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# Strategies for Improving the Professionalism of Civics Teachers in the Age of Artificial Intelligence

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**SUMMARY:** *In the gradually intelligent teaching environment, teaching and learning have undergone a fundamental transformation, and Civics teachers, who are carrying out the fundamental task of cultivating moral integrity, are faced with the great challenges brought about by the new situation of educational change. Based on this, this study takes the professional literacy of Civics teachers in the era of artificial intelligence as the research theme, takes the construction of the structural model of teachers' professional literacy as the main research objective and content, and starts from the "construction of structural model" at the theoretical level to the "application of structural model" at the practical level. The study was conducted with the aim of providing some references for the subsequent enhancement strategies. Through the research, it is found that the current Civics teachers achieved the highest score of 4.25 in the dimension of Intelligent Thinking Literacy, but only 3.81 in the dimension of Intelligent Competence Literacy, which indicates that the Civics teachers only stay in the theoretical level of Intelligent Teaching and lack the ability to apply it in the actual teaching, and that Civics teachers with different ages and academic qualifications have uneven abilities in terms of their professional literacy. In view of the above problems, we put forward corresponding improvement strategies from three aspects: teachers, schools and government, expecting to make certain reference programs for the improvement of the professional literacy of Civics teachers, and to better promote the development of Civics education in the era of artificial intelligence.*

***KEYWORDS:*** *artificial intelligence; structural model; professionalism; intelligent teaching; civic education*

## 1 Introduction

Teachers' professionalism refers to the qualities and abilities that teachers must have in order to complete their teaching work and fulfill their responsibilities, as well as the conceptual awareness and behavioral qualities that teachers show in teaching [1]. In current educational practice, teachers' professionalism and the implementation of teaching strategies are directly related to the quality and effectiveness of teaching [2]. The progress of artificial intelligence technology profoundly affects the process of society, and also promotes a fundamental change in the education system. The introduction of artificial intelligence into the classroom not only changes the education and teaching methods and teaching equipment, but also gives new connotation and higher expectations to the improvement of the professional quality of teachers of Civics and Political Science [3, 4].

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The sharing of information resources in the era of artificial intelligence breaks the traditional dominant ideological education ecology, but the information content provided by artificial intelligence is intermingled and mixed, which inevitably conflicts with the dominant values advocated by the Civic and Political Science Class, which is very easy to mislead the formation of the students' thoughts and concepts, and influences the performance of the value-led function of Civic and Political Science Class [5-7]. Artificial intelligence is promoting the teaching mode from the traditional “teacher-student” dual structure to the “teacher-machine-student” ternary structure, and the new teaching structure will inevitably lead to new changes in the teaching environment of Civic and Political Science Class [8, 9]. The continuous iteration and updating of artificial intelligence technology, the teacher's function of transmitting knowledge and answering questions is partially replaced by technology, and the teachers of Civics and Political Science courses are facing the dilemma of marginalization of their roles [10]. At the same time, technology allows teachers of Civics and Political Science to access a large amount of data and other information according to their own wishes, and it is very easy to blindly pursue the supremacy of technology, and the consensus on teacher ethics is gradually dissolved in a technology-oriented environment [11, 12]. In this context, how to make full use of artificial intelligence technology and innovate the path of professionalism enhancement is an important issue that needs to be explored in the construction of Civics and Political Science teacher team.

This study aims to construct a structural model of the professional literacy of Civics teachers that fits the AI era and rigorously validate it. Subsequently, the model is applied to practice using empirical research methods as a way to systematically assess the professional literacy level of Civics teachers at this stage. At the beginning of the research, a comprehensive and in-depth review of the research progress on the professional quality of ideological and political teachers was conducted to precisely determine its constituent dimensions and deep connotations. At the same time, the theoretical foundation of the research was clarified. Secondly, literature was collected as qualitative research materials, and the grounded theory research paradigm was adopted. Through the three-level coding method of openness, main axis, and selection, the qualitative materials were processed and analyzed respectively Obtain the structural elements of ideological and political teachers' professional qualities and construct a professional quality structure model in the era of artificial intelligence. After that, questionnaires were designed and distributed for recovery according to the structural model, and the survey data were analyzed in depth with the help of professional statistical software such as SPSS. Finally, the status quo of the professional literacy of Civics teachers in the era of artificial intelligence is comprehensively investigated, and targeted strategies are proposed for enhancing the professional literacy of Civics teachers from three dimensions: personalized training, building a hybrid training system, and establishing a scientific and diversified evaluation mechanism.

# 2 Construction of a structural model of teachers' professionalism

## 2.1 Research design for modeling

### 2.1.1 Research methodology

The modeling of this study utilizes the rooted theory research method. Rooted theory is not a traditional “theory”, but a means of constructing theory based on qualitative data analysis. Rooted theory emphasizes the bottom-up construction of theory based on empirical data. By systematically collecting and analyzing data on specific phenomena, the discovery, expansion,

and testing of theories are realized, and the results can provide theoretical explanations that fit reality. In this research process, the characteristics of the research problem determine the inevitability of rooted theory used for theory construction. Mining the elements of professional literacy of Civics teachers in the era of artificial intelligence, and the construction of models need to generate theories, and the rooted theory can solve this challenge. When building the theoretical framework, it is operated in strict accordance with its requirements. Rooted theory has a rigorous and standardized process as shown in Figure 1.

