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Using Artificial Intelligence to Assist Teaching and Learning to Optimize the Path of Civic and Political Integration in Western Economics Courses in Applied Colleges and Universities

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Abstract In recent years, with the rapid development of artificial intelligence technology, combining it with western economics course civics provides new possibilities for improving students' comprehensive quality. In this study, we realized learner profiling and personalized teaching resources recommendation by designing a smart teaching platform, combining convolutional neural network and deep learning algorithms. The experimental results show that the experimental class utilizing the smart teaching platform performs significantly better than the control class in the final exam, especially in the freshman and junior grades, where the difference reaches a significant level (p-value of 0.018 and 0.042, respectively). By comparing the midterm and final grades, it was found that the students in the experimental class not only improved their academic performance, but also gained enhancement in their knowledge of ideological and political education. The application of this platform effectively promotes the organic integration of western economics courses and ideological and political education, and provides a new solution for improving the quality of talent cultivation in applied colleges and universities.

Index Terms artificial intelligence, western economics, curriculum Civic and political education, intelligent teaching platform, personalized recommendation, education reform

I. Introduction

In April 2018, China's Ministry of Education issued the Education Informatization 2.0 Action Plan, which aims to comprehensively promote the use of modern information technology based on computers, multimedia, big data, and artificial intelligence in the education process in order to promote education reform [1]. In May 2020, the Guideline for the Construction of Curriculum Civics and Politics in Higher Education Issued by the Ministry of Education clearly states that “Comprehensively promoting the construction of curriculum civics and politics is a strategic initiative to implement the fundamental task of establishing moral character” “It is an important task to comprehensively improve the quality of talent training” [2]. Professional courses as the basic support for the construction of higher education course ideology and politics, only in the teaching of professional courses to promote the course ideology and politics in a solid manner, in order to fundamentally play the core role of colleges and universities for the party to educate people, for the country to educate talent [3], [4].

Under the wave of digitalization, new technologies represented by big data, artificial intelligence and so on continue to impact the traditional classroom teaching mode, bringing great opportunities and challenges to the construction of the curriculum [5], [6]. As a core basic professional course for economics and management majors, the multidimensional characteristics of Western economics, such as its theoretical abstraction, intellectual complexity, frontier expansion and practical synthesis, put forward high requirements for teachers' teaching design and lecturing ability [7]-[10]. Based on this, focusing on the practical exploration of western economics course ideology and politics in the context of digital intelligence, and constructing an integrated teaching system of western economics course ideology and politics based on artificial intelligence assistance can provide a reference basis for solidly promoting the construction of university course ideology and politics, comprehensively improving the quality of talent cultivation, and accelerating the implementation of the strategy of strengthening the country through education [11], [12].

Under the background of deepening globalization and informatization, the goal of higher education is no longer only to impart knowledge, but also to pay more attention to cultivating high-quality talents with a sense of social responsibility and a sense of mission. As a core course in applied colleges and universities, Western economics, in addition to the teaching of theoretical knowledge, also needs to assume the responsibility of leading students to establish correct values. However, under the traditional teaching mode, the western economics course often favors theoretical lectures and neglects the organic integration of students' ideological and political education, which makes the students' leading effect on ideological and political awareness weak despite the fact that they have mastered a large amount of economic knowledge. For this reason, how to effectively integrate the elements of ideology and politics in the western economics course has become a major challenge in the current education reform in colleges and universities. The research in this paper focuses on optimizing the integration path of western economics course ideology and politics through the empowerment of artificial intelligence technology. Specifically, firstly, by constructing a smart teaching platform based on artificial intelligence, combined with a personalized recommendation system and learner profiling function, it provides students with accurate teaching content and resource push. Secondly, it explores how to add Civic and political elements in the teaching of Western Economics, and strengthens the penetration effect of Civic and political education through artificial intelligence technology. Finally, an experimental comparison method was used to assess the actual effect of the smart teaching platform in the integration of Civics and Politics in the Western Economics course, focusing on the changes in students' academic performance and ideological and political cognition. In this way, this study seeks to provide practical solutions for the construction of course Civic-Political in applied colleges and universities, as well as new perspectives on the application of intelligent educational technology in higher education.

II. Civic and political construction of western economics courses in applied colleges and universities

II. A. Objectives of Civics Teaching in Western Economics Courses in Applied Colleges and Universities

The goal of the Civics teaching of Western Economics course in applied colleges and universities is to equip students with the ability to analyze and solve problems by using the analytical methods of Western Economics on the basis of mastering the basic theoretical contents of Western Economics. It also guides students to form a correct worldview, outlook on life and values, and cultivates students into high-quality applied talents with strong ideals and beliefs, a sense of mission and responsibility, a learning attitude of rigorously and actively searching for scientific truth, and a professional quality of conscientiousness, meticulousness and pragmatism.

