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Article

Research on the Logical Mechanism and Development Path of Red Culture in Civic and Political Education in Colleges and Universities under Digital Environment

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Abstract: Red cultural resources contain rich ideological and political education value, and it is of great practical significance to utilize red culture to effectively carry out ideological and political education in colleges and universities. The study explores the logical mechanism of red culture in ideological and political education in colleges and universities through questionnaire surveys of teachers and students in two colleges and universities, using statistical methods, establishing theoretical models, proposing research hypotheses, and conducting correlation analysis and linear regression analysis. The results show that the current integration of red culture into civic and political education has achieved certain results, with good performance in students' interest and recognition, teachers' recognition and teaching methods. Both red culture experience practice and red culture propaganda and education positively affect the integration of red culture into the work of ideological and political education in colleges and universities ($p < 0.01$), with impact coefficients of 0.516 and 0.409. Therefore, it is necessary to integrate high-quality red cultural resources, build a media matrix of red culture and carry out red culture practice activities in order to promote the development of the integration of red culture and ideological and political education in colleges and universities.

Keywords: correlation analysis; linear regression analysis; red culture; civic education

1. Introduction

In the era of high-quality development, the deep integration of digital technology and the Civics and Political Science classroom has become a core priority of educational reform in colleges and universities. Compared with traditional teaching methods, digital means can reconfigure the Civics and Politics classroom, establish a multi-dimensional interactive and dynamically generated teaching environment, and make students' learning experience richer [1]. As colleges and universities, as an important position for ideological and political education, shoulder the important mission of inheriting the red culture and cultivating new people of the times, the construction of the integration of red culture and the ideological and political courses will be conducive to promoting China's education and teaching towards high-quality development.

Red culture, as a profound imprint of the glorious history of the Communist Party of China, not only carries the indomitable memory of the struggle of the Chinese nation, but also is a valuable asset for constructing cultural confidence and stimulating the national spirit [2]. In the new era of digital transformation of the profound change, red culture ushered in an unprecedented opportunity for development, digital technology not only breaks the limitations of the traditional means of communication, but also the inheritance and promotion of red culture has opened up a whole new realm

[3-6]. With the help of digital technology, red culture can materialize the abstract content such as historical events and revolutionary spirit, bring students a more profound experience, and enhance the effect of ideological education [7-8]. Colleges and universities should actively explore digital technology, digging red resources in depth, so that the red culture can take on new vitality, become an important support for students to establish values, and promote the development of the Civic and Political classroom to a higher level [9-10]. It can be seen that the red culture as an important carrier of the ideological education in colleges and universities, and its digital empowerment has become an innovative breakthrough, which can effectively enhance the attractiveness and effectiveness of the ideological class [11]. However, in the face of challenges such as the classroom form staying on the surface and the lack of deep-level interaction in classroom education, it is a long way to deeply explore the integration mechanism and development path of red culture in college civic education under the digital environment [12].

The article explores the theoretical logic of the role of red culture in the ideological education of colleges and universities from the three levels of value guidance, political leadership and environmental guidance. On this basis, the teachers and students of two colleges and universities A and B are taken as the research objects, and the data are collected by questionnaire survey. Propaganda and education, experiential practice and self-perception of red culture were selected as independent variables, and overall satisfaction of red culture as dependent variable, and theoretical models and research hypotheses were put forward to dig out the logical mechanism of red culture in ideological and political education in colleges and universities. Subsequently, statistical methods are used to analyze the effectiveness of the integration of red culture into civic education from the dimensions of students and teachers, and then correlation analysis and linear regression analysis are used to test the hypotheses made and obtain the impact of each variable on the satisfaction of the integration of red culture into the work of civic education in colleges and universities. Finally, based on the digital environment, the development path of red culture in the ideological and political education is proposed from the dimensions of integrating resources, building matrices and carrying out practical activities.

2. Theoretical logic of red culture in the civic education of colleges and universities

Ideological and political education in colleges and universities is the main channel of moral education in colleges and universities, and the teaching content and educational quality of the ideological and political courses are the top priority of course construction. To improve ideological and political education in colleges and universities, it is necessary to fully explore high-quality educational resources, especially red cultural resources. Specifically, the role of red culture in ideological and political education in colleges and universities is mainly embodied in the following aspects: value guidance, political leadership, environmental guidance and so on.

2.1. Value Leadership

The red culture contains rich resources for educating people, which is conducive to stimulating people's emotions, inspiring people's actions and motivating people's fighting spirit. Red culture plays an important value-oriented role in the ideological education of colleges and universities, and it can influence students through subtle ways, make them broaden their horizons and think creatively, so as to form moral concepts and cultivate national personality. In the process of ideological education, the organic integration of red culture and classroom teaching can improve students' interest in learning and improve their quality. The deeds and spirits of these characters belonging to the red culture become the spiritual food for students, so that college students can establish the will of perseverance and further promote the development of ideological and political education in colleges and universities.

2.2. Political Guidance

The formation of red culture is a testimony to the party's centuries-old revolutionary history, in which the patriotic spirit of many revolutionary generals and the brilliant achievements of many revolutionary heroes are contained. In colleges and universities, integrating these red heritages into the Civic and Political Education class can enable students to be well educated in the knowledge of red culture. In the theoretical and practical teaching, students can be politically firm and correct direction, firmly establish correct ideal beliefs, actively approach the Party, keep in line with the Party Central Committee, unite their personal interests with the interests of the collective, and strive for the great rejuvenation of the motherland.

2.3. Environmental Guidance

The cultural environment has a great influence on people, so it is necessary to realize this goal. College students are in the key period of personality shaping and value formation, through the cultivation of red culture, it can make college students adhere to Marxism, enhance their ideological and moral cultivation, cultivate their thinking and comprehension, and further improve their thinking and depth. Red culture condenses the old generation's courageous spirit and heroic people's grand initiative of pioneering and innovation, red culture into ideological and political education in colleges and universities, can create a cultural environment full of patriotism, overflowing with the spirit of national unity for the students, so that the belief education to achieve the effect of "silently". At the same time, it can also be injected into the curriculum for the red spiritual genes, to create a cultural atmosphere of reverence for science, hard work, and its huge red resources can give students a wealth of emotional material and spiritual sustenance, so that students thrive in this red land, not forgetting the original intention, and work hard.

