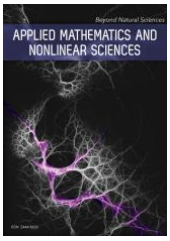
sciendo Applied Mathematics and Nonlinear Sciences, 9(1) (2024) 1-15



Applied Mathematics and Nonlinear Sciences

https://www.sciendo.com

An Advanced Approach to Optimizing Teaching Strategies Using Game Theory in English Curriculum Ideology and Politics

Zhihong Hu[1,†]

1. Foundational Courses Department, Hubei Water Resources Technical College, Wuhan, Hubei, 430202, China.

Submission Info

Communicated by Z. Sabir
Received June 28, 2024
Accepted October 5, 2024
Available online November 14, 2024

Abstract

Ideology and politics education is both an innovative practice of professional talent training reform in colleges and universities and a realistic response to the cultivation of high-quality and high-level talents in the society of the new era. This paper creates an evolutionary game model that represents the ideology and politics of the English curriculum for teachers and students. Based on the evolutionary stability strategy, we put forward the game hypothesis, use the replication dynamic equation to construct the evolutionary game model for the optimization of the English course, and describe the model stability test principle and calculation process. Our exploration of the English course is based on game theory using the data simulation method. The cost directly impacts the likelihood of teachers' ideologies and political education as well as students' ability to take a serious attitude. When both sides of the benefit exceed 75, both sides of the evolutionary stability strategy adopt serious attitudes, leading to an increase in the speed of choosing a serious attitude. This increase is also reflected in the results of the overall game analysis, which determines the teaching strategy for the English curriculum's ideology and politics. The complete interpretation of game theory regarding the English course optimization effect is necessary to enhance the level of ideological and political education in colleges and universities.

Keywords: Game hypothesis; Evolutionary game model; Stability test; English curriculum ideology and politics.
AMS 2010 codes: 97C70

†Corresponding author.
Email address: hzh001@126.com

ISSN 2444-8656
https://doi.org/10.2478/amns-2024-3239

sciendo
OPEN ACCESS © 2024 Zhihong Hu, published by Sciendo.

CC BY This work is licensed under the Creative Commons Attribution alone 4.0 License.

1 Introduction

The so-called "curriculum ideology and politics" refers to the integration of elements of ideological and political education, including theoretical knowledge, value concepts and spiritual pursuit of ideological and political education, into various courses, which positively affects students' ideology and behavior [1-3]. In English courses, we should adhere to the principles of unification of English teaching and ideological education, a combination of in-depth excavation and organic integration, and echoing of English courses, guiding students to form healthy aesthetic interests and correct "three views", establish an international vision and firm cultural confidence [4-6]. In teaching practice, we should be good at discovering the elements of Ideology and Politics, grasping the textbooks as the main position, making good use of the English press as the backyard, and fully embodying the nurturing value of Ideology and Politics in the English curriculum [7-8].

Game theory, also known as countermeasure theory, is the study of an individual or an organization, faced with certain environmental conditions under certain rules, relying on the information they have to choose and implement strategies for their optional behaviors and obtain the corresponding results or benefits from the process [9-11]. Game theory is used to optimize teaching strategies in the analysis that can clearly recognize the deep-rooted impact of teaching strategies. Game theory considers the predicted and actual behavior of individuals in teaching and studying their optimization strategies. Teaching activity is an interactive game between teachers and students, and clarifying the types of games in teaching activity is of great significance in reflecting on teaching strategies [12-15].

Ideological and political education in English courses is committed to cultivating students' patriotic feelings, moral qualities, Chinese cultural inheritance and development, international vision, and innovation ability, aiming to form citizens with social responsibility, creativity and global vision. Literature [16] analyzes the importance of ideological and political education in college English courses in the new era, as well as the teaching strategies for integrating ideological and political education into college English courses. It reveals that integrating ideological and political education into university English teaching can effectively improve students' English learning and the effect of ideological and political education. Literature [17] emphasized the necessity of integrating ideological and political education into university English courses and discussed the strategies for effective implementation. It indicated that, in the context of curriculum ideological and political theory, English teachers should not only strive to improve the quality of English teaching, but also promote the overall development of students' comprehensive quality and ideological and political education. Literature [18] indicates that it is important to cultivate students' firm political stance in English education. The importance of integrating Ideological and Political Education into English education is proposed, and effective strategies for integrating the two into education are discussed. Literature [19] points out that under the influence of globalization, college students have problems such as a lack of ideological beliefs and weak moral consciousness. The practical significance and advantages of ideological and political education in college English teaching are described, and it is emphasized that the integration of ideological and political education and college English courses can promote the quality of education and the improvement of students' ideological quality.

Game theory is a broad and complex discipline that is widely used in pedagogy, economics, political science, military, diplomacy, international relations, etc. The application of game theory in various fields can promote strategy adjustment, achieve strategy optimization and strengthen the strategic advantages in order to achieve the effective conduct of the task. Literature [20] mentions that teachers' teaching strategies and methods have a significant impact on the learning environment. Teaching strategies commonly used by teachers in the context of game theory were explored. A questionnaire survey revealed two game problems in which the zero-sum game represents the state of two competing teaching strategies, and the advantages and disadvantages of the two teaching strategies

were discussed. Literature [21] emphasizes the wide range of applications of game theory and analyzes how it can be a tool to improve medical training work environment and patient care. It is shown that combining game theory with good judgment and sound knowledge can lead training colleges and physicians to recognize their competitive advantages and make appropriate adjustments to their strategies. Literature [22] describes that university English teaching in China is reforming towards an integrated mooc teaching model, but the lack of effective strategies makes its reform unsatisfactory. The teaching strategies and potential game conflicts of this reform process are analyzed from the perspective of game theory, and a win-win situation for teachers and students is achieved by designing strategies to improve the efficiency of teaching reform. Literature [23] proposed a framework for the strategic choices of universities and governments, analyzed the available information in order to determine the strategic choices of universities and governments, and used game theory to determine the optimal strategies of the two games. The results of the study show that both tend to incentivize high-quality academic research in all games.

