

Retraction

Retracted: Optimization of Flipped Classroom Teaching Model Based on Social Cognitive Network

Complexity

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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] X. Wang, "Optimization of Flipped Classroom Teaching Model Based on Social Cognitive Network," *Complexity*, vol. 2021, Article ID 4313188, 12 pages, 2021.

Research Article

Optimization of Flipped Classroom Teaching Model Based on Social Cognitive Network

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This article evaluates learners' thinking in the complex environment of teaching level and cognitive construct process and examines learners within the framework of cognitive factors, as well as the degree of consistency in the training process, in the social practice as the teaching of teachers and students to provide timely and dynamic feedback, first of all to "evidence centered" education evaluation of design patterns and cognitive framework theory as the theoretical basis. An evaluation model based on learners' cognitive network analysis is designed and constructed by integrating cognitive visualization analysis techniques such as network analysis. Secondly, at the beginning of action research, the teaching framework structure sequence is established under the guidance of the implementation model of flipped classroom, and the investigation results of the current situation are designed under the guidance of operational steps and organizational strategies, and categories and autonomous learning theories are divided, so as to preliminarily construct strategies to improve the ability of autonomous learning. Then through three rounds of iterative action research to improve the flip classroom teaching middle school students' autonomous learning ability of teaching strategy, the interview method is used; the questionnaire and autonomous learning process to improve the students' autonomous learning ability training effect evaluation questionnaire is analyzed, and finally a complete set of reverse ascending of classroom teaching is formed to improve students' autonomous learning ability of effective classroom strategies.

1. Introduction

At present, the new generation of information technology represented by mobile Internet, cloud computing, big data, and artificial intelligence has changed the way of knowledge creation and dissemination and affected the entire education ecology, talent training objectives, and teaching mode. "We will make every effort to promote the deep integration of information technology with education and teaching, build high-quality open online courses and resource libraries that combine curriculum teaching with application services, encourage teachers to use information technology to improve their teaching level, innovate teaching models, and make good use of high-quality digital resources in various ways, such as flipped classroom and mixed teaching. Implement student-centered heuristic, cooperative, participatory and discussion-based learning methods, and strengthen personalized training [1]." "Education informatization is regarded as the endogenous

variable of the systematic reform of education, supporting and leading the development of education modernization, promoting the renewal of education concept, model reform and system reconstruction [2]." Flipped classroom development students need to have higher self-learning ability, because only with high self-learning ability, students can effectively use learning resources to learn and find problems at their own pace. Through further active and collaborative learning in the classroom, the internalization of knowledge is completed. Therefore, how to improve students' autonomous learning ability has become an urgent problem to be solved in the development process of flipped classroom.

Existing researches on flipped classroom teaching mode mostly use Excel, SPSS, and other statistical analysis tools to analyze learning data, but such a number, table, and stacked presentation method is difficult to vividly show the specific development level and cognitive structure of individual learners, as well as lack of support to learn analytical

techniques. With the help of cognitive network analysis and other new learning analysis tools, discourse data generated in the teaching process can be collected, which is a supplement and improvement to the previous educational evaluation methods. Study analysis technology education activities can accumulate large amounts of data in the right way, which not only can be used but also can show details of data at the same time, keep insight on detailed data, and realize the precise evaluation of learners, as well as learning analysis technology combined with statistical analysis method, and it is feasible to evaluate the learner's cognitive level comprehensively and in depth. Reasonable use of learning analysis technology for educational evaluation, using evaluation feedback to promote the decision-makers to comprehensively, correctly, in-depth understand data, and scientific educational decision-making, plays a key role. What evaluation method should be used has been determined; therefore, how to use these learners to solve complex problems caused by words of abundant data and measure their knowledge, skills, degree, and development level of thinking and cognitive differences and the ability of how to use visual feedback in personalized teaching has become a problem to solve.

Based on the characteristics and theories of flipped classroom, combined with the typical flipped classroom model, the framework and links of flipped classroom model implemented in this study are constructed, and flipped classroom students are taken as the practical objects to carry out teaching practice activities. Through practice, this paper discusses whether the flipped classroom teaching model can promote the cultivation of flipped classroom students' autonomous learning ability and what specific aspects are reflected in the changes of flipped classroom students' autonomous learning ability. In "flipped classroom," students' autonomous learning ability is analyzed, the teaching practice effect of "flipped classroom" is verified, relevant conclusions are drawn through practical activities, and problems that need to be paid attention to in the implementation process are summarized, so as to enrich the perspective of flipped classroom teaching model research and increase the research depth of flipped classroom. At the same time, it also provides a reference for the practical research of flipped classroom in colleges and universities and provides a practical basis for the development and reform of the new teaching model in China.

2. Related Work

The most striking breakthrough of flipped classroom teaching mode is the change of teaching process. Through my long-term practice in the course of "Linear Algebra," I put forward the whole structure of flipped classroom. It includes two stages: preclass and in class: "preclass is divided into video lectures and targeted exercises; it includes quick and small amounts of feedback, problem solving for internalization, and summary and feedback" [3, 4], but this model is not suitable for liberal arts courses. The experiential learning cycle creates a circular four-stage flipped classroom teaching mode, and a corresponding learning activity is