3. Research Survey Design

3.1. Subjects of Study

This paper takes the teachers and students of universities A and B as the research object, and conducts a sample survey on the teachers and students of universities A and B by means of questionnaires, in order to deeply understand the logical mechanism of red culture in civic and political education from the perspectives of teachers and students. The online and offline forms were used to collect the questionnaires, and a total of 300 questionnaires were issued to students, of which 286 were valid questionnaires, with an effective rate of 95.33%. Next is the teacher's questionnaire, 50 questionnaires were distributed and recovered, with a validity rate of 100%.

3.2. Research Methodology

This study compiled its own questionnaire, which was designed to address the status quo, existing problems and countermeasure suggestions of red culture integration into ideological and political education in colleges and universities. In particular, the questionnaire was designed to provide an in-depth understanding of college students' knowledge of local red culture, the development of red culture education, and the development of red culture practice and experience activities.

3.2.1. Questionnaire Design

The questionnaire design is based on a Likert scale, which consists of a set of statements, each of which has five levels and is assigned a value of 1-5 points. The design of the questionnaire includes two parts, namely, the survey on the current situation of the integration of red culture into ideological education and the satisfaction-related survey. The four dimensions of self-perception of red culture, propaganda and education, experience and practice, and satisfaction of integration into ideological and political education in colleges and universities are taken as the primary indicators of measurement, and the related contents of refining the integration of red culture into ideological and political education in colleges and universities are taken as the secondary indicators. Among them, the dependent variable of statistical analysis is set as the satisfaction of red culture integrating into ideological and political education in colleges and universities, to explore the influence of three potential factors on the satisfaction of red culture integrating into ideological and political education in colleges and universities.

3.2.2. Statistical Methods

According to the survey, the samples were screened for validity, and the data were processed and analyzed using SPSS 20.0 statistical software, and the differences were considered statistically significant at $p < 0.01$ and $p < 0.05$. Constructing theoretical models and establishing research hypotheses, using questionnaires or scales that meet statistical indicators, quantifying the questionnaire questions, administering and collecting data through large samples, based on the research hypotheses, and data-oriented linear regression analysis.

3.2.3. Linear Regression Methods

1) Multiple linear regression model

The multiple linear regression model is interpreted as a linear relationship between the variable Y and multiple explanatory variables $X_1, X_2, \cdots, X_k$. It is assumed that there is a linear relationship

between the explanatory variable Y and multiple explanatory variables $X_1, X_2, \cdots, X_k$, which is a multivariate linear function of the explanatory variables and is known as a multivariate linear regression model. To wit:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k + \mu \tag{1}$$

where Y is the explanatory variable (dependent variable), $X_j (j = 1, 2, \cdots, k)$ is the k explanatory variables (independent variables), $\beta_j (j = 0, 1, 2, \cdots, k)$ is the $k+1$ unknown parameter, i.e., regression coefficients, and μ is the random error, also known as the residual, which is usually It is assumed that $\mu \sim N(0, \sigma^2)$.

The linear equation between the expected value of the explanatory variable Y and the explanatory variables $X_1, X_2, \cdots, X_k$ is:

$$E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k \tag{2}$$

It is called the multivariate overall linear regression equation, or overall regression equation for short.

For n sets of observations $Y_i, X_{1i}, X_{2i}, \cdots, X_{ki} (i = 1, 2, \cdots, n)$, the system of equations takes the form:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \mu_i, (i = 1, 2, \cdots, n) \tag{3}$$

To wit:

$$\begin{cases} Y_1 = \beta_0 + \beta_1 X_{11} + \beta_2 X_{21} + \cdots + \beta_k X_{k1} + \mu_1 \\ Y_2 = \beta_0 + \beta_1 X_{12} + \beta_2 X_{22} + \cdots + \beta_k X_{k2} + \mu_2 \\ \cdots\cdots \\ Y_n = \beta_0 + \beta_1 X_{1n} + \beta_2 X_{2n} + \cdots + \beta_k X_{kn} + \mu_n \end{cases} \tag{4}$$

Its matrix form is:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} = \begin{bmatrix} 1 & X_{11} & X_{21} & \cdots & X_{k1} \\ 1 & X_{12} & X_{22} & \cdots & X_{k2} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & X_{1n} & X_{2n} & \cdots & X_{kn} \end{bmatrix} \begin{bmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{bmatrix} + \begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix} \tag{5}$$

To wit:

$$Y = X\beta + \mu \tag{6}$$

where $Y_{n\times 1} = \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix}$ is the vector of observations of the explanatory variables, $X_{n\times(k+1)} = \begin{bmatrix} 1 & X_{11} & X_{21} & \cdots & X_{k1} \\ 1 & X_{12} & X_{22} & \cdots & X_{k2} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & X_{1n} & X_{2n} & \cdots & X_{kn} \end{bmatrix}$ is the matrix of observations of the explanatory variables,

$B_{(k+1)\times 1}=\begin{bmatrix}\beta_0\\ \beta_1\\ \beta_2\\ \vdots\\ \beta_k\end{bmatrix}$ is the overall vector of regression parameters, and $\mu_{n\times 1}=\begin{bmatrix}\mu_1\\ \mu_2\\ \vdots\\ \mu_n\end{bmatrix}$ is the vector of random error terms the overall regression equation is expressed as:

$$E(Y)=X\beta \tag{7}$$

Multiple linear regression analysis is to estimate each parameter in the model based on the observed samples, and to perform statistical tests on the estimated parameters and regression equations, so as to utilize the regression model for size prediction and analysis. The multiple linear regression model contains multiple explanatory variables, and multiple explanatory variables act simultaneously on the explanatory variable Y. To examine the effect of one of the explanatory variables on Y, the analysis must be performed assuming that the other explanatory variables remain unchanged. Therefore the regression coefficients in the multiple linear regression model are partial regression coefficients, i.e., they reflect the mean effect of one of the explanatory variables on the dependent variable Y when the other variables in the model remain unchanged.

