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To participate or not to participate? Influence mechanism of artificial intelligence on Chinese college students' willingness to participate in online politics

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Abstract

This study probes the mechanism of artificial intelligence's (AI's) influence on Chinese college students' willingness to participate in online politics and constructs a theoretical model based on the theory of planned behavior. Through the analysis of questionnaire data acquired from up to 317 Chinese college students in total, it turns out that the use of AI affects Chinese college students' willingness to the participation of online political practice significantly and positively, and such online political participation cognition of Chinese college students plays a mediating role, three aspects of which included as the followings on behavioral attitudes, subjective norms, and perceived behavioral control. Additionally, media literacy level plays a moderating role in online political participation cognition and willingness to participate. All the findings highlight the importance of optimizing the online political participation environment, enhancing college students' cognition of political participation, and improving media literacy in the context of the digital era, which provides practical guidance for promoting healthy and positive online political participation among college students.

Keywords Artificial intelligence, Online political participation, Theory of planned behavior, University students, Media literacy

Introduction

Changes in artificial intelligence (AI) technology and its widespread application in various fields of society have reshaped the values, behavioral patterns, and interactive relationships of individuals, and have also affected their political participation all over the world. Political participation is a fundamental political behavior for the maintenance of social stability, and it is the voluntary and

active participation of citizens in the political life of society, the expression of demands or preferences for public political life, and the attempt to influence the prior political process and its outcome. With the iterative development of Internet technology, social media, and intelligent algorithms, there are more channels for online political participation, and online social media provide the public with a platform for political viewpoints expression and effectively promote inter-individual contact [1, 2], and latent political participation, represented by online likes, retweets and comments, is increasingly becoming a major way for contemporary youth to participate in political life [3]. The availability of online resources has empowered and strengthened the confidence and ability

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of contemporary citizens to participate in political life in varied fashions [4], and has greatly supported citizens' online political participation behaviors [5], especially in promoting informal and non-institutional participation [6].

So far, the level of exposure to political information affects citizens' political participation behavior [7–9], and the predictive algorithms and filtering effects of AI can shape an individual's online information experience [10, 11], e.g., selective exposure to certain political information may create political echo chambers [8, 12–14], which can further influence an individual's political engagement behavior. The facilitating effect of AI on the speed and quantity of information dissemination will also contribute to the enhancement of an individual's sense of political efficacy, thereby influencing the frequency of emergence of political participation behaviors [15].

As a young, active, and intellectual group of citizens, college students have a great need for their political participation behavior. Targeted pushing of college students by artificial intelligence technology can increase the frequency and precise content of political information exposure of college students by changing the cost and way of college students' information acquisition [16–18]. Most of the established studies on the relationship between the Internet and political participation were focused on the perspective of media technology characteristics, ignoring other factors such as individual characteristics of college students and online social behavior characteristics.

In this study, we provide more convincing evidence for the impact of AI on college students' online political participation behaviors by conducting research with a group of Chinese college students. In our research, we collected information on Chinese college students' motivation, willingness, level of participation, and frequency of online political participation, and measured their political efficacy, media literacy, and other factors. The goal of our study is to address the following three research questions:

Q1 Does AI affect Chinese college students' online political participation?

Q2 What aspects of Chinese college students' online political participation have been affected by AI?

Q3 How does AI affect Chinese college students' online political participation?

Literature review and theoretical framework

Online political participation of university students

Political participation refers to the behavior of citizens who participate in the political process and have the intention or actual effect of influencing the government's

action [19]. With the development of the Internet and new media, the citizens' political participation behavior has been expanded from offline to online [20], and has developed from the traditional forms of offline rallies and marches to the convenient and fast completion of the participation behavior with the help of the Internet platform. Therefore, citizens' attempts to influence the political process by engaging in online platforms are referred to as online political participation. Online political participation is an important element in the study of political participation.

With the development of Internet technology, the scope of online political participation has become broader and broader, including signing or sharing online petitions, participating in online opinion polls, etc. Some scholars also believe that the discussion of political issues and content dissemination in cyberspace belong to the content of online political participation as well [21–24]. Compared with other youth groups, college students are more active in paying attention to information, expressing their opinions, and using the Internet more frequently, therefore, online political participation of college students is undoubtedly an important topic in the digital age, and a research field to which college students at home and abroad pay much attention in terms of political participation at the college level.

Some studies have pointed out that college students have shifted from the traditional "dutiful citizenship" style of political participation to a "real citizenship" style, in which they express their political positions in their daily lives by liking, forwarding and commenting on the Internet, a form of participation that researchers refer to as "latent political participation" [3, 25], which is believed could be free from the constraints of time and economic costs, and also the most common form of online political participation among the college student population.

