A Study of IKH Algorithm for Civic Education Strategies of Graduate Medical Students in Information Age

Lin Xin¹,†, Ruhua He², Mengge Chen¹, Ming Xu¹, Hongliang Hao³

1. Graduate School, Ningxia Medical University, Yinchuan, Ningxia, 750004, China.
2. Heart Center Medical, General Hospital of Ningxia Medical University, Yinchuan, Ningxia, 750004, China.
3. School of Marxism, Ningxia Medical University Yinchuan, Ningxia, 750004, China.

Submission Info
Communicated by Z. Sabir
Received February 3, 2024
Accepted April 13, 2024
Available online May 15, 2024

Abstract

In this paper, we use the krill swarm optimization algorithm to optimize the optimization-seeking ability of the projection-seeking analysis model and construct the IKH-PP model. Evaluation indexes of ideological and political education strategies are built from seven dimensions, such as moral quality and political performance, and the index values are standardized using the extreme value normalization method. Create and enhance the projection indicator function, sort based on the projection value size, and determine the advantages and disadvantages of various samples. Taking psychology as the perspective, efforts were made to explore a collaborative educational path for psychological counseling and ideological education for medical students using the psychological perspective. The results showed that 50% of the 600 medical students at University Z chose “realization of ideal pursuit,” and they were generally more positive and progressive. However, only 48 of them expressed that they were very concerned about current affairs and that their political awareness still needed to be improved. Before and after the collaborative psychological counseling and political education interventions, there were statistically significant differences between Group I and Group II in the G3/F3 dimension (P=0.047, 0.008) and the G11/F11 dimension (P=0.022, 0.034), which were statistically significant or not. There were statistically significant differences in the overall access to Civics and all dimensions of Civics among medical students of different genders (P<0.05), grades (P<0.001), and political profiles (P<0.05) students.

Keywords: Krill swarm algorithm; IKH-PP model; Evaluation indicators; Civic education.
AMS 2010 codes: 68T05
1 Introduction

As the future builders and leaders of China’s “Healthy China” strategy, continuously improving the quality of medical graduate students is the core of graduate education [1]. The ideological and political education of medical postgraduates is a long-lasting war, an essential part of cultivating high-quality medical talents, and a necessary means of implementing the fundamental task of establishing moral character in medical schools and colleges [2]. Medical education collaborative training mode is a standardized and standardized medical training system with Chinese characteristics that combines China’s medical status quo with clear training objectives and a short training cycle, etc. However, it is also straightforward to create a “blank zone” of ideological and political education under this mode [3-5]. Therefore, medical schools should carry out diversified ideological and political education activities, strengthen the construction of tutors and counselors, and establish a sound ideological and political education mechanism to cultivate new-era medical talents with a high sense of responsibility and mission [6-7].

The ideological and political work of colleges and universities is related to the questions of what kind of people to cultivate, how to grow people, and for whom to develop people. As the excellent talents of higher education, postgraduates will become practitioners to realize the great rejuvenation of the Chinese nation. In the new period of medical education, synergy background should correctly recognize the importance of ideological and political education of medical professional degree graduate students, have an in-depth understanding of the current situation of ideological and political education, and take the corresponding strategy in the relevant education departments. Literature [8] introduces E-learning online education based on Internet information technology, which realizes distance teaching and promotes the informatization of political teaching in colleges and universities. Literature [9] talks about the transformative teaching strategies in the field of teaching, differentiated according to different pedagogical theories as formalist and moralist teaching models, being used for the development of people’s social justice consciousness and teaching output. Literature [10] discusses the standards of morality and argues that the standards of decency have preferential conditions and that morality is slowly formed in cultivation and inquiry, even if people do not fully understand where they come from. Literature [11] describes the purpose of cosmopolitan education as the establishment of world moral standards to regulate moral standards among humans and nations, and after comparing moderate and severe cosmopolitan education, states that moderate cosmopolitan education is better able to embody the claims of world moral standards, and is more consistently effective and accessible. Literature [12] systematically and dialectically dissects and examines relevant articles on moral identity. The study is informed by a theory of perspectives that offers new horizons in the field of moral studies. Literature [13] intensely explores the relationship between education and morality and suggests that the formation of moral values is often accompanied by social practice and learning reflection. Literature [14] reveals that the purpose of moral education is to help people form good outlooks and moral qualities and points out that moral education often takes the form of teaching, books, and political speeches. Literature [15] looks at the future development path of medical education, the basics of medical specialties, and information technology skills.