The teaching objectives are mainly divided into three levels:

(1) Knowledge transfer

Knowledge transfer is the first level goal of the teaching of western economics courses in applied colleges and universities. Through various teaching methods, students can master the basic concepts and principles of western economics, master various analytical methods of western economics, and have economic thinking.

(2) Ability Enhancement

Ability enhancement is the second level goal. Through case studies, seminars, group presentations and other teaching methods, students can enhance their ability to analyze and interpret the current situation and trend of economic development and their decision-making ability, so as to achieve the goal of applying what they have learned, especially the ability to analyze economic development by using the theories and models of macroeconomics under the guidance of Marxism.

(3) Value Leadership

Value leadership is the third level goal. Under the guidance of ideas, the development process of the economy is interpreted, the great economic achievements made since the reform and opening up are shared, and road confidence, theoretical confidence, institutional confidence and cultural confidence are carried through the whole process of teaching. Cultivate college students' national pride and root core values in their hearts, enhance patriotic awareness and social responsibility, and achieve the purpose of educating people and cultivating morality.

II. B. Analysis of the Necessity of Implementing Civics in Western Economics Courses in Colleges and Universities

(1) The content and characteristics of the course determine that it has the characteristics of Civics and Politics

Western economics studies the laws of operation of the Western capitalist market economy, with the purpose of publicizing the rationality of the capitalist economic system [13]. It has certain differences with the socialist economic system. Therefore, the content of the western economics course and its own characteristics determine that it has the characteristics of political thinking, which requires that teachers should not be confined to the explanation of the original knowledge system in teaching, but should be compared and contrasted with the actual situation in a critical way. In other words, if the teaching of western economics courses at the same time to carry out political education, the use of some teaching techniques and appropriate teaching methods, you can make students in the study of professional knowledge at the same time by the intangible inculcation, enhance the sense of identity and sense of honor to the country, the development of the nation.

(2) An important way to improve the quality of applied talents training

At present, higher education has entered the stage of improving quality from the stage of scale expansion, and improving the quality of schooling and enriching the connotation of schooling has become the primary task of each university to seek development.

In such a situation, the construction of western economics courses in colleges and universities should be based on the social reality, focusing on the process of teaching theoretical knowledge to guide students to establish a correct world view, outlook on life, values, so that they can fully understand the operation mechanism of the market economy, and cultivate students into applied talents with a high degree of social responsibility and a sense of mission for the construction of a modernized and powerful country.

(3) Inevitable requirements for cultivating students' correct economic and world views

Western economics mainly studies how to rationally allocate and utilize resources under the condition of resource scarcity in order to maximize the benefits. In the process of teaching western economics, integrating the content of social ethics and morality and guiding students to discuss economic issues can not only stimulate students' interest in learning and make them think deeply about economic issues, but also help them establish a correct economic outlook.

II. C.The Mining of Curriculum Civics Elements in the Teaching Process of Western Economics

The excavation and refinement of the elements of course politics is an important prerequisite for practicing “people-oriented, moral education first” in Western economics under the perspective of new liberal arts, and solves the key problem of “what to talk about” in the reform of course politics education.

(1) The source of the ideological and political elements of the Western economics course

Excellent cultural heritage, nurtured by the “mediocrity”, “peace is precious” and other philosophical ideas, and the balanced concept of Western economics has a profound inner connection, can provide rich nutrition for the excavation of the elements of the course of political thinking.

(2) Mining of Civic-Political Elements in Western Economics Courses

The mining of the elements of the Civic and Political Science of the curriculum, first of all, is at the basic knowledge level, which is usually dispersed in the content of each specific chapter of the textbook. The elements of Civics at the knowledge level are characterized by many, detailed and miscellaneous, which are relatively easier to be mastered and used by teachers, and are also the prerequisite for higher-level education in Civics.

The elements of Civic Politics at the knowledge level of Western economics are isolated, fragmented and scattered, and teachers need to dig deeper into the intrinsic connection between the elements, carry out refinement, fusion and energy level upgrading, and rise from the knowledge level to the level of skills, thoughts and consciousness.

The ideological and political ideology or consciousness level of the course is as follows: cultivate students' rational thinking and learn to think about problems like economists. Balanced approach with harmonious, win-win thinking. "Two hands" is usually better than "one hand". Since both the visible and invisible hands have advantages and disadvantages in resource allocation, the logic is naturally to combine the two closely, which is in line with the middle-of-the-road thinking in traditional culture. Demand management affects short-term fluctuations in the economy, while long-term economic growth still depends on the fundamentals of the economy, such as capital, population and innovation.

