obvious time-varying characteristics.

3.1.1. Markov Process. Let $X = (X_1, X_2, X_3, \ldots, X_t)$ be a sequence of random variables, where each random variable takes values in a finite set $S = \{s_1, s_2, s_3, \ldots, s_n\}$, called the state space. Markov is characterized by the following.

(1) Finite history assumption:

$$P(X_{t+1} = s_k | X_1, \ldots, X_t) = P(X_{t+1} = s_k | X_t). \tag{1}$$

(2) Time invariance assumption:

$$\forall i \in \{1, 2, 3, \ldots, T\} \forall x, y \in S, P(X_i = y | X_{i-1} = x) = p(y|x). \tag{2}$$

If X has these characteristics above, then this sequence of X is called a Markov process (chain).

If this sequence is a Markov chain, it has the $n \gg 0$ following $i, j \in I$, properties for all $p_{ij}^{(n)}$ integers, and n-step transfer probabilities.

$$\begin{aligned} p_{ij}^{(n)} &= \sum_{k \varepsilon I} p_{ik}^{1} p_{kj}^{(n-1)}, \\ & P\{X(n_1) = i_1, X(n_2) = i_2, \ldots X(n_m) = i_m\} \\ &= \sum_{i} p_i^{(0)} p_{ii_1}(n_i) p_{i_1 i_2}(n_2 - n_1) \ldots p_{i_{m-1} i_m}(n_m - n_{m-1}), \\ & \mathbf{P}^{(n)} = \mathbf{P}^{(n-1)} \mathbf{P}. \end{aligned} \tag{3}$$

3.1.2. Markov Analysis Method. The basic model of the Markov analysis method is

$$\mathbf{X}(K+1) = \mathbf{X}(K) \times \mathbf{P}, \tag{4}$$

.

Let $p_{ij} = P(X_i = j | X_0 = i), i, j \in I$; then, p_{ij} is called transfer probability, which denotes the transfer probability from state i to state j. The transfer p_{ij} probability matrix thought of as an element is shown as follows:

$$\mathbf{P} = \begin{pmatrix} p_{11} & \cdots & p_{1m} \\ \vdots & \ddots & \vdots \\ p_{m1} & \cdots & p_{mm} \end{pmatrix} = \left(p_{ij}\right)_{m \times n}. \tag{5}$$

3.1.3. Test of the Markov Model. If a Markov model is to be used to make predictions about something, it is a very important prerequisite that such a thing must have Markovianity. Therefore, it is necessary to test the thing first and use χ^2 to judge the test results. Assume that the index series is divided into m states, the frequency of transformation from state i to state j is recorded as f_{ij}, the transfer probability is p_{ij}, and the conditional probability of the state transfer frequency matrix is taken as the marginal probability [24]. The calculation formula is as follows:

$$P_j = \frac{\sum_{i=1}^{m} f_{ij}}{\sum_{j=1}^{m} \sum_{i=1}^{m} f_{ij}}. \tag{6}$$

The formula for calculating the χ^2 statistic is as follows:

$$\chi^2 = 2 \sum_{j=1}^{m} \sum_{i=1}^{m} f_{ij} \left| \log \frac{p_{ij}}{P_j} \right|. \tag{7}$$

It should be noted here that the log in equation is because $\ln x$ is often written as $\log x$ in programming.

The degrees of freedom are obtained by checking the table given the significant $\chi_\alpha^2((m-1)^2)$ level α. So if $\chi^2 > \chi_\alpha^2[(m-1)^2]$, then the test is passed.

3.1.4. Constructing the Multistep Transfer Probability Matrix. The calculation of the multistep transfer probability matrix requires the use of the C-K equation (Chapman–Kolmogorov equation), which is calculated as follows:

$$P(u+v) = P(u)P(v). \tag{8}$$

In the equation, if we make $u = 1$ and $v = n - 1$, then we can get the following recurrence $P(n) = P(1)P(n-1) = PP(n-1) = \ldots = P^n$ relation, so for the chi-square Markov chain, the n-step transfer probability matrix is equal to the nth power of the one-step transfer probability.