In this paper, in the context of presetting the positive and negative incentives of medical students’ Civic and Political Cognition, we use the improved krill swarm algorithm’s good merit-seeking ability to optimize the projection-seeking analytical model and establish the Ideological and Political Education Strategy Model of IKH-PP. The basic process is to read the evaluation index data of ideological and political education strategies, divide the training set and test set, and normalize them to eliminate the influence of the difference in the data scale. Set the parameters of the IKH algorithm, including the krill population size, maximum random diffusion speed, maximum induction speed, maximum number of iterations, and maximum foraging speed, and randomly initialize the population. For the training session, the population’s fitness was calculated and ranked, and each movement
component was calculated. Then, update the position of the krill population and judge the termination condition of the algorithm. If the maximum number of iterations is reached, then output the optimal solution, that is, obtain the best projection direction, and vice versa, return to the step to calculate each motion component. Finally, the optimal projection direction is taken into account in the PP model to calculate the ranking of the ideological and political education strategy solution.

2 Krill swarm optimization algorithm

The krill swarm optimization algorithm (IKH) uses real numbers, generates an initial population arbitrarily, and influences the evolution of the population particles through three motion components. After the particle evolution, crossover, or genetic mutation operations are carried out for each individual in the population, the stopping criterion is determined according to the iteration. The flow of the standard krill swarm algorithm is shown in Fig. 1, which contains genetic operation, calculation of individual fitness value, output of optimal solution, etc. The process is all-encompassing and complete.

![Flowchart of standard krill swarm algorithm](image)

**Figure 1.** Flowchart of standard krill swarm algorithm

In the iterative part of the krill swarm algorithm, the updating of the particles is clarified on the basis of the fitness function of the particles, and the optimal solution is clarified on the basis of the fitness value. The concept of general fitness function is rooted in practical problems.
Three movement fractions around the krill’s “neighborhood” induced a shift in speed of \( N_i \):

\[
N_i = N_{i}^{\text{max}} a_i + w_i N_i^\text{old}
\]  

(1)

Where \( N_{i}^{\text{max}} \) is the induced maximum velocity, \( a_i \) is the induced orientation, and \( w_i \) is the induced inertia weight. As shown in equation (2):

\[
a_i = a_i^{\text{local}} + a_i^{\text{larger}}
\]  

(2)

Among them, \( a_i^{\text{local}} \) is the orientation of the “neighbor” particle induction, and \( a_i^{\text{larger}} \) is the orientation of the global optimal individual induction at this stage.

For the induction of “neighbor” particles, the formula (3) is generally used to determine the comparative sensitivity interval \( d_{i,j} \) of a particle, and the current particle as the center, and the comparative sensitivity interval as the radius to generate a ring-shaped area. Where krill individuals are evolving particles at this time:

\[
d_{i,j} = \frac{1}{5NP} \sum_{j=1}^{NP} \left\| x_i - x_j \right\|
\]  

(3)

\( NP \) is the population size, \( i \in [1, 2, \ldots, NP], j \in [1, 2, \ldots, NP] \) and \( j \neq i \), \( x_i \) and \( x_j \) are the positions of the \( i \) th and \( j \) th individuals, respectively:

\[
a_i^{\text{local}} = \sum_{j=1}^{NP} \hat{K}_{i,j} \hat{x}_{j-i}
\]  

(4)

Among them, \( \hat{K}_{i,j} \) is the influence produced by the “neighbor”, and \( \hat{x}_{i,j} \) is the direction of the particle towards the “neighbor” at this stage. Generally, Eqs. (5) and (6) unitarize the influence and direction vectors so that the particle can move within the appropriate range. When \( \hat{K}_{i,j} > 0 \), the fitness value of the “neighbor” particle \( j \) is lower than that of particle \( i \), and then the neighbor particle \( j \) is attracted to particle \( i \). Otherwise, particle \( i \) is repelled at this stage:

\[
\hat{K}_{i,j} = \frac{K_i - K_j}{K^\text{worst} - K^\text{best}}
\]  

(5)

Among them, \( K_i \) and \( K_j \) are the fitness values of the current and neighboring particles, and \( K^\text{worst} \) and \( K^\text{best} \) are the fitness values of the poorer and better individuals of the whole species:

\[
\hat{x}_{i,j} = \frac{x_j - x_i}{\| x_j - x_i \| + \varepsilon}
\]  

(6)

Where \( x_j \) and \( x_i \) are the positions of the neighboring particles \( j \) and \( i \) at this stage, and \( \varepsilon \) is a small positive integer to avoid a zero denominator in the formula:
\[ a_{i}^{\text{target}} = C_{i, \text{best}} \hat{K}_{i, \text{best}} \hat{x}_{i, \text{best}} \]  

(7)

Where \( C_{\text{best}} \) is the perturbation variable, \( \hat{K}_{i, \text{best}} \) is the influence of the globally optimal individual on the current particle, and \( \hat{x}_{i, \text{best}} \) is the direction of the optimal particle on the current particle:

\[ C_{\text{best}} = 2 \left( \text{rand} + \frac{t}{t_{\text{max}}} \right) \]  

(8)

Where \( \text{rand} \) is a random number uniformly distributed in \([0, 1]\) and \( t, t_{\text{max}} \) is the number of iterations at this stage and the maximum number of iterations.