designed for each stage [5]. This model provides reference for the specific development of classroom activities of teachers in flipped classroom. According to the data, many schools have carried out flipped classroom practice activities [6], and these schools have also built localized flipped classroom model on the basis of practice and achieved varying degrees of effects, which is worth our reference and reflection. In terms of literature content, flipped classroom research involves theoretical research on its origin, definition, characteristics, local applicability of teaching mode, and construction of teaching mode, as well as practical research on teaching design combined with subject application and application effect detection. The applied research fields involve five levels: primary school, junior high school, senior high school, vocational college, and university, among which the flipped classroom teaching model is mostly applied in universities [7, 8]. Based on the differences between Chinese and American cultures, this paper discusses how to localize the advantages of flipped classroom [9]. Based on the investigation of the teaching mode and current situation of colleges and universities and the learning characteristics of students in flipped classroom, this paper analyzes and discusses the feasibility of flipped classroom application in colleges and universities and draws the conclusion that colleges and universities have the hardware environment conditions and students' adaptability conditions for implementing flipped classroom [10, 11]. There are also many scholars trying to put forward the flipped classroom teaching model. A more detailed and explicit model is designed on the basis of flipped classroom model. It is characterized by taking information technology and learning activities as the two major levers to create a learning environment, constructing a personalized collaborative learning environment of flipped classroom, and presenting students' activities completely [12]. Later, through my long-term practice, combined with the concept of gamified learning, he designed the flipped teaching model [13], but these two models are difficult to implement. The Tai Chi thought in traditional Chinese culture and the classification theory of teaching objectives are integrated into the flipped classroom to construct the Tai Chi loop flipped classroom model, which not only highlights "learning" but also gives full play to "teaching," so as to avoid the extreme transformation from "teaching" to "learning" in the flipped classroom, but this model has not been applied in practice [14]. Emphasizing the optimization process of knowledge internalization, the flipped classroom model is analyzed from the macro, meso, and micro levels to form the flipped classroom teaching model from the perspective of knowledge internalization [15]. Some scholars combine the ideas of micro class, MOOCs, SPOC [16] (an online open course type that is more delicate and less popular than MOOCs), and task-driven [17] to design the teaching mode of flipped classroom.

To the relationship of keywords in-depth grasp, further analyzing the collinear matrix [18], the dot of cooccurrence of college English and autonomous learning, autonomous learning in school age level has certain requirements, general ability of autonomic learning and school age normally

distributed, and explain the process of autonomous learning in the liberal arts curriculum action effect is better. Secondly, it is also closely related to key words such as ability cultivation, teaching mode, learning strategy, and network environment, indicating that innovating teaching mode and strategy based on network learning environment to cultivate independent learning ability is an important focus in the research process of independent learning. Thirdly, it is also closely related to classroom teaching, metacognitive strategy, teacher's role, and other keywords, indicating that metacognition plays an important role in the process of independent learning, and teachers' classroom teaching also plays an important role in promoting the improvement of independent learning ability [19–23]. Reasonable components of different research results were absorbed, and a systematic research framework for autonomous learning was proposed [24–27], on which subsequent studies were mostly carried out. The third column of its research framework is the six aspects of task conditions, which are the comprehensive embodiment of confirming whether students are independent in learning. However, in the actual learning environment, there is rarely absolute autonomous learning and extreme involuntary learning, and most of them are in between. Therefore, the focus of attention should be to identify which aspects of learning students are involuntary and then implement targeted educational intervention [28–30]. Autonomous learning can be divided into three stages of cycle phase, the project control, and self-reflection, or will stage, every stage and contains a number of processes, including self-efficacy, goal setting, strategy selection and use, self-process such as observation, self-evaluation also easier operation, more important is focuses on aspects of cultivating the ability of autonomous learning [31, 32] model, points out that the ability of autonomic learning is the result of the system development, a static structure and dynamic process of two components, which constitutes the general cognitive process of autonomous learning and the cognitive process of metacognitive process. It is embodied in three stages: goal setting, plan and strategy selection, and behavior execution and evaluation. Therefore, it is the key to improve the autonomous learning ability to help students establish a positive cognition of their own ability and to conduct systematic training of their own process. It is believed that the acquisition of autonomous learning ability is the process of internalizing external learning skills into self-ability [33], and the role of example and practical practice is the most important. It goes through four stages: observation, imitation, self-control, and autonomy, from imitation of behavior to exemplary of a general pattern or style to imitation of self-control and finally to automation. It is believed that accepting autonomous learning for teaching, observing, and imitating others' effective autonomous learning and practicing by trial and error are effective ways to cultivate students' autonomous learning ability [34–36].

Based on the above analysis, the current flipped classroom research is still in the preliminary exploratory stage. Theoretical research is more, and empirical research is relatively less. The design of teaching mode is based either on theoretical analysis or on the basis of practice summary and has not yet obtained

mature and effective implementation mode. Moreover, in the practice research of flipped classroom, more attention is paid to the changes in students' final academic performance than to the improvement of students' other abilities. In terms of the current research status, there is still a lot of room for theoretical research and empirical research on flipped classroom. We can verify the effect of flipped classroom teaching mode from multiple perspectives, including teachers' teaching methods and students' learning methods.

3. Research on the Framework of Flipped Classroom Teaching Model

Under the theoretical guidance of flipped classroom teaching mode, combined with existing typical modes, the process and characteristics of flipped classroom are analyzed, and a general flipped classroom teaching mode is constructed, as shown in Figure 1.

As shown in Figure 1, in the implementation framework of flipped classroom, classroom activities begin with the joint determination of difficult problems by teachers and students, and then the interaction between students and teachers and students is carried out. Finally, classroom learning is completed by the joint summary of teachers and students. First, teachers and students focus on the problem and sort out the knowledge together. For the difficult problems before class, students can explore independently or discuss them in cooperation, and teachers can make targeted supplementary explanations to analyze the difficult concepts, properties, and other forms of theoretical knowledge. Second, students complete their homework or show their achievements by themselves. During this time, teachers inspect students to do homework and give individual guidance to students. After the students finish the homework, the teacher will use the way of collective tutoring to comment on the homework exercises, and the students will conduct self-examination and reflection to complete the internalization of knowledge. Finally, teachers and students summarize the knowledge of this lesson together, give feedback on the learning situation, and determine the content to be learned in the next section together.