Since the parameters $\beta_0,\beta_1,\beta_2,\cdots,\beta_k$ are unknown, the sample observations $(X_{1i},X_{2i},\cdots,X_{ki};Y_i)$ are estimated for them. If the calculated parameter estimates are $\hat{\beta}_0,\hat{\beta}_1,\hat{\beta}_2,\cdots,\hat{\beta}_k$, replace the unknown parameters of the overall regression function with the parameter estimates $\beta_0,\beta_1,\beta_2,\cdots,\beta_k$, the multiple linear sample regression equation is obtained:

$$\hat{Y}_i=\hat{\beta}_0+\hat{\beta}_1X_{1i}+\hat{\beta}_2X_{2i}+\cdots+\hat{\beta}_kX_{kn} \tag{8}$$

where $\hat{\beta}_j(j=0,1,2,\cdots,k)$ is the parameter estimate, and $\hat{Y}_i(i=1,2,\cdots,n)$ is the sample regression value or the sample fit, the sample estimate of Y_i.

Its matrix expression form is:

$$\hat{Y}=x\hat{\beta} \tag{9}$$

where $\hat{Y}_{n\times 1}=\begin{bmatrix}\hat{Y}\\ \hat{Y}_2\\ \vdots\\ \hat{Y}_n\end{bmatrix}$ is the column vector of $n\times 1$ th order fitted values of the vector of sample observations of the explanatory variables Y, $X_{n\times(k+1)}=\begin{bmatrix}1 & X_{11} & X_{21} & \cdots & X_{k1}\\ 1 & X_{12} & X_{22} & \cdots & X_{k2}\\ \vdots & \vdots & \vdots & \vdots & \vdots\\ 1 & X_{1n} & X_{2n} & \cdots & X_{kn}\end{bmatrix}$ is the $n\times(k+1)$ order sample observation matrix of the explanatory variable X, $(k+1)k1=\begin{bmatrix}\hat{\beta}_0\\ \hat{\beta}_2\\ \vdots\\ \hat{\beta}_2\end{bmatrix}$ is a column vector of $(k+1)\times 1$ order estimates of the unknown parameter vector β.

The deviation between the estimates of the explanatory variables $\hat{Y}_i$ obtained from the sample regression equation and the actual observations Y_i is called the residual e_i :

$$e_i = Y_i - \hat{Y}_i = Y_i - (\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_{2i} + \cdots + \hat{\beta}_{ki} X_{ki}) \tag{10}$$

When selecting samples, the sample capacity used for calculation must meet the following conditions:

(1) Minimum sample capacity: that is, from the principle of least squares and the principle of maximum nature, to get the parameter estimates, regardless of its quality, the lower limit of the required sample capacity. The minimum sample capacity must be no less than the number of explanatory variables (including constant terms) in the model. It follows that the above sample capacity should be greater than n+1.

(2) Sample capacity that meets the basic requirements. From the perspective of parameter estimation, the sample capacity should be greater than 5 times the number of explanatory variables. From the perspective of validity of the test should be greater than 30.

(3) The good properties of the model can only be theoretically proven with a large sample.

2) Least squares method for solving parameter estimates

The following assumptions must be met when the multiple linear regression model utilizes ordinary least squares (OLS) to estimate the parameters:

The zero mean assumes: $E(\mu_i) = 0, i = 1, 2, \cdots, n$, i.e.,:

$$E(\mu) = E\begin{bmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix} = \begin{bmatrix} E(\mu_1) \\ E(\mu_2) \\ \vdots \\ E(\mu_n) \end{bmatrix} = 0 \tag{11}$$

Homoscedasticity is assumed (the variance of μ is the same constant):

$$Var(\mu_i) = E(\mu_i^2) = \sigma^2, (i = 1, 2, \cdots, n) \tag{12}$$

No self-relevance:

$$Cov(\mu_i, \mu_j) = E(\mu_i \mu_j) = 0, (i \neq j, i, j = 1, 2, \cdots, n) \tag{13}$$

$$\begin{aligned} E(\mu\mu') &= E\left[\begin{bmatrix} \mu \\ \mu_2 \\ \vdots \\ \mu_n \end{bmatrix} (\mu_1, \mu_2, \cdots, \mu_n)\right] = E\begin{bmatrix} \mu_1^2 & \mu_1\mu_2 & \cdots & \mu_1\mu_n \\ \mu_2\mu_1 & \mu_2^2 & \cdots & \mu_2\mu_n \\ \vdots & \vdots & \vdots & \vdots \\ \mu_n\mu_1 & \mu_n\mu_2 & \cdots & \mu_n^2 \end{bmatrix} \\ &= \begin{bmatrix} E(\mu_1^2) & E(\mu_1\mu_2) & \cdots & E(\mu_1\mu_n) \\ E(\mu_2\mu_1) & E(\mu_2^2) & \cdots & E(\mu_2\mu_n) \\ \vdots & \vdots & \vdots & \vdots \\ E(\mu_n\mu_1) & E(\mu_n\mu_2) & \cdots & E(\mu_n^2) \end{bmatrix} = \begin{bmatrix} \sigma_\mu^2 & 0 & \cdots & 0 \\ 0 & \sigma_\mu^2 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & \sigma_\mu^2 \end{bmatrix} = \sigma_u^2 I_n \end{aligned} \tag{14}$$

The random error term μ is uncorrelated with the explanatory variable X (this assumption holds automatically):

$$Cov(X_{ji}, \mu_i) = 0, (j = 1, 2, \cdots, k, i = 1, 2, \cdots, n) \tag{15}$$

The random error term μ obeys a normal distribution with mean zero and variance σ^2 :

$$\mu_i \sim N(0, \sigma_\mu^2 I_n) \tag{16}$$

There is no multicollinearity between the explanatory variables:

$$rank(X) = k+1 \le n \tag{17}$$

That is, the sample observations of each explanatory variable are linearly independent of each other, and the rank of the matrix of sample observations of the explanatory variables X is the number of parameters $k+1$, which ensures that the estimates of the parameters $\beta_0, \beta_1, \beta_2, \cdots, \beta_k$ are unique.

