Evaluation of the Integration Effect of Civic and Political Elements in Higher Mathematics Courses Based on the Social Network Analysis Method -Take a basic calculus course as an example

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Abstract. In order to further improve the quality of teaching of curriculum Civics in colleges and universities, and to realize the in-depth integration of curriculum Civics and teaching, this paper introduces the social network analysis method into the study of evaluating the effect of elements of curriculum Civics, constructs a model diagram of evaluating the effect of integrating elements of curriculum Civics and its relationship matrix, calculates the values of relevant variables of each factor, and uses this as a criterion of discernment to identify the key elements of curriculum Civics, which can effectively fill the The current gap of the lack of quantifiable teaching evaluation system for curriculum Civics, which provides guidance for professional teachers to practice curriculum Civics in a targeted way.

Keywords: Curriculum Civics; Social Network Analysis; Effectiveness Evaluation

1 Introduction

This Preliminary Calculus, as an important compulsory general education course offered by university majors in economics, management and science (except for mathematics majors), is itself a study and abstraction of the natural laws of objective reality, transcends ideology, and does not concern ideological and political standpoints, so there are certain difficulties in making it participate in the teaching content of the "course of ideology and politics"[1]. However, combing the elements of the course of ideology and politics, found that mathematics reveals the universal law, which contains philosophical ideas are often universal, can set up a correct outlook on life for students, guiding the rational development of the positive significance, with the "course of ideology and politics" organic integration of the unique advantages. As a college mathematics teacher, should consciously implement the higher mathematics "and ideological and political theory courses in the same direction, the formation of synergistic effect" of the educational requirements, and actively carry out the "knowledge transfer and value-led combination of" the course of the ideological and political teaching

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reform and exploration, to realize the moral and moral education. The course will be a silent and positive one, and it will realize the realization of moral education.

Through the collation and induction of the literature, it is found that most scholars focus on how to integrate the ideology and politics of mathematics curriculum into the teaching process, but the research on the evaluation of the integration effect of the elements of the ideology and politics of the mathematics curriculum is seldom involved, and no scholars have ever studied the evaluation of the integration effect of the elements of the ideology and politics of the curriculum of mathematics by using a quantitative method to analyze the integration effect of the elements of the ideology and politics of the curriculum of mathematics from this point of view. To sum up, combined with the characteristics of higher mathematics education and teaching, "higher mathematics course ideology and politics" is to fully explore and integrate the ideological and political education factors of higher mathematics, and do a good job of evaluating the effect of integrating the ideological and political elements of the higher mathematics course, so that it can give full play to the nurturing function of the higher mathematics course, and improve the ideological and political quality of the higher mathematics course, while improving the ability of mathematical thinking, and thus internalize it as a kind of "political quality". The quality of ideology and politics can be internalized into a quality or ability, which can become the basic ability and method for individuals to know the world and transform the world[2].

2 Modeling Principles and Methods

2.1 Social Network Analysis

SNA belongs to an important branch of sociology, which analyzes sociological problems by quantitative methods, and after nearly 20 years of rapid development, it has now become a new paradigm of sociological research. Networks make connections between independent things, and the relationships are multi-faceted and multi-type. Since relational data do not satisfy the assumption of independence of variables in the sense of conventional statistics, multivariate statistical methods cannot be used to analyze relational data in the usual sense.

2.2 Organization of relational data

Social network analysis provides a different perspective for analyzing social networks, generally changing from an incidence matrix to two adjacency matrices, a square matrix with rows and columns of cases, describing how cases are linked to each other through affiliation terms, and a square matrix of whether affiliation terms are linked to each other through the same actors, which usually illuminates important aspects of social structure not evident only from the case - case square matrix. -cases squares that are not evident in the social structure.

2.3 Density and central potential

The concepts of density and centrality represent different aspects of the overall "compactness" of a graph. Density describes the overall degree of relatedness between points in a graph. The more "complete" a graph is, i.e., the more neighborly all points are, the greater its density. The central potential describes the extent to which the cohesion of the graph is organized around

particular points[3]. The central potential index given by Freeman (1979) attempts to disentangle aspects of the simplified idea of central potential, and he gives three types of graph central potential measures, all of which are based on the idea of point centrality, i.e., calculating the difference between the centrality of the most central point and the centrality of the other points[4].