Impact of artificial intelligence on college students' online political participation

For quite a long time, the political participation behavior of Chinese youth groups has been mainly based on the call for participation by the government and schools [26, 27]. With the development of social media and AI, its low-threshold, omni-directional, and all-time-space characteristics allow youth groups to access more and more political information, and as such the social media platforms have gradually become an important channel for the youths to convey their political views [28]. Research has found that individuals' access to online information enriches their political knowledge and stimulates political enthusiasm, thus affecting online political participation positively [29, 30]. Therefore, with the advancement of AI technology, current Chinese college students are gradually changing from passive participants in political

participation to active participants in public affairs and active boosters of online public opinions [31].

Artificial intelligence technology reduces the time cost and economic cost of college students' access to information, and also improves the efficiency of information dissemination [32]. The existence of AI has led to an exponential growth in the quantity, dissemination range and speed of political information, etc. Under the influence of AI technology, college students can not only actively seek to obtain political information, but also passively receive hot news information through the existence of big data and algorithmic recommendation technology. The increase in the frequency and quantity of political information reception expands their opportunities to learn about public affairs, which influences their willingness to participate in politics [5, 33] and stimulates them to produce political participation behaviours [34].

On the other hand, AI can also have negative impacts on college students' online political participation such as interference and misinformation. Deep mining of university students' browsing habits and information needs and targeted information pushing can help achieve a precise allocation between information production and individual needs [16], but it can also make university students make irrational decisions by reinforcing a certain single political viewpoint due to the influence of the "information cocoon" effect, or lead to retreat and avoidance behaviours [17]. At the same time, deep falsification technology can produce false information such as voice cloning, image synthesis, video synthesis, etc., which will lead to cognitive bias among college students, weakening the credibility of political information to a certain extent, thus affecting the willingness to participate and decision-making results.

In this study, online political participation of university students in the context of AI is defined as the behaviour of university students who use intelligent and personalised tools and platforms provided by AI technology to participate in and influence the political decision-making process in a direct or indirect way.

Artificial intelligence can also have an impact on college students' online participation behaviour by influencing their sense of political efficacy. Political efficacy is an attitudinal variable that affects citizens' political participation, referring to citizens' perception and evaluation of the influence their participation in politics can have in the political process [35], and is the motivational factor behind political participation behaviour [36]. Political efficacy is categorised into internal and external efficacy, with internal efficacy referring to an individual's perception of his or her ability to influence government and political decisions, and external efficacy referring to an individual's perception of the state of governmental responsiveness, reflecting an individual's ability to

participate in political activities and the ideas held about the effectiveness of participation [37, 38]. Studies have suggested that the level of political efficacy is a significant predictor of an individual's political participation behaviour, and that people with a high level of political efficacy will be more inclined to participate in public affairs [39] and will also be more active in the participation process [40, 41], such as being more involved when voting [42]. In contrast, people with low political efficacy tend to show more political apathy and withdrawal tendencies. By analysing the voting data during the US election, some studies have found that online political discussions help to increase citizens' sense of political participation efficacy [43], and that political information posted and shared by close friends on the Internet also has a direct impact on citizens' political attitudes and voting behaviour.

The development of digital technology has enabled the media to play an increasingly role of importance in the political perceptions of college students. Some scholars have argued that citizens can increase their confidence in political participation by learning about news reports or the experiences of others [36, 44–46], and also by weakening the pressure of social norms on the political participation behaviors of university student groups [47], allowing them to express their views more freely and openly [48, 49], stimulating college students to develop a stronger interest in political participation [50], and increasing their involvement in political activities [51, 52], to realize their demands.

Theory of planned behavior

Of the existing models used to understand and predict human behavior, the Theory of Planned Behavior (TPB) is the most influential and widely acknowledged and used in studies, which is proposed by psychologist Ajzen [53]. And such TPB measures individual cognition from three dimensions: individual attitude towards behavior, subjective norms, and perceptual behavioral control, and argues that an individual's level of cognition determines the willingness to act, which in turn influences his or her behavioral decision-making [53], i.e., the more positive an individual's attitude is, the greater his or her sense of norms is, and the lower the degree of perceived difficulty, the stronger his or her willingness to act. The more positive an individual's attitude is and the less difficulty he or she perceives, the stronger his or her willingness will be and the higher the likelihood that he or she will commit a particular behavior. Thus, college students' willingness to participate in online political activities refers to their psychological expectation or subjective desire to participate in online political activities, which is the "prelude" to their eventual adoption of online political participation behaviors. Additionally, based on this TPB model, college students' behavioral attitudes, subjective norms

and perceived behavioral control of online political participation will affect their willingness to participate, and thus have an impact on their online political participation behaviors.

Furthermore, as described in such TPB model, behavioral attitude refers to the individual's evaluation of his/her liking or disliking of the participation behavior, including the value judgement of the behavior and the assessment of the consequences, and some studies have proved that the more positive the individual's behavioral attitude is, the stronger his/her willingness to participate will be [54]. It has been found that college students' mastery of political information affects their willingness to participate, and their political interest, political trust, perception of the cost of the behavior, and expectation of the effect of the behavior also have an impact on their political perception and willingness to participate [55]. Besides, the values and political psychological factors may also have a greater impact on online political participation [56, 57].