For a multiple linear regression model with k explanatory variables:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \mu_i \quad (i = 1, 2, \cdots, n) \tag{18}$$

Setting $\hat{\beta}_0, \hat{\beta}_1, \cdots, \hat{\beta}_k$ as the estimators of the parameters $\beta_0, \beta_1, \cdots, \beta_k$, respectively. The sample regression equation is obtained as:

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_2 X_{2i} + \cdots + \hat{\beta}_k X_{ki} \tag{19}$$

The residual e_i of the observation Y_i and the regression value $\hat{Y}_i$ is:

$$e_i = Y_i - \hat{Y}_i = Y_i - (\hat{\beta}_0 + \hat{\beta}_1 X_{1i} + \hat{\beta}_{2i} + \cdots + \hat{\beta}_{ki} X_{ki}) \tag{20}$$

By least squares, $\hat{\beta}_0, \hat{\beta}_1, \cdots, \hat{\beta}_k$ should be such that the residuals e_i of the full observations Y_i and regressions $\hat{Y}_i$ should be the sum of squares is minimized, even though:

$$\begin{aligned} &Q(\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \cdots, \hat{\beta}_k) = \sum e_i^2 = \sum (Y_i - \hat{Y}_i)^2 \\ &= \sum (Y_i - \hat{\beta}_0 - \hat{\beta}_1 X_{1i} - \hat{\beta}_2 X_{2i} - \cdots - \hat{\beta}_k X_{ki})^2 \end{aligned} \tag{21}$$

Obtain the minimum value. According to the principle of extremum of multivariate functions, Q finds the first-order partial derivatives of $\hat{\beta}_0, \hat{\beta}_1, \cdots, \hat{\beta}_k$ respectively, and makes them equal to zero, denoted as:

$$\frac{\partial Q}{\partial \hat{\beta}_j} = 0, (j = 1, 2, \cdots, k) \tag{22}$$

Unfolding as:

$$\begin{cases} \dfrac{\partial Q}{\partial \hat{\beta}_0} = 2\sum (Y_i - \hat{\beta}_0 - \hat{\beta}_1 X_{1i} - \hat{\beta}_2 X_{2i} - \cdots - \hat{\beta}_k X_{ki})(-1) = 0 \\ \dfrac{\partial Q}{\partial \hat{\beta}_1} = 2\sum (Y_i - \hat{\beta}_0 - \hat{\beta}_1 X_{1i} - \hat{\beta}_2 X_{2i} - \cdots - \hat{\beta}_k X_{ki})(-X_{1i}) = 0 \\ \cdots \\ \dfrac{\partial Q}{\partial \hat{\beta}_k} = \sum (Y_i - \hat{\beta}_0 - \hat{\beta}_1 X_{1i} - \hat{\beta}_2 X_{2i} - \cdots - \hat{\beta}_k X_{ki})(-X_{ki}) = 0 \end{cases} \tag{23}$$

Simplify to obtain the following system of equations:

$$\begin{cases} n\hat{\beta}_0 + \hat{\beta}_1 \sum X_{1i} + \hat{\beta}_2 \sum X_{2i} + \cdots + \hat{\beta}_k \sum X_{ki} X_{1i} = \sum X_{1i} Y_i \\ \hat{\beta}_0 \sum X_{1i} + \hat{\beta}_1 \sum X_{1i}^2 + \hat{\beta}_2 \sum X_{2i} X_{1i} + \cdots + \hat{\beta}_k \sum X_{ki} X_{1i} = \sum X_{1i} Y_i \\ \cdots \\ \hat{\beta}_0 \sum X_{ki} + \hat{\beta}_1 \sum X_{1i} X_{ki} + \hat{\beta}_2 \sum X_{2i} X_{ki} + \cdots + \hat{\beta}_k \sum X_{ki}^2 = \sum X_{ki} Y_i \end{cases} \tag{24}$$

The above $(k+1)$ equation is called the regular equation and its matrix form is:

$$\begin{bmatrix} n & \sum X_{1i} & \sum X_{2i} & \cdots & \sum X_{ki} \\ \sum X_{1i} & \sum X_{1i}^2 & \sum X_{2i} X_{1i} & \cdots & \sum X_{ki} X_{1i} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \sum X_{ki} & \sum X_{1i} X_{ki} & \sum X_{2i} X_{ki} & \cdots & \sum X_{ki}^2 \end{bmatrix} \begin{bmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \hat{\beta}_2 \\ \vdots \\ \hat{\beta}_k \end{bmatrix} = \begin{bmatrix} \sum Y_i \\ \sum X_{1i} Y_i \\ \vdots \\ \sum X_{ki} Y_i \end{bmatrix} \tag{27}$$

Because:

$$\begin{bmatrix} n & \sum X_{1i} & \sum X_{2i} & \cdots & \sum X_{ki} \\ \sum X_{1i} & \sum X_{1i}^2 & \sum X_{2i} X_{1i} & \cdots & \sum X_{ki} X_{1i} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \sum X_{ki} & \sum X_{1i} X_{ki} & \sum X_{2i} X_{ki} & \cdots & \sum X_{ki}^2 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 1 & \cdots & 1 \\ X_{11} & X_{12} & \cdots & X_{1n} \\ X_{21} & X_{22} & \cdots & X_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ X_{k1} & X_{k2} & \cdots & X_{kn} \end{bmatrix} \begin{bmatrix} 1 & X_{11} & X_{21} & \cdots & X_{k1} \\ 1 & X_{12} & X_{22} & \cdots & X_{k2} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & X_{1n} & X_{2n} & \cdots & X_{kn} \end{bmatrix} = X'X \tag{26}$$

$$\begin{bmatrix} \sum Y_i \\ \sum X_{1i} Y_i \\ \vdots \\ \sum X_{ki} Y_i \end{bmatrix} = \begin{bmatrix} 1 & 1 & \cdots & 1 \\ X_{11} & X_{12} & \cdots & X_{1n} \\ X_{21} & X_{22} & \cdots & X_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ X_{k1} & X_{k2} & \cdots & X_{kn} \end{bmatrix} \begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} = X'Y$$

Let $\hat{\beta} = \begin{bmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \hat{\beta}_2 \\ \vdots \\ \hat{\beta}_k \end{bmatrix}$ be the vector of estimates and the sample regression model $Y = X\hat{\beta} + e$ with both sides multiplied by the transpose matrix X' of the matrix of sample observations X, then we have:

$$X'Y = X'X\hat{\beta} + X'e \tag{27}$$

to obtain a regular system of equations:

$$X^{'}Y = X^{'}X\hat{\beta} \tag{28}$$

From Eq. (17), $R(X) = k+1$, $X^{'}X$ is a square matrix of order $(k+1)$, so $X^{'}X$ full rank, $X^{'}X$ ' inverse matrix $(X^{'}X)^{-1}$ exists. Thus:

$$\hat{\beta} = (X^{'}X)^{-1}X^{'}Y \tag{29}$$

is the OLS estimator of the vector β.