To improve people's knowledge of English course politics, an evolutionary game model is being used to investigate the current situation of English course politics in colleges and universities. Five research hypotheses are proposed based on the research purpose, taking game theory as the main focus. Based on the replicated dynamic equation of relevant variable parameters to establish the evolutionary game model for English curriculum ideology and politics, take the mathematical integral derivation to calculate the replicated dynamic equation, which can realize the stability test of the evolutionary game model according to the calculation results. Assigning values to the variable parameters, with the help of data simulation tools, we study the development of English courses under the perspective of game theory and put forward the optimized teaching strategy of English Curriculum Ideology and Politics based on the results of simulation analysis.

2 Research on Teaching Strategies of Ideology and Politics in English Courses

2.1 Connotation of Ideology and Politics in the Curriculum

Curriculum Ideology and Politics is an effective way for colleges and universities to implement ideological and political education activities for students, which can add impetus to the development of English education on the basis of curriculum ideology and politics to educate people [24]. The meaning and components of the course of ideological politics need to have a relatively clear understanding, which will help to realize the positive effects of the course of ideological politics. These two aspects are the basis for this part of the corresponding analysis.

2.1.1 Basic Meaning of Curriculum Ideology and Politics

Curriculum Ideology and Politics is a kind of teaching concept that adheres to the fundamental task of "cultivating morality and educating people", takes the curriculum as a carrier, and integrates ideological and political education into all aspects of curriculum teaching and reform under the premise of following the logic of curriculum construction and the law of college students' ideological concepts, and realizes the goal of cultivating people in four aspects through this infiltration method. The four-in-one goal of educating people is realized through this infiltration. The teaching concept of curriculum ideology requires educators to fully explore the connotation of ideological and political education in professional courses, effectively carry out ideological and political education activities, and realize the double effect of knowledge transfer and ideological value guidance.

2.1.2 Components of Curriculum Ideology and Politics

Composition is the term used to describe how things are put together and how they interact with each other. Understanding the nature of curriculum ideology and politics, curriculum ideology and politics is an important carrier for the implementation of moral education in schools. According to the laws of teaching and student growth, the composition is three-dimensional, which mainly includes the main body, object, medium, and ring of curriculum and politics.

2.2 The Necessity and Feasibility of Conducting Ideology and Politics in English Programs

At present, many colleges and universities are conducting teaching activities in the teaching of ideology and politics in college English courses, which shows that the feasibility of college English courses is verified by practice. This part analyzes the necessity and feasibility of incorporating Ideology-Political education into college English courses at the theoretical level.

2.2.1 Necessity

It is of great significance to implement the teaching activities of the university English program, Ideology and Politics. China's time background and social development require the implementation of curriculum Ideology and Politics in college English, which can help students establish correct values, resist the influence of Western foreign bad trends, and cultivate the talents needed by China.

2.2.2 Feasibility

In view of the curriculum requirements and learning contents of the university English course, this part elaborates the practical feasibility of English teachers being able to provide students with ideological and political education in the university English course, starting from the three aspects of the characteristics of the course, namely, the length and coverage of university English, the synergistic nature between the university English course and the ideological and political education, and the potential of the university English course for carrying out the ideological and political education in the course.

2.3 Research on Optimization of English Curriculum Ideology and Politics Based on Game Theory

The essence of the Ideology and Politics curriculum is that it takes human education as the goal of teaching. The impact of the college English curriculum on ideology and politics needs to be based on the teaching link. However, in actual teaching, the effect of college English curriculum Ideology and Politics on human cultivation is not very obvious, which needs to be further discovered through the game theory to find out the problems and the reasons that appear in practice and optimize the teaching strategy for it.

2.3.1 Game theory

Game theory, also known as response theory, refers to the fact that the various actions of the participants in the game relationship are mutually influential, and each participant will take action after considering the actions of other individuals, with the aim of ensuring the maximization of their interests through actions [25]. Game theory generally includes a total of seven constituent elements:

participants, information, behavior, strategy, profit and loss, ending, and equilibrium. These are described as follows:

1) Participants are individuals involved in the game, which can be individuals, enterprises, organizations, countries, etc., and need to bear the consequences of making choices for themselves.

2) Information is the knowledge of the participants about the rules of the game, where the knowledge of the type and behavior of the cubes is crucial.

3) Behavior refers to the variables that participants are able to choose.

4) Strategy is the complete course of action (preplanning) specified by the participant before acting, with diversity, unobservability and completeness.

5) Profit and loss refers to the fact that different strategy choices of the participants will correspond to different results; there are gains and losses, and the quantitative value of the gains and losses is the profit and loss.

6) The ending is the result after the participants choose their strategies to participate in the game.

7) Equilibrium refers to the optimal combination of strategies in the game, but it should be emphasized that equilibrium does not mean the optimal outcome that participants wish to obtain.