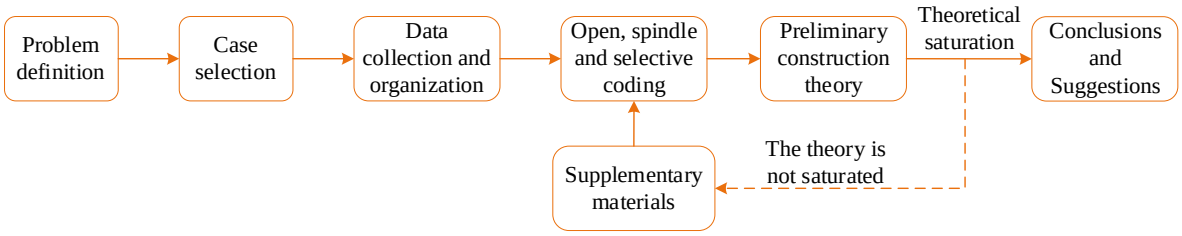


*Figure 1: Grounded Theory Research Process*

### 2.1.2 Research tools

In this study, raw text was processed with Excel and NVivo software.Excel organizes the data, and NVivo, as a professional qualitative analysis software, can read and code the interview scripts and documents with practical functions such as coding, analyzing, visualizing, and transcribing, which can deal with diversified data and make it easy to compare the nodes. With this software, the tedious affairs of data analysis can be avoided. In this study, the manual coding function was mainly used to build the theoretical framework by analyzing each interview text and literature, establishing nodes one by one, and then integrating the nodes.

## 2.2 Data collection

The data sources of the rootedness theory cover all the information related to the subject of the study. In this study, the primary textual data consists of both primary and secondary research materials. Primary research materials are mainly from interviews, while secondary research materials are literature of high quality that fit the research objectives, mainly including policy texts related to the professionalism of Civics teachers and literature related to the professionalism of Civics teachers in the era of artificial intelligence.

The elements obtained through interviews are from the perspective of Civics teachers, and the researcher focuses on the explicit elements that are clearly characterized and easy to detect, which can visually reflect the reality of teaching. On the other hand, the elements coded and extracted from various types of literature are usually characterized by generality and universality, and they may supplement or expand the information obtained from the interviews in some aspects, and the specific process of data collection is shown in Figure 2. Since the elements profiled by the two types of sources are intrinsically related, and the ultimate goal of both is to construct a complete structural model of the professional literacy of Civics teachers in the era of artificial intelligence, this study combines the two types of sources. This integrated use can effectively circumvent the limitations of a single source and make the research results more comprehensive and reliable.

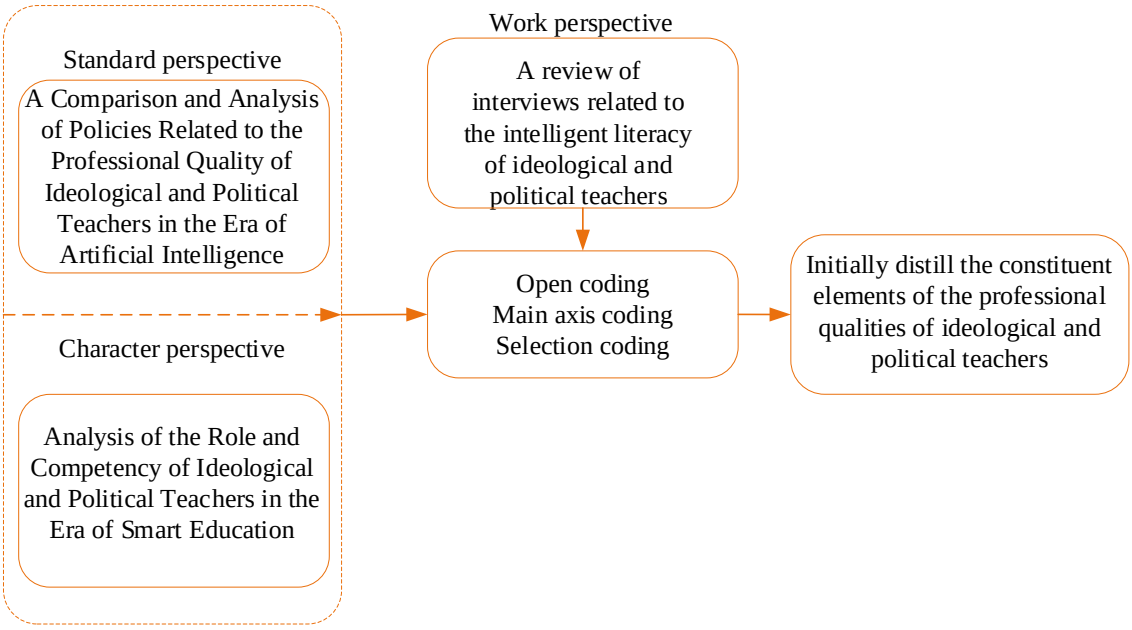


*Figure 2: The specific process of data collection*

## 2.3 Data processing

### 2.3.1 Open coding

Open coding, as the initial step in the coding process of rooted theory data, requires the researcher to read the collected primary data word by word and sentence by sentence, and then extract the content related to the "professionalism of Civics teachers in the era of Artificial Intelligence" and give it a concept. During the implementation of this step, the researchers coded 42 documents and the interview records of 8 interviewees (experts in related fields in our university), and after in-depth analysis, a total of 578 concepts were extracted.