(1) Centrality Analysis "Centrality" is one of the research focuses of social network analysis. The idea of what rights or centrality an individual or organization has in its social network is one of the earliest explored by social network analysts. It is divided into degree centrality, proximity centrality, intermediate centrality and eigenvector centrality.

1) Degree center degree

The degree centrality of a point A is the number of other points that are directly connected to point A. If a point is directly connected to many points, we say that the point has a high degree centrality. The more points are connected, the higher the degree centrality of n. The formula for degree centrality is:

$$C_D(n_i) = \frac{n_i(n_i)}{N-1} \tag{1}$$

Where: n_i refers to the ith stakeholder; N is the number of points in the graph; and $n_n(n_i)$ refers to the number of arrows linked to the n_i stakeholder [5].

2) Betweenness centrality If many people must pass through a certain person in order to establish contact, this person can be considered to be important because "individuals in this position can influence the group by controlling or misinterpreting the transmission of information (Freeman, 1979:221)". Therefore, the indicator that portrays the individual centrality of an actor is the betweenness centrality, which measures the degree to which an actor controls resources[6]. Its calculation formula is:

$$C_C(n_i) = \frac{N-1}{\sum_{j=1}^{n} d(n_i, n_j)} \tag{2}$$

Where: $d(n_i, n_j)$ is the distance between points n_i , n_j . Proximity centrality is used to describe the distance between points, if the distance between the study point n and all other points in the network is short, the point is said to have a high proximity centrality, and it has a high probability of being located in the center of the graph.

3 Modeling and Analysis

3.1 Construction of the indicator system

On the basis of referring to a large amount of literature, this paper conducts in-depth interviews with the instructors of Fundamentals of Calculus, organizes the civic elements of

the course, and combines the views of other experts and other mathematics instructors to summarize the civic elements of the higher mathematics course, and establishes the indicators for evaluating the effect of the civic elements of the higher mathematics course. The evaluation index is divided into 3 first-level indexes and 12 second-level indexes, and the interpretation of the indexes is shown Table 1:

Table 1 Indicators for evaluating the effectiveness of the ideological elements of higher mathematics courses

serial number	name (of a thing)	an explanation of the meaning of words or phrases
1	national consciousness	Love for the Party, love for the country, love for socialism, love for the people, love for the collective, love for the family
2	political position	Adhere to the construction of socialism with Chinese characteristics, the people's democratic dictatorship, the leadership of the Communist Party, Marxism-Leninism, Mao Zedong Thought, Deng Xiaoping Theory, the Important Thought of the Three Represents, the Scientific Outlook on Development, and Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era;
3	Chinese culture	Recognition of and adherence to the spirit of the nation and the spirit of the times, as well as the outstanding traditional Chinese culture
4	Socialist core values	At the national level: prosperity, democracy, civilization and harmony; at the social level: freedom, equality, justice and the rule of law; and at the individual level: patriotism, dedication, honesty and friendliness.
5	ideals and beliefs	Adhere to the socialism with Chinese characteristics road confidence, theoretical confidence, institutional confidence, cultural confidence; have political consciousness, the overall situation consciousness, core consciousness, alignment consciousness; do not forget the original heart, remember the mission, realize the great rejuvenation of the Chinese nation, etc.
6	cognitive ability	Basic cognitive ability to recognize right and wrong in a variety of natural and social phenomena
7	creativity	The courage to emancipate the mind, break through stereotypes, explore boldly, have dreams, dare to innovate, etc.
8	A sense of competition and collaboration	Keeping abreast of the times, not willing to lag behind, striving to be the first, pursuing progress, being tenacious, persevering, self-improvement, enterprising, pursuing higher, farther, faster, stronger, leaner, more efficient, daring to win, teamwork spirit, etc.
9	dialectical thinking	Adherence to materialism, dialectical thinking, respect for history, respect for science, respect for objective laws, truth-seeking and pragmatism
10	scientific attitude	Adhere to an objective and impartial scientific attitude to view and evaluate problems, and insist that practice is the criterion for testing the truth, etc.
11	professionalism	Professional proficiency, excellence, craftsmanship, and staying on the cutting edge of the discipline and profession
12	professionalism	Compliance with professional ethics, love of work, sense of responsibility, commitment, service to the people, dedication to the community, etc.