2.3.2 Evolutionary stabilization strategies

An evolutionarily stable strategy, as a foundational concept, is a stable state achieved by a population that resists interference from irrational strategies, where s represents a single strategy, S represents a collection of strategies, and p represents the returns under the corresponding strategy. Specifically: there exists a strategy $s \in S$ and satisfies: (1) any $s \neq s'$, and $s' \in S$, $p(s,s) > p(s',s)$. (2) when $s' \neq s$ and $p(s,s) = p(s',s)$, $p(s,s') > p(s',s')$, then s is called an evolutionarily stable strategy (ESS) for this model. The corresponding set of mixed strategies $S = \{(s_1, s_2, \cdots s_{n-1}, s_n) | \sum_{i=1}^{n} s_i = 1, s_i \geq 0\}$, where s_i denotes the probability that the i th strategy accounts for the set of strategies.

Evolutionary equilibrium (EE) in evolutionary game theory refers to the combination of static concepts and dynamic processes in evolutionary game theory, which more accurately describes the evolutionary dynamic process, and in general, the evolutionary equilibrium, Nash equilibrium, and evolutionary stabilization strategy are not necessarily related [26]. Therefore, in order to reach the evolutionary equilibrium of the evolutionary stabilization strategy, the replication dynamic equation can be utilized. The replication dynamic equation is specifically expressed as:

$$\frac{dy_i}{dt} = y_i[f(s_i, y) - f(y, y)] \tag{1}$$

$$f(y, y) = \sum_i y_i f(s_i, y) \tag{2}$$

Where y_i is the proportion of the strategy set accounted for by a single strategy, $f(s_i, y)$ is the individual payoff expectation of strategy s_i, and $f(y, y)$ is the overall average payoff.

Therefore, when the difference between the individual payoffs of strategy s_i and the average payoff of the group is positively correlated with the proportion of strategy s_i in the set of strategies, and when $\frac{dy_i}{dt} = 0$ then the system is said to have reached a stable state. Evolutionary game theory is applied to formulate hypotheses and model the real problem, and the model is analyzed with the help of replicated dynamic equations, the solution of which corresponds to an evolutionarily stable strategy.

2.3.3 Game assumptions

To construct a game evolution model based on the Lotka-Volterra model oriented to the teaching of Civics in English courses in order to analyze the evolutionary trajectory of the teacher-student relationship, the following assumptions are first made:

Assumption 1: The process of students' Civics training includes two groups of English course Civics teachers and students with the same strategy choice space. There is information asymmetry between English course Civics teachers and student groups, so it is assumed that the decision-making between English course Civics teachers and students is based on finite rationality, and the game model constructed between the two is in the form of 2×2.

Hypothesis 2: Both teachers and students of the English course Civics have a choice of strategies; teachers of the English course Civics can choose whether or not to provide serious instruction in the course Civics, and students can choose whether or not to study the course Civics seriously. The English program Civics teacher chose to give serious instruction with probability $x \in [0,1]$ and chose not to give serious instruction with probability $(1-x)$. Students choose with probability $y \in [0,1]$ to engage in serious study and with probability $(1-y)$ to not engage in serious study.

Hypothesis 3: English teachers gain a sense of accomplishment by not instructing seriously as R_1, the increased sense of accomplishment if they choose to instruct seriously as ΔR_1, and the cost of instructing seriously as C_1. Whether or not an English teacher chooses to instruct seriously depends on whether or not instructing seriously will lead to maximizing the sense of accomplishment, where $R_1 > 0, \Delta R_1 > 0, C_1 > 0$.

Hypothesis 4: The student gains a benefit of R_2 by not studying seriously, the increased benefit if he or she chooses to study seriously is ΔR_2, and the cost of studying seriously is C_2. Whether or not the student chooses to study seriously depends on whether or not studying seriously will lead to the maximization of the benefit, where $R_2 > 0, \Delta R_2 > 0, C_2 > 0$.

Hypothesis 5: If the student is serious about learning, and if the English program Civics teacher chooses not to be serious about instruction, the English program Civics teacher hitchhikes on the student's extra benefit of being serious about learning, ΔV_1, where $\Delta V_1 > 0$, when the English program Civics teacher gains a total of $R_1 + \Delta V_1$. If the English program Civics teacher is serious about instruction, and if the student chooses not to be serious about learning, the student hitchhikes on the student's extra benefit of the English program Civics teacher being serious about instruction,

ΔV_2, where $\Delta V_2 > 0$, when the student gains a total of $R_2 + \Delta V_2$. If the teacher of English program Civics chooses to instruct seriously and the student chooses to study seriously, due to the knowledge spillover effect, the teacher of English program Civics obtains an additional gain of ΔU_1, of which $\Delta U_1 > \Delta V_1 > 0$, and the student obtains an additional gain of ΔU_2, of which $\Delta U_2 > \Delta V_2 > 0$.

Based on the above assumptions, the evolutionary game payment matrix between English course Civics teachers and students is constructed, as shown in Table 1.