3.3. Theoretical Model and Research Hypotheses

College students' self-perception of red culture and ideological and political education carried out by colleges and universities are the main entry points of this research work. Among them, the practical experience of red culture is an important content and carrier of red culture into ideological and political education in colleges and universities, thus this is taken as one of the hypothesized factors in the research. The theoretical model of satisfaction evaluation of red culture in ideological and political education in colleges and universities is shown in Figure 1. From this, the following hypotheses can be put forward:

H1: Red culture self-perception has a significant positive effect on satisfaction.

H2: Red culture propaganda and education has a significant positive effect on satisfaction.

H3: Red culture experience practice has a significant positive effect on satisfaction.

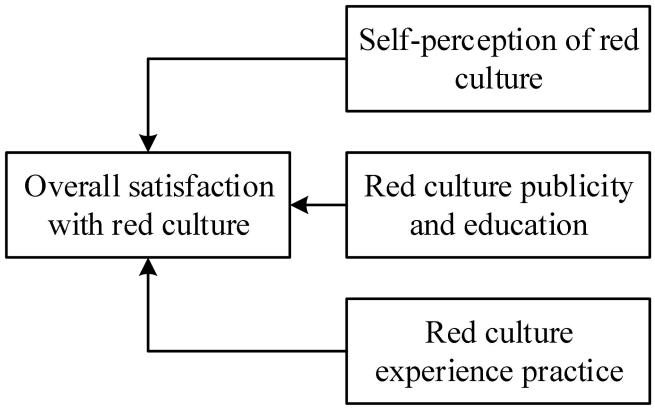

Figure 1. The satisfaction theory model of red culture in ideological and political education.

4. Findings and Analysis

4.1. Effectiveness of the Integration of Red Culture into Ideological Education

4.1.1. Student Interest Level

Through the offline interviews, it is understood that students mainly learn about the red culture through newspapers, movies, radio, the Internet, etc. The digital environment further promotes the dissemination of the red cultural resources, so that students can learn about the red cultural resources in a timely manner. In order to further understand students' interest in the use of red cultural resources in ideological and political classes, the questionnaire was designed to ask “Are you interested in the use of red cultural resources in teaching by teachers of ideology and politics?” As shown in Figure 2, 48.25% of the students are very interested in the use of red cultural resources in teaching, 47.90% of the students are moderately interested in the use of red cultural resources in teaching, and 3.85% of the students are not interested in the use of red cultural resources in teaching. On the whole, most of the students are still interested in the use of red cultural resources in teaching, which plays a good role in paving the way for teachers to use red cultural resources in teaching ideological and political courses.

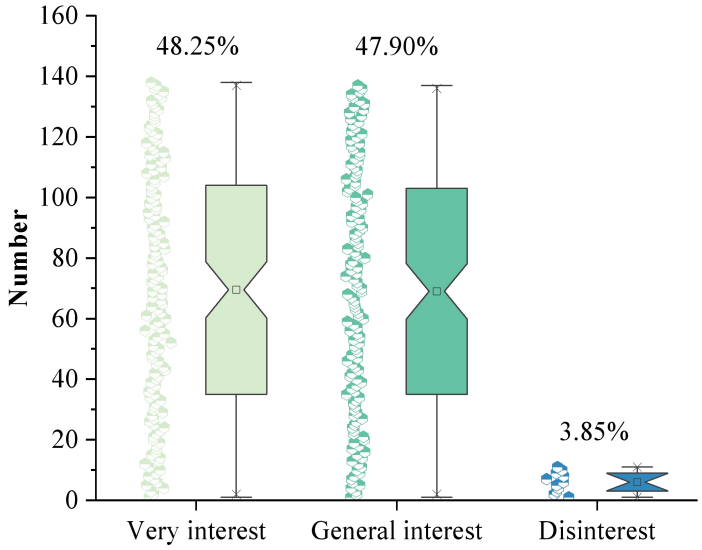

Figure 2. Students' interest in red culture.

4.1.2. Student Recognition

When asked whether it is necessary to use red cultural resources in the teaching of ideological and political courses, the results of the survey on the necessity of the use of red cultural resources are shown in Figure 3, and the students who chose "very necessary", "general", "not necessary" and "indifferent" accounted for 69.93%, 23.08%, 2.80% and 4.20% respectively, and more than half of the students thought that it was "very necessary" to apply red cultural resources to the teaching of ideological and political courses. It can be seen that most students generally have a high degree of recognition for the development and use of red cultural resources in ideological and political courses. This also reflects from the side that red cultural resources are a kind of high-quality curriculum resources, and their application to the teaching of ideological and political courses has a greater attraction to students.

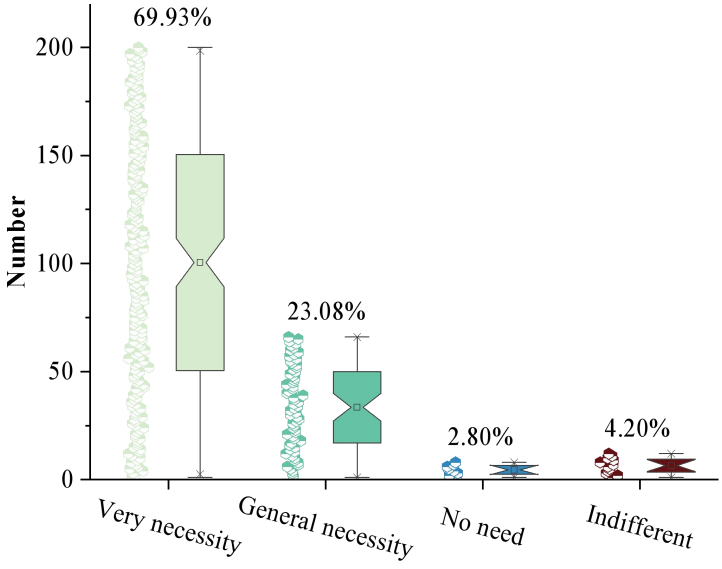

Figure 3. The necessity of red cultural resources.

Most of the students are happy to see the use of red cultural resources in the ideological and political class. When asked, “What positive impact do you think the use of red cultural resources in the teaching of ideological and political courses has had on you? (Multiple choice)”, the positive impact of the use of red cultural resources is shown in Figure 4, 83.22% of the students think that it can deepen their understanding of red cultural resources, and 71.68% of the students think that it can stimulate their love of the party and patriotism. It shows that the integration of red resources into teaching can improve

students' sense of cultural identity and at the same time, it can also set up correct values for students and ignite the passion of patriotism and love for the Party.