The foraging shift speed of individual krill \( F_i \):

\[ F_i = V_f \beta_i + w_f F_i^{\text{old}} \]  

(9)

Among them, the maximum foraging speed is \( V_f \), the foraging direction is \( \beta_i \), and the foraging inertia weight is \( w_f \):

\[ \beta_i = \beta_i^{\text{food}} + \beta_i^{\text{ibest}} \]  

(10)

Among them, \( \beta_i^{\text{food}} \) and \( \beta_i^{\text{ibest}} \) are the directions induced by the “food” and the particles themselves in the history of optimal individuals. In foraging, a species seeks an “ingredient” that is an “optimal, best advantage,” the definition of whose area is inspired by the definition of the “center of mass” in physics:

\[ x_{\text{food}} = \frac{\sum_{i=1}^{NP} \frac{1}{K_i} x_i}{\sum_{i=1}^{NP} \frac{1}{K_i}} \]  

(11)

\[ \beta_i^{\text{food}} = C_{\text{food}} \hat{K}_{i, \text{food}} \hat{x}_{i, \text{food}} \]  

(12)

Where \( x_{\text{food}} \) is the position of the “food,” \( C_{\text{food}} \) is a dynamic independent variable, \( \hat{K}_{i, \text{food}} \) is the influence of the “food” on the current particle, and \( \hat{x}_{i, \text{food}} \) represents the direction of the particle on the “food” at the current stage:

\[ C_{\text{food}} = 2 \left( 1 - \frac{t}{t_{\text{max}}} \right) \]  

(13)

\[ \beta_i^{\text{ibest}} = \hat{K}_{i, \text{ibest}} \hat{x}_{i, \text{ibest}} \]  

(14)

Where \( \hat{K}_{i, \text{ibest}} \) indicates the influence of the current particle on the current particle, and \( \hat{x}_{i, \text{ibest}} \) indicates the direction of the current particle on the current particle.
The arbitrary diffusion shift speed of individual krill $D_i$:

$$D_i = D_{\text{max}} \left( 1 - \frac{t}{t_{\text{max}}} \right) \delta$$  \hspace{1cm} (15)

Where $D_{\text{max}}$ is the maximum arbitrary diffusion velocity and $\delta$ is the arbitrary diffusion orientation. The velocity of a particle consists of three velocity components:

$$\frac{dx_i}{dt} = N_i + F_i + D_i$$  \hspace{1cm} (16)

Particle position update:

$$x_i(t + \Delta t) = x_i(t) + \Delta t \frac{dx_i}{dt}$$  \hspace{1cm} (17)

$$\Delta t = Ct \sum_{j=1}^{NV} (UB_j - LB_j)$$  \hspace{1cm} (18)

Where $Ct$ is the step scaling factor, $UB_j$ and $LB_j$ are the upper and lower bounds of the decision variable, and $NV$ is the dimension of the decision variable. Crossover and mutation operations, the substitution and reorganization operations on the vector elements of the parent individual to form a new child, called crossover operations:

$$x_{i,m} = \begin{cases} x_{r,m} & \text{rand}_{i,m} < Cr \\ x_{i,m} & \text{else} \end{cases}$$  \hspace{1cm} (19)

Where $r \in [1, \ldots, NP]$ and $r \neq i, x_{r,m}$ are the $m$th dimensional elements of the individual distinct from $x_{i,m}$ and $Cr$ is the crossover probability. The adjustment of the parent individual vector elements to change is called the variation operation:

$$x_{i,m} = \begin{cases} x_{\text{gbest},m} + \mu(x_{p,m} - x_{q,m}) & \text{rand}_{i,m} < Mu \\ x_{i,m} & \text{else} \end{cases}$$  \hspace{1cm} (20)

Where $x_{i,m}$ is the $m$th dimensional element of the globally optimal individual in the current stage, $x_{p,m}$ and $x_{q,m}$ are the $m$th dimensional elements of the two individuals distinct from $x_{i,m}$, and $Mu$ is the probability of variation:

$$x_i^{t+1} = \begin{cases} x_i^{t+1} & f(x_i^{t+1}) \geq f(x_i^t) \\ x_i^t & \text{else} \end{cases}$$  \hspace{1cm} (21)
Where, \( x^{e+1}_i \) means the iteratively updated particle with fitness function value of \( f \). The selection operation can be realized by comparing the fitness values of the parent generation individual \( x^e_i \) and the child generation iterative individual \( x^{e+1}_i \).