These 578 concepts cover the whole teaching process of intelligent Civic Education from preparation, implementation to evaluation, and also include the personal thinking level of Civic Teachers as well as the scope of ethics and morality. Among them, carrying out the teaching practice of artificial intelligence technology, mastering the ontological knowledge of intelligent technology, mastering the basic principles of intelligent technology, privacy issues, behavioral norms and ethical guidelines, designing teaching methods with intelligent technology, and handling teaching resources with intelligent technology were mentioned repeatedly by a number of teachers in the course of the interviews.

### 2.3.2 Spindle coding

When the coding of the main axes was carried out, the contents of each code were first thought over, sorted out and analyzed based on the results of the open coding. In this process, the logical relationship between the categories was gradually clarified, the association between the categories and sub-categories was clarified, and 13 main categories were finally summarized.

Specifically, they include, theoretical knowledge (A1), practical knowledge (A2), technical knowledge (A3), intelligent application ability (A4), intelligent analysis ability (A5), intelligent evaluation ability (A6), intelligent innovation ability (A7), human-machine synergistic thinking (A8), technological thinking (A9), data thinking (A10), design thinking (A11), rational attitude (A12), and Moral Ethics (A13).

### 2.3.3 Selection of codes

Selection of codes is the final step in the coding analysis of rootedness theory, which requires the researcher to systematically analyze the categories coded by the principal axes in order to identify a "core category" that can unify and summarize multiple categories. The selected core categories need to be highly generalizable and integrative. In the process of analysis, the content of the core category should be supplemented and improved according to its connotation and attributes.

By comparing, selecting and summarizing the results of open coding and spindle coding, and adding the "thinking" level according to Bloom's target classification theory, four core categories were finally identified. Specifically, intelligent knowledge (X1), intelligent ability (X2), intelligent thinking (X3) and intelligent ethical attitudes (X4).

## 2.4 Model construction

Through the three-step coding process of rooted theory, the structural model of professionalism of Civics teachers in the era of artificial intelligence was finally clarified as shown in Figure 3. It contains four first-level dimensions (X1-X4) and a total of 13 second-level dimensions (A1-A13) under the first-level dimensions.

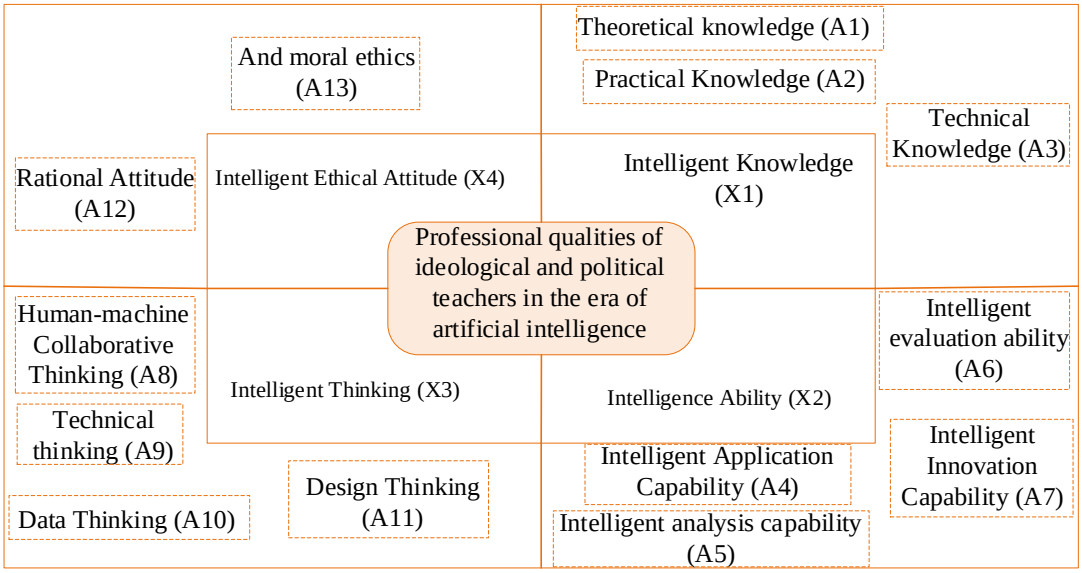


*Figure 3: The professional quality structure model of ideological and political teachers*

The "Civics Teachers' Professional Literacy Structure Model in the Age of Artificial Intelligence" is targeted at all Civics teachers in primary and secondary schools and colleges and universities, and has the characteristic of universality. With the concept of intelligent education as its guiding philosophy, the model can not only serve as an assessment tool for AI education ability, but also as a guideline for teachers' intelligent literacy training and education. Specifically, it clearly defines the responsibilities of Civics teachers in carrying out AI learning or teaching, and covers the professional qualities that need to be implemented and can be achieved. At the same time, it provides valuable references for teachers in the selection of teaching content, the use of teaching methods, and the expected goals of intelligent Civic Education in their teaching practice.

# 3 Application of the structural model of teacher professionalism

On the basis of further calibrating the scientific rationality of the preliminary construction of the structural model of professional literacy of Civics teachers in the era of artificial intelligence, it is proposed to use a questionnaire survey to further validate the structural model to ensure the scientificity and rationality of the structural model. The results of the questionnaire survey are used to analyze the current problems of the professional literacy of Civics teachers in the era of artificial intelligence, and provide reference for the subsequent training and enhancement.

