



Exploring AI Application Capability among Undergraduate Fashion Design Students: Current Status and Influencing Factors

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Abstract

Background and Aims: As artificial intelligence becomes increasingly important in fashion design education, students' ability to apply AI tools has become a key issue in talent development. This study aimed to examine the current status of AI application capability among undergraduate fashion design students and to identify its main influencing factors.

Methodology: A quantitative research design was adopted. Data were collected from 180 undergraduate students majoring in Fashion and Apparel Design at Xianyang Normal University, China. Descriptive statistics, independent samples t-tests, one-way ANOVA, correlation analysis, and hierarchical regression analysis were used to analyze the data.

Results: The results showed that students' self-rated AI application capability was at a moderate level ($M = 3.17$, $SD = 1.03$), while their developmental demand was relatively high. Significant differences were found across gender and grade level. Personal, school, and social factors were all positively associated with AI application capability. Hierarchical regression analysis further showed that these three factors had significant positive effects, with grade remaining the strongest predictor ($\beta = .383$, $p < .001$).

Conclusion: AI application capability among fashion design students is shaped by multiple factors and develops progressively across academic stages. Improving this capability requires stronger student engagement, better curriculum support, more practice-oriented teaching, and closer university-industry collaboration. However, the findings should be interpreted with caution because the study relied on self-reported data from a single university.

Keywords: AI Application Capability; Fashion Design Education; Influencing Factors; Undergraduate Students





Introduction

Artificial intelligence has increasingly reshaped the logic of design work in recent years. In the fashion industry, AI is no longer limited to technical assistance but has gradually entered multiple stages of the design process, including idea generation, visual development, trend analysis, and market-oriented decision-making. As a result, the professional competence required of future fashion designers is also changing. In addition to traditional design knowledge and creative skills, students are now expected to develop the ability to understand, use, and critically apply AI tools in design-related tasks. This shift has created new expectations for fashion design education and has made AI application capability an important issue in talent cultivation. Recent studies have emphasized that AI is not only transforming industrial practices but also reshaping competency frameworks in higher education (Dwivedi et al., 2023; Zawacki-Richter et al., 2019).

The development of artificial intelligence-related abilities in higher education is uneven among different disciplines or institutions (Selwyn 2019; Chiu et al. 2023). Many fashion design courses focus on traditional studio practice, hands-on experience, and basic digital software training, and the systematic cultivation of artificial intelligence application abilities is still insufficient. The existing educational arrangements often cannot fully meet students' needs in actually applying artificial intelligence, solving digital problems, and integrating artificial intelligence tools into the creative workflow, etc. (Mishra & Koehler, 2006; Chiu et al., 2023). In the case reflected in this study, students in the Fashion and Apparel Design program at Xianyang Normal University have already shown a clear need for stronger AI-related learning support, while differences in learning background and access to resources may further shape their level of capability development. The issue, therefore, is not simply whether AI should be introduced into fashion design education, but how students' AI application capability currently develops and what factors are associated with it.

Previous studies have discussed AI in design education from several perspectives, such as AI literacy, digital literacy, motivation, curriculum reform, and interdisciplinary learning. These studies have helped explain why AI matters in creative disciplines, yet the empirical focus is still often placed on conceptual discussion, technological potential, or instructional innovation. Comparatively less attention has been paid to the quantitative examination of students' actual AI application capability and the factors associated with variation in that capability within a specific disciplinary context. For fashion design education in particular, it remains necessary to clarify whether students differ by background characteristics, how strongly motivation and digital literacy relate to AI application capability, and which factors have greater explanatory power in practice. A clearer answer to these questions would help move the discussion from general advocacy of AI integration toward evidence-based educational planning. In particular, there is growing





recognition that AI-related competencies require systematic empirical examination rather than purely conceptual discussion (Chiu et al., 2023). However, existing studies have paid relatively limited attention to discipline-specific quantitative evidence on students' perceived AI application capability in fashion design education, especially with regard to how personal, school, and social factors jointly relate to such capability.