3.2 Establishing a social network for the integration effect of the ideological and political elements of higher mathematics courses

The evaluation of the effect of the integration of the Civic and Political elements in higher mathematics courses is conducted by anonymous questionnaire survey of the students in the Preliminary Calculus course, and the students in this research require the attendance rate of more than 80%. Through the collection and organization of the questionnaire, 127 valid

questionnaires were obtained to obtain the relational adjacency matrix of the integration effect of the Civic and Political elements of higher mathematics courses, as shown in Table 1. Among them, if the row object has relationship to the column object, which can have an effect, it is recorded as 1, otherwise it is 0. When the object relationship is judged, more than half of the relationship that is considered to have a connection is taken. The matrix table 2 is obtained:

Table 2 Neighborhood matrix

	national consciousness	political position	Chinese culture	Socialist core values	ideals and beliefs	cognitive ability	creativity	A sense of competition and collaboration	dialectical thinking	scientific attitude	professionalism	professionalism
national consciousness	0	1	0	1	1	1	0	0	1	1	1	0
political position	1	0	0	0	1	0	0	0	1	1	0	0
Chinese culture	0	0	0	1	1	1	0	0	1	1	0	0
Socialist core values	1	1	1	0	1	1	0	0	1	0	0	0
ideals and beliefs	0	0	0	0	0	0	0	0	1	0	0	0
cognitive ability	1	1	1	1	1	0	1	1	1	1	1	1
creativity	0	0	0	0	1	1	0	1	1	1	1	1
A sense of competition and collaboration	0	0	0	0	0	0	1	0	1	0	1	1
dialectical thinking	1	1	0	1	0	1	1	1	0	1	1	1
scientific attitude	1	1	1	0	0	1	0	0	1	0	1	1
professionalism	0	0	0	0	0	0	0	1	1	1	0	1
professionalism	0	0	0	0	0	0	1	1	1	1	1	0

In this paper, social network analysis was performed using UCINET6 and the network diagram obtained is shown in Figure 1:

The arrows in Figure 1 represent the relationship designations, and the distance between the points represents the relationship proximity. Take "dialectical thinking" which is relatively in the center of the figure as an example, each indicator points to "dialectical thinking", "dialectical thinking" points to the following "Competition and Collaboration", "Innovation and Creative Spirit", "Professionalism", "Political Stance", "Professionalism", "Professionalism", "Professionalism", "Professionalism", "Professionalism", "Professionalism", "Professionalism", "Professionalism" and "Professionalism". "Professionalism" "National awareness" "Scientific attitude" "Socialist core values" "Cognitive ability".

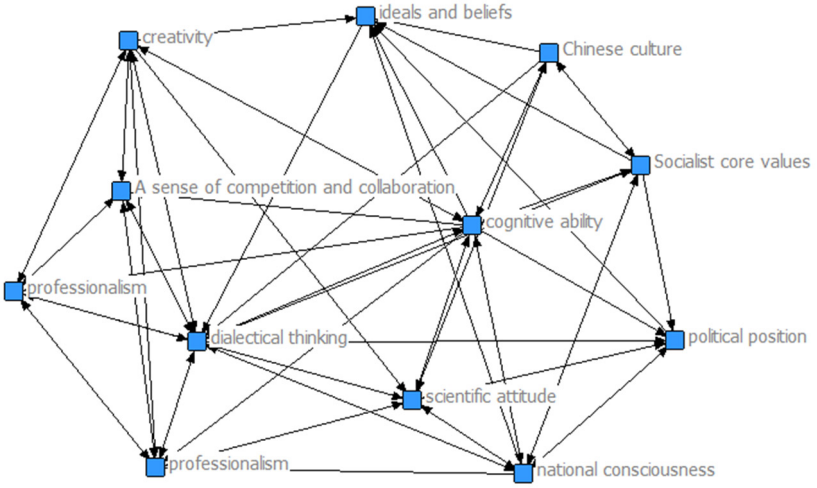

Fig. 1 Visualization of the effect of the integration of the elements of the higher mathematics course of the ideology and politics of social relations