## 3.1 Questionnaire design

Based on the structural model of professional literacy of Civics teachers in the era of artificial intelligence proposed to be constructed in the previous paper, this study designed the Questionnaire on Professional Literacy of Civics Teachers in the Era of Artificial Intelligence. The content of the questionnaire is divided into three parts, the instruction for filling in the questionnaire is the content of the first part of the questionnaire, and the basic information of the filler is the content of the second part of the questionnaire, which mainly includes information such as gender, age, academic qualifications, teaching age, title, and current teaching grade. In the third part, it is the evaluation scale for evaluating the professionalism of Civics teachers in the era of industrial intelligence. The main basis for the preparation of its items is the secondary elements of the structural model, which are quantified into specific behaviors or expressions of competence, and a total of 42 assessment items are prepared based on the 13 secondary elements. The scale adopts the Likert 5-point scale, in which teachers need to choose a level from very non-compliant to very compliant according to their own actual situation, and score 1-5 points in turn.

In order to make the questionnaire design more reasonable, the questionnaires were randomly distributed before the formal survey, and finally 72 pre-test questionnaires were obtained, and the reliability and validity of the pre-test questionnaires were analyzed by using the SPSS software to validate the questionnaire's scientificity and reasonableness, and to prepare for the conduct of the formal survey.

### 3.1.1 Reliability analysis

Reliability refers to the reliability of the questionnaire, i.e., the degree of credibility of the results obtained. In order to verify the reliability of the questionnaire and adjust the questionnaire to make it more scientific and reasonable, it is essential to analyze the reliability of the questionnaire. The commonly used reliability tests in Likert attitude scales are “Cronbach's alpha” coefficients and “folded half reliability”.

In this study, Cronbach's Alpha coefficient was used to test the reliability of the questionnaire, and the data were processed and calculated using the function of analyzing-measurement-reliability analysis in the SPSS software, and the details of the results obtained are shown in Table 1. If the reliability of a scale is higher, it indicates that the scale is more stable. Psychology considers a reliability coefficient of 0.70 to be acceptable, and 0.80 indicates good reliability of the questionnaire. As can be seen from the table, the total Cronbach's Alpha of the questionnaire developed in this study based on the structural model of the professionalism of Civic Teachers in the era of Artificial Intelligence is 0.943, and the Cronbach's Alpha coefficients of the four first-level dimensions and the 13 second-level dimensions are all over 0.80, which indicates that the questionnaire's reliability is good and its design is more reasonable.

*Table 1: Reliability Analysis Table of the Questionnaire*

| First-level | Cronbach's Alpha | Second-level | Cronbach's Alpha | Item |
|---|---|---|---|---|
| Intelligent Knowledge (X1) | 0.813 | A1 | 0.824 | 3 |
| | | A2 | 0.922 | 5 |
| | | A3 | 0.873 | 2 |
| Intelligence Ability (X2) | 0.906 | A4 | 0.812 | 3 |
| | | A5 | 0.836 | 4 |
| | | A6 | 0.855 | 2 |
| | | A7 | 0.843 | 2 |
| Intelligent Thinking (X3) | 0.837 | A8 | 0.819 | 3 |
| | | A9 | 0.901 | 6 |
| | | A10 | 0.866 | 5 |
| | | A11 | 0.821 | 2 |
| Intelligent Ethical Attitude (X4) | 0.856 | A12 | 0.857 | 2 |
| | | A13 | 0.838 | 3 |
| Total | 0.943 | - | - | 42 |

### 3.1.2 Validity analysis

Questionnaire validity refers to the extent to which the designed questionnaire scale measures the real situation to be measured, reflecting the validity and accuracy of the questionnaire. There are generally three approaches to questionnaire validity analysis, which are divided into content validity analysis, criterion validity analysis and structural validity analysis. The questionnaire setting of this study was developed and obtained based on the structural model of professional literacy of Civics teachers in the era of Artificial Intelligence constructed in the previous section, which has a certain theoretical basis and content validity. Therefore, only the structural validity of the questionnaire is analyzed here using SPSS software, and the results of the validity analysis are obtained as shown in Table 2.It can be seen that the KMO value is 0.881, which is greater than 0.7, indicating that the structural validity of the questionnaire is good.

*Table 2: Validity Analysis Table of the Questionnaire*

| The measurement of the suitability of KMO sampling | | 0.881 |
|---|---|---|
| Bartlett sphericity test | Approximate chi-square | 2242.833 |
| | Degree of freedom | 435 |
| | Significance | 0.0001 |

## 3.2 Analysis of formal survey results

### 3.2.1 Basic information on survey respondents

In this study, we chose the Civics teachers in G city as the questionnaire respondents and distributed 250 questionnaires by combining online and offline methods, eliminating 17 invalid questionnaires and getting 233 valid questionnaires, with an effective recovery rate of 93.2%. Table 3 lists the basic information of the survey respondents. From the data in the table, it can be seen that in this survey, there are 85 male teachers and 148 female teachers, accounting for 63.52% of the total number of surveyed, which is in line with the current situation of the composition of the Civics teachers “male and female”. 105 teachers are under 30 years old, 52 teachers are 30-40 years old, 49 teachers are 40-50 years old, and 27 teachers' age is lower than 30 years old, 52 teachers are 40-50 years old, and 49 teachers' age is lower than 30 years old.