Subjective norms refer to an individual's perceived pressure to perform or not perform a certain behavior, which mainly originates from socially close significant others or groups [53]. Subjective norms of college students' online political participation refer to the social pressure and subjective influence of significant others around college students on whether they participate in online political behavior, which for college students mainly include family members, classmates, teachers, and members of online groups. College students are more likely to engage in online political behaviors if they are perceived as necessary by their significant others, especially members of their online community. Then, the subjective norms have a direct impact on college students' online political participation behavior.

Perceived behavioral control indicates an individual's confidence in his or her ability to perform a behavior successfully, and this perception is mainly derived from conditions that facilitate or hinder the production of the behavior. Thus, this perceived behavioral control

is reported to be measured through self-efficacy and perceived barriers [58, 59]. College students' ability to engage in online political participation is closely related to their daily experiences and their personal characteristics, and the degree of difficulty in participating and their perception of the outcome of participation are important aspects that affect their participation behavior. In other words, the stronger the online behavioral ability of college students, the stronger their willingness to participate, and the less they are hindered by external obstacles, the stronger their willingness to participate.

Accordingly, the following three hypotheses are proposed with the research model as schemed in Fig. 1.

H1 Artificial intelligence use positively predicts college students' online political participation willingness.

H2a Behavioural attitudes of college students mediate the relationship between AI use and willingness to participate in online politics.

H2b College students' subjective norms mediate the relationship between AI use and online political participation intentions.

H2c College students' perceived behavioural control mediates the relationship between AI use and willingness to participate in online politics.

H3a Media literacy level moderates the relationship between college students' behavioural attitudes and willingness to engage in online political participation.

H3b Level of media literacy moderates the relationship between college students' subjective norms and willingness to engage in online political participation.

H3c Media literacy level moderates the relationship between perceived behavioural control and willingness to participate in online politics among college students.

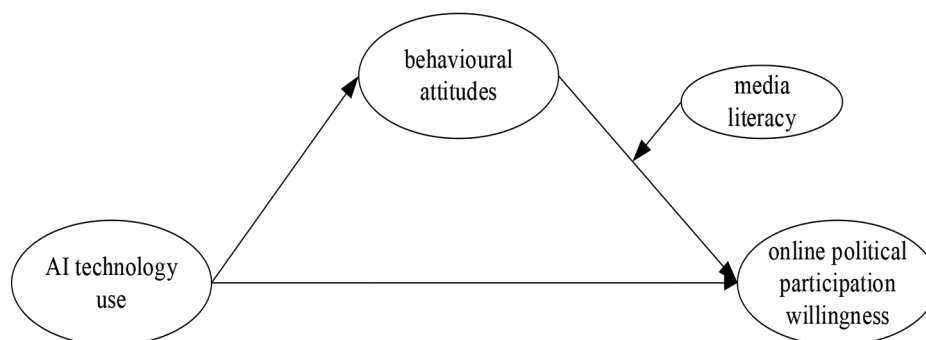


Fig. 1 Diagram of the theoretical model

Research methodology

Data collection

The researcher adopts the convenience sampling method to distribute questionnaires, the survey is anonymous, 400 questionnaires were distributed, 380 questionnaires were recovered, excluding questionnaires that have not used AI, the answer time is too short, the questions are incomplete, the answers are all the same and the answers are contradictory, 317 valid questionnaires, the questionnaire validity rate is 79.25%. The research subjects are college students, covering a wide range of college types, major categories, grades, political profiles, family backgrounds, and so on. The details on the distribution of all valid questionnaires are reported in Table 1.

In order to further verify the impact of AI on Chinese college students' willingness to participate in online politics, this study used random sampling method to interview the questionnaire distribution recipients. A total of 15 college students were interviewed before and after

the study, including 7 males and 8 females, 9 majoring in science and engineering, and 6 majoring in humanities and social sciences, with a balanced distribution of grade level and personal background information as far as possible. The length of the interviews ranged from 30 min to 1 h per person, and the interviewees all expressed their willingness to participate in the interviews and agreed to the recording of the whole interview, and the final text of the interviews was nearly 30,000 words.

Measurements

The main variables measured in this study include the degree of college students' AI use (independent variable), college students' perception of online political participation (mediator variable), college students' online political participation (dependent variable), and media literacy (moderator variable). Among those mentioned above, the mediator variable consists of three dimensions: behavioral attitudes, subjective norms, and perceived behavioral control. The measurement of the degree of AI Technology Use is mainly in terms of the degree of use of AI by university students, the frequency of participation in using AI to participate in political activities, the use of scenarios, and attitudes towards the use of AI. The measurement topics of college students' online participation were mainly based on Wang's [60] and Zhang & Huang's [50] measurement scales of online political participation. Behavioral attitudes include four dimensions: perceived importance of participation, perceived need for participation, perceived expectation of participation, and perceived risk of participation, and are mainly based on self-administered scales. Subjective norms include three dimensions, which are significant others support, peer pressure, and social media exposure, and the measurement questions mainly refer to the studies of Vaccari & Valeriani [61] and Huang [25]. Perceived behavioral control includes two dimensions, political efficacy and perceived ease of use, and the measurement topics mainly refer to the studies of Ding et al. [62], Chen et al. [63]. The measurement of media literacy mainly referred to the studies of Li [64], and Chu & Tang [65].