II. D.Intelligent technology-enabled Western Economics Course Civic and Political Integration Paths

II. D. 1) Teaching Methods and Teaching Competencies

(1) Innovative Teaching Methods: Expanding the Path of Civic-Political Integration in Courses

In the teaching practice of western economics, the traditional teaching methods often focus on classroom lectures, light on practical exploration, heavy knowledge transfer, light on ability cultivation, heavy theoretical indoctrination, light on the integration of Civics and Politics, resulting in the teaching of the course is prone to the emergence of the students' theoretical knowledge is solid. But the practical ability and value shaping relatively lagging behind the “short board effect”.

Under the background of intelligence, the innovation of teaching methods should be enhanced through the whole process of empowerment before, during and after class. Before class, based on intelligent teaching + exploratory teaching methods, students learn the main content of the course in catechism and Internet platforms, and at the same time use the Internet, multimedia, literature search, artificial intelligence, etc. to conduct independent inquiry and form independent learning reports.

During the class, based on classroom lectures + discussion-based teaching + case teaching methods, teachers systematically explain and sort out the course content system, guide students to exchange independent learning experiences and effects, and help students establish a correct value system.

After class, based on the digital intelligence teaching and learning + heuristic teaching methods, further independent practice around the main body of the course content, make full use of the network digital intelligence technology teaching and learning platform and practice teaching platform, in-depth analysis of economic phenomena and the laws of social development under the guidance and inspiration of the teacher, mobilize the enthusiasm of students to learn, and cultivate good thinking and correct values in economics.

(2) Strengthening Teaching Ability: Improving the Mathematical and Intellectual Literacy of Professional Teachers

At this stage, the teaching of western economics courses is mainly based on the traditional teaching of theoretical knowledge. The time and space for the integration of course Civics is limited to offline classrooms and classroom teaching time, and teachers impart Civics content during classroom lectures. Therefore, in the traditional education and teaching reform and the construction of course Civics, the capacity development of teachers of specialized courses mainly focuses on academic upgrading, teaching skills training, and accumulation of professional knowledge reserves. However, the law of diminishing marginal utility occurs when Civic-Political education is conducted purely in the classroom space, and the value-led effect on students gradually decreases.

II. D. 2) Civics Teaching System for Western Economics Courses

The framework of the Civic and Political Teaching System of Western Economics Course in the context of digitalization is shown in Figure 1.

Under the background of digital intellectualization, the western economics course Civic and political education presents the characteristics of digitalization, networking, diversification, abstraction and multi-scenario. Teachers of specialized courses should focus on the improvement of digital literacy while improving their professional knowledge reserves. On the one hand, teachers' basic knowledge of digital intelligence is improved through technical training, independent study and peer exchanges. On the other hand, through the introduction of incentives and policies, teachers are encouraged to change their concepts, actively adapt to the changing trends of society, actively explore ways of combining digital intelligence technology with Civic and political education, and utilize digital intelligence technology to support the integration of Civics into the pathway and improve the effect of Civic and political education.

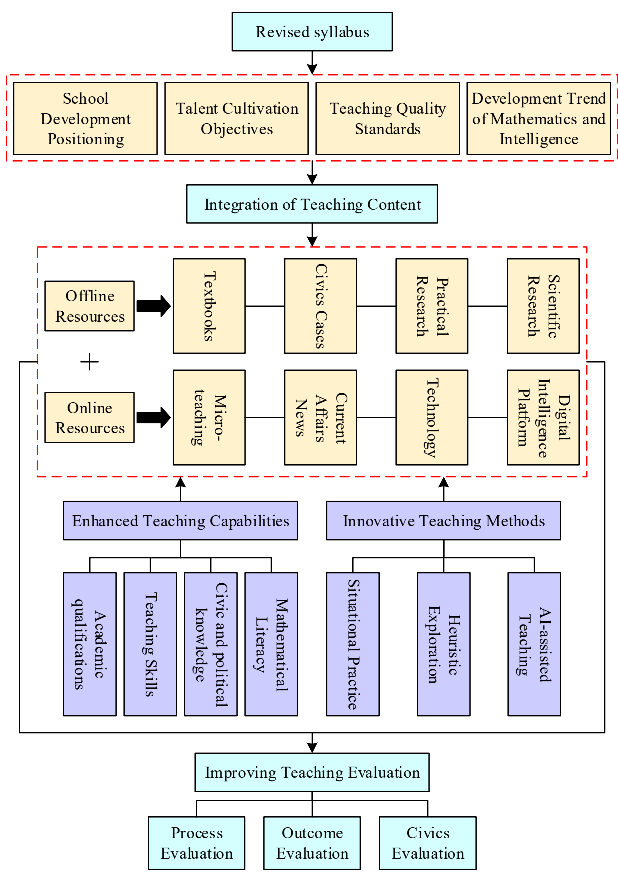

Figure 1: Western economics curriculum thinking politics teaching system framework