49 teachers, 27 teachers are over 50 years old, accounting for 11.59%. In terms of education, the largest number of Civics teachers whose education is bachelor's degree or above, and the smallest number of teachers whose education is below junior college. In the distribution of teaching experience, there are more novice teachers, 101 Civics teachers have less than 5 years of teaching experience, 74 teachers have between 5-10 years of teaching experience, 42 teachers have between 10-20 years of teaching experience, and only 16 teachers have more than 20 years of teaching experience. In the distribution of titles, the percentage of teachers with no title rank amounted to 32.19%. In the distribution of teaching grades, the highest number of teachers in junior high school reached 81 (34.76%). In terms of the distribution of the dimensions of the research participants, the deviation is within the normal range and can be followed up.

*Table 3: Basic Information of the Survey Subjects*

| Categorical variable | Specific category | N | % |
|---|---|---|---|
| Gender | Male | 85 | 36.48 |
| | Female | 148 | 63.52 |
| Age | Under 30 years old | 105 | 45.06 |
| | 30 to 40 years old | 52 | 22.32 |
| | 40 to 50 years old | 49 | 21.03 |
| | Over 50 years old | 27 | 11.59 |
| Educational background | Bachelor's degree or above | 207 | 88.84 |
| | Junior college | 25 | 10.73 |
| | Below junior college | 1 | 0.43 |
| Teaching experience | 0 to 5 years | 101 | 43.35 |
| | 5 to 10 years | 74 | 31.76 |
| | 10 to 20 years | 42 | 18.03 |
| | More than 20 years | 16 | 6.87 |
| Professional title grade | Second-level teacher | 73 | 31.33 |
| | First-level teacher | 61 | 26.18 |
| | Senior Teacher | 24 | 10.30 |
| | Not | 75 | 32.19 |
| Grade taught | Primary school | 56 | 24.03 |
| | Junior high school | 81 | 34.76 |
| | High school | 66 | 28.33 |
| | University | 30 | 12.88 |

### 3.2.2 General analysis of the professionalism of Civics teachers

The results of the analysis of the overall level of professional literacy of Civics teachers in the era of artificial intelligence are shown in Table 4. As can be seen from the data in the table, the average value of the professional literacy level of Civics teachers in the era of artificial intelligence is 4.00 points, which reaches a more compatible level ($\geq 4$). Among them, in the dimensions of Intelligent Knowledge Literacy (X1) and Intelligent Competence Literacy (X2), the scores are 3.92 and 3.81 respectively, which do not reach the level of comparative conformity. While in the intelligent thinking literacy (X3) achieved the highest score of 4.25, indicating that the traditional teaching thinking of the current Civics teachers gradually began to change, and they have a more correct and clear understanding of the specific value of AI-enabled Civics education. The low intelligent ability literacy may be limited by teachers' insufficient knowledge of advanced technology and the slow acceptance of new things by older teachers.

*Table 4: Analysis of the overall level of teachers' professional qualities*

| First-level | Item | Mean | SD |
|---|---|---|---|
| Intelligent Knowledge (X1) | 10 | 3.92 | 0.87 |
| Intelligence Ability (X2) | 11 | 3.81 | 1.01 |
| Intelligent Thinking (X3) | 16 | 4.25 | 0.68 |
| Intelligent Ethical Attitude (X4) | 5 | 4.03 | 0.84 |
| Total | 42 | 4.00 | 0.75 |

### 3.2.3 Situation analysis by dimension

In order to understand in more detail the specific status of the professional literacy of Civics teachers in the era of artificial intelligence, the researcher used SPSS software to do a descriptive statistical analysis of the results of each literacy dimension as shown in Table 5. The dimension of literacy where it is located is clearly labeled to facilitate the reader's understanding of the subsequent general summary. The elements of the dimensions analyzed in the table mainly consisted of the mean and standard deviation of each question statistically according to the scores assigned to the options. In terms of intelligent knowledge literacy (X1), most of the Civics teachers have already understood and clarified the concept and connotation of AI-enabled Civics education, and thus scored more than 4 points in both theoretical knowledge (A1) and technical knowledge (A3). While in the practical knowledge (A2) dimension, it only gained 3.62 points, which also shows the current status quo, i.e., more theory than practice, and relatively speaking, the practical ability of Civics teachers who should integrate AI technology into educational and teaching activities has yet to be strengthened. As for intelligent ability literacy (X2), all other dimensions were below 4 points, except for intelligent evaluation ability (A6), which barely exceeded 4 points. Through further analysis, it is found that intelligent application ability (A4), intelligent analysis ability (A5) and intelligent innovation ability (A7) are professional literacies that Civics teachers generally consider themselves to be more lacking in, and at the same time, they are also professional literacies that need to be focused on in the learning and cultivation of Civics teachers in the era of artificial intelligence.