In addition, with reference to Wang's [66] method, variables such as gender, grade, major, political affiliation, grade ranking, family economic situation and educational level of parents were introduced as control variables to examine whether there is a significant difference in the online political participation Chengdu of college students with different of these background variables. The questionnaire was measured using a five-point Likert scale from 1 (very much in line) to 5 (very much out of line), and the measurement items are shown in Table 2.

Table 1 Demographic characteristics of the survey sample

Basic characteristics		Sample	Percentage
Sex	Male	149	47.00%
	Female	168	53.00%
Political profile	CPC member (including reserve member)	92	29.02%
	Communist Youth League members	71	22.40%
	Masses	154	48.58%
Professional category	Science, Technology, Agriculture, and Medicine	193	60.88%
	Humanities and Social Sciences	124	39.12%
Grade	Freshmen	73	23.03%
	Sophomore	63	19.87%
	Junior	99	31.23%
	Senior	67	21.14%
	Fifth year	15	4.73%
Student leader	YES	154	48.58%
	No	163	51.42%
Achievement	Top 20%	27	8.52%
	21-40%	39	12.30%
	41-60%	110	34.70%
	61-80%	83	26.18%
	After 81%	57	17.98%
Family Economic Situation	Low income	57	17.98%
	Lower middle income	88	27.76%
	Middle income	94	29.65%
	Upper middle income	54	17.03%
Educational level of parents	High income	24	7.57%
	Primary school and below	69	21.77%
	Junior high school	69	21.77%
	High school/Junior college	103	32.49%
	Bachelor's Degree	45	14.20%
Master's degree and above	31	9.78%	

Table 2 Questionnaire Design and Reference sources

Variable	Question Items	Reference
AI Technology Use	The extent to which you use AI on a regular basis	Li et al. [67]
	Your familiarity with AI technology	
	The extent to which you normally use AI to generate content	
	How often you normally use AI to obtain political information	
Perceived importance	Your perception of the impact of AI on political participation	Kim et al. [23] and Vaccari & Valeriani [61]
	I think using AI in politics is important for personal growth and social progress.	
	For me, using AI in political campaigns is responsible behavior.	
	I think college students should be seriously involved in politics to influence the direction of society.	
Perceived need for participation	In my opinion, the use of AI political engagement is an important matter that I should focus on as a college student.	Li & Chan [69] and Huang [25]
	For me, using AI in politics is a way to fulfill my need for social problem-solving.	
	I feel that using AI in politics fulfills my need for personal social responsibility.	
Perceived Expected Returns	Using AI in politics is one of the ways I contribute to society.	Chen et al. [63] and Ding [62]
	I believe that using AI in politics can increase my social influence.	
	I believe that political participation increases my social network and relationships.	
	Being involved in politics is an opportunity for me to improve my leadership and decision-making skills.	
Perceived Risk of Involvement	I look forward to more personal growth and learning opportunities through political participation.	Hu [70] and Grimmelikhuisen et al. [71]
	I am concerned that online political participation may pose risks in terms of personal privacy and security.	
	I am concerned that the political views I post on the internet may lead to conflict and disagreement with others.	
	I think it's possible to be influenced by disinformation in political participation.	
Perceived support from significant others	I am concerned about the negativity and stress that can be caused by being involved in politics.	Vaccari & Valeriani [61] and Huang [25]
	My family encourages me to engage in political discussions on social media.	
	I feel supported by important people around me to engage in politics on social media.	
	It is important to me that people around me think about my involvement in politics on social media.	
Perceived peer pressure	My classmates think that my involvement in politics on social media is a positive behavior.	Ardèvol-Abreu et al. [33]
	I feel that my peers want me to be more active in expressing political views in my online circle group.	
	I feel that political expression on social media is a common behavior among my peers.	
	My classmates usually share information and opinions about politics.	
Perceived political efficacy	Participating in political discussions is a popular behavior among my classmates around me.	Chen et al. [63] and Ding [62]
	I feel that the act of online participation has empowered me politically.	
	I feel that online political participation gives me a better understanding of social reality.	
Perceived ease of use	I feel that online political participation has allowed me to defend my interests.	Bhattacharjee [72] and Ding [62]
	Online participation in activities such as political voting is easy for me to follow.	
	Online participation in political discussions is easy for me to maneuver.	
Willingness to Participate in Online Politics	It is easy for me to find the information I need online.	Li & Chan [69] and Huang [25]
	I am willing to share my political views on social media.	
	I am willing to participate in the discussion of hot issues on the network platform.	
	I am willing to express my interests on online platforms.	
Media literacy	I am willing to spend time browsing political information.	Li [64] and Chu & Tang [65]
	I am willing to spend time searching for political news or hot public events.	
	I can recognize false or misleading content in online political information.	
	I will regularly check different media channels for comprehensive political information.	
	I can effectively screen and evaluate political information posted on different media channels.	
	I know how to use social media platforms to share my political views.	