III. Optimization of university curriculum ideology based on artificial intelligence technology

III. A. Functional Design of Artificial Intelligence-Enabled Smart Teaching Platforms

III. A. 1) Learner Portrait Modeling

(1) The platform extracts key information from multi-dimensional data such as behavioral data, learning habits, and interests through convolutional neural networks and deep belief networks to ensure the accuracy and multi-dimensional characterization of the portrait.

(2) Collaborative filtering algorithms combined with matrix decomposition intelligently recommend resources, improve matching accuracy and optimize learning paths, so that resources are highly compatible with learner needs.

(3) Reinforcement learning deep Q-network to realize dynamic updating of the portrait, adjust the recommendation strategy based on real-time feedback to ensure that the portrait is consistent with the actual situation of the learner.

(4) Emotion computing analyzes facial expressions, voice and text emotions, adjusts the teaching rhythm and resource recommendation, and improves the learning experience.

III. A. 2) Western Economics Program Civics Module

(1) Generative Adversarial Networks provide students with diverse cases of Western Economics through deep learning of existing program data to help efficient comprehension.

(2) Bayesian Optimization and Collaborative Filtering Technology intelligently matches the Western Economics course's Civics module to highly match learner behavioral data with teaching needs, improving teaching success and course fit.

(3) Natural language processing technology guides students in market research and technology positioning through the analysis of economics data and related industry reports, shortening the search time and pinpointing teaching resources tutoring.

III. A. 3) Artificial Intelligence Based Course Content Matching Module

(1) The Transformer model performs deep semantic analysis of the course content through the attention mechanism, realizing accurate matching with learners' needs.

(2) Knowledge map structurally presents the knowledge points of the course, reveals the connection and hierarchy, and intelligently recommends related knowledge according to the learning process to ensure the coherence and depth of learning.

(3) Convolutional neural network processes learners' behavioral data, generates a multi-dimensional interest model, and pushes the most suitable course content through the personalized recommendation engine.

(4) Collaborative filtering technology analyzes learner similarity, optimizes the course recommendation strategy, dynamically adjusts the content, and ensures real-time adaptation of course resources and learner needs.

III. B. Functional Module Key Technology Development

III. B. 1) Establishment of user profiles of college and university students

Before recommending teaching resources for college students, a conditional random field model incorporating long and short-term memory neural networks was first applied. Long and short-term memory neural network is a variant of recurrent neural network (RNN). According to the information field definition inspiration principle, the basic information of college student users is extracted in an all-round way, based on which the college student user profile is established. The user information extraction model is applied to the homepage of college libraries, and the college student profile information is extracted through the steps of mailbox and avatar information extraction and webpage preprocessing. The entity structure and text information of each college student user's homepage have some similarity, and this part of information is inputted into the long and short-term memory neural network model to automatically extract the user webpage information features, and the text is subjected to lexical processing, so that the corresponding information can be screened out more accurately.

In the webpage preprocessing link, considering the existence of some redundant information in the user profile, this part of information will interfere with the western economics course recommendation and increase the computational complexity of the course recommendation algorithm. Therefore, the 1st session of college student user information extraction needs to start cleaning for user web pages.

Invalid tags are used to annotate the redundant information in the webpage, and the annotated information is removed by text filtering to get the simplified text information of the user webpage. Valid tags are set for the types of information extracted. Summarize all the labels to build a thesaurus table, input it into the long and short-term memory neural network to extract word features and character word vectors.

The word features are extracted as follows:

$$h(t) = f_{LSTM}(x(t), h(t-1)) \tag{1}$$

where $x(t)$ denotes the t th input word, $h(t-1)$ denotes the hidden state at the previous time step, and $h(t)$ denotes the hidden state at the current time step. By inputting words one by one and constantly updating the hidden state, the LSTM model can capture the dependencies between words and extract the feature representation of the words.

The character word vectors are extracted as follows:

$$v(t) = f_{LSTM}(c(t), v(t-1)) \tag{2}$$

where $c(t)$ denotes the t th character, $v(t-1)$ denotes the vector representation at the previous time step, and $v(t)$ denotes the vector representation at the current time step. By inputting characters one by one and continuously updating the vector representation, the LSTM model can learn the character-level contextual information and generate the corresponding word vector representation.