Table 1. Evolution game payment matrix

Strategy		Graduate student	
		Study hard	Don't study hard
tutors	Direct guidance	$R_1 + \Delta R_1 + \Delta U_1 - C_1$	$R_1 + \Delta R_1 - C_1$
		$R_2 + \Delta R_2 + \Delta U_2 - C_2$	$R_2 + \Delta V_2$
	You don't really guide it	$R_1 + \Delta V_1$	R_1
		$R_2 + \Delta R_2 - C_2$	R_2

2.3.4 Evolutionary game modeling

From the game payoff matrix between the Civics teacher and the students of the English program, the expected payoff E_{1Y} for the Civics teacher of the English program who instructs the students seriously, the expected payoff E_{1N} for the students who are not instructed seriously, and the average payoff $\bar{E}_1$ can be obtained, respectively:

$$E_{1Y} = y\left(R_1 + \Delta R_1 + \Delta U_1 - C_1\right) + \left(1 - y\right)\left(R_1 + \Delta R_1 - C_1\right) \tag{3}$$

$$E_{1N} = y(R_1 + \Delta V_1) + (1 - y)R_1 \tag{4}$$

$$\bar{E}_1 = xE_{1Y} + (1 - x)E_{1N} = xy\left(\Delta U_1 - \Delta V_1\right) + x\left(\Delta R_1 - C_1\right) + y\Delta V_1 + R_1 \tag{5}$$

The expected return E_{2Y}, the expected return E_{2N} and the average return $\bar{E}_2$ for students who are serious about their studies and not serious about their studies, respectively:

$$E_{2Y} = x(R_2 + \Delta R_2 + \Delta U_2 - C_2) + (1 - x)(R_2 + \Delta R_2 - C_2) \tag{6}$$

$$E_{2N} = x(R_2 + \Delta V_2) + (1 - x)R_2 \tag{7}$$

$$\bar{E}_2 = yE_{2Y} + (1 - y)E_{2N} = xy\left(\Delta U_2 - \square V_2\right) + y\left(\Delta R_2 - C_2\right) + x\Delta V_2 + R_2 \tag{8}$$

Based on the malhusian dynamic equation, the English course Civics teacher and the students are a replicated game of mutual learning, and its adjustment process can be modeled by the replicated dynamic equation mechanism, which results in the replicated dynamic equation of the English course Civics teacher's serious instruction as:

$$F\left(x\right) = \frac{dx}{dt} = x\left(E_{1Y} - \bar{E}_1\right) = x\left(1 - x\right)\left[y\left(\Delta U_1 - \Delta V_1\right) + \Delta R_1 - C_1\right] \tag{9}$$

The replicated dynamic equations that students study carefully are:

$$F(y)=\frac{\mathrm{d}y}{\mathrm{d}t}=y\left(E_{2Y}-\bar{E}_2\right)=y(1-y)\left[x\left(\Delta U_2-\Delta V_2\right)+\Delta R_2-C_2\right] \tag{10}$$

2.3.5 Stability testing

The stability test is shown in Table 2, and the evolutionary game between Civics teachers and students in English courses can be analyzed using a two-dimensional dynamical system consisting of two differential equations (9) and (10), for which partial derivatives with respect to x and y are taken in turn, yielding a J_E -matrix:

$$J_E=\begin{Bmatrix}(1-2x)[y(\Delta U_1-\Delta V_1)+\Delta R_1-C_1] & x(1-x)(\Delta U_1-\Delta V_1)\\ y(1-y)(\Delta U_2-\Delta V_2) & (1-2y)[x(\Delta U_2-\Delta V_2)+\Delta R_2-C_2]\end{Bmatrix} \tag{11}$$

Based on the principle of "survival of the fittest" in biology, i.e., if a strategy has a higher fitness than the average fitness of the population, then that strategy will gradually develop in the population. If a strategy has a lower fitness than the average fitness of the population, then the strategy will gradually disappear in the population. Evolutionary game theory studies the change of population structure, and the equilibrium point of the final evolutionary game is the "evolutionary stable strategy" (i.e., ESS), which is locally stable, and requires that the determinant condition $detJ>0$ and condition $trJ<0$ are satisfied in the matrix J_E at the same time.

Scenario (1): $0<\Delta R_1-C_1, 0<\Delta R_2-C_2$.

When the achievement obtained by the English course teachers is higher than the cost, and the benefit obtained by the students is more than the cost, $R(1,1)$ is the stable point of system evolution, $O(0,0)$ is the unstable point, $Q(0,0)$ and $P(1,0)$ are the saddle points, at this time, the English course teachers tend to instruct seriously, and the students tend to study seriously, as shown in Table 2, Scenario (1).

Scenario (2): $0<\Delta R_1-C_1, 0<\Delta U_2-\Delta V_2<C_2-\Delta R_2$

When the sense of achievement obtained by the English teacher's serious guidance is higher than the cost paid, and the net cost paid by the students' serious learning is higher than the difference between the knowledge spillover obtained by the students from the English teacher's serious guidance and non-serious guidance, $P(1,0)$ is the point of stability of the system evolution, $O(0,0)$ and $R(1,1)$ are the saddle points, and $Q(0,1)$ is the point of instability, when the English teacher tends to seriously guide the students, and the students tend to not seriously learn, as shown in Table 2. Specifically, see Table 2 situation (2) shown.

Scenario (3): $0<\Delta U_1-\Delta V_1<C_1-\Delta R_1, 0<\Delta R_2-C_2$

When the net cost paid by the English course Civics teacher for serious instruction is higher than the difference between the knowledge spillover obtained by the English course Civics teacher from students' serious learning and not serious learning, and the benefits obtained by students' serious scientific research are higher than the cost paid, $Q(0,1)$ is the stable point of the system evolution,

$O(0,0)$ is the saddle point of the system evolution, and $P(1,0)$ and $R(1,1)$ are the unstable point of the evolutionary game, at this time, the English course Civics teacher tends not to give serious instruction, and the students tend to study seriously, as shown in Table 2 situation (3).

Scenario (4): $\Delta R_1 - C_1 < 0, \Delta R_2 - C_2 < 0$.