3.1.5. Calculating the Invariant Probability Measure. It can be seen that the core problem of Markov model is to determine the transfer probability matrix **P.** In this paper, we take the number of people (ten people) as the scale, take the predicted 50,000 people as the initial value of Markov probability prediction, calculate the value of the frequency that various auxiliary methods of learning will appear, respectively, and

then take the natural year as the scale, establish Markov model for the change process of the frequency of students using a certain auxiliary method at different stages in several years, and predict the change trend of the frequency of using this auxiliary method in the next few years [25].

3.2. Analysis of Auxiliary Learning Methods in Civics Courses

3.2.1. The Necessity of Aided Learning Methods in Civics Courses. First of all, in modern teaching, teachers are not exactly the "people who teach knowledge" in the traditional sense anymore. The teacher is transformed from "the person who teaches knowledge" to "the person who guides students to learn." The main body of learning is not the teacher but the students, and the process of learning can be seen as the process of improving knowledge in the minds of the learners themselves [26]. Therefore, teachers should not only teach literature knowledge, but also guide students to learn and help them to learn and improve themselves and try to build their own learning system [27]. In traditional teaching, teachers and textbooks are the only sources for students to acquire knowledge, but with the progress of information technology, the development of the Internet, and the diversification of values, students have far more ability and opportunities to acquire knowledge than before, but on the contrary, in the vast information network, students who have not yet entered the world may also lose their way and lose their judgment. Under such conditions, teachers should, on the one hand, rely on their own rich experience and grasp of subject knowledge to connect what students have learned in various places into a complete knowledge system; on the other hand, teachers should guide students to correctly distinguish between the best and the worst and consciously resist the erosion of bad culture. In the traditional teaching, students are taught by teachers in the classroom according to the knowledge points in the textbook. Nowadays, with the development of multichannel information technology, students' knowledge acquisition not only is concentrated in the classroom, but also has many other supplementary learning methods [28].

Secondly, students in China not only are active in their thinking and personality, but also like to pursue new things and are enthusiastic about the Internet and offline activities. Most of the students learn computer-related knowledge by looking up information, reading news, or chatting with online friends through the Internet. Einstein once said that science is a powerful tool, and it depends on mankind itself, not on the tool, how to use it to bring happiness or disaster to mankind. Ideological and political theory is not an obscure theoretical derivation; on the contrary, it is very easy to understand; in the traditional teaching, teachers only need to prepare lessons carefully before class, study the textbook carefully, integrate the knowledge in the textbook, pass the knowledge to students in the classroom, and correct homework carefully after class to complete the basic work, but ideology and politics are closely related to the real society and everyone, so only the classroom learning is not enough [29]. In addition to the knowledge imparted by teachers in the classroom, it is more important to practice, which requires the use of, for example, television, the Internet, lectures, newspapers, extracurricular books, etc., to change the traditional static teaching materials into dynamic teaching materials composed of sound, images, real people, etc. to attract students' interest and, on this basis, with the help of multimedia networks to constantly update the supplementary methods. The teaching contents are constantly updated by multimedia network [30].

3.2.2. Analysis of Students' Learning Aids in Civics Courses. First of all, we investigate the auxiliary learning methods of students in the Civic Science course, and we can get the following more common auxiliary learning methods: news reading, online classroom, lectures and conferences, and visits to red bases. The distribution of the number of people who use the above four methods for the auxiliary learning of Civics and Political Science courses is shown in Figure 1.

The steps of using Markov model for data analysis of students' study assistance methods in Civics courses are shown in Figure 2. Firstly, the Markov transfer matrix needs to be established, secondly, the Markov transfer matrix is initially solved by using statistical method, quadratic programming method, and other methods of mathematical calculation, then the results are normalized to obtain the transfer probability matrix, and finally the probability matrix is analyzed and summarized [31].