*Table 5: Descriptive statistical analysis results of each literacy dimension*

| First-level | Second-level | Item | Mean | SD |
|---|---|---|---|---|
| Intelligent Knowledge (X1) | A1 | Q1-Q3 | 4.03 | 0.87 |
| | A2 | Q4-Q8 | 3.62 | 0.72 |
| | A3 | Q9-Q10 | 4.12 | 0.72 |
| Intelligence Ability (X2) | A4 | Q11-Q13 | 3.99 | 0.94 |
| | A5 | Q14-Q17 | 3.51 | 0.59 |
| | A6 | Q18-Q19 | 4.01 | 0.88 |
| | A7 | Q20-Q21 | 3.73 | 0.47 |
| Intelligent Thinking (X3) | A8 | Q22-Q24 | 4.25 | 0.91 |
| | A9 | Q25-Q30 | 4.18 | 0.89 |
| | A10 | Q31-Q35 | 4.41 | 0.94 |
| | A11 | Q36-Q37 | 4.15 | 0.46 |
| Intelligent Ethical Attitude (X4) | A12 | Q38-Q39 | 4.09 | 0.59 |
| | A13 | Q40-Q42 | 3.97 | 0.45 |

In terms of Intelligent Thinking Literacy (X3), the four dimensions of Human-Computer Collaborative Thinking (A8), Technological Thinking (A9), Data Thinking (A10), and Design

Thinking (A11) all exceeded a score of 4, which shows that Civics teachers are already equipped with the mindset of using advanced tools such as Artificial Intelligence for learning and teaching. Intelligent thinking literacy is a national requirement for every citizen, and as a Civics teacher, it is even more necessary to have intelligent thinking literacy to meet the basic requirements of the development of the times and education reform. As for intelligent ethical attitudes (X4), the scores of rational attitude (A12) and moral ethics (A13) are 4.09 and 3.97 respectively, and this data indicates that Civic Teachers have high cognitive level and moral concerns about AI ethical issues. In terms of rational attitude, mostly the Civics teachers are able to view the development of AI-enabled Civics education in an objective way of thinking. The moral and ethical dimension, on the other hand, shows that the Civics teachers have a strong statement about the ethical norms of AI.

## 3.3 Analysis of Differences in the Professionalism of Civics Teachers

In order to understand how the competence level of the professional literacy of Civics teachers in the era of Artificial Intelligence varies under different factors, this paper mainly investigated the gender, age, and education level of the subjects when conducting the questionnaire, in order to find out whether these variables have any influence on the professional literacy of Civics teachers in the analysis. Based on this, this paper analyzes the difference between these different variables separately. There are two main ways to test the difference in means, one is the independent sample t-test, which is applicable to the test of the difference between the means of two groups, and the other is ANOVA, which is applicable to the analysis of more than three variables.

### 3.3.1 Analysis of gender differences in professionalism

In order to determine the influence of gender on the professionalism of AI Civics teachers, this paper analyzes the difference between the gender of Civics teachers. In this case, the teacher's gender is used as the independent variable, and other variables are used as the dependent variables for the analysis of independent sample t-test, and the results are shown in Table 6. Through the analysis of independent samples test, it can be seen from the table that the p-value of all professional literacy dimensions is greater than 0.05, which does not reach the significant level, indicating that there is no difference between the professional literacy competence of Civics teachers of different genders.

*Table 6: Independent Sample Test*

| First-level | Item | Levin's equivalence test of variance | | Mean equivalence t-test |
|---|---|---|---|---|
| | | F | Sig. | Sig. (Two-tailed) |
| Intelligence Knowledge (X1) | Assuming equal variance | 3.015 | 0.091 | 0.071 |
| | Equal variance is not assumed | | | 0.088 |
| Intelligence Ability (X2) | Assuming equal variance | 0.141 | 0.772 | 0.662 |
| | Equal variance is not assumed | | | 0.583 |
| Intelligent Thinking (X3) | Assuming equal variance | 0.682 | 0.455 | 0.418 |
| | Equal variance is not assumed | | | 0.505 |
| Intelligent Ethical Attitude (X4) | Assuming equal variance | 1.837 | 0.178 | 0.214 |
| | Equal variance is not assumed | | | 0.176 |

### 3.3.2 Analysis of age differences in professionalism

To explore the influence of age on the professional literacy of Civics teachers in the era of artificial intelligence, one-way ANOVA was used because the independent variable "age" is a four-category variable and the dependent variable is a continuous variable, and the results are shown in Table 7. From the following ANOVA, it can be seen that for the three dependent variables of "Intelligent Knowledge Literacy (X1)", "Intelligent Competence Literacy (X2)" and "Intelligent Thinking Literacy (X3)", the F-values of the overall test were higher than those of the overall test. For the overall test, the F-values of 9.652 ($p=0.0001<0.01$), 8.938 ($p=0.0001<0.01$), and 4.707 ($p=0.001<0.01$), respectively, have reached the level of significance, while in the case of Intelligent Ethical Attitude Literacy (X4) F-value is 3.504 ($p=0.015<0.05$). Therefore, the null hypothesis is rejected and the opposing hypothesis is accepted. That is, there is a significant difference between Civics teachers of different ages in all four dimensions of professionalism of Civics teachers in the era of artificial intelligence.