Reliability and validity test

Several tests have been conducted to confirm the reliability and validity of the scales used in this study, the Cronbach's coefficient test (Cronbach's $\alpha > 0.7$) of which was used for the reliability tests and the combined reliability test ($CR > 0.7$) proposed by Straub and Boudreau. And the results as showed in Table 3 implies that the

Cronbach's coefficient values (Cronbach's α) of the latent variables in the scale ranged from 0.770 to 0.901, which were higher than the suggested threshold of 0.7, indicating that the scores of the measurement items had a high degree of consistency and that the questionnaire had a high degree of reliability, and that the combined reliability values (CR) ranged from 0.826 to 0.894, which were

Table 3 Results of reliability and validity tests

Variable	Item	Factor loadings	α	KMO	CR	AVE
AI Technology Use	A1	0.774	0.770	0.822	0.846	0.524
	A2	0.769				
	A3	0.689				
	A4	0.649				
	A5	0.730				
Perceived importance	B1	0.788	0.892	0.837	0.858	0.602
	B2	0.780				
	B3	0.771				
	B4	0.766				
Perceived need for participation	C1	0.756	0.827	0.718	0.826	0.612
	C2	0.774				
	C3	0.817				
Participation Expected Benefits	D1	0.732	0.901	0.847	0.828	0.546
	D2	0.733				
	D3	0.710				
	D4	0.782				
Participation Risk Perception	E1	0.794	0.842	0.811	0.852	0.591
	E2	0.716				
	E3	0.785				
	E4	0.825				
Significant Other Support	F1	0.785	0.880	0.835	0.882	0.652
	F2	0.808				
	F3	0.806				
	F4	0.832				
Peer pressure	G1	0.803	0.857	0.821	0.867	0.620
	G2	0.788				
	G3	0.777				
	G4	0.779				
Perceived political efficacy	H1	0.858	0.906	0.755	0.894	0.737
	H2	0.865				
	H3	0.853				
Perceived ease of use	I1	0.828	0.888	0.747	0.855	0.663
	I2	0.781				
	I3	0.833				
Willingness to participate	J1	0.783	0.892	0.884	0.883	0.601
	J2	0.776				
	J3	0.787				
	J4	0.778				
	J5	0.751				
Media literacy	K1	0.825	0.881	0.832	0.890	0.670
	K2	0.853				
	K3	0.795				
	K4	0.798				

also higher than the suggested threshold of 0.7, and thus both Cronbach’s α and CR tests indicating a high degree of consistency among the measures in the latent variables. The KMO values of the latent variables ranged from 0.718 to 0.884, which were all higher than the suggested threshold of 0.5, and the significance of Bartlett’s test of sphericity is 0.000 indicating that the sample data is suitable for factor analysis.

The validity tests used were the standardized factor loading test, the convergent validity test, and the discriminant validity test as proposed by Fornell and Larcker. The results showed that: the standardized factor loading values of the latent variables in the scale ranged from 0.611 to 0.859, which were all higher than the standardized value of 0.5, indicating that the factor loading values of the measurement indicators were in line with the standard requirements; and the mean extracted variance

values of the test of convergent validity ranged from 0.524 to 0.737, which were all higher than the recommended threshold value of 0.5, indicating that the scale and the measurement model had a better degree of convergent validity. Moreover, the square root of the AVEs for the variables was greater than their correlation coefficients, which indicated that the scale has good discriminant validity.

Common method variance test

Common Method Variance (CMV) refers to the artificial errors between predictor variables and calibration variables caused by the same data source or rater, the same measurement environment, item context, and the characteristics of the items themselves. Since this questionnaire was completed by respondents on a self-assessment basis and the study sample was drawn from a uniform sample source, a common method bias test was necessary. The study in this paper used Herman’s one-way test to conduct an exploratory factor analysis of all question items for all variables, and the results show that the first principal factor explains 29.114% of the variance, which is less than the critical criterion of 40%, indicating that common method bias is not a significant problem. Therefore, it is concluded that this study does not have serious homoscedastic errors and is able to conduct a follow-up study.