3 Optimal choice of IKH-PP algorithm for ideological and political education strategy

3.1 Projection Tracing Analysis

In order to realize the selection of ideological and political strategies, the evaluation indexes of ideological and political education strategies are constructed from seven dimensions, including moral quality, political performance, ideological and political theory, attendance index, learning index, achievement index, and daily performance. Projective tracing analysis (PP) is a statistical technique used to process and analyze high-dimensional data. Assuming that if the \( i \) st sample \( j \) nd index is \( x_{ij} (i=1,2,\ldots,n; j=1,2,\ldots,m) \), where, \( n \) and \( m \) are the number of samples and the number of indexes, respectively, the PP analysis steps are:

1) Data pre-processing: in order to eliminate the influence of the outline of each indicator on the evaluation results and to unify the range of changes in the values of each indicator, the standardization of the indicator values was carried out by the method of extreme value normalization:

For positive type indicators, as in equation (22):

\[
x^{\alpha*}_{ij} = \frac{x_{ij} - \min(x_j)}{\max(x_j) - \min(x_j)}
\]

(22)

For the reverse type indicator as in equation (23):

\[
x^{*}_{ij} = \frac{\max(x_j) - x_{ij}}{\max(x_j) - \min(x_j)}
\]

(23)

In Eqs. (22) and (23), \( \max(x_j) \) and \( \min(x_j) \) are the maximum and minimum values of the \( j \) rd indicator sample; \( x^{*}_{ij} \) is the standardized indicator value.

2) Construct the projection indicator function, set \( \alpha = (\alpha(1), \alpha(2), \ldots, \alpha(m)) \) as the projection direction, and project \( x^{*}_{ij} \) onto \( \alpha \) to obtain the one-dimensional projection value \( z(i) \) as in equation (24):

\[
z(i) = \sum_{j=1}^{m} \alpha_j x^{*}_{ij}
\]

(24)

Define the objective function \( Q(\alpha) \) as the product of the interclass distance \( S_z \) of the projected values and the intraclass density \( D_z \) as in equation (25):

\[
Q(\alpha) = S_z |D_z|
\]

(25)
The interclass distance $S_z$ is calculated using the standard deviation of the projection value $z(i)$, and the intraclass density $D_z$ is the local density of the projection value $z(i)$ as in Eq. (26) and Eq. (27):

$$S_z = \sqrt{\frac{\sum_{i=1}^{n} (z(i) - E(z))^2}{n-1}} \quad (26)$$

$$D_z = \sum_{i=1}^{n} \sum_{j=1}^{n} (R - r_{ij}) u(R - r_{ij}) \quad (27)$$

In Eqs. (26) and (27), $E(z)$ is the average of the projected values $z(i)$, and the larger the value of $S_z$, the more spread out the point clusters are. $r_{ij}$ is the distance between the projected values $r_{ij} = |z(i) - z(k)|$ $(i, k = 1, 2, \ldots, n)$. $u(t)$ is the unit step function, when $t = (R - r_{ij}) \geq 0$, its value is 1, when $t = (R - r_{ij}) < 0$, its value is 0. $R$ is the radius of the window for the local density, take

$$R = \left[ \min(x(i, j)) + \max(x(i, j)) \right] / 2.$$

3) Optimize the projection indicator function to find the best projection direction by maximizing the product of interclass distance and intraclass density, i.e., The problem of finding the maximum value of the projection indicator function, as in equation (28):

$$\text{Max } Q(\alpha) = S_z |D_z|$$

s.t. $\sum_{j=1}^{m} \alpha_j^2 = 1, 0, \alpha_j, 1 \quad (28)$

4) Classification: the best projection direction $\alpha^*$ will be substituted into the formula (28), and the projection value $z^*(i)$ of a sample point is calculated, comparing the size of $z^*(i)$ and $z^*(j)$, if the closer the two, the two tend to be classified into one category. If sorted according to the projection value $z^*(i)$ size, the advantages and disadvantages of different samples can be calculated, as in equation (29):