III. B. 2) Course Recommendation Techniques Based on Generative Adversarial Networks

The original GAN consists of two parts, a generator G and a discriminator D. Where G is responsible for capturing the distribution of real sample data and generating fake data that resembles the real data as much as possible.D is a binary classifier that determines the probability that the input sample data comes from the real data distribution.

The goal of G is to learn the distribution $P_{data}(x)$ of the real data, and after inputting the random variable z (which will generally be referred to as noise) to G, G generates a spurious data $G(z)$ that is similar to the real sample, with a distribution notated as $P_z(x)$.

The input to D is divided into two parts, the false data $G(z)$ and the true data x. The goal of D is to determine whether the input data is false data generated by G or real data, and its output is a probability value in the interval 0~1. The closer it is to 0, the higher the probability that D considers the data to be false data. The closer it is to 1, the greater the probability that D considers the data to be true.

In the optimal case, the false data generated by G has the effect of making it false, making it completely impossible for D to distinguish whether the data is false data generated by G or real data, i.e.:

$$D(x) = \frac{P_{data}(x)}{P_{data}(x) + P_z(x)} \tag{3}$$

The value of equation (3) is close to 0.5.

Generally in this case it is considered that G has been trained to be optimal, has successfully captured and learned the distribution of real data, and that G and D have reached a Nash equilibrium.

The overall optimization objective of GAN is actually a miniaturization of the maximal problem, as shown in Equation (4):

$$\begin{aligned}\min_G \max_D V(D,G) = &\mathop{\mathrm{E}}_{x \sim P_{data}(x)}[\log D(x)] \\ &+ \mathop{\mathrm{E}}_{z \sim P_z(z)}[\log(1 - D(G(z)))]\end{aligned} \tag{4}$$

GAN is optimized in two steps per round.

Step 1 fixes G, i.e., the parameters of G are not updated. At the same time, optimize D to find the current optimal discriminator. For Eq. (4), at this time, G is no longer updated, and the interval of the output result of $D(x)$ is $[0,1]$, so the range of values of $\log(D(x))$ and $\log\left(1 - D(G(z))\right)$ is $(-\infty, 0]$. In order to maximize the formula, $D(x)$ outputs a value close to 1 and $D(G(z))$ outputs a value close to 0, which means that D successfully identifies the true data from the false data.

Step 2 fixes D while optimizing G to find the current optimal generator.

At this point in the equation $\mathop{\mathrm{E}}_{x \sim P_{data}(x)}[\log D(x)]$ will not be updated, just focus on the other item in the equation $\mathop{\mathrm{E}}_{z \sim P_z(z)}\left[\log\left(1 - D(G(z))\right)\right]$. In each round of optimization, the discriminator should be a little stronger than the generator, but not too much. So in general, the discriminator is updated many times before the generator is updated once. G and D play against each other, and eventually both reach the optimal state.

For the original GAN, the generation process is not subject to any constraints, resulting in uncontrollable generated data. In order to constrain the generation process, the conditional generation adversarial network (CGAN) is proposed. CGAN differs from GAN in that the inputs of both G and D are additionally added with a conditional variable y. y can be a category label, a descriptive text. CGAN guides and constrains the generation process through the conditional variable y, so that the result generated by G can fit the conditional variable y. If y is a category label, then we can regard the CGAN as an improvement of unsupervised learning GAN model to supervised learning.

The objective function of CGAN is similar to that of GAN, except that the conditional variable y is added to the input part of G and D, and the form of the objective function is shown in Equation (5):

$$\min_{G}\max_{D} V(D,G) = \underset{x\sim P_{data}(x)}{\mathrm{E}}\left[\log D(x\mid y)\right] + \underset{z\sim P_{z}(z)}{\mathrm{E}}\left[\log(1-D(G(z\mid y)))\right] \tag{5}$$

The training steps of CGAN are also similar to those of GAN. While the input parts $G(z\mid y)$ and $D(x\mid y)$ of the variables are written in the form of conditional probabilities in Eq. In the specific implementation of CGAN, it is only necessary to splice z or x with y.

In this paper, we encode the attribute features of users as additional information conditions of CFGAN model, and different users have different attribute features. Common user attribute features include: gender, age, occupation, income, interest, zip code, etc. In this paper, user attributes are categorized into category type, enumeration type and numeric variables for encoding. For category type variables encoded using one-hot, this method will generate multiple features after mapping. For enumerated type user attributes, the nominal type data is mapped as a set of numbers, and the same nominal type is mapped as the same number, and this mapping finally generates only one feature.