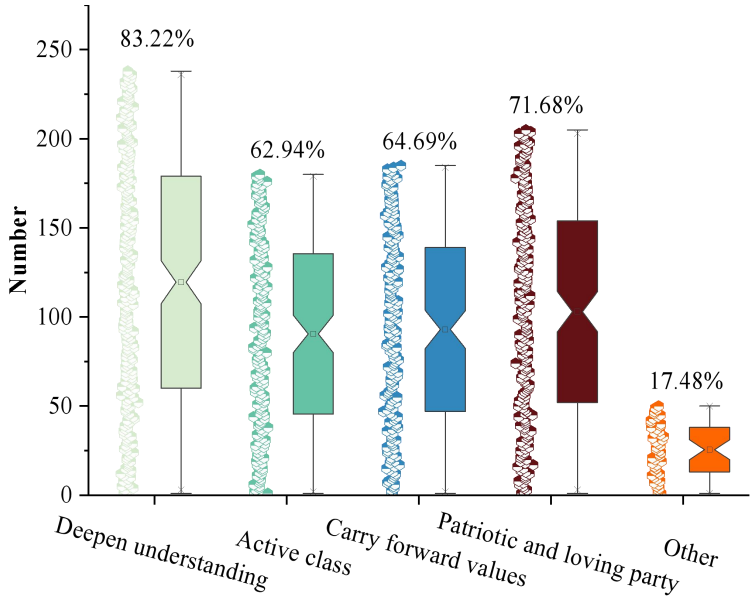

Figure 4. Positive effects of red cultural resources.

4.1.3. Teacher Identification

Most of the political science teachers agree that red cultural resources are high-quality curriculum resources. When asked, “Do you agree that red cultural resources should be used in the Civics and Political Science class?” When asked “Do you agree with the use of red cultural resources in Civics and Politics classes?”, teachers' recognition of the use of red cultural resources is shown in Figure 5, with 62.00% and 38.00% of teachers choosing “strongly agree” and “relatively agree” respectively, basically all of them expressed their recognition, indicating that the teachers' awareness and attitude towards the use of red cultural resources are positive and positive. This shows that teachers' utilization awareness and attitude are positive.

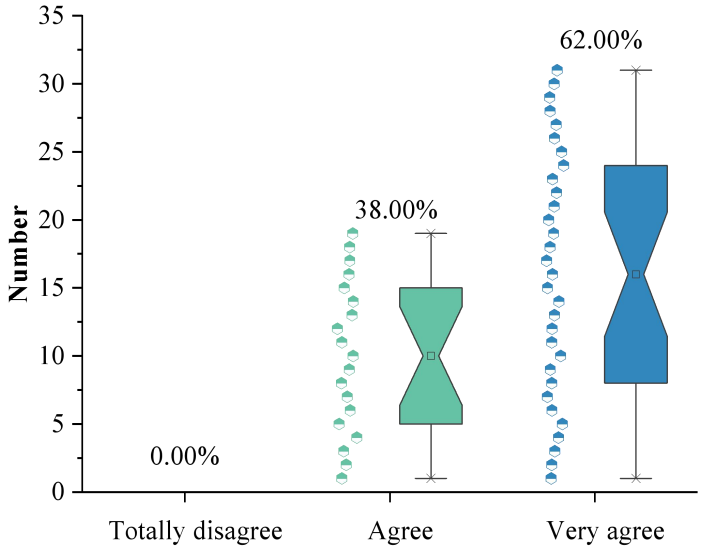

Figure 5. The teacher's identity of red cultural resources.

4.1.4. Frequency of Application

Most teachers are able to use red cultural resources in their teaching. When asked "how often do you

use red cultural resources in teaching", the frequency of teachers' use of red cultural resources is shown in Figure 6, 22.00% of political teachers often use red cultural resources, 34.00% and 28.00% of political teachers occasionally or rarely use red cultural resources, and only 16.00% of political teachers never use red cultural resources in teaching. This shows that most politics teachers generally pay more attention to the development and use of red cultural resources in their teaching. Some politics teachers seldom or never use red cultural resources because they do not know enough about red cultural resources, and schools have not organized corresponding training, resulting in a small number of teachers being less motivated to develop and use red cultural resources.

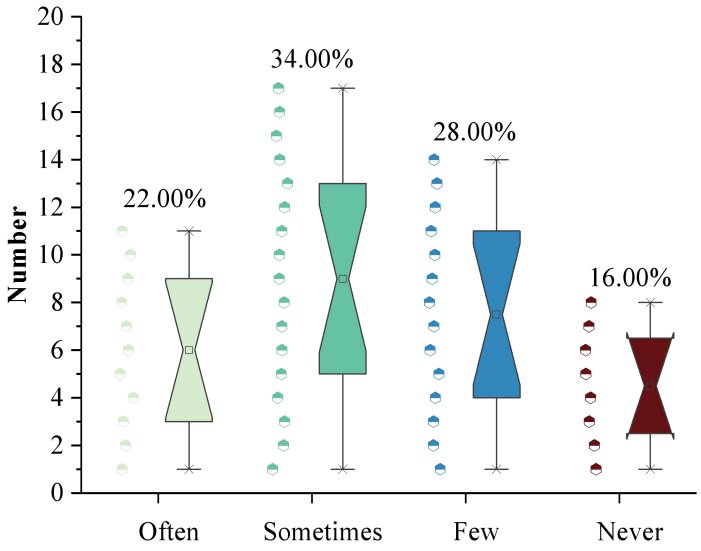

Figure 6. The frequency of teachers' use of red cultural resources.

4.1.5. Teaching Methods

Teachers' ways and means of using red cultural resources are innovative on the basis of retaining traditional teaching methods. The teaching methods of using red cultural resources are shown in Figure 7, the vast majority of teachers choose the traditional case teaching method, multimedia demonstration method, and direct lecture method when using red cultural resources, accounting for 74.00%, 78.00%, and 22.00% of the political science teachers respectively. In addition, some teachers innovated teaching methods, such as 78.00% of the teachers adopted the issue-based teaching method, which guided students to inherit the red genes by setting up issues in the classroom, 28.00% of the teachers adopted the experiential activity-based teaching method, which carried out role-playing in the classroom, dubbing of the red movie and other activities, and 36.00% of the teachers chose the “other Other” methods were chosen by 36.00% of the teachers.