$$z(i) = \sum_{j=1}^{m} \alpha(j)x^*(i, j), i = 1, 2, \ldots, n \quad (29)$$

3.2 Strategies for Civic Education Based on IKH-PP

When evaluating the selection of ideological and political education strategies, evaluation indexes are used as inputs to the IKH-PP model, and the strategy levels are used as outputs of the IKH-PP model. Psychology not only advocates focusing on the knowledge and skills of medical students but also attaches importance to the cultivation of good character strengths and virtues of medical students. Its educational ideology is consistent with the fundamental task of moral education, which helps to improve the psychological quality as well as ideological and political literacy of medical students and plays a positive role in realizing the fundamental task of moral education for medical education. In the context of increasingly fierce social competition, the country’s demand for talent no longer focuses only on high academic qualifications but on the more comprehensive development of
comprehensive talents. Psychology is not just a new concept of parenting but also a new approach to parenting. Through the application of psychological counseling, medical students can make up for their defects and discover their advantages. This can promote the psychological health of medical student groups and enhance the overall quality of medical talents. Therefore, this paper takes psychological counseling as a perspective, draws on the latest achievements in the development of psychology, absorbs the contents of positive psychology, focuses on the actual needs of the development of medical students, explores the positive psychological qualities of medical students, and strives to explore the path of ideological and political education of medical students in the field of psychological counseling, in order to adapt to the requirements of the ideological and political education of medical students in the new era and provide feasible solutions to the expansion of the theory and practice of medical students’ ideological and political education. We are trying to explore a path of ideological and political education for medical students under the perspective of psychological counseling to meet the requirements of ideological and political education for medical students in the new era, to provide feasibility for the expansion of the theory and practice of medical students’ ideological and political education, and to further enhance the positive psychological quality of medical students.

4 Research on Medical Students’ Cognition and Application of Strategies in Civic Politics

4.1 General cognitive status of Civics among medical students

In this study, 600 postgraduate medical students from University Z were selected for the research. 600 questionnaires were distributed and collected, and a recovery rate of 100% was achieved. The results of the survey on the ideological and moral status of medical students are shown in Table 1. 44.17% of medical students think that their university life is colorful, complete, and happy. In terms of the criteria for realizing the value of life, the number of people who chose “the realization of ideal pursuit” was relatively large, with a proportion of 50.00%, followed by “contribution to society,” accounting for 21.17%. In terms of the distribution of the willingness to participate in volunteer activities such as teaching, border aid, and foreign aid, most of the samples chose “very willing, dedication makes me happy,” with a proportion of 43.50%.

Moreover, the proportion of samples choosing “more willing” is 35.67%. The survey shows that medical students, in general, are more positive and progressive in their thinking, have strong ideals and beliefs, high moral standards, and a strong spirit of dedication. Furthermore, the following conclusions can be drawn.

Medical students are experiencing a more significant amount of pressure. It is a well-known fact that medical students undergo training for a extended time and at a high cost and are under tremendous academic pressure. The current complex medical environment is inevitably affecting medical students at school, resulting in negative psychological factors for their future careers. 16.67% of them think that their medical student life is “academically heavy and mentally pressurized,” and 18.00% of them feel “confused and have no confidence in the future.”

Secondly, pragmatism has a significant influence on medical students. In the survey on the purpose of choosing a medical specialty for our medical students, although more of them decided on “the ideal of saving lives and selfless dedication,” it only accounted for 31.50%. 27.00% of them chose “higher income and social status of medical personnel,” and 14.50% chose “parents’ requirements.” The study reveals that the outside world easily influences medical students and is heavily influenced by pragmatism and utilitarianism when making career choices.
Table 1. Ideological and moral status of medical students

<table>
<thead>
<tr>
<th>Name</th>
<th>Options</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a medical student, how to evaluate your size Student?</td>
<td>Rich and colorful, enrich your happiness</td>
<td>265</td>
<td>44.17%</td>
</tr>
<tr>
<td></td>
<td>Heavy academic work, too much stress</td>
<td>100</td>
<td>16.67%</td>
</tr>
<tr>
<td></td>
<td>Empty and boring, very flat</td>
<td>63</td>
<td>10.50%</td>
</tr>
<tr>
<td></td>
<td>Lost in mind, no confidence in the future</td>
<td>108</td>
<td>18.00%</td>
</tr>
<tr>
<td></td>
<td>I don’t know</td>
<td>64</td>
<td>10.67%</td>
</tr>
<tr>
<td>Why do you choose to study in medicine</td>
<td>The income and social status of medical personnel are higher</td>
<td>162</td>
<td>27.00%</td>
</tr>
<tr>
<td></td>
<td>The ideal belief of salvation and dedication</td>
<td>189</td>
<td>31.50%</td>
</tr>
<tr>
<td></td>
<td>Parental request</td>
<td>87</td>
<td>14.50%</td>
</tr>
<tr>
<td></td>
<td>Inclarity</td>
<td>97</td>
<td>16.17%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>65</td>
<td>10.83%</td>
</tr>
<tr>
<td>You think the standard for achieving your life is What?</td>
<td>A lot of material wealth</td>
<td>91</td>
<td>15.17%</td>
</tr>
<tr>
<td></td>
<td>High social status</td>
<td>57</td>
<td>9.50%</td>
</tr>
<tr>
<td></td>
<td>The contribution to society</td>
<td>127</td>
<td>21.17%</td>
</tr>
<tr>
<td></td>
<td>The realization of the ideal</td>
<td>300</td>
<td>50.00%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>25</td>
<td>4.17%</td>
</tr>
<tr>
<td>Do you want to be involved in education and assistance!</td>
<td>Very willing, dedication makes me happy</td>
<td>261</td>
<td>43.50%</td>
</tr>
<tr>
<td></td>
<td>Prefer</td>
<td>214</td>
<td>35.67%</td>
</tr>
<tr>
<td></td>
<td>Nonrejection</td>
<td>104</td>
<td>17.33%</td>
</tr>
<tr>
<td></td>
<td>Unwillingness</td>
<td>21</td>
<td>3.50%</td>
</tr>
</tbody>
</table>