When the achievement gained by the English teachers is lower than the cost paid, and the benefit gained by the students is lower than the cost paid, the stable point of the evolutionary game is $O(0,0)$, i.e., the English teachers tend not to instruct seriously, and the students tend not to study seriously. $Q(0,1), P(1,0)$ and $R(1,1)$ are the unstable points of the evolutionary game, as shown in Table 2, scenario (4).

Table 2. Stability detection

N	Equilibrium point	Equation type	Symbol	Local stability	N	Equilibrium point	Equation type	Symbol	Local stability
1	O(0,0)	Det J	+	Unstable point	3	O(0,0)	Det J	+	Saddle point
	Q(0,1)	TrJ	+	Saddle point		Q(0,1)	TrJ	+	ESS
	P(1,0)	Det J	-	Saddle point		P(1,0)	Det J	-	Unstable point
	R(1,1)	TrJ	+/-	ESS		R(1,1)	TrJ	+/-	Unstable point
2	O(0,0)	Det J	-	Saddle point	4	O(0,0)	Det J	-	ESS
	Q(0,1)	TrJ	+/-	Unstable point		Q(0,1)	TrJ	+/-	Unstable point
	P(1,0)	Det J	-	ESS		P(1,0)	Det J	-	Unstable point
	R(1,1)	TrJ	+/-	Saddle point		R(1,1)	TrJ	+/-	Unstable point

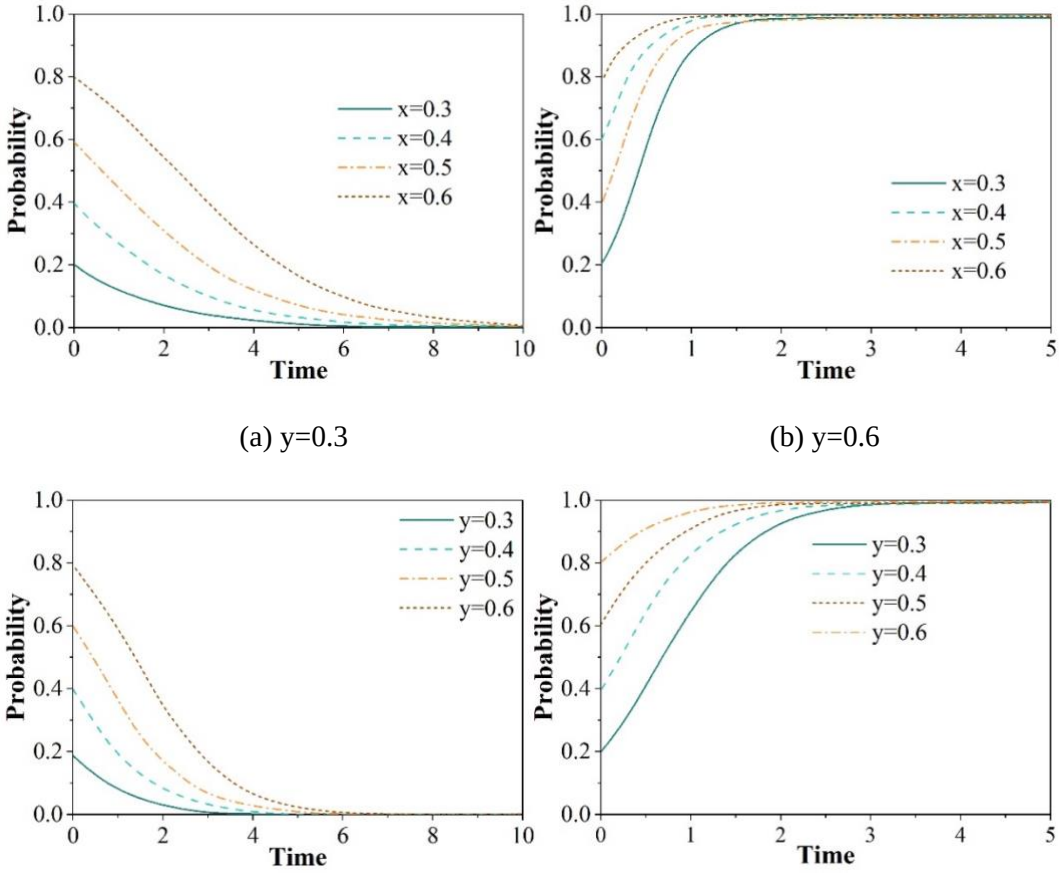
3 Analysis of English Course from the Perspective of Game Theory

3.1 Effect of initial endowment on evolutionary outcomes

3.1.1 Participant sequential games

To discuss the effects of the game order and initial endowment on the game paths and evolution results, the evolution curves in Fig. 1 are plotted, where x represents the probability that the English course instructor chooses the strategy of "conscientiously educating on the ideology of the course", and y represents the probability that the student chooses the strategy of "accepting the guidance on the ideology of the course". The results show that at the initial stage of engaging on the other side, the probability of students choosing the strategy of "accepting the instruction of the course's ideology and politics" was higher than that of students. The results show that the direction of convergence is determined by the initial endowment of the other party when the initial endowment of the other party is given, while the speed of convergence of the other party is affected by its own initial endowment. For example, when y is below the low probability zone (Fig. 1a), x will eventually converge faster towards the equilibrium $E_0(0,0)$ regardless of the initial probability. Conversely when y is in the high probability region (Fig. 1b), x converges eventually to the equilibrium point $E_4(1,1)$ no matter how large the initial probability is, the smaller the initial probability of x is, the faster x converges to the equilibrium point $E_4(1,1)$, and the larger the initial probability of x is, the faster x converges to the equilibrium point $E_4(1,1)$. Similarly, Fig. (1c) and Fig. (1d) show the

convergence of y when x is in the low probability region and high probability region, respectively, and the pattern is consistent with the above, so we will not repeat it here. This suggests that when college English course instructors prefer course ideological guidance, college students will eventually choose to accept the "English course ideological guidance" strategy, but the initial endowment of the teachers and students themselves determines the final equilibrium state. Similarly, when students choose the "English course ideological and political guidance", the game paths and evolutionary outcomes of college English course teachers are also consistent.