*Table 7: Analysis of Age Differences in Professional Qualities of Ideological and Political Teachers*

| First-level | Item | F | Sig. |
|---|---|---|---|
| Intelligent Knowledge (X1) | Between-groups | 9.652 | 0.0001 |
| | Within-groups | | |
| Intelligence Ability (X2) | Between-groups | 8.938 | 0.0001 |
| | Within-groups | | |
| Intelligent Thinking (X3) | Between-groups | 4.707 | 0.001 |
| | Within-groups | | |
| Intelligent Ethical Attitude (X4) | Between-groups | 3.504 | 0.015 |
| | Within-groups | | |

With the increase of age, the professionalism of Civics teachers in the age of artificial intelligence is also relatively weaker. In the process of preliminary investigation and practice, it was found that some older teachers are difficult to change their role and status as teachers from the ideological point of view. Teachers are affected by the traditional concept of teaching, that the role of the teacher is "teacher, the role of the teacher, also preaching and teaching to solve the puzzle," the lack of a certain degree of initiative and positivity, that as long as the students are well educated is their own work, for the development of the artificial intelligence era, the pace of the development of the pace of the requirements to follow up is not particularly obvious. For the requirements of the artificial intelligence era, many teachers of political science may just turn a blind eye, or just stay on the level of awareness, refusing to dig deeper into the hidden information and value behind the artificial intelligence technology. Therefore, for the older teachers in the group of Civics teachers, more attention should be paid to the cultivation of teachers' professionalism.

### 3.3.3 Analysis of academic differences in professionalism

In the questionnaire, the educational backgrounds of Civics teachers were mainly "Bachelor's degree and above" and "Specialized". There is only one person with the educational background of "below specialist", so it is not involved in the difference analysis. By analyzing the professionalism of Civics teachers in the era of artificial intelligence, the results of the difference in educational background are shown in Table 8. As can be seen from the table, for the X1-X4 dependent variables, the F-values of the overall test were 17.072 ($p=0.001<0.05$), 12.381 ($p=0.002<0.05$), 14.656 ($p=0.004<0.05$), and 8.437 ($p=0.006<0.05$), which all reached

the significant level. Therefore, the null hypothesis is rejected and the opposing hypothesis is accepted, indicating that there is a significant difference in all four dimensions of professionalism among Civics teachers with different educational qualifications.

*Table 8: Analysis of Educational Attainment Differences in Professional Competence*

| First-level | Item | Sum of squares | Degree of freedom | Equal square | F | Sig. |
|---|---|---|---|---|---|---|
| X1 * Educational background | Between-groups | 8.521 | 1 | 8.731 | 17.072 | 0.001 |
| | Within-groups | 83.478 | 231 | 0.522 | | |
| | Total | 91.999 | 232 | | | |
| X2 * Educational background | Between-groups | 6.018 | 1 | 5.718 | 12.381 | 0.002 |
| | Within-groups | 51.423 | 231 | 0.451 | | |
| | Total | 57.441 | 232 | | | |
| X3 * Educational background | Between-groups | 6.113 | 1 | 7.637 | 14.656 | 0.004 |
| | Within-groups | 84.336 | 231 | 0.523 | | |
| | Total | 90.449 | 232 | | | |
| X4 * Educational background | Between-groups | 7.056 | 1 | 4.156 | 8.437 | 0.006 |
| | Within-groups | 83.382 | 231 | 0.501 | | |
| | Total | 90.438 | 232 | | | |

In this paper, the data were post hoc analyzed using correlation measures to find the effect values between the variables. If the effect value is less than or equal to 0.06, then it means that the grouped variables and the variable to be tested are in a state of low correlation strength. If the effect value is greater than or equal to 0.14, then it means that there is a high strength of association between the two groups of variables. If the effect value is between 0.06 and 0.14 then it means that the two groups of variables are in a state of medium strength of association.

The results of the correlation measurements are shown in Table 9, from the results of the table, it can be seen that the effect value of the quality of intellectual knowledge (X1) is 0.101, which is between 0.06 and 0.14, which indicates that the educational qualifications and the quality of intellectual knowledge are in a state of medium correlation. The effect value of intelligent ability quality (X2) is 0.068, between 0.06 and 0.14, indicating that the education and intelligent ability quality are moderately correlated, and there is a difference between the two kinds of education quality teachers in the aspect of intelligent ability, but it is not very significant. The effect value of Intelligent Thinking Quality (X3) is 0.051, which is less than 0.06, indicating that there is very little difference between the Civics teachers with different academic qualifications in the aspect of Intelligent Thinking. The effect value of Intelligent Ethical Attitude (X4) is 0.085, which is between 0.06 and 0.14, indicating that the education level and intelligent ethical attitude are moderately correlated, and the effect of education level on intelligent ethical attitude is in an intermediate state.

*Table 9: Correlation Measurement*

| | Eta | Eta square |
|---|---|---|
| X1* Educational background | 0.314 | 0.101 |
| X2* Educational background | 0.287 | 0.068 |
| X3* Educational background | 0.245 | 0.051 |
| X4* Educational background | 0.296 | 0.085 |

## 3.4 Strategies for Improving the Professionalism of Civics Teachers

The development of professional literacy of Civics teachers in the era of artificial intelligence not only affects the process of education informatization and constrains the integration of modern information technology and Civics education and teaching, but also has an important impact on the development of Civics teachers themselves. The development of the professional literacy of Civics teachers is a long-term dynamic process, combined with its developmental stage characteristics, combined with the results of the questionnaire survey, this paper proposes a strategy for the improvement of the professional literacy of Civics teachers in the era of artificial intelligence as shown in Figure 4. The improvement of the professional literacy of Civics teachers not only requires scientific guidance and standardization by schools, but also requires teachers to consciously and continuously learn, and requires the joint efforts of society, schools, teachers and other parties.