4.2 Medical Students’ Political Perceptions

The results of the medical students’ political awareness survey are shown in Figure 2, with options 1-4 being very aware/concerned/necessary/frequent, somewhat aware/concerned/necessary/frequent, generally aware/concerned/necessary/frequent, and not aware/concerned/necessary/frequent, respectively. Questions A-D were whether medical students understand the party and state’s line policies, whether medical students pay attention to current political news, whether medical students think it is necessary to study Civics and Politics, and whether medical students’ attendance in Civics and Politics classes, respectively.

Among the 600 medical students surveyed, when asked whether they understood the primary line, guidelines, and policies of the Party and the country, only 42 students said they understood them very well, and only 24 said they understood them relatively well. In contrast, 356 said they understood them somewhat but not much. Meanwhile, in the survey result of “whether to pay attention to current political news,” the data structure is very similar: only 48 students said they pay great attention to it, 172 students pay more attention to it, and 352 students only pay attention to it occasionally. The findings above show that the political awareness of students at University Z still needs improvement. First of all, the attendance rate for the Civics and Politics class at this medical university is high. According to the survey, more than 80% of the samples think that it is “necessary” for medical students to study Civics and Politics, and a minimal number of them believe that it does not matter or is not necessary. There are more than 500 students who can come to the class without any particular circumstances, 88 students can come to the class most of the time, and there are very few absentees or no-shows, so the attendance is good.
4.3 Strategies for Applying Psychological Counseling Civic Education

4.3.1 Results of the cognitive intervention

It is clear that psychological counseling teachers are included in the ideological and political work category, and psychological counseling has advantages that other ideological and political work teams cannot match. Psychological counseling teacher team and ideological and political theory course teacher team mainly rely on theoretical inculcation of ideological and political theory courses, lack of practical foundation, compared with other professional courses teacher team, other professional courses teacher team to a certain extent, lack human emotion grasp of the sensitivity, and with the counselor classroom teacher team, compared with the psychological counseling teacher team in the ideological leadership of the more significant professionalization of the advantages of conscientization. Compared to counselors and class teachers, teachers of psychological counseling have more significant specialized scientific advantages in thought leadership.

Measured by the Simple Coping Styles Scale (SCSQ), which is designed to measure the attitudes and practices that respondents may adopt when they encounter difficult setbacks, Group I was set up as the control group and Group II as the operation group. The results of the reflective cognitive intervention are shown in Table 2. In the positive dimensions, before and after the intervention, there were statistically significant differences between Groups I and II in the G3/F3 dimension (P=0.047, 0.008) and G11/F11 (P=0.022, 0.034) dimensions, and Group II had statistically significant or and their considerable differences in the G5/F5 (P=0.028) and G10/F10 (P= 0.025) dimensions had statistically significant differences. The post-intervention means were more fantastic than the pre-intervention means in the positive dimensions measured, both in Group II and Group I. According to the intervention and statistical indications, psychological counseling can significantly improve the ideological and political cognitive status of medical school students.
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Group</th>
<th>Preintervention mean</th>
<th>Intervention Mean</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>G3/F3</td>
<td>I</td>
<td>2.04</td>
<td>2.28</td>
<td>0.047</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>1.83</td>
<td>2.43</td>
<td>0.008</td>
</tr>
<tr>
<td>G5/F5</td>
<td>II</td>
<td>1.78</td>
<td>2.2</td>
<td>0.028</td>
</tr>
<tr>
<td>G10/F10</td>
<td>II</td>
<td>1.86</td>
<td>2.25</td>
<td>0.025</td>
</tr>
<tr>
<td>G11/F11</td>
<td>I</td>
<td>1.66</td>
<td>1.94</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>1.76</td>
<td>2.1</td>
<td>0.034</td>
</tr>
</tbody>
</table>