Inspired by the mixed learning theory, flipped classroom should not only highlight the leading role of teachers in guiding, motivating, and monitoring in the teaching process but also fully reflect the initiative, enthusiasm, and creativity of students as the subject in the learning process. Moreover, the smooth implementation of flipped classroom cannot be separated from the creation of personalized learning environment. Therefore, this model is carried out in three main lines: teacher activities, student activities, and the main learning environment. According to the learning order of learning-first and teaching-second, the whole learning process is divided into three links: before class, in class, and after class. Teachers' activities before class mainly include analyzing the teaching material learning situation, refining the learning content, formulating teaching objectives, preparing teaching resources, designing learning task lists, summarizing difficulties before class, and formulating classroom objectives. Students' activities mainly include

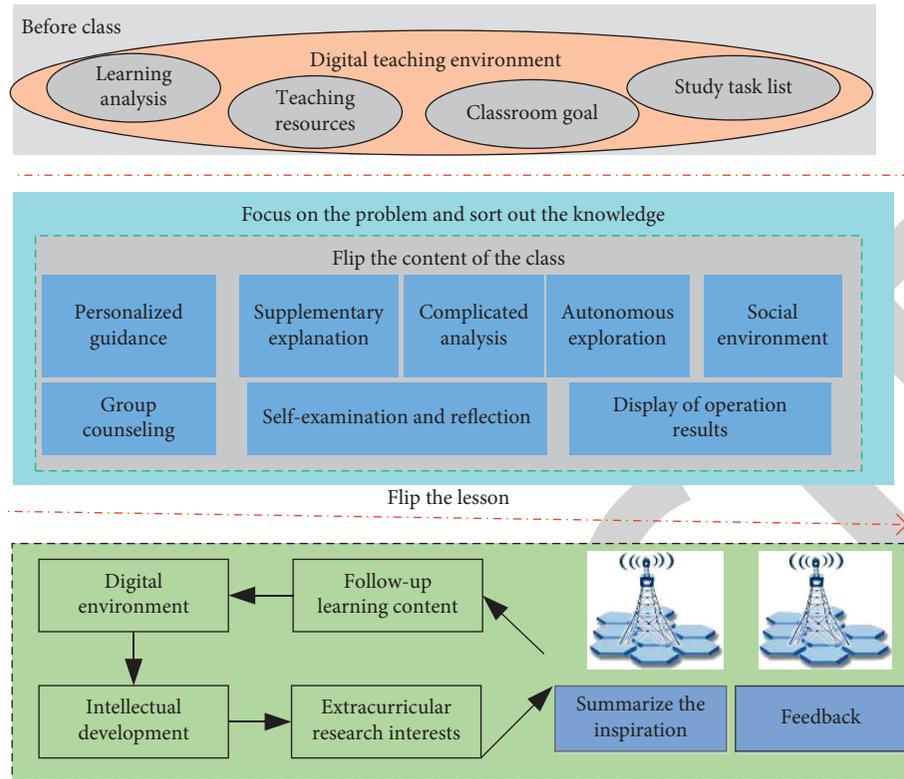


FIGURE 1: Implementation framework of flipped classroom teaching model.

watching teaching videos, collecting auxiliary materials, making learning task lists, asking difficult questions, working in groups, answering questions interactively, and reporting the learning situation before class. The links in the class are mainly the interaction between teachers and students, which can be summarized as focusing on problems, sorting out knowledge, independent exploration, cooperative discussion, supplementary explanation, problem analysis, homework completion, achievement display, personalized guidance, self-examination and reflection, summary and suggestion, feedback and evaluation, and determination of follow-up learning content. The after-class links mainly include the following: teachers guide the direction of knowledge expansion, and students develop their interest in extracurricular exploration.

In order to analyze the specific impact of flipped classroom teaching mode on students' autonomous learning ability, we adopted a self-presentation questionnaire that is relatively easy to design, implement, and score. It has the advantages of objectivity, high efficiency, low cost, quantifiable statistical results, and so on. It is also a commonly used method in the measurement of autonomous learning ability. Instead of specific learning activities, the subjects were given answers based on how well they learned in various situations. The questionnaire is divided into five dimensions: learning motivation dimension, learning strategy dimension, self-monitoring dimension, self-regulation dimension, and learning environment dimension. Each dimension has corresponding subdimensions, each of which is composed of 2 questions, and the total table is composed of 38 questions. Each question states

a learning situation, and the students answer it according to their usual learning situation. The contents of the questionnaire are scored by Likert scale: 1 to 5 points are scored successively from "Very Not Conformed," "Not Conformed," "General," "Conformed," and "Very Conformed," and some of the questions are scored in reverse. The dimension table of autonomous learning ability survey is shown in Table 1.

The algorithm of flipped classroom teaching model of social cognitive network is as follows:

Step 1: initialization process:

- (1) Generate a certain number of knowledge points randomly in the knowledge base (including the position and level of each knowledge point), where X stands for flipped classroom influencing factors:

$$\|\chi(x)\| = \sum_i \exp(\chi(x))^p, \quad (1)$$

$$F_p(x) = \frac{1}{p} \ln \sum_i \exp|p(\chi(x))|. \quad (2)$$

- (2) Randomly assign a knowledge point in the library to each learning agent, but it is not allowed to assign a knowledge point to multiple learning agents repeatedly.