For numeric types, the data is standardized by subtracting the mean and then dividing by the variance (or standard deviation), and this method of data standardization is processed so that the data conforms to a standard normal distribution. Numerical type attributes such as age and income type can be characterized by this method. Finally, all the processed attribute features are concatenated as the user's attribute feature vector, and each item of this feature vector has a clear meaning without any dichotomy.

The CFGAN model based on user attributes differs from the original GAN model in that different results can be generated depending on the random noise variable z. The goal of recommender system is to generate one most reasonable recommendation result for the user instead of multiple results, so the random noise variable z is not used.

GAN aims to make the generator produce interaction vectors that are as similar as possible to real user interaction vectors. That is, G tries to simulate the sparsity of real data, and only the output of G on the interaction terms helps the learning of G and D, so the terms in the generated user interaction vector $\hat{r}_u$ corresponding to the uninteracted terms of the real user interaction vector r_u are masked. Through the mask $\hat{r}_u \odot e_u$, in series with the user attribute vectors are fed into the discriminator for true/false discrimination and return the gradient for further learning by the generator, where e_u is an n-dimensional indicator vector $\left(e_u = r_u\right)$ that specifies whether or not u is interacting with the item i (interacting then $e_{ui}=1$ else $e_{ui}=0$), and $\odot$ denotes the product by element. $D(\cdot)$ denotes the probability that the input comes from a real user interaction vector, and the discriminator wants to distinguish the real data from the generator-generated data as much as possible, i.e., to make $D(r_u\mid c_u)$ as large as possible and $D((\hat{r}_u \odot e_u)\mid c_u)$ as small as possible. The generator G wants to generate interaction vectors that are close to the real interaction vectors, i.e., even if $D((\hat{r}_u \odot e_u)\mid c_u)$ is as large as possible. For the sake of model simplicity, both objective functions are transformed into minimization problems, so the objective function J^D of the discriminator D can be expressed:

$$\begin{aligned} J^D &= -\mathrm{E}_{x\sim p_{data}}\left[\log\left(D(x\mid y)\right)\right] - \mathrm{E}_{\hat{x}\sim p_g}\left[\log\left(1-D\left(G\left(z\mid y\right)\right)\right)\right] \\ &= -\sum_u\left(\log D\left(r_u\mid c_u\right) + \log\left(1-D\left(\left(\hat{r}_u \odot e_u\right)\mid c_u\right)\right)\right) \end{aligned} \tag{6}$$

The objective function J^G of G can be expressed as:

$$J^G = \sum_u \log\left(1-D\left(\left(\hat{r}_u \odot e_u\right)\mid c_u\right)\right) \tag{7}$$

The model performs adversarial learning by minimizing J^D and J^G, where c_u denotes the user's attribute vector and $\hat{r}_u \odot e_u$ denotes the value of the original non-interaction term in the masked user-generated interaction vector.

When the adversarial training is completed, the generator G generates the dense vector $\hat{r}_u$. Denote by I the set of all items and I_u the set of items of interaction items of user u. The j th element in $\hat{r}_u$ denotes the predicted preference score of user u for each item j. Eventually the top-N items with the highest predicted scores in the set of items in $j \in I \setminus I_u$ are selected and recommended to user u, where $I \setminus I_u$ denotes the set of items other than the set of items of user u's interaction items.

To solve the problem of mundane solutions, CFGAN introduces the partial masking method.

Partial Masking Method (PM): $N_u^{\mathrm{PM}(t)}$ and S^{PM} are used to denote the negative sample items selected in the t th round of training and the sampling proportion parameter, respectively. In each round of training iteration, items corresponding to $N_u^{\mathrm{PM}(t)}$ are retained, assuming that these items are not relevant to the user and that D and G have to take them into account during the training period, and D now utilizes inputs not only from the interacting items, but also from the negatively-sampled items, in the discriminative task. D The loss gradient in the output of the negative sample items is passed back to G, and G is guided so that the output it generates is closer to 1 for the interactive items, and closer to 0 for the selected negative item samples. The objective functions of D and G are modified as follows, respectively:

$$J^D = -\sum_l \left(\log D\left(r_u \mid c_u\right) + \log\left(1 - D\left(\hat{r}_u \odot \left(e_u + k_u\right)\right) \mid c_u\right)\right) \tag{8}$$

$$J^G = \sum \log\left(1 - D(\hat{r}_u \odot (e_u + k_u) \mid c_u)\right) \tag{9}$$

And meet:

$$k_{uj} = \begin{cases} 1, & j \in N_u^{PM(t)} \\ 0, & Other \end{cases} \tag{10}$$

IV. Optimization results of the integration of Civics and Politics in the Western Economics course

IV. A. Smart Teaching Platform Course Application

The datasets used in this chapter are Movielens 100K and Movielens 1M. Movielens is a movie rating dataset widely used to study the performance of collaborative filtering algorithms, in which the Movielens 100K dataset has a total of 10,000 pieces of interaction data, with a data sparsity of more than 90%. The Movielens 1M dataset has a larger size which contains more than 1 million pieces of interaction data with a data sparsity rate of more than 90%.