### 4.3.2 Learning Access in Synergistic Counseling Civics Classes

In order to further explore the influence factors of medical students’ sense of access to learning in collaborative psychological counseling and civics classes, using the IKH algorithm, the overall sense of access was taken as the dependent variable. Indicators such as the teaching quality of teachers, the degree of students’ interest in civics classes, extracurricular attention to current political information, classroom concentration, classroom attendance, and other indicators were used as the independent variables to conduct the analysis. The way of entering the independent variables was step-by-step, and the criteria of selecting the variables and excluding the variables were adopted as the system’s default test level. The criterion of variables is adopted as the default test level of the system when the independent variables are included in the optimized projection indicator function. The results of the influencing factors of the sense of learning acquisition in collaborative psychological counseling Civics and Politics class are shown in Table 3. The degree of medical students’ interest in learning, the degree of attention to current political information outside the classroom, the degree of classroom concentration, classroom attendance (P=0.043), and the quality of teaching of psychological teachers have an impact on the sense of learning acquisition of Civics and Politics class.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardization Regression coefficient</th>
<th>Nonstandardization Regression coefficient B</th>
<th>Standard error</th>
<th>T</th>
<th>P</th>
<th>95% of B Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.87</td>
<td>0.16</td>
<td>4.68</td>
<td>P&lt;0.01</td>
<td>0.57, 1.32</td>
<td></td>
</tr>
<tr>
<td>Degree of interest</td>
<td>0.23</td>
<td>0.19</td>
<td>0.04</td>
<td>5.62</td>
<td>P&lt;0.01</td>
<td>0.13, 0.25</td>
</tr>
<tr>
<td>Extracurricular attention</td>
<td>0.30</td>
<td>0.18</td>
<td>0.05</td>
<td>6.76</td>
<td>P&lt;0.01</td>
<td>0.14, 0.25</td>
</tr>
<tr>
<td>Mental teaching quality</td>
<td>0.18</td>
<td>0.21</td>
<td>0.04</td>
<td>6.12</td>
<td>P&lt;0.01</td>
<td>0.15, 0.28</td>
</tr>
<tr>
<td>Classroom focus</td>
<td>0.22</td>
<td>0.20</td>
<td>0.05</td>
<td>5.17</td>
<td>P&lt;0.01</td>
<td>0.12, 0.26</td>
</tr>
<tr>
<td>Classroom attendance</td>
<td>0.07</td>
<td>0.08</td>
<td>0.03</td>
<td>2.11</td>
<td>0.043</td>
<td>0.02, 0.13</td>
</tr>
</tbody>
</table>

The learning access scores of the collaborative counseling Civics course are shown in Table 4, which indicates that there is statistical significance in the comparison of the scores of different genders of medical students in terms of the overall access and the scores of the dimensions of the Civics course (P-values of 0.002, 0.006, 0.022, 0.006, 0.003, respectively), and that all the male students have higher access than the female students. There was no statistical significance in the comparison of the overall sense of access to Civics and the scores of the dimensions among medical students from different places of origin (p-values of 0.149, 0.206, 0.086, 0.695, and 0.141, respectively). There was statistical significance in the comparison of scores of overall access to Civics and emotional access among medical students with different political profiles (P<0.05) but not in the comparison of scores of knowledge access, competence access, and values access (P>0.05). There was a statistically
significant (P<0.001) comparison of the overall access to Civics and scores on each dimension among medical students of different graduate grades. A two-by-two comparison revealed that third-year students were higher than first- and second-year students, while second-year students were lower than first- and third-year students, both in terms of overall access to Civics scores and in terms of scores on the dimensions.