Step 2: Replace the learning process (for each learning agent):

- (1) Imitation learning: two or more knowledge points are randomly selected from the knowledge base,

TABLE 1: Dimensions of investigation on autonomous learning ability.

Dimensions of investigation of autonomous learning ability	Secondary dimension	Explain
Learning motivation	Active consciousness	Active learning without external pressure can take the form of learning-first or learning-more
	Value consciousness	Connect the results of learning activities with your own personal reality, endowing certain value tendency, and strive for it
	Self-responsibility	Degree of confidence in one's ability to complete a certain learning activity
	Self-efficacy	Able to attribute learning success or failure to their own factors
Learning strategies	Repeat	A strategy to promote declarative learning in which information is recalled or practiced over and over again in order to retain information
	Finishing strategy	Give examples, add details, draw inferences, or make associations with other ideas to gain a deeper understanding of the material
	Organizational strategy	According to the relationship between knowledge and experience, I can systematically and orderly classify, arrange, and summarize learning materials, so as to rationalize their structure
	Review the strategy	After class, consolidate the knowledge done that day in time
Self-monitoring	Time to plan	Arrange your study time according to your study content
	Time management	Able to complete the study content according to the planned study time
	Overcome psychological barriers	In the process of learning to overcome irrelevant interference and difficulties, so that learning activities smoothly
	Learning process	Monitor specific learning activities to ensure no deviation from the learning objectives
Self-adjusting	Self-check	Proactively check the correctness of the work
	Self-summary	Summarize the study of a period of time
	Self-assessment	Determine whether the learning result reaches the learning goal and makes progress
	Self-reinforcing	Punish or motivate yourself for the results of your learning
Learning environment	Physical environment	Take the initiative to create material conditions suitable for learning, such as studying in the library
	Social environment	Take advantage of social conditions conducive to learning, such as seeking help from others
	Digital learning environment	Able to consciously and effectively obtain, evaluate, and identify network information resources, use multimedia integrated facilities and platforms

and the selected knowledge points are all the same as the knowledge points of the learning agent itself, and a better knowledge point is selected among these knowledge points according to the competitive selection principle.

$$\ln|\chi(x)| = \sum_i \exp|p(\chi(x))|. \quad (3)$$

(2) Observational learning: the selected knowledge points are compared with the knowledge points of the agent itself, the good point is set as the central point, and the poor point is set as the reference point. Then, the agent learns the principle of domain search, moves to a new knowledge point, and stores the new knowledge x point in the database $F(x)$.

$$F_p(x) = \begin{bmatrix} \varphi_x(x_1 F_1(x)) \\ \dots \\ \varphi_x(x_n F_n(x)) \end{bmatrix}, \quad (4)$$

Step 3: Delete N knowledge points with the worst level from the library.

$$F_p(x) = -y \ln(\exp(-x) + \exp(-b)). \quad (5)$$

Repeat steps 1 and 2 until the stop condition is met.

4. Optimization of Flipped Classroom Teaching Evaluation Model Based on Learner Cognitive Network Analysis

For evaluation of the evidence for the center with design pattern and cognitive frame theory as theoretical basis, this study uses a cognitive network analysis and visual analysis methods and tools used in the education teaching evaluation, under the guidance of cognitive framework theory research as evidence gathering the appropriate data information, through the analysis of the individual (or group) to participate in the real task of interaction, communication words or work. It can reveal the relationship between these attributes in its cognitive framework and conduct visual processing on the collected data to analyze and evaluate the learners' thinking process and learning process. The cognitive framework of learners is explored, the cognitive structure and cognitive level of learners are analyzed, personalized and visual evaluation and feedback are provided, and an evaluation model based on epistemic network analysis is constructed. EB ENA mode by the learners' cognitive framework, cognitive factors, learning, cognitive

network to present evidence, statistical analysis, such as modules, they are mutual coordination between operations, consisting of linked EB ENA mode with learners as the core, the purpose is through to the learners' evaluation to promote the development of the learner's level of thinking and cognitive framework and carry out effective learning. The details of the pattern are shown in Figure 2.

Figure 2 shows the flow chart of the evaluation mode of EB ENA mode. In the diagram, the teaching activity is able to collect the education and teaching activities of data, can be natural or practice of teaching training, and also can be specially designed for example peer evaluation, as well as other forms of teaching activities, such as peer evaluation and examination, including lectures, discussion, collaboration, examination test, and submit work. Learners use their specific cognitive framework for thinking and solving problems; according to different fields, the cognitive framework is decomposed into different cognitive factors, and then reflecting the cognitive factors in the teaching activities record data information, analysis and evaluation as learners learning evidence of development level of thinking and cognitive structure is sought. Through the combination of cognitive network analysis and statistical analysis, the dynamic process of learners' knowledge, skill development level, thinking mode, and cognitive construction is measured.

By defining the concept of autonomous learning ability, four points of concern for improving flipped classroom students' autonomous learning ability in flipped classroom are determined, which are learning motivation, learning planning ability, learning environment utilization, and learning reflection ability. To sequence framework for structure analysis method of teaching, to Jackie Gerstein's "experience to participate in a concept to explore the significance to construct a display application" flip class ring was a strategy based on four-stage model established, combining points class thought and the related knowledge of autonomous learning teaching mode, as well as the existing problems in turn based on the investigation on the current situation in the classroom, the specific construct the strategy model of promote students' autonomous learning ability, and organization strategies of each link, as shown in Figure 3.