Randomly selecting 1000 college and university students to conduct a survey of Civics course learning, to investigate their main auxiliary learning methods used in Civics course learning, where the numbers from 1 to 5 represent news reading, online classes, lecture meetings, visits and exchanges and other learning methods, and data processing and construction of transfer matrix, auxiliary learning methods statistical results are shown in Figure 3.

Based on the preliminary understanding of the above students' situation and the analysis of the pattern, the following hypotheses can be made about the Markov model of students' learning auxiliary learning methods for Civics and Political Science courses:

(1) The number of students using learning methods that are transferred from one state to adjacent states is 10 (data are counted by number).

(2) The transfer order is from state 1 to state 2, state 2 to state 3, state 3 to state 4, state 4 to state 5, and state 5 to state 1, respectively.

For a sample of 1000 school and university students, the number of transfers using different learning methods for the number of students can be calculated, and the transfer probability matrix can be calculated by the formula. Using this transfer matrix, the auxiliary learning methods used by 50,000 students in their Civics courses can be predicted, and the results obtained are shown in Figure 4.

4. Results and Discussion

According to the predicted results of the auxiliary learning methods used by 50,000 students in the study of Civics and

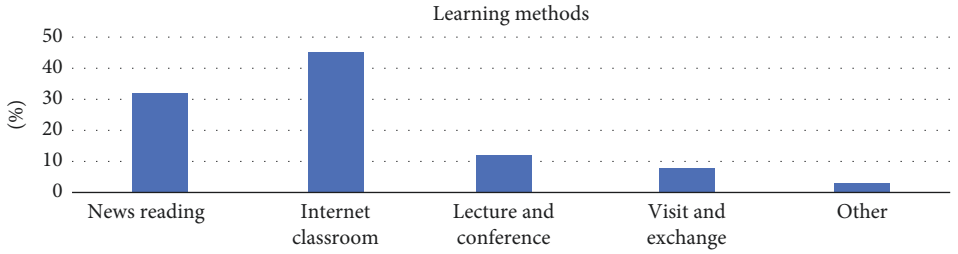

Figure 1: Distribution of the number of people using different auxiliary learning methods for Civics courses.

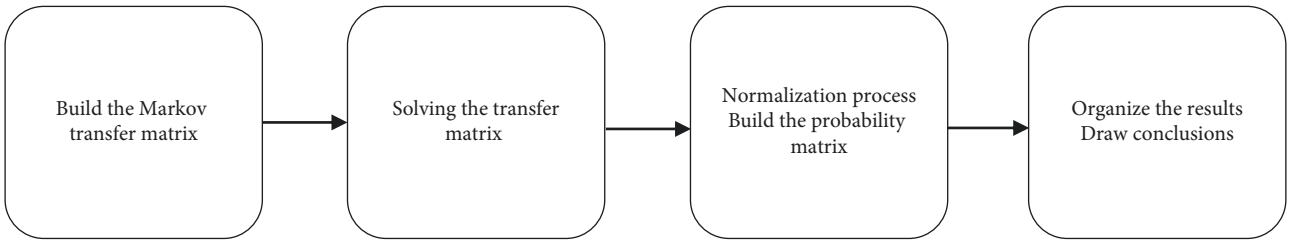

Figure 2: Steps of analyzing students' auxiliary methods of learning Civics courses using Markov model.