### Table 4. The study of thinking politics is a score

<table>
<thead>
<tr>
<th>Project</th>
<th>Categories</th>
<th>Number</th>
<th>Knowledge acquisition</th>
<th>Affective acquisition</th>
<th>Ability acquisition</th>
<th>Value acquisition</th>
<th>Overall feeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Man</td>
<td>396</td>
<td>4.11±0.78</td>
<td>4.22±0.95</td>
<td>4.16±0.78</td>
<td>4.02±0.87</td>
<td>4.15±0.74</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>204</td>
<td>3.79±0.76</td>
<td>3.98±0.85</td>
<td>3.85±0.75</td>
<td>3.79±0.82</td>
<td>3.85±0.74</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td></td>
<td>3.42</td>
<td>2.85</td>
<td>2.41</td>
<td>2.85</td>
<td>3.11</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>0.002</td>
<td>0.006</td>
<td>0.022</td>
<td>0.006</td>
<td>0.003</td>
</tr>
<tr>
<td>Biotically</td>
<td>Countryside</td>
<td>335</td>
<td>3.85±0.74</td>
<td>3.96±0.82</td>
<td>3.86±0.81</td>
<td>3.89±0.96</td>
<td>3.89±0.68</td>
</tr>
<tr>
<td></td>
<td>Town</td>
<td>265</td>
<td>3.86±0.77</td>
<td>4.12±0.85</td>
<td>3.98±0.76</td>
<td>3.93±0.95</td>
<td>3.99±0.72</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td></td>
<td>-1.85</td>
<td>-1.84</td>
<td>-1.74</td>
<td>-0.26</td>
<td>-1.23</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>0.149</td>
<td>0.206</td>
<td>0.086</td>
<td>0.695</td>
<td>0.141</td>
</tr>
<tr>
<td>Political appearance</td>
<td>The Communist Party of China</td>
<td>126</td>
<td>4.08±0.75</td>
<td>4.13±0.74</td>
<td>4.10±0.77</td>
<td>3.85±0.79</td>
<td>4.03±0.71</td>
</tr>
<tr>
<td></td>
<td>Communist youth league member</td>
<td>474</td>
<td>3.75±0.66</td>
<td>3.87±0.79</td>
<td>3.84±0.86</td>
<td>3.89±0.93</td>
<td>3.83±0.71</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td></td>
<td>1.98</td>
<td>2.78</td>
<td>1.66</td>
<td>1.28</td>
<td>2.15</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>0.053</td>
<td>0.006</td>
<td>0.089</td>
<td>0.175</td>
<td>0.042</td>
</tr>
<tr>
<td>Grade</td>
<td>First grade</td>
<td>162</td>
<td>4.11±0.77</td>
<td>4.16±0.79</td>
<td>4.08±0.65</td>
<td>3.87±0.85</td>
<td>4.13±0.71</td>
</tr>
<tr>
<td></td>
<td>Second grade</td>
<td>236</td>
<td>3.56±0.72</td>
<td>3.74±0.85</td>
<td>3.46±0.74</td>
<td>3.49±0.76</td>
<td>3.62±0.73</td>
</tr>
<tr>
<td></td>
<td>Third grade</td>
<td>202</td>
<td>4.32±0.68</td>
<td>4.32±0.76</td>
<td>4.42±0.62</td>
<td>4.59±0.65</td>
<td>4.46±0.63</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td></td>
<td>57.85</td>
<td>45.02</td>
<td>71.15</td>
<td>98.96</td>
<td>54.37</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td></td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

### 5 Conclusion

In this study, we harness the robust merit-seeking capabilities of the enhanced krill swarm algorithm to optimize the projection-seeking analysis model. We develop the IKH-PP ideological and political education strategy model, focusing on the positive psychological attributes of medical students. Our goal is to explore and define a pathway for the ideological and political education of medical students from the perspective of positive psychology. We have arrived at the following conclusions:

1) Medical students at University Z are generally more positive and progressive in their thinking, with strong ideals and beliefs. Students’ mentality and career choices are inevitably affected by the current complex medical environment.

2) The results of the survey on political awareness of medical students in University Z, only 48 students said that they were very concerned about current political news, indicating that the political awareness of students in University Z still needs to be improved.

3) In both Group II and Group I, the post-intervention mean was more significant than the pre-intervention mean (P<0.05). Improving the ideological and political awareness of medical
school students can be significantly influenced by psychological counseling. There is a statistically significant difference in the overall sense of access to collaborative psychological counseling, ideological and political classes, and emotional access scores of medical students of different political profiles and ages.

4) Medical students’ degree of interest in learning, degree of attention to current political information outside the classroom, classroom concentration, classroom attendance, and the quality of teaching by the psychological teachers affected their sense of learning acquisition in collaborative psychological counseling ideology and politics class.

Acknowledgements

1. Education Department of Ningxia Hui Autonomous Region: Postgraduate Education and Teaching Reform Research and Practice Project in 2018: Analysis on the Effectiveness of Improving the Social Responsibility and Comprehensive Quality of Medical Doctoral Students— Taking Social Practice as the Starting Point (No. YJG201842).

2. Special Research on Online Education and Teaching Reform in Ningxia Medical University in 2020: Research on the Effectiveness of Integrating Curriculum Ideology and Politics in Postgraduate Online Teaching (No. NYJY2077).

References