Through the investigation and research on the status quo, it is found that students in flipped classroom have a good initial learning motivation, and most of their autonomous learning behaviors take place to acquire knowledge. However, influenced by the difficulty of learning tasks and the cognition of subject value, students lack a reasonable estimate of themselves and have a low sense of self-efficacy, which makes it difficult for them to maintain their initial learning motivation. Therefore, this stage draws lessons from the general operational links of the self-directed learning model based on the problem of meaning construction, including context creation, problem determination, self-directed learning, collaborative learning, effect evaluation, and other links. It focuses on the stimulation and maintenance of students' learning motivation and provides students with certain learning method guidance through relevant organizational strategy intervention, so as to realize the

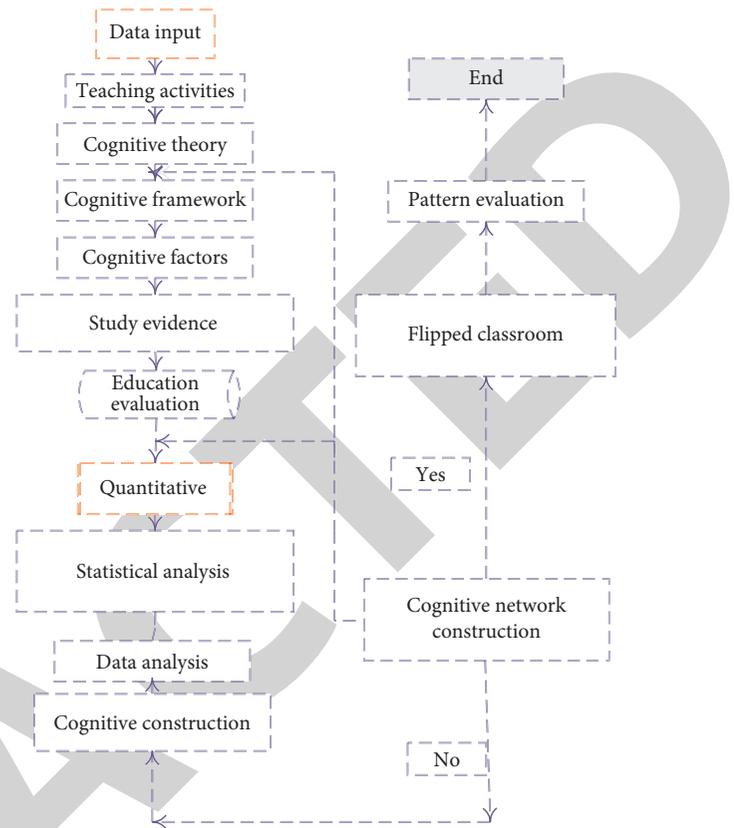


FIGURE 2: Process of flipped classroom teaching evaluation model based on learner cognitive network analysis.

training of students' independent planning ability in flipped classroom, specifically the strategic planning ability. It specifically answers the scientific questions of "why to learn" and "how to learn" in Zimmerman's framework of autonomous learning.

This stage is carried out in the class, and the implementation time can be determined according to the specific teaching arrangement, which is generally the second half of the previous class, including the three following links:

- (1) *Create a Situation*. It has absorbed the relevant research results of social cognition theory and believes that autonomous learning is a process of interaction among self, behavior, and environment. Therefore, by creating an actual or close to the actual learning environment, students can perceive the value of the subject in a relaxed atmosphere, thus mobilizing the enthusiasm and initiative of learning and promoting the occurrence of autonomous learning behavior. The main task of the teacher in this link is to create interesting learning situations closely related to the exploration theme. The creation of task situations should be as consistent as possible, communicate with the class after class, and publish it on the platform of Blue Ink Cloud Class, so that students can reference and summarize each link of the learning process. At the same time, in order to ensure the effectiveness of the situation experience, teachers