(a) y=0.3 (b) y=0.6

(c) x=0.3 (d) x=0.6

Figure 1. The effect of the initial endowment on the evolutionary results

3.1.2 Simultaneous gaming of participants

Table 3 shows the effects of different initial endowments on the game paths and evolution results when English course teachers and students play the game at the same time. It is found that the larger the values of x and y are, the more likely that both sides of the game will eventually reach an equilibrium point $E_4(1,1)$, i.e., the English course teachers adopt the strategy of "seriously carrying out the education of curriculum ideology and politics", and the college students adopt the strategy of "accepting the guidance of curriculum ideology and politics education". On the other hand, if the values of x and y are smaller, both sides of the game may reach an equilibrium point $E(0,0)$, i.e., the English course teachers adopt the strategy of "not seriously carrying out the education of curriculum ideology and politics", and the college students adopt the strategy of "not accepting the education of curriculum ideology and politics".

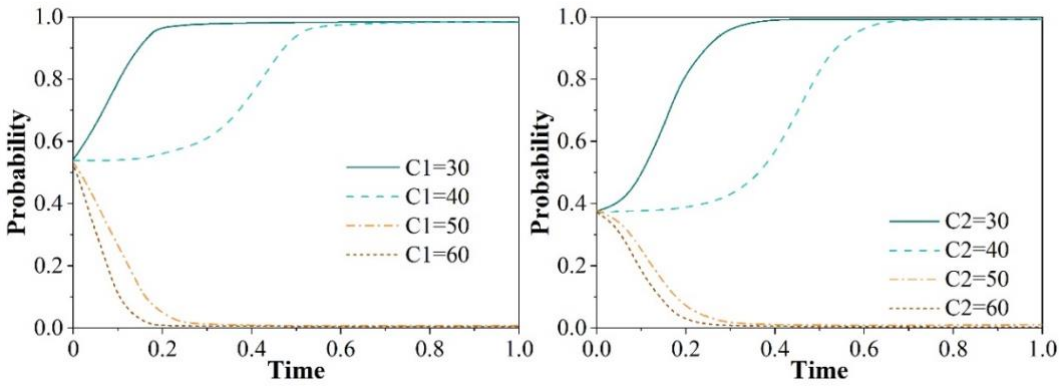
Table 3. The effect of the initial endowment on the evolution of the game

Evolutionary result		Student								
		Y=0.1	Y=0.2	Y=0.3	Y=0.4	Y=0.5	Y=0.6	Y=0.7	Y=0.8	Y=0.9
Teacher	X=0.1	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(1,1)
	X=0.2	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(1,1)	(1,1)
	X=0.3	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(1,1)	(1,1)	(1,1)
	X=0.4	(0,0)	(0,0)	(0,0)	(0,0)	(0,0)	(1,1)	(1,1)	(1,1)	(1,1)
	X=0.5	(0,0)	(0,0)	(0,0)	(0,0)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)
	X=0.6	(0,0)	(0,0)	(0,0)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)
	X=0.7	(0,0)	(0,0)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)
	X=0.8	(0,0)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)
	X=0.9	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)	(1,1)

3.2 Analysis of the effect of system parameters on evolutionary stabilization strategies

3.2.1 Analysis of the impact of cost on evolutionary stabilization strategies

The game cost C_1, C_2 were set to 30, 40, 50, 60, and the rest of the parameters were kept unchanged at the initial value, and the game simulation of the relationship between teachers' curriculum and students' learning was carried out in turn, and the results of the analysis of the effect of the cost on the evolutionary stabilization strategy are shown in Fig. 2, in which (a) ~ (b) are the teachers' curriculum and students' learning, respectively. From the simulation results in Fig. 2, it can be seen that when the cost C_1, C_2 is higher than 40, the final evolutionary strategy of both sides is negative cooperation, and the speed of choosing negative cooperation gradually increases. When cost C_1 and C_2 are equal to 40, the evolutionary stabilization strategy of both parties is positive cooperation. When costs C_1 and C_2 are lower than 20, the final evolutionary stabilization strategy of both parties is positive cooperation. Therefore, the probability and speed of choosing positive attitudes for both teachers' courses and students' learning decreases with the increase of costs C_1 and C_2. Similarly, Costs C_1 and C_2 have the same effect on the evolutionary strategies of teachers' curriculum ideology and politics of Education and students' learning. In summary, the probability of adopting a serious attitude towards teacher curriculum ideology, politics, and education and student learning is inversely proportional to the cost.