3.3 Analysis of indicators of the effect of integrating the ideological and political elements in higher mathematics courses

In UCINET6 using the centrality analysis of Multiple Measures obtained by the higher mathematics course Civic and political elements of the integration of the effect of the graph degree of centrality close to the center degree. As can be seen, the three centrality degrees of dialectical thinking, cognitive ability and scientific attitude are all high, then these three parties are the core of the social network diagram, that is, the center of these 12 evaluation indicators of the effect of integration of the elements of the higher mathematics curriculum civics and politics. This corresponds to Figure 1, and is also consistent with the nature of the curriculum of higher mathematics, i.e., these three evaluation elements occupy an important position in the whole integration effect of the civic-political elements of the higher mathematics curriculum, linking the whole social network.

As can be seen from the median centrality , the dialectical thinking of the higher mathematics course's ideological elements is 11, the cognitive ability is 117, and the scientific attitude is 8, which are in the top three; this is in line with the nature of the higher mathematics course; mathematics reveals universal laws, and the philosophical ideas contained therein tend to be universal in nature, which can be of positive significance to the students' establishment of a correct outlook on life, and guidance of rational development, and thus it is easy to It is easy to integrate dialectical thinking and easy for students to accept. Secondly, the higher mathematics course itself is to study and abstract the natural laws that exist in objective reality, and it is easy to popularize students' cognitive ability and scientific attitude.As shown in Tables 3 and 4:

Table3 Analysis of the degree of centrality in the middle of the Civics element of higher mathematics courses

		1	2	3
		Degree	NrmDegree	Share
9	dialectical thinking	11.000	100.000	0.128
6	cognitive ability	11.000	100.000	0.128
10	scientific attitude	8.000	72.727	0.093
5	ideals and beliefs	7.000	63.636	0.081
1	national consciousness	7.000	63.636	0.081
11	professionalism	7.000	63.636	0.081
7	creativity	7.000	63.636	0.081
2	political position	6.000	54.545	0.070
12	professionalism	6.000	54.545	0.070
4	Socialist core values	6.000	54.545	0.070
8	A sense of competition and collaboration	5.000	45.455	0.058
3	Chinese culture	5.000	45.455	0.058

Table 4 the Civics element of higher mathematics courses

		1	2	3
		Degree	NrmDegree	Share
1	Mean	7.167	65.152	0.083
2	Std Dev	1.908	17.342	0.022
3	Sum	86.000	781.818	1.000
4	Variance	3.639	300.735	0.000
5	SSQ	660.000	54545.453	0.089
6	MCSSQ	43.667	3608.815	0.006
7	Euc Norm	25.690	233.550	0.299
8	Minimum	5.000	45.455	0.058
9	Maximum	11.000	100.000	0.128
Network Centralization = 41.82% Heterogeneity = 8.92%. Normalized = 0.64%				

4 Conclusion

In this paper, we use social network analysis method to analyze the relationship network of the integration effect of the higher mathematics course civic elements, among the course civic elements of higher mathematics, the civic elements that are most likely to be absorbed and recognized by the students are dialectical thinking, cognitive ability, and scientific attitude. The method has the advantages of combining qualitative and quantitative, better judging the relationship and role of the higher mathematics course civic and political elements in the relational network, providing data support for the effective excavation of the higher mathematics course civic and political elements, and is also a new attempt of today's teaching

reform, the innovative teaching method and the excavation of civic and political materials is the direction of future teaching efforts.

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