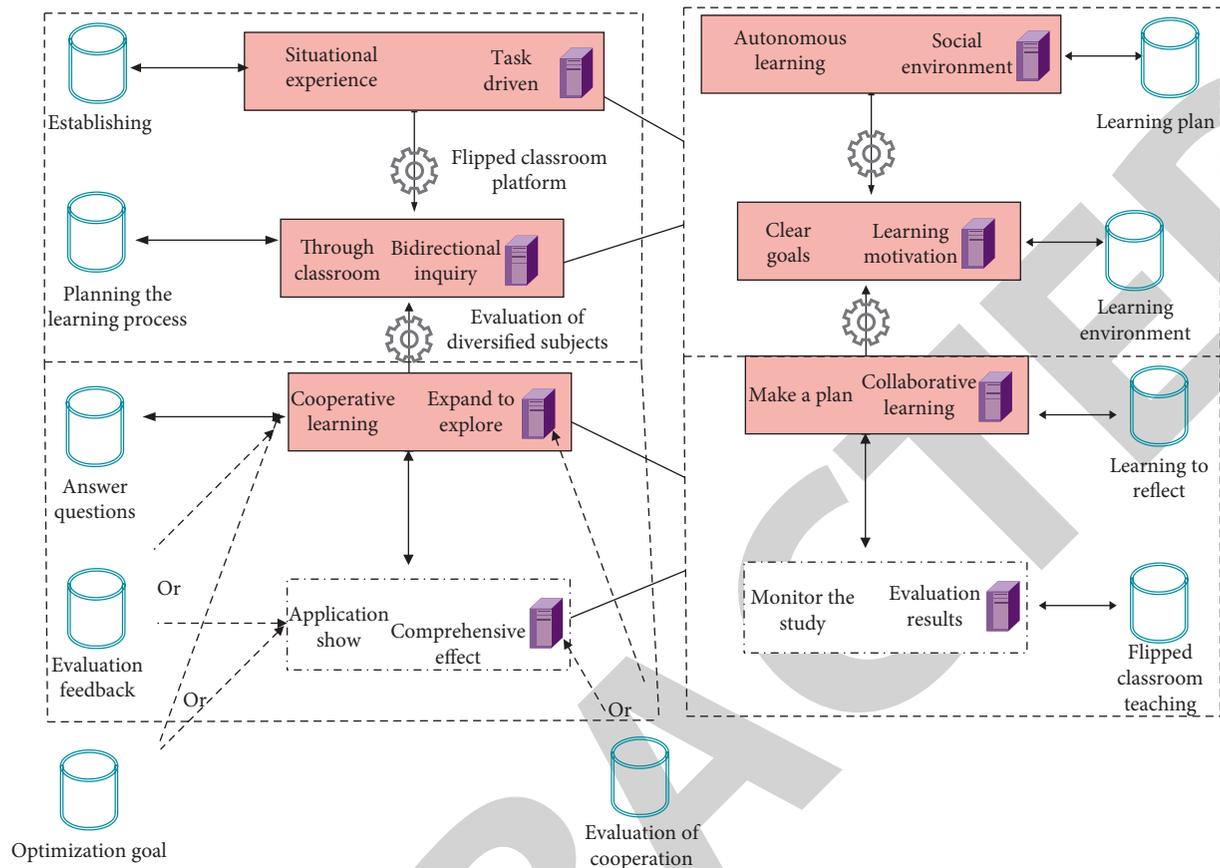


FIGURE 3: Initial strategy diagram of improving students' autonomous learning ability in flipped classroom.

should guide students to record the effective information of the case situation so as to provide a basis for follow-up organization and communication and answer questions. Make the students move closer to the teaching goal

- (2) *Ask Questions.* The cognitive constructivist school of autonomous learning holds that students' learning of knowledge is not a process of passive acceptance but a process of constructing new knowledge through the "interaction" of old and new knowledge on the basis of their own experience and under the guidance of others. Therefore, after stimulating students' motivation through real situational awareness in the previous stage, teachers should propose scientific and reasonable preset questions to make students feel relevant and challenged and try to use the existing knowledge to support the solution of the problems. First let students be based on already uploaded case situation and its own text records of independent thinking, and use the blue ink cloud platform class "brainstorming" activity to record their point of view, and at the end of the stipulated time, open "brainstorming" thinking as a result, in the form of a debate, organizes the student to support or refute analysis from different points of view and based on the student, the zone of proximal

development gives appropriate guidance, the students gradually decompose default problem, successful experience, and thus improve self-confidence, the organic combination of learning and group learning alone.

- (3) *Clear Goals.* According to the social cognition theory of autonomous learning, self-efficacy and set goals are important internal factors that restrict autonomous learning. In a link to fully consider questions and discussion, students formed a relatively messy point of view; teachers should guide students to analyze the intrinsic logical relation between different views, as well as summary, also can be further questions, ask while summary, through its own inductive, combining the general train of thought, and overall grasp the teaching goal, completed the preliminary construction of meaning. The process of viewpoint enables students to gradually obtain successful experience and clarify the goals of independent learning to be carried out after class, thus forming a positive psychological cognitive state. The self-evaluation table of cooperative learning is shown in Table 2.

Comparing each link of research strategy design with the framework of autonomous learning, it can be found that they are basically beneficial to each other. From this

TABLE 2: Self-evaluation table of cooperative learning.

Project	Evaluation content	Score
Participate in the attitude	Actively participate in group activities	10
	Actively provide personal insights to the group	10
	Obey the arrangement of the group and finish the group tasks seriously	10
Cooperation spirit	Be able to actively interact and discuss with members within and between groups, and respect them	10
Innovation and practice	People's opinions and results	10
	Able to actively help team members and learn from them	10
	Propose reasonable solutions to team problems	10
Ability to improve	Self-expression skills have improved	10
	Be able to reflect on your learning process in a timely manner	10

TABLE 3: Comparison table of flipped classroom teaching strategy and autonomous learning process.

Teaching stage	Teaching link	Teachers' activities	Student activities	Psychological dimensions	Focus of autonomous ability
Situational experience (class)	By establishing	Creating situation	Situational experience	Motivation	Learning motivation
	Ask questions	Ask questions	Analyze problems	Social Target	Learning environment
	Clear goals	Combining point	Clear goals	Target	Learning plan
Independent inquiry (class)	Planning to study	Design task list	Independent planning	Method, time	Learning plan
	Personalized learning	Uploading resources	Watch the micro class	Environment, sociality	Learning environment
	Comprehensive effect	To provide feedback	Reflection adjustment	Study result	Reflection on learning
	Group work	Guide the cooperation	Cooperation inquiry	Sociality and environment	Learning environment
	Combining doubt	Communication instruction	To solve the question	Study result	Reflection on learning
Application show (class)	Cooperation with misgivings	Guide the misgivings	Answer and listen to opinions	Method, sociality	Learning plan, learning environment
	Perfect plan	Guide to modify	Suggest for revision	Learning outcomes, sociality	Learning environment, learning reflection
	Expand to explore	Guided inquiry	Independent exploration	Methods, learning results	Learning planning, learning reflection
	Communication show	Your organization	Report the results	Learning outcomes, environment	Study reflection, study environment
	Evaluation of reflection	A comprehensive review	Self-evaluated reciprocity	Study result	Reflection on learning

TABLE 4: Results of Example 1.