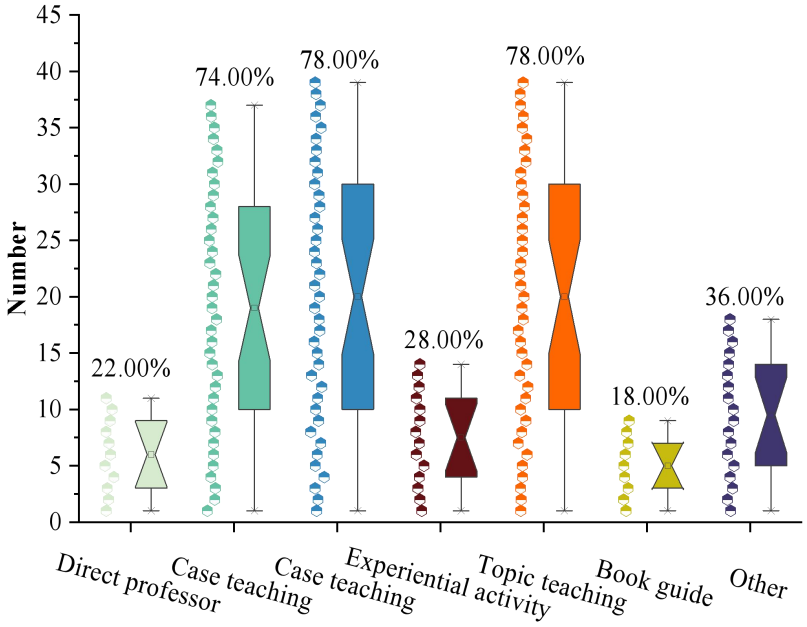

Figure 7. The teaching method of red cultural resources.

4.2 Research Model Testing

On the basis of understanding the teaching effectiveness of red culture in the ideological education in colleges and universities, combining correlation analysis and linear regression analysis, discussing the influence of each variable on the satisfaction of red culture into the ideological education, the logical mechanism of red culture in the ideological education in colleges and universities teaching inquiry.

4.2.1. Correlation Analysis

The Pearson correlation coefficient method was used to analyze the correlation between the respective variables and the overall satisfaction of red culture. According to the data obtained from the questionnaire, the results of correlation analysis of each variable are shown in Figure 8. Among the three potential influencing factors, the correlation coefficients of three potential influencing factors, namely the overall satisfaction of red culture and the experience practice of red culture (0.834**), the overall satisfaction of red culture and the publicity and education of red culture (0.822**), and the overall satisfaction of red culture and self-perception of red culture (0.462**), reached a very significant level (P<0.01).

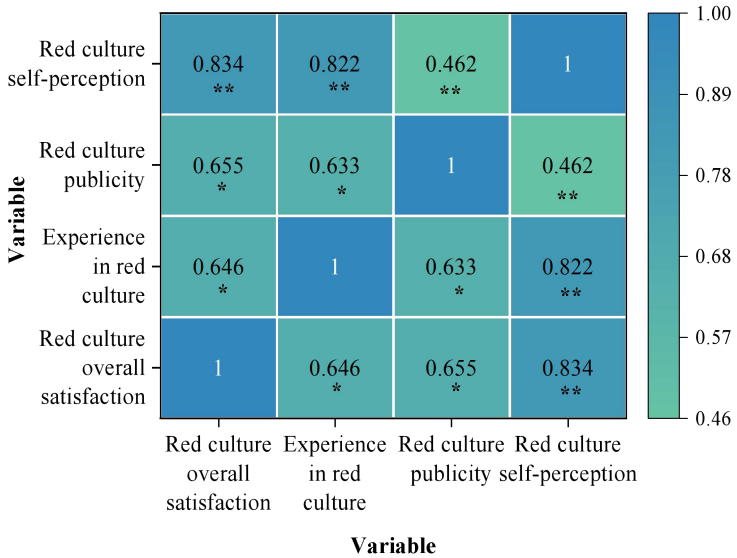

Figure 8. The correlation analysis results of each variable.

4.2.2. Linear Regression Analysis

The results of linear regression analysis are shown in Table 1, with * indicating $p < 0.05$ and ** indicating $p < 0.01$. The analysis of model 1 shows that the R^2 value is 0.789, indicating that the three levels can explain 78.9% of the variance in the organizational effectiveness dependent variable, and the F value is 103.558 ($p = 0.000$), which is at the 0.01 significant level. The regression coefficient test of the red culture self-perception of the first-level indicator shows that $t = 0.541$, $p > 0.05$, so it indicates that the red culture self-perception factor of the first-level indicator does not pass the test of significance, and is not statistically significant. The regression coefficients of the first-level indicators of red culture experience practice and red culture propaganda and education are 0.516 and 0.409, respectively, indicating that the first-level indicators of red culture experience practice and red culture propaganda and education will have a highly significant positive influence on the overall satisfaction of red culture ($p < 0.01$). Research hypotheses H2 and H3 are valid, and hypothesis H1 is not valid.

The analysis of model 2 shows that the R^2 value is 0.828, indicating that the three dimensions can explain 82.8% of the variance in organizational effectiveness depending on the variable, and the F value is 111.649 ($p = 0.000$), which reaches the 0.01 level of significance. In the red culture propaganda and education, the three factors of the school's use of traditional media to propagate red culture, the school's arrangement and decoration of buildings with red elements, and the school's use of the Internet and new media to propagate the red culture aspects passed the significance test ($p < 0.05$). Among them, the significance of the factor of the school's use of the Internet and new media for propaganda in terms of red culture is extremely significant ($p < 0.01$). In the practice of red culture experience, all secondary indicator factors passed the significance test ($p < 0.05$).

Table 1. Linear regression analysis results.