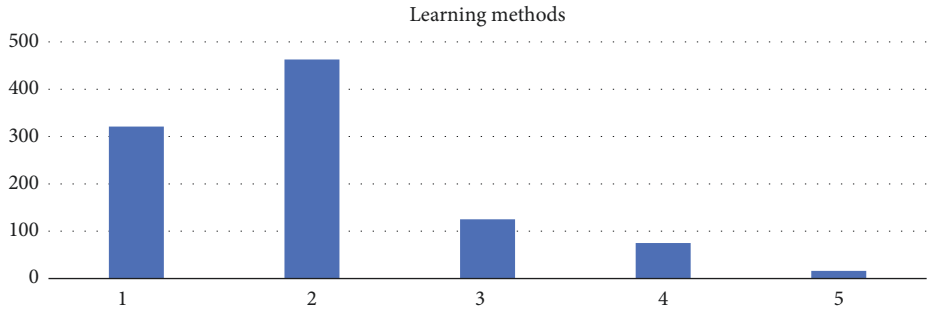

Figure 3: Statistics of 1000 university, school, and college students' auxiliary learning methods of Civics and Political Science courses.

Political Science courses, the fan chart shown in Figure 5 can be obtained. The largest number of students, 47.2%, used online classes for learning, followed by those who learned by reading news, about 33.7%, followed by those who learned by attending lectures and conferences, 11.8%, and finally those who learned by visiting red bases and other attractions, 6.8%. This is a small difference from the actual results of the statistics. This shows that the Markov model can be used to predict the auxiliary methods used by students in Civics courses in the future and to better utilize the results of this study for course improvement and study guidance.

From the above results, it can be seen that the online classroom is the most widely used learning support method among students. Combined with the survey on the frequency of Internet use by college and university students in recent years, the above results can be used to predict the frequency of Internet use by college and university students in the next three years.

After the questionnaire survey, the curves of the change of frequency of using online classroom for learning by junior and senior high school students in recent years are shown in Figure 6, and the Markov model is established according to the method outlined above, and the Markov transfer matrix

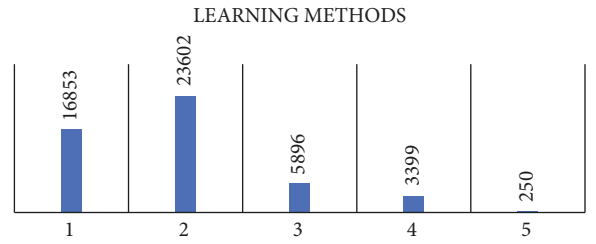

Figure 4: Prediction of the number of different supplementary methods used by 50,000 students in their Civics course study.

is set, then the mathematical calculation methods such as statistical method and quadratic programming method are used to solve the Markov transfer matrix initially, then the results are normalized to obtain the transfer probability matrix. The analysis and summary were conducted to obtain the frequency change curve of university and school students using online classroom for the three years from 2022 to 2024, as shown in Figure 7.

From the above results, we can see that online classroom has played an increasingly important role in students' learning life, and setting up online classroom for students' Civic Science course assisted learning has become urgent.

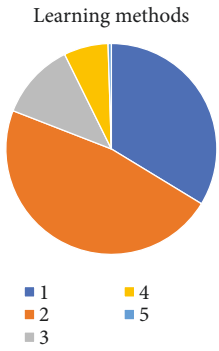

Figure 5: Sectoral graph of the percentage of students using different assistive methods in their Civics courses.

Among them, constructing Civic Science network-assisted teaching system is a good method, which can combine some of the abovementioned methods of assisted learning and share relevant videos and electronic versions of book materials about Civic Science courses for all students including primary and secondary school students and also provide a platform for teachers and students to exchange and learn. Here, university, high school, and elementary school students can exchange relevant knowledge. It can also provide a platform for teachers and students to exchange knowledge and expand their knowledge and make up for the shortcomings of classroom teaching, which is of great importance and far-reaching significance to students' development. The working module diagram of the constructed Civic Science Course Learning Support System is shown in Figure 8. The main modules of the system can be divided into five types, which are online courses, assignments and quizzes, lecture meetings, discussion and exchange, and system management.