No.	X1	X2	X3	X4	X5
1	0.1234	0.6303	0.0005	0.5085	0.0017
2	0.1585	0.5242	0.0034	0.5003	0.0061
3	0.1846	0.4467	0.0082	0.5067	0.0027
4	0.1478	0.5572	0.0006	0.5036	0.0048
5	0.0352	0.8941	0.0013	0.5082	0.0012
6	0.0812	0.7564	0.0022	0.5051	0.0064
7	0.1872	0.4386	0.0022	0.5073	0.0032
8	0.1836	0.4498	0.0065	0.5044	0.0075
9	0.0822	0.7533	0.0028	0.5032	0.0077
10	0.1788	0.4632	0.0022	0.5018	0.0053

perspective, the flipped classroom teaching strategy designed in this study is in line with the theoretical conception of promoting flipped classroom students' autonomous learning. Table 3 shows the flipped classroom teaching design, effective strategies, and the

corresponding autonomous process in detail by referring to the framework of independent learning and combining the teaching design and the teaching strategies mentioned above.

5. Results Analysis

In order to test the solving performance of the optimization algorithm of the flipped classroom teaching mode of the social cognitive network, two examples are selected for numerical calculation. The parameters are set as follows: $N = 350$, $N = 70$, and $T = 1000$, and the maximum iteration algebra is 10000.

Example 1. Linear complementarity problem $F(x) = Nx + p$, where the matrix M and vector q are given by the following equations:

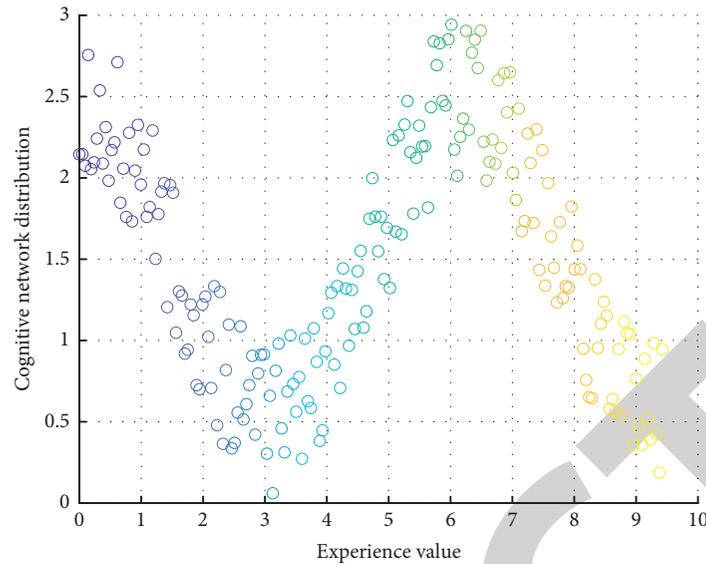


FIGURE 4: Cognitive network diagram of learners in experienced group (*E*) and inexperienced group (*I*).

$$N = \begin{bmatrix} 0, 0, 2, 3, 3 \\ 0, 0, 2, 3, 1 \\ 2, 3, 1, 0, 0 \\ 3, 4, 0, 1, 0 \end{bmatrix}, \quad (6)$$

$$p = \begin{bmatrix} -1 \\ 1 \\ -1 \\ 1 \\ -1 \end{bmatrix}$$

Example 1 was calculated for 10 times, and the numerical results of 10 times were given in Table 4.

In this study, the ENA tool was used to generate cognitive network diagrams of experienced group (*E*) and inexperienced group (*I*). As shown in Figure 4, each small dot represents the center of mass of a learner’s cognitive network. The green dot represents the average center of mass of the cognitive network of the two groups, and the solid line outside the center of mass represents the 95% confidence interval of each group’s center of mass.

In the experimental process, we randomly recorded the solutions searched by the three algorithms and the corresponding running time. Comparison of the search capabilities of the three algorithms is shown in Figure 5, where the abscissa represents the number of records and the ordinate represents the evaluation value of the searched solutions.

As can be seen from Figure 5, the searching ability of the optimization algorithm of flipped classroom teaching mode of social cognitive network is stronger than that of the ISCO algorithm, while that of the ISCO algorithm is stronger than that of the MMAS algorithm.

The average score and standard deviation of students’ digital civic literacy in flipped classroom were 3.58 and

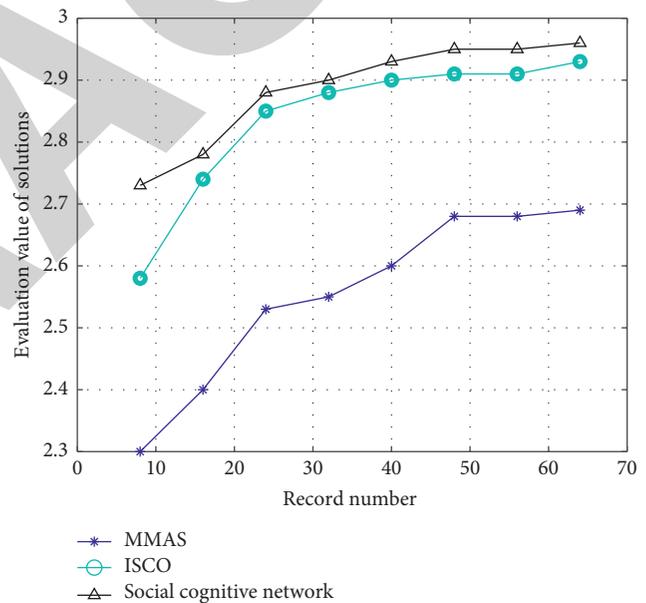


FIGURE 5: Comparison of search capabilities of the three algorithms.