The experiments in this chapter are divided into training set and test set according to the ratio of 9:1. The experiments in this chapter only use the triad of user ID, item ID, and rating information, and the rating information in the original dataset is transformed into an implicit feedback form of 0 or 1.

IV. A. 1) Comparison algorithm

ItemPop: Items are sorted in descending order based on the number of item interactions in the training set. This is one of the simplest non-personalization algorithms, but is considered as a baseline for evaluating other personalization algorithms.

BPR: Optimizing matrix decomposition models using pairwise loss functions is a commonly used baseline for comparison.

FISM: This is an item-based recommendation algorithm that generates two vector representations for each item, for historical interaction items and target items.

CDAE: applies a noise-reducing autoencoder to the recommendation task by adding noise to the user data before feeding it to the noise-reducing autoencoder, and adding a specific user feature vector for each user.

IRGAN: This is the first GAN-based collaborative filtering approach that unifies the generative and discriminative models for recommendation tasks and updates the model parameters using a policy gradient-based reinforcement learning approach.

GraphGAN: This is a recommendation method similar to IRGAN, where the authors propose the graph-softmax approach to compute the distribution of user preferences for items.

IV. A. 2) Experimental environment

The experimental programming environment in this chapter is carried out under windows 10 system with CPU model i7. In order to reduce the running time of the experiment, a GPU with model NVIDIA GTX 1060Ti is used for acceleration. The algorithm model in this chapter is built based on TensorFlow deep learning framework and the programming language used is python 3.6.

The comparison results of Movielens 100K are shown in Fig. 2, which shows the comparison results of CFGAN algorithm on the dataset with all the compared algorithms when the test list N is taken as 5 and 20.

Overall, the CFGAN algorithm achieves the best experimental results on the data set Movielens 100K.The CFGAN algorithm improves over the better performing GraphGAN algorithm by 0.29, 0.127, 0.039, 0.127, 0.368, 0.228, 0.425, and 0.384 for each metric.

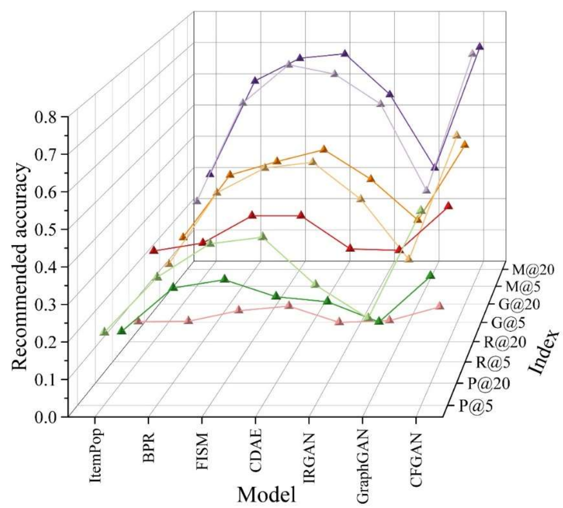

Figure 2: Movielens 100k comparison results

The comparative results for Movielens 1M are shown in Fig. 3 for the CFGAN algorithm on the dataset when the test list N is taken as 5 and 20.

On the Movielens 1M dataset, the degree of improvement in the recommendation accuracy of the CFGAN algorithm is similar to that on the Movilens 100K dataset, which is a relatively large data size dataset containing more than one million user-item interactions, and the CFGAN algorithm still achieves better recommendation results. The scores on each metric are 0.424, 0.372, 0.154, 0.306, 0.477, 0.434, 0.682, and 0.681, in that order.