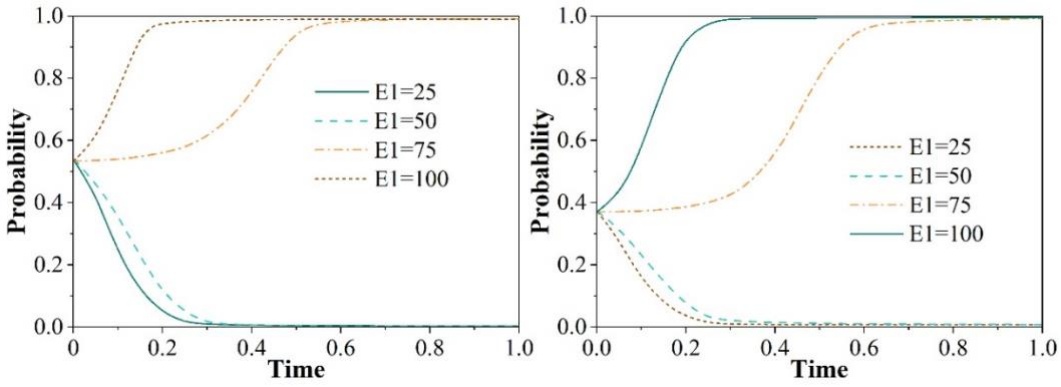


(a) Teacher (b) Student

Figure 2. Impact analysis of cost on evolutionary stability strategy

3.2.2 Analysis of the impact of earnings on chemical stabilization strategies

The E_1 and E_2 values of the gains of both sides are set to 25, 50, 75 and 100, respectively, and the rest of the parameters are kept unchanged from the initial values. The simulation of teachers' ideology and politics education course and students' learning is carried out in turn. The results of the analysis of the impact of gains on the evolutionary stabilization strategy are shown in Fig. 3. When both sides of the gain are lower than 75, both sides of the final evolutionary stabilization strategy do not have a serious attitude. The speed of choosing a non-serious attitude gradually slows down. When both sides make gains equal to 75, their evolutionary stabilization strategies change from an unserious to a serious attitude. When both parties' gains are higher than 75, their evolutionary stabilization strategies are serious attitudes, and the speed of choosing serious attitudes increases. Therefore, the probability of choosing a serious attitude towards both the teacher's curriculum ideology, political education, and student learning is directly proportional to the gains of both sides.



(a) Teacher (b) Student

Figure 3. Analysis of the impact of income on stabilizing strategy

4 Teaching Strategies for Optimizing Ideology and Politics in English Courses

According to the results of the game of the evolution of the teacher-student co-relationship in the Ideology and Politics Education of the English course, combined with the current reality of the English Ideology and Politics Education in colleges and universities, the Ideology and Politics Education of the English course is managed through the following measures.

4.1 Conducting subject-based instruction

(c) To carry out subjective teaching and rationalize the relationship between teachers and students. In accordance with the requirements of the new curriculum reform, we implement the educational philosophy of "people-oriented" and "student development-oriented", promote the development of students' personalities, and strengthen the effectiveness and practicality of ideological and political education. Close to the actual situation of students, pay attention to the learning, life, psychology and individual differences of college students, pay attention to the play of students' subjective initiative, and guide college students to actively carry out self-education. At the same time, the rational use of teacher authority, close to the students, helps teachers and students move forward.

4.2 Strengthening campus culture

Strengthening campus culture, reflecting humanistic care. An organized series of cultural activities is conducted to develop classroom and dormitory cultures, forming a local culture with characteristics close to those of students. Focus on students' personal experiences, enhance mutual trust and communication in interaction, create scenarios to enhance students' sense of social responsibility, and pay attention to art and skill. Therefore, when carrying out activities, attention should be paid to the implementation of hidden education strategies, so that ideological and political education becomes the inner requirements of college students and actively guides their externalization into action.

4.3 Broadening of communication channels

(c) Broaden the channels of dissemination and construct a feedback mechanism. Through the "two courses" of education, strengthen the integration of Taoism and other professions, and adopt forms of education that are popular with students to stimulate students. Interest. Utilizing network media, publicizing current events and hot spots, meeting students' desire for knowledge, opening up discussion areas, and making WeChat, QQ, and space play a role in timely education on current affairs. At the same time, educators should also go deeper into it, theorize and systematize the analysis, and discuss the real problems in connection with students' actuality so as to continuously deepen students' understanding. Strengthen social practice education so that ideological and political education is actually implemented. In the process of education and teaching, constantly explore new content and methods. Lead by example, plan long-term development goals, and cultivate the pursuit of long-term interests.

4.4 Construct a strict reward and punishment system

Constructing a strict system of rewards and punishments to improve the educational process. Strict punishment for uncooperative behavior can lead to a cooperative balance. In the process of ideological and political education of college students, a specific punishment mechanism is also needed to avoid uncooperative behavior of the educated caused by the arbitrariness of the principle. The purpose of establishing a strict punishment mechanism is not to impose severe penalties but to make the educated realize the benefits of long-term cooperation and not dare to betray once they have violated or betrayed, which will be conducive to the formation of a stable situation in ideological and political education, and will be conducive to the realization of the common interests of the educators and the educated.

5 Conclusion

College English is a compulsory course of general studies in higher education institutions, and it is the primary arena for promoting curriculum ideology and political education in colleges and universities. The evolutionary game model is used in this paper to conduct a useful exploration of English curriculum ideology and politics. When y is below the low probability region, x no matter how large the initial probability is, the faster it will eventually converge to the equilibrium point $E_0(0,0)$. The probability of both teachers and students choosing a serious attitude will keep decreasing as the cost C_1 and C_2 increases, and the probability of teachers' curriculum ideology and political education and students' learning to adopt a serious attitude is inversely proportional to the cost. When the two sides of the gains split over 75, the evolutionarily stable strategy of both teachers' curriculum ideology and political education and students' learning is a serious attitude, and the speed of the strategy of choosing a serious attitude increases. The game analysis results indicate

that the teaching strategy for English curriculum ideology and politics is proposed. The game perspective of this study analyzes the evolutionary game relationship between English course Civics teachers and students' seriousness in learning, which provides new ideas and new strategies for college teachers' "cultivating souls and educating people".