The main purpose of the "online course" learning module is to provide students at different stages with different information about classroom knowledge, hot news, and real-time national events. Because students at different stages learn different specific knowledge, this module can show the textbook knowledge and extracurricular knowledge that need to be read and understood at different stages in the form of videos and pictures, so that students with different needs can study selectively according to their actual situation and improve the learning efficiency.

The "homework assessment" is an area open to both teachers and students. Teachers mainly assign and correct online homework for their own classes and answer students' questions when they are asked online. Students submit their assignments on time and provide feedback on their completion according to the teacher's schedule. This is a very efficient way to learn, and in the case of objective questions, the system can automatically correct them, which to a certain extent also improves efficiency. Classroom quizzes, as the name implies, are tests on what is learned in class. The main purpose of this module is to give students the opportunity to consolidate and test themselves on relevant knowledge points after systematic learning of Civics in the classroom. Therefore, the module can include special exercises and quizzes. The special exercises are the quizzes after each chapter to consolidate what they have learned and try to do some extracurricular extensions, while the thematic quizzes are in the form of online exams for students to answer within a certain period of time, so as to test the degree of students' integration of what they have learned.

The module "Lectures and Conferences" can replace students' participation in lectures and seminars offline, with more flexible time online, and can include such current affairs conferences as the Fourth Plenary Session of the 19th Central Committee, which are of national concern and significance, for students to study and research. It is also possible to hold activities such as lectures and symposiums online, which can avoid offline meetings where the number of people cannot get together and can reduce contact, which is also helpful for epidemic control and can be attended by students at all levels of school and university. Teachers at all levels can also make presentations, providing a good platform and opportunity for cross-learning and disciplinary integration.

The "Discussion and Communication" module is primarily open to students. Students of all grades can ask questions and communicate with each other on this platform, and they can reply to each other and speak freely.

Finally, the module of "System Management" is mainly to coordinate and organize, including user registration management, information release, question bank management, video upload, and other functions. Registration management is to verify the identity of users who register for the learning platform; information release is mainly for system administrators to release and modify information about courses and issue meeting notices, etc.; question bank management is mainly for teachers to examine and test their students according to the actual situation; and video upload is mainly for teachers to upload Civic Science course videos and current affairs content to the website for students to watch and study. The video uploads allow teachers to upload the videos of Civics courses and current affairs content to the website for students to watch and learn.

This kind of ideological and political auxiliary teaching system provides a new way for students to learn ideological and political courses. Through this system, students can not be restricted by time, place, and other situations, according to their own actual situation to learn but can communicate and discuss; the development of students learning is of great significance.

5. Summary and Prospect

5.1. Summary. This paper analyzes the auxiliary learning methods used by students in ideological and political courses through the establishment of Markov model. The main work is as follows:

(1) This paper introduces the significance and importance of studying the auxiliary methods of students' ideological and political courses.

(2) This paper introduces the concept, significance, and establishment method of Markov model and investigates the application scenarios of Markov model in practice through literature.

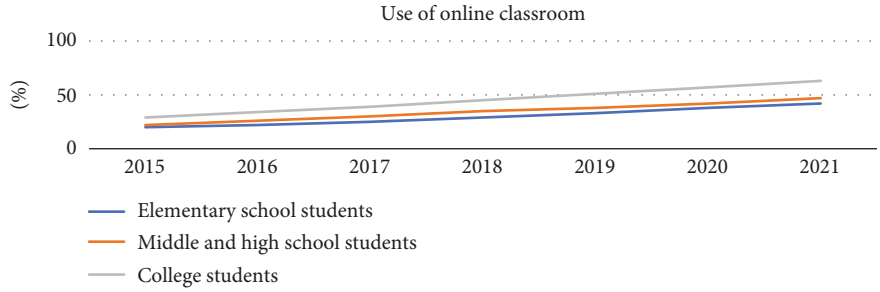

Figure 6: Curve of the change of the frequency of using online classroom for learning by school and university students in recent years.