Table 4 Total effects, mediating effects of perceptions of participation

	Dependent variable: willingness to participate in online politics		
	Model 1	Model 2	Model 3
Control Variables			
Gender	-0.02	-0.099	0.081
Political profile	-0.059	-0.029	-0.033
Professional category	0.232	0.142	0.066
Grade	-0.004	-0.007	-0.002
Student Leadership Experience	0.325**	0.314**	-0.071
Achievement	0.468**	0.334**	0.054*
Family economic situation	0.033	0.022	-0.014
Educational level of parents	0.146*	0.135**	0.009
Independent Variables			
AI Technology Use		0.265**	0.109*
Mediator variable			
Perceptions of online political participation			0.864**
Statistical parameters			
Adjusted R2	0.239	0.076	0.090
F-value	20.295***	19.805***	166.529***

Note: * is $P < 0.05$; ** is $P < 0.01$; *** is $P < 0.001$

Path analysis and hypothesis testing

Effect of AI technology use on college students’ willingness to participate in online political participation

The article adopts multiple linear regression analysis to test the total effect of artificial intelligence technology use on college students’ willingness to participate in online political participation and the mediating effect of online political participation cognition between the two. Table 4 illustrated that all the three Models use college students’ willingness to participate in online politics as the dependent variable. Model 1 incorporates the control variables (gender, political appearance, major category, grade level, student cadre experience, grades, family economic situation, and educational level of parents) into the regression model. Model 2 explores the independent variable (AI technology use) into the regression model, while Model 3 covers the mediating variable (online political participation perception) into the regression model.

As can be seen from Model 1, student cadre experience, achievement status and educational level of parents have a significant effect on college students’ willingness to participate in online politics. Meanwhile, from Model 2 in Table 4, the artificial intelligence technology use ($\beta = 0.265, P < 0.01$) has a highly significant positive effect on college students’ willingness to participate in online politics, and thus hypothesis H1 is valid. In the interviews, the interviewees mentioned that the massive dissemination of information fully automated by AI does give them more access to political information, and some interviewees said that once they follow a piece of politically relevant news or a hot social event, a lot of similar information is pushed out on the various platforms they use, ‘This does make it easier for me to follow some events to a certain extent, to even participate in online voting.’ In addition, according to the interviewees’ recollections, when they use AI to query or generate relevant content, the convenience of AI also makes it easier for them to take the next step, i.e., they are more willing to do some voting or information dissemination.

Analysis of the mediating role of online political participation cognition between AI technology use and online political participation intention

As can be seen from Model 3 as listed in Table 4, the mediator variable (online political participation cognition) added to Model 3 shows $\beta = 0.864, P < 0.01$, and the effect value of the independent variable AI technology use becomes smaller, but still has a very significant positive effect, indicating that online political participation cognition has a significant mediating effect between AI technology use and online political participation willingness. In addition, Table 5 shows that the confidence interval of the regression coefficient of the mediation path of “AI technology behavior attitude → willingness

Table 5 Mediating role of dimensions of online participation perceptions

Path	β	Boot SE	95%CI
Total effect	0.43	0.04	[0.14,0.30]
AI technology use \rightarrow behavioural attitudes \rightarrow Online political participation willingness	0.11	0.02	[0.02,0.09]
AI technology use \rightarrow subjective norms \rightarrow online political participation willingness	0.25	0.03	[0.08,0.18]
AI technology use \rightarrow perceived behavioural control \rightarrow online political participation willingness	0.07	0.02	[0.01,0.07]