0.57, respectively. This indicates that the overall level of digital citizenship literacy of flipped classroom students is above average, with a high level of digital citizenship literacy. In terms of the mean value of all dimensions, the mean value of all dimensions is above 3 points, among which the dimension of local consciousness is the highest, with 3.83 points, followed by the dimension of professional skills, 3.55 points of critical perspective, 3.54 points of interpersonal network, and the lowest is the dimension of Internet political activities, with 3.18 points. The above-average results were also shown at each dimension level. The status quo of digital citizenship literacy and its dimensions are shown in Figure 6.

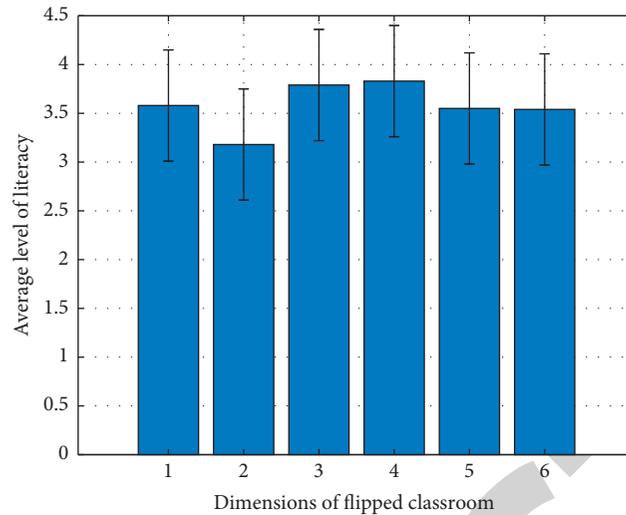


FIGURE 6: Digital citizenship literacy of college students and its current situation in various dimensions.

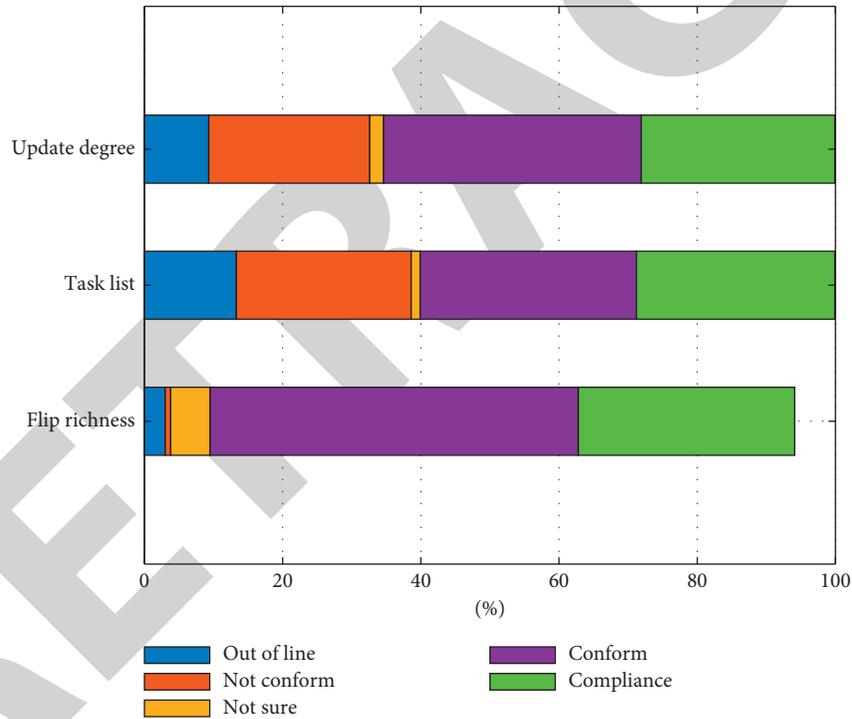


FIGURE 7: Percentage of resource construction.

Figure 7 shows resource construction survey of “resource update timely” item score the highest, 84.6% of the respondents choose to “meet” or “fits,” an average 4.06 “resources” and “task list to help big” question survey, respondents choose to “meet” or “fits” only 65.3% and 60%, two averages 3.51 and 3.37, compared with “resource update in a timely manner,” and the mean difference is very big.

As shown in Figure 7, explain the current classroom teaching; the teaching staff are fully aware of each student, give attention to two or more things released ahead of learning resources, and set aside enough learning time for

students to learn the importance of individuation; this to flip the classroom provides a good practical premise and, in the subsequent action research practice, needs not to be too concerned. But, due to the traditional curriculum teaching resource view or creating difficulty, the influence of such factors as tutors providing form of learning resources richness is insufficient, and the personalized learning tasks in the process of planning and regulating role play are limited; therefore, forms and the improvement of the task list of resources to flip the classroom need to focus on the aspects of the implementation, and staff members should

summarize unceasingly and improve the quality of the production resources.

6. Conclusion

This study puts forward based on the analysis of the learners' cognitive network education evaluation model which will be closely linked with theory, data, and analysis and builds the evaluation model based on the analysis of the learners' cognitive network, data analysis, the process of education that gives the general education workers a chance to interpret from the perspective of the new teaching content, using more diverse and abundant data and more comprehensive implementation of the education evaluation. Integrating the cultivation of students' independent learning ability into the teaching link of flipped classroom can promote the improvement of students' independent learning ability. It can promote the development of independent learning in all aspects and has a significant and positive influence on learning motivation, learning planning, learning environment, learning reflection, and other aspects. Compared with the traditional curriculum teaching resource view or creating difficulties, provide learning resources in the form of richness, the influence of such factors as the personalized learning task in the process of planning and regulating role is limited; therefore, the implementation of the task list and class format needs to focus on improvement, which is flipped, and should be continuously summarized to improve the quality of production resources.

Data Availability

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

Conflicts of Interest

The author declares that there are no conflicts of interest.

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