References

[1] Zhang, X., Li, Y., & Niu, L. (2022). The Exploring of Curriculum Ideology and Politics in the Teaching of Operational Research [J]. Adult and Higher Education, 4(13), 43-49.

[2] Cantoni, D., Chen, Y., Yang, D. Y., Yuchtman, N., & Zhang, Y. J. (2017). Curriculum and ideology. Journal of political economy, 125(2), 338-392.

[3] Wang, J., & Zhu, M. (2022). Research on the construction of college English reading courses based on ideology and politics curriculum. Scientific and Social Research, 4(1), 181-185.

[4] Zhang, Y. (2023). The Integration Path of Curriculum Ideology and Politics in English Teaching. Adult and Higher Education, 5(13), 103-107.

[5] Li, L. (2022). The countermeasures of ideological and political education into primary school English class. International Journal of Social Science and Education Research, 5(5), 689-693.

[6] Yanli, L., Min, X., & Yuhua, C. (2020). The Application of the Teaching Mode for "Ideological and Political Education" in College English Teaching. International Journal of New Developments in Education, 2(7).

[7] Xu, D. (2024). Values and Paths of Ideological and Political Education in College English Teaching in Applied Universities. Journal of Contemporary Educational Research, 8(4), 144-149.

[8] Wang, Y. (2021). The exploration and practice of the organic integration model of ideological and political education in college English teaching. Learning & Education, 10(2), 162-163.

[9] Yao, R., Zhang, G., Wang, Y., & Bie, R. (2022). Design of teaching material evaluation incentive mechanism based on Game Theory. Procedia Computer Science, 202, 47-54.

[10] Hamman, S. T., Hopkinson, K. M., Markham, R. L., Chaplik, A. M., & Metzler, G. E. (2017). Teaching game theory to improve adversarial thinking in cybersecurity students. IEEE Transactions on Education, 60(3), 205-211.

[11] Zhang, F. (2018, March). The application of game-based approach in primary school English teaching. In 2nd International Conference on Economics and Management, Education, Humanities and Social Sciences (EMEHSS 2018) (pp. 595-600). Atlantis Press.

[12] Yan, F. J. (2018, May). Application of Game Theory in Mathematical Comprehensive Quality Training System. In 2018 8th International Conference on Social science and Education Research (SSER 2018) (pp. 127-130). Atlantis Press.

[13] Piraveenan, M. (2019). Applications of game theory in project management: a structured review and analysis. Mathematics, 7(9), 858.

[14] Munoz-Garcia, F., Munoz-Garcia, & Toro-Gonzalez, D. (2019). Strategy and Game Theory. Springer International Publishing.

[15] Viola, G., & Gambini, A. (2022, February). Cooperative learning in game theory activities. In Twelfth Congress of the European Society for Research in Mathematics Education (CERME12) (No. 21).

[16] Zhang, Y. (2020). On the integration of ideological and political elements into college English curriculum in the information age. International Journal of Social Sciences in Universities, 3(3).

[17] Li, X. (2020, May). Research on Integrating Ideological and Political Education into College English Teaching. In 6th International Conference on Humanities and Social Science Research (ICHSSR 2020) (pp. 102-106). Atlantis Press.

[18] Zhu, J., & Yang, C. (2024). Research on the Teaching Reform of "Curriculum Ideology and Politics" for English Majors under the Background of the "New Liberal Arts Construction". International Journal of Education and Humanities, 13(3), 55-60.

[19] Huang, Y. (2021). Research on innovative practice of ideological and political in college English courses. Open Access Library Journal, 8(8), 1-6.

[20] Göktepe Yildiz, S., & Göktepe Körpeoglu, S. (2019). A New Approach for Assessing Teachers' Teaching Methods Used in Lessons: Game Theoretic Analysis. Acta Didactica Napocensia, 12(2), 29-44.

[21] Blake, A., & Carroll, B. T. (2016). Game theory and strategy in medical training. Medical education, 50(11), 1094-1106.

[22] Shen, X., & Bian, T. (2022). Study on teaching and learning strategies of MOOC-based college English teaching reform from the perspective of game theory. In SHS Web of Conferences (Vol. 140, p. 01015). EDP Sciences.

[23] Ekinci, Y., Orbay, B. Z., & Karadayi, M. A. (2022). An MCDM-based game-theoretic approach for strategy selection in higher education. Socio-Economic Planning Sciences, 81, 101186.

[24] Dan Shen & Yan Wang. (2024). Ideological and Political Design of College English Curriculum Based on Understanding Contemporary China. Region - Educational Research and Reviews(8),

[25] Mustafa Yurdakul,İbrahim Ülke & Yusuf Tansel İÇ. (2024). Investigation of the Additional Powder Effect on the Strength of Joined Aluminum Alloy Plates in Friction Stir Welding Using the Topsis-Game Theory Model. Journal of Advanced Manufacturing Systems(03),

[26] Paolo Renna. (2024). A Review of Game Theory Models to Support Production Planning, Scheduling, Cloud Manufacturing and Sustainable Production Systems. Designs(2),26-.