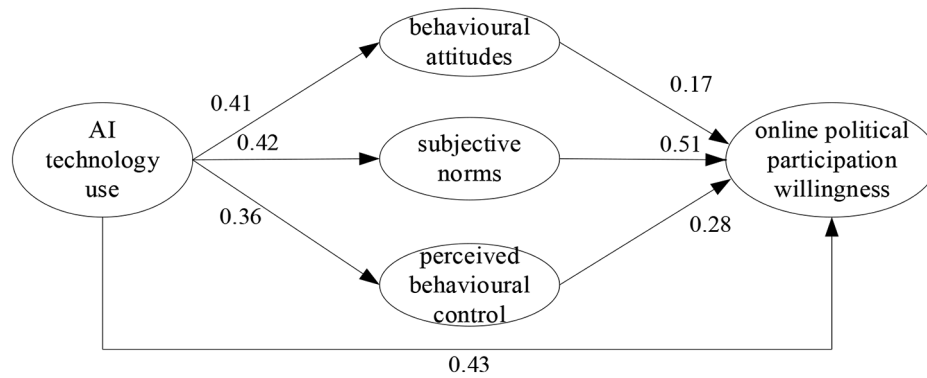


Fig. 2 Structural model of path diagram

to participate in online political participation” does not include 0 ($\beta=0.11$, $SE=0.02$, 95% *CI*: 0.02–0.09), which indicates that the behavioral attitude plays a mediating role between the use of AI technology and online political participation willingness. The mediating role between willingness is significant. The confidence interval of the regression coefficient of the mediation path as portrayed in Fig. 2 of “AI technology use \rightarrow subjective norms \rightarrow online political participation willingness ” does not include 0 ($\beta=0.25$, $SE=0.03$, 95% *CI*: 0.08–0.18), indicating that the mediating role of subjective norms between AI technology use and online political participation willingness is significant. The confidence interval of the regression coefficient of the mediation path of “AI technology use \rightarrow perceived behavioral control \rightarrow online political participation willingness ” does not include 0 ($\beta=0.07$, $SE=0.02$, 95% *CI*: 0.01–0.17), suggests that subjective norms mediate significantly between AI technology use and willingness to engage in online political participation. Hypothesis H2a、H2b、H2c holds. Interview results also show that university students pay a lot of attention to and use AI, believing that it is very easy to get the answer to a certain question and disseminate and use it, which makes them more inclined to make some ‘attempts of political participation.’ Some interviewees mentioned that university students are easily guided and influenced, and that information pushed by AI and the success stories of others can indeed motivate them to engage in political participation.

Analysis of the moderating role of media literacy between online political participation cognition and online political participation intention

The moderating role of media literacy level was tested by hierarchical regression analysis, and all models to be tested were diagnosed with Variance Inflation Factor (VIF), which proved that there was no problem of multicollinearity in the model and that the model was well-constructed. As can be seen from Table 6, Models 1-Model 3 all use online political participation willingness as the dependent variable. Model 1 incorporates the control variables into the regression model; Model 2 incorporates the independent variables behavioural attitudes, subjective norms, and perceived behavioural control into the regression model; Model 3 incorporates the moderator variable media literacy into the regression model; and Model 3 incorporates the centred behavioural attitudes, subjective norms, perceived behavioural control, and media literacy, as well as the product term of the two, into the regression model. From the coefficients of the interaction terms in Model 3, we can see that the interaction terms of behavioural attitudes and media literacy ($\beta=0.027$, $P<0.05$), subjective norms and media literacy ($\beta=0.553$, $P<0.05$), and perceived behavioural control and media literacy ($\beta=0.027$, $P<0.05$) indicate that media literacy plays an important role in the perception of online political participation (behavioural attitudes, subjective norms, perceived behavioural control) and willingness to participate in online politics moderated significantly, thus supporting hypotheses H3a, H3b and H3c. Some interviewees said that it is difficult to distinguish the truth of information in cyberspace

Table 6 Moderating effects of media literacy

	Dependent variable: willingness to engage in online political participation		
	Model 1	Model 2	Model 3
Control Variables			
Gender	-.020	.042	.046*
Political profile	-.057	-.018	-.013
Professional category	.107*	.028	.026
Grade	.001	.004	-.003
Student Leadership Experience	.139**	-.016	-.008
Achievement	.504***	.080**	.065**
Family economic situation	.027	.008	.017
Educational level of parents	.168*	-.010	-.019
Independent Variables			
behavioral attitudes		.271***	.440***
subjective norms		.464***	.693***
perceived behavioral control		.195***	.111
Moderating Variables			
Media literacy			.959***
Interaction term			
Behavioral Attitudes × Media Literacy			.070*
Subjective Norms × Media Literacy			.553*
Perceived Behavioral Control × Media Literacy			.027*
Statistical parameters			
Adjusted R2	0.404	0.884	0.889
F-value	27.773***	426.528***	14.355***

Note: * is $P < 0.05$; ** is $P < 0.01$; *** is $P < 0.001$

at present, and that they would refuse to make further forwarding, support or other participatory behaviours because they are not sure of its truthfulness. Some interviewees think that schools should offer some lectures or courses to help college students improve their media literacy.

Discussion

Based on the Theory of Planned Behaviour, this study systematically examined the role of AI use in influencing Chinese college students' online political participation by analysing the data from 317 questionnaires, and explored among them the mediating mechanism of online politics in the perception of participation and the moderating mechanism of media literacy. The study found that college students' willingness to participate in online politics is the result of a multifactorial combination of factors, which is mainly influenced by the degree of college students' AI use, their perception of online political participation (including perceived importance, perceived need for participation, perceived benefits of participation, perceived risks of participation, degree of support from significant others, degree of peer pressure, political efficacy, and perceived ease of use), and the level of college students' media literacy. The influence of internal factors and external conditions. The deeper and more frequent college students' AI technology use, the more in-depth

their perception of online political participation, and the increase in perception will increase their willingness to participate in online political participation, resulting in more online political participation, and AI use has a positive promotion effect on online political participation. The effect of AI technology use on college students' online political participation is partly attributed to online political participation cognition, and online political participation cognition has a mediating effect. Meanwhile, media literacy moderates the relationship between online political participation cognition and online political participation, with higher media literacy leading to more online political participation. These findings are important for understanding the political participation behaviour of youth groups in the contemporary digital context.