Primary indicator	Secondary indicator	Model 1		Model 2	
		β	P	β	*p*
(constant)	(constant)	0.449	0.042*	0.236	0.037*
Red culture propaganda and education	The level of teacher teaching in red culture	0.516	0.004**	0.062	0.371
	The school uses traditional media to promote red culture			0.082	0.019*
	Incorporate red culture into admission education			0.079	0.178
	The school decorated buildings with red elements			0.103	0.025*
	The school uses the Internet and new media to promote the red culture			0.147	0.003**
	The school holds red culture related art activities			0.151	0.694
Red culture experience and practice	The school forms the relevant students' red clubs, such as party history salon	0.409	0.005**	0.104	0.023*
	The school organizes red cultural and social practice			0.136	0.016*
	The school organizes the relevant party history and the party building knowledge competition			0.127	0.026*
	Establish the relevant red education teaching practice base			0.138	0.034*
	The school holds relevant red cultural theme exhibitions			0.145	0.012*
	The school holds relevant red culture history preach			0.114	0.021*
Red culture self-perception	I'm interested in red culture	0.011	0.541	0.108	0.341
	I know a lot about red culture			0.101	0.252
	I'm familiar with red spots			0.106	0.234
Regression model	F	103.558**		111.649**	

summary	R^2	0.789	0.828

5. Paths for the Development of Red Culture in Civic Education

According to the above analysis of the logical mechanism of red culture in ideological and political education, it is found that experiential practice and propaganda and education are significant positive influencing factors affecting the integration of red culture into the ideological and political education of students in colleges and universities. Therefore, the development path of red culture in ideological and political education is proposed by combining this conclusion and the digitalized environment.

5.1. Integration of High-Quality Red Cultural Resources

Under the digital environment, the application path of red cultural resources in the ideological education of colleges and universities has been expanded and deepened. Teachers can use new media technology to integrate high-quality red cultural resources to optimize the content of civic and political education.

At present, teachers can obtain rich and diversified red cultural resources through the new media platform, including textual materials of red historical events, red movies, red songs and so on. On this basis, teachers can analyze and study them comprehensively, extract representative and educational content from them, and integrate and process them, so as to provide rich material cases for subsequent teaching activities. Specifically, teachers can use the new media platform to collect and organize red cultural resources, including text, pictures, audio, video and other forms, to create a professional and systematic red cultural resource base. For example, when teaching knowledge related to the Long March, teachers can search for and select short videos about the Long March, so that students can understand the historical background, process and significance of the Long March more intuitively through vivid visual materials. In addition, teachers can also search for red movies, documentaries and other resources on the video platform, and organize students to watch these films and videos, which is conducive to students accepting the culture of red culture in a relaxing and pleasant atmosphere, and enhancing the patriotic sentiment.

5.2. Establishment of a Red Culture Media Matrix

In the pre-preparation stage, colleges and universities should establish a clear goal of integrating red culture into ideological and political education, and set up a team of teachers and students, which needs to systematically organize the red cultural resources, excavate educational red stories, heroes and historical relics, etc., so as to provide rich materials for the creation of the content of the new media matrix. On this basis, a comprehensive implementation plan for the construction, operation and promotion of the red culture new media matrix should be prepared according to the specific conditions of the school.

In the medium-term implementation stage, universities need to strictly follow the implementation plan established in the early stage to promote the construction and operation of the red culture new media matrix. They should pay close attention to the development of the new media platform, and adjust the expression form and communication strategy of the red culture content in time to adapt to the changing new media environment.

In the later consolidation stage, colleges and universities need to establish a set of long-term mechanisms to incorporate the operation of the red culture new media matrix into the system of ideological education, standardize management, and continuously optimize the content and make adjustments according to the feedback and the development trend of the new media, in order to maintain the attractiveness and influence of the red culture new media matrix.

5.3. Carrying Out Practical Activities on Red Culture

Under the digital environment, in order to deepen the connotation of civic education, colleges and universities should actively carry out red cultural practice activities from both on-campus and off-campus aspects, so as to effectively integrate and disseminate red cultural resources.

For on-campus, colleges and universities should make full use of red cultural resources to carry out diversified activities of ideological and political education. On the one hand, colleges and universities can integrate red culture into the curriculum system through classroom teaching, lectures, seminars and other forms, so that students can feel the charm of red culture in their professional learning. On the other hand, colleges and universities can carry out red culture theme education, such as red classic recitation, red movie exhibition, red song singing, etc., so that students can enhance their sense of identity and pride in red culture in the process of participating in the activities. In addition, in the digital environment, colleges and universities should also make full use of network platforms to promote the digital

dissemination of red cultural resources. For example, with the help of short videos, live broadcasts, animation and other forms, innovative expression of red cultural stories, red classics, etc., to attract more students to pay attention to and inherit red culture.

For off-campus, colleges and universities should actively build a red culture practice platform, combining ideological education with social practice. On the one hand, students can be organized to visit red education bases, revolutionary historical sites, etc., so that students can feel the atmosphere of red culture in an immersive way and inspire their patriotic feelings. At the same time, red culture volunteer activities can be carried out, such as caring for war veterans and helping poor areas. On the other hand, colleges and universities can also cooperate with local governments, enterprises and institutions, social organizations, etc., to jointly organize red culture themed practical activities, such as red culture festivals, red tours and so on.

6. Conclusion

Promoting and learning red culture in the ideological education of colleges and universities is conducive to the formation of value-guiding, political-guiding and environment-guiding roles. This project investigates the teachers and students of a two colleges and universities, and designs a theoretical model to excavate the current situation as well as the logical mechanism of the integration of red culture into civic and political education, and thus puts forward the development path of red culture in civic and political education. The main research results are as follows:

(1) Students have good demand and recognition for the integration of red culture into Civic and Political Education, more than 95% of students show interest in learning, and nearly 70% of students think that the integration of red culture is necessary. Teachers' recognition of red culture people's ideological education reaches 100%, and 22% of teachers often use red culture resources. In terms of teaching methods, it is reflected in the combination of traditional and innovative methods, in which the use of case teaching method, multimedia presentation method and issue-based teaching method are all above 70%.

(2) The hypotheses H2 and H3 proposed in this paper passed the test, i.e., red culture experience practice, red culture propaganda and education have a significant positive effect on the overall satisfaction of red culture ($p < 0.01$), and the regression coefficients are 0.516 and 0.409, respectively. Among them, the school's use of the Internet and new media to publicize the red cultural aspects can have an extremely significant impact on the red cultural education of college students ($p < 0.01$).

(3) In order to better play the role of red cultural resources in ideological and political education in colleges and universities, firstly, high-quality red cultural resources should be integrated to optimize the content of ideological and political education. Secondly, the red cultural media matrix should be built to broaden the channels of ideological and political education. Then, carry out red cultural practice activities to deepen the connotation of ideological and political education. Actively use the digital environment to innovate educational means and strengthen the effect of ideological education.

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