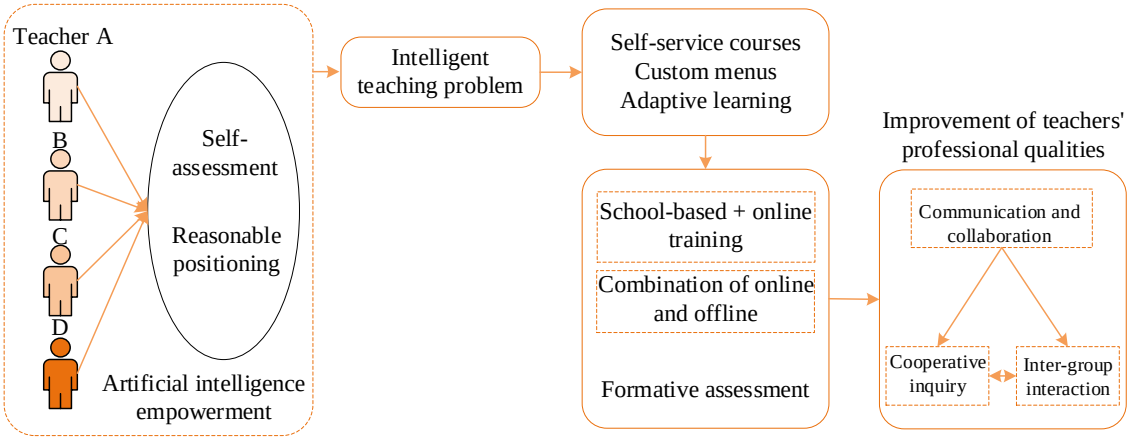


*Figure 4: Strategies for Enhancing the Professional Quality of Ideological and Political teachers*

(1) Personalized training supported by artificial intelligence

Artificial intelligence technology featuring arbitrary time, place and self-paced pace provides more possibilities for lifelong learning, and the increasingly intelligent information age presents more accurate personalized learning support services. As a member of the learning society, it is especially important for Civics teachers to improve their teaching ability. The professional quality training of Civics teachers supported by artificial intelligence technology is first based on teachers' self-assessment, reasonable positioning and clarification of intelligent Civics teaching problems, and independent selection of suitable learning and training programs according to the needs. Relying on the personalized learning services provided by artificial intelligence technology, teachers can choose suitable training courses according to their personal learning needs and learning preferences, and comprehensively improve their teaching ability in a targeted manner.

(2) Online and offline hybrid training system

With the goal of building a high-quality professionalized and innovative team of teachers of ideology and politics, update the training concept, promote the organic integration of AI technology and teacher training, establish a multi-party synergistic lifelong learning and training system for the development of teachers' professional qualities that combines online and offline, and connects pre-service and post-service, so as to boost the sustainable development of teachers. With the rapid development of artificial intelligence technology, there are many high-quality teacher intelligent teaching ability improvement courses on the network. And in

the specific teaching practice to summarize the teaching problems encountered, targeted participation in offline face-to-face coaching, through the teacher's workshop, master teacher studio and so on to establish a learning community, to help the sustainable development of the professional quality of Civics teachers.

(3) Scientific and diversified evaluation mechanism

Establishing a scientific evaluation mechanism and playing the essential role of evaluation to motivate, regulate and guarantee the sustainable development of the professional quality of Civics teachers. Through self-assessment, Civics teachers can clearly understand the current advantages and shortcomings of their own intelligent teaching ability, and schools can organize collective assessment to understand the current status of their teachers' intelligent teaching ability, which will provide a reference for the next further targeted training for teachers. In blended training, the trainer releases the learning content, the teacher interacts and communicates, collaborates and explores, and adopts a combination of inter-group and intra-group evaluation to show objective and accurate evaluation results. Trainees further understand their own and their peers' intelligent teaching abilities based on the evaluation results. Trainers make corresponding adjustments to the training content based on the evaluation results, and the scientific and diversified evaluation mechanism provides a guarantee for the implementation of blended training.

# 4 Conclusion

This study takes the Civics teachers as the research subject, takes the concept of intelligent education as the theoretical basis, focuses on the components of Civics teachers' professional literacy, and is committed to exploring the strategies for improving the professional literacy of Civics teachers in the era of artificial intelligence. In view of the scientific and reasonable methodology adopted throughout the study and the strict adherence to the standardized process, the structural model of the professional literacy of Civics and Political Science teachers was finally successfully completed. The model covers four first-level dimensions, intelligent knowledge, intelligent ability, intelligent thinking and intelligent ethical attitude, which are subdivided into 13 second-level dimensions. The four levels of professional literacy of Civics teachers are interrelated and mutually reinforcing, and together they form a complete framework, resulting in a model diagram of the structure of the professional literacy model of Civics teachers in the era of artificial intelligence. Based on the constructed model, the Civics teachers were taken as the research object to carry out a questionnaire survey on the status of professional literacy to understand the current level of Civics teachers' professional literacy. The survey results show that the Civics teachers have the highest intelligent thinking literacy (4.25), the second highest intelligent thinking quality (4.03), and the lowest intelligent ability literacy (3.81), which indicates that the current need to pay attention to the Civics teachers' ability to cultivate and improve their ability to apply AI technology to practical teaching.

# About the Author

Xianzhao Yang was born in Xinxiang, Henan Province, China in 1988. He graduated from Jinan University, China, with a PhD degree. He works at Zhuhai University of Science and Technology, with research interests including Chinese history and ideological and political education.

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