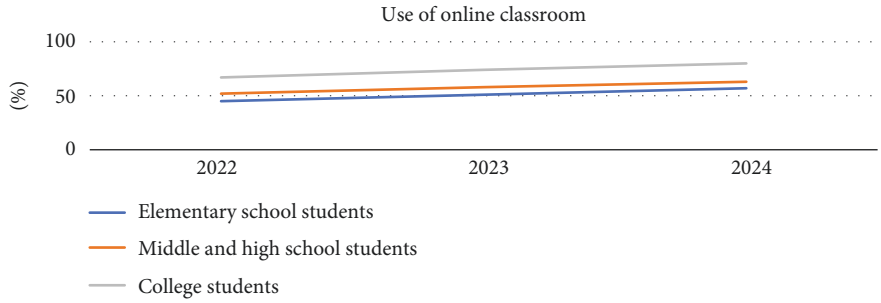

Figure 7: Curves of the change of frequency of using online classroom for learning by university and junior high school students in the latter three years using Markov model.

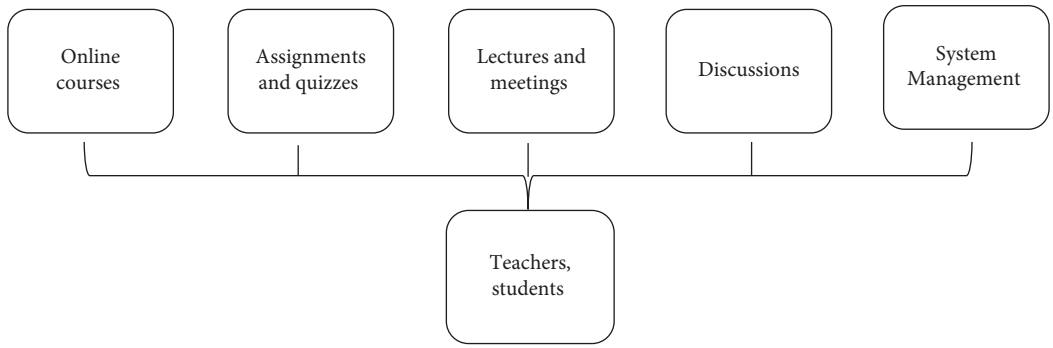

Figure 8: Working module of the simulated civic studies learning support system.

(3) A Markov model, a supplemental learning method used by students in political science courses, was developed and results were obtained by creating transfer matrices and calculating transition probabilities.

(4) In view of the research results, suggestions are put forward for further improvement of ideological and political curriculum, especially for the use of network classroom assisted teaching method.

5.2. Prospect. Markov model is a statistical probability model, which has great value and significance. The establishment of Markov model can be used for statistics, prediction, and evaluation of many different fields of research. It can be imagined that, with the rapid development of various technologies, Markov model can be combined with a variety of other models and algorithms, providing more help to many deeper fields of research.

In the future, the network classroom learning will become one of the main auxiliary methods for the student to study the course, because the network class has many advantages; it is not restricted by time and place, and through the network platform, the students of all ages can have education curriculum content of what they learn to share and ask questions and to expand the scope of study. It is of great significance to the growth of students.

The prediction and statistics of the assisted learning method of students' ideological and political course based on Markov model proposed in this paper still have many shortcomings, which need to be further improved.

First of all, establish a model of one thousand media and students in the process of the statistics; only do the statistics of the single option, but in fact many students in the

education course learning will use a lot of kinds of methods; the alternative to the follow-up to establish state transition matrix and probability matrix has a great influence; matrix becomes more complex and needs further consideration.

Second, organize students to use Markov models to predict future learning, because the progress of science and technology, the international situation, the evolution of the epidemic, etc. all have a big impact on students' learning manner, but these factors are not calculated in the model, which will reduce the accuracy of the model. Later, multiple variables should be set and other statistical models combined to make a more accurate prediction of students' use of online classroom learning.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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