Direct relationship between artificial intelligence and online political participation

First, the study confirms that the use of AI technology has a significant positive impact on college students' online political participation. This finding is consistent with existing literature on technological advances for political participation [31, 34]. Artificial intelligence (AI) technologies, particularly through personalised information pushing on social media platforms, have improved the efficiency and quality of information access, making it easier for university students to access rich political

content. This suggests that AI technology enhances college students' interest in political information and willingness to participate by optimizing information delivery channels and content personalization. Therefore, for universities and colleges, they can think about stimulating students' interest and willingness to participate by enhancing education on AI technology, such as through lectures and trainings to help students improve their ability to acquire and process relevant information, facilitating their access to high-quality information and resources, and making it easier and more positive to engage in political participation, etc. This study further extends existing research by highlighting the unique impact of AI technology on political participation behaviours in specific socio-cultural contexts, especially for the realities of the Chinese university student population, providing new empirical support.

The mediating role of online political participation cognition

Second, the study found that online political participation perceptions mediated the relationship between AI technology use and online political participation intentions. Specifically, college students developed a deeper understanding of political participation through cognitive factors such as behavioural attitudes, subjective norms, and perceived behavioural control during their interactions with and discussions of information on social media, thereby increasing their willingness to participate. This result suggests that college students' willingness to participate in politics is not only directly affected by the use of technology, but also indirectly affected by their cognitive processes. Therefore, from the perspective of colleges and universities, they can provide more opportunities for college students to participate in political activities, such as providing internships in relevant positions and participating in political discussions, etc. They can also set up corresponding incentives to increase the motivation to participate, and the individual college students can take the initiative to participate in order to enhance their own sense of political efficacy, which will promote their political participation behaviours in the digital era. This finding suggests that cognitive factors are not only a mediating mechanism between the use of AI technology and political participation, but also a key variable in understanding college students' political behaviour.

The moderating role of media literacy

In addition, media literacy played an important moderating role between AI technology use and college students' willingness to participate in online politics. Highly media literate college students are able to identify and evaluate information more effectively, leading to more rational and positive decision-making in complex information

environments. This finding emphasises the importance of media literacy for effective political participation in an information-rich and complex online environment. Therefore, colleges and universities can make efforts to enhance the media literacy of college students, such as setting up relevant courses or organising training and debate activities to improve students' critical thinking ability and ability to identify misinformation, so as to help them make rational judgments in a complex information environment, and thus make rational political participation behaviours. This study not only confirms the moderating role of media literacy, but also emphasises the important practical significance of improving media literacy in enhancing college students' political participation, which provides a theoretical basis for policy making and universities.

Limitations and further research

A limitation of this study is that the use of questionnaire methods for data collection may have resulted in some responses being influenced by social desirability bias, and respondents may have concealed their actual perceptions or behaviors, making it difficult to capture the complex motivational and emotional context. Besides, there may be other unconsidered variables, such as personal political inclination, family social status, and geographic and cultural background, which may also affect Chinese college students' willingness to engage in online political participation, and which can be further explored and thoroughly researched in future studies. The sample size needs to be enlarged in future studies, and more in-depth studies and analyses can also be conducted on special cases to understand the responsible psychological mechanisms and socio-cultural factors behind individual behaviours at a deeper level.

Conclusion

This study analyses the impact of artificial intelligence on Chinese college students' willingness to participate in online political participation through the framework of the theory of planned behaviour and the use of structural equation modeling. The study reveals the multilevel mechanism of the impact of AI technology on college students' willingness to participate in online political participation in the digital era, with a good model fit and validated causality between potential variables. Specifically, the use of AI technology not only directly increases college students' willingness to participate in politics, but also indirectly promotes political participation behaviours through the mediating factor of online political participation perceptions. In addition, media literacy, as a moderating factor, further enhanced the effect of this process.

This study highlights the importance of optimising the online political participation environment and enhancing media literacy among college students in the digital context, and the findings supplement the insufficient attention paid to factors such as individual characteristics and online social behavioural characteristics of college students in previous studies, as well as expanding the evidence of research on the application of AI technology and online political participation among Chinese college students, breaking through some of the limitations of the existing perceptions. This study not only provides new perspectives for understanding how AI affects college students' online political participation, but also provides practical guidance on how the government, society, schools, and families can synergise their roles to jointly promote healthy and positive online political participation among college students. By improving educational strategies and policy measures, AI technology can be better utilised to stimulate college students' enthusiasm for political participation and cultivate their rational judgement, thereby promoting the progress and development of society. Future research can further explore the impact of AI technology on youth political participation in different cultural contexts, and how AI can be effectively used to promote the breadth and depth of political participation in an evolving technological environment.

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Author contributions

P.Z.: Writing – original draft, Methodology, Formal analysis, Conceptualization. S.C.: Writing - review & editing, Validation, Supervision.

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Data availability

Data will be available on request.

Declarations

Ethics approval and consent to participate

Informed consent to participate was obtained from all of the participants in the study. Furthermore, the study was developed in accordance with the Declaration of Helsinki and was approved by the institutional review board of the School of Materials Science and Engineering, Shanghai Dianji University.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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