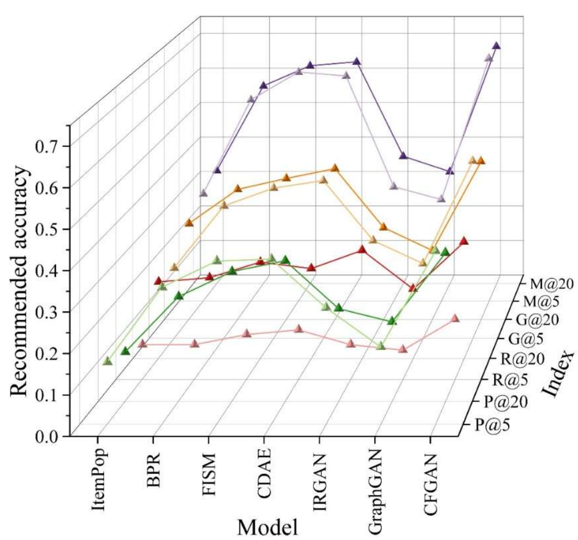

Figure 3: Movielens 1m comparison results

IV. B. Results of Curriculum Civic Integration

In the first semester of 2023-2024, a total of six classes of freshmen, sophomores and juniors in an applied college were selected for the experiment, in which freshmen, sophomores and junior 1 classes were the experimental classes and freshmen, sophomores and junior 2 classes were the control classes. The experimental and control classes in the same grade were taught by the same economics major teacher.

For class 1 and class 2, the teacher made different requirements as follows:

Class 1: Students completed the tasks assigned by the teacher on time, and students had to make full use of the resources on the smart teaching platform provided by the teacher to complete tasks such as pre-class pre-study and completing the pre-class pre-study effect test questions. Based on the Numerical Intelligence Teaching and Learning Support, students make full use of the online Numerical Intelligence Technology Teaching and Learning Support Platform and the Practical Teaching Platform to analyze the economic phenomena and the laws of social development in-depth under the guidance and inspiration of the teachers.

Class 2: Students review the content of the previous class and preview the new class in the traditional way.

The purpose here is to analyze the learning effect of Western Economics course Civics and Politics of students in applied colleges and universities under the support of smart teaching platform. Students are the main body of learning and the direct beneficiaries of the learning of Western Economics Course Civics and Politics based on the support of smart teaching platform. In order to test the practical effect of teaching students in applied colleges and universities the Civics and Politics of Western Economics course through the Smart Teaching Platform designed by artificial intelligence technology, two scores (midterm examination score and final examination score) of students in the experimental class and the control class, were compared and analyzed in one semester of practice.

Using SPSS27.0 tool, independent samples t-test and paired samples t-test were used to test whether there is any difference and the degree of difference between the grades of experimental class and control class in the same grade. Class 1 was the experimental class and class 2 was the control class.

The comparison of midterm grades between experimental and control classes is shown in Table 1. The test of midterm grades of experimental and control classes in freshman, sophomore, and junior years showed that there was no significant difference between the grades of experimental and control classes in the first period.

Table 1: The experimental class is compared to the midterm

	Class 1	Class 2	T value	P value
Freshman year	89.652 ± 20.151	92.554 ± 18.019	0.562	0.781
Sophomore	92.175 ± 17.824	91.908 ± 19.521	0.896	0.496
Junior	91.860 ± 18.549	90.134 ± 20.164	0.711	0.524

The results of the comparison of the final grades of the experimental and control classes are shown in Table 2.

After the freshman, sophomore, and junior 1 classes passed the western economics course Civics study supported by the smart teaching platform in this semester, the average grade of western economics in the classes was higher than that of the freshman, sophomore, and junior 2 classes.

The results of independent samples t-test show that the t-value of the sophomore class is 0.428, the sig value is 0.075 greater than 0.05, and there is no significant difference between the final grades of the experimental class and the control class.

However, the sig values of 0.018 and 0.042 for the freshman and junior year are less than 0.05, and there is a significant difference between the final grades of the experimental class and the control class. The use of smart teaching platform for western economics course civics learning can enhance students' understanding of the relationship and connotation of western economics and course civics more quickly, and strengthen the cultivation of economics talents in applied colleges and universities.

Table 2: The results of the final results of the experimental class and the comparison class

	Class 1	Class 2	T value	P value
Freshman year	95.623 ± 17.521	91.054 ± 18.403	0.356	0.018
Sophomore	96.218 ± 15.894	92.187 ± 19.567	0.428	0.075
Junior	96.565 ± 18.002	91.245 ± 18.899	0.652	0.042

V. Conclusion

The experimental results show that the intelligent teaching platform based on artificial intelligence technology has a significant effect on the optimization of western economics course civics. In terms of final exam scores, the experimental class scored significantly higher than the control class in the freshman and junior years, and the P-values were 0.018 and 0.042, respectively, indicating that the application of the intelligent platform significantly enhanced students' learning performance. In addition, the intelligent teaching platform effectively enhances students' learning interest and value identity by means of personalized recommendation and learner profiling, and strengthens the penetration of course ideology and politics. Taken together, the application of AI technology not only optimizes the teaching effect of the course, but also provides a new path for the innovation of the Civic and Political Education in colleges and universities, which has a greater promotion value.

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