Against this background, the present study focuses on undergraduate students majoring in Fashion and Apparel Design at Xianyang Normal University in China. Using a quantitative research design, this study examines the current status of students' AI application capability, tests group differences across selected demographic variables, and analyzes the relationships between AI application capability and its influencing factors. By doing so, the study aims to provide empirical support for curriculum improvement and for a more targeted approach to AI-related competence development in fashion design education.

Literature Review

1. AI Application Capability

Artificial intelligence application capability is the effective use of artificial intelligence tools in household tasks, such as idea generation (idea gen), information processing, design support, and decision-making. In fashion design, this ability not only includes technical operations but also the ability to integrate artificial intelligence into the creative process, such as design development, material selection, and market-oriented analysis. From a technical perspective, the progress of generative models has expanded the applications of visual content generation and optimization in creative design tasks (Goodfellow et al. 2014). With the more widespread application of artificial intelligence in the fashion industry, students increasingly need to combine design thinking and digital tools (dig tools) more flexibly and practically (Holmes 2019; Kumar 2020).

In apparel design education, AI application capability has gradually become an important part of students' professional competence. Existing studies suggest that AI tools can improve design efficiency, expand creative possibilities, and support more personalized design outputs (Holmes, 2019). At the same time, AI technologies can help students interpret market trends and user preferences through data-based analysis, which strengthens the connection between design learning and industry practice (Kumar, 2020). For this reason, AI application capability should not be understood as a narrow technical skill alone, but as a broader ability to apply digital technologies in creative and professional contexts. This perspective aligns with recent discussions that emphasize AI literacy as a combination of technical, cognitive, and application-oriented competencies (Long & Magerko, 2020; Luckin et al., 2016).





Scholars have also argued that AI-related competence should be viewed as a multidimensional construct that includes technical understanding, operational ability, and critical awareness in the use of AI tools (Ng et al., 2021). In fashion design education, this perspective is especially relevant because students are required to balance creative expression with technological application. Without sufficient AI application capability, students may find it difficult to adapt to increasingly digitalized design environments (Zhou, 2023). Checking students' artificial intelligence application abilities provides an important basis for evaluating the effectiveness of current teaching practices (Selwyn, 2019). And the development of this ability is related to the broader transformation of the creative industry, where artificial intelligence supports more in the conception and innovation in the creative industry (Huang et al., 2021).

2. Influencing Factors

The development of AI application capability is influenced by multiple factors at both the individual and contextual levels. In this study, these factors are discussed under three broad dimensions: personal factors, school factors, and social factors.

First of all, some personal circumstances are related to students' willingness to participate in artificial intelligence learning. For example, learning attitudes, time investment, subjective initiative, and other situations. According to self-determination theory, students with stronger internal motivation are more willing to actively explore new tools and can persevere in more difficult learning tasks (Deci & Ryan, 2000). In the learning related to artificial intelligence, this participation is relatively important because students need to conduct experiments, reflections in practice, and also repeatedly use digital tools. Since students' ability to use and understand digital systems will directly affect the effectiveness of technology-supported learning, a certain amount of digital literacy is also required in this process (Tsai & Yen, 2021). Previous studies (Prev studies) also showed that there is a relationship between the degree of students' proactive participation and the results of artificial intelligence-related learning. This is consistent with the research findings in a broader category, that is, students' own learning ability (student agency) and autonomous learning are quite crucial in technology-assisted learning (Aoun, 2017).

Second, school-related factors include institutional support for students, such as learning resources, the practicality of courses, and lecture training opportunities. This kind of support is related to students' ability to understand and handle digital information in more technical learning (Martin, 2006). From the perspective of educational technology integration, the development of AI-related abilities not only requires tool-related abilities but also needs to pay attention to how technology is integrated into course design and teaching practice (Mishra & Koehler, 2006). According to design education research, support in courses, arrangements for actual teaching, and guided learning opportunities all help students apply AI in practical tasks (Holmes, 2019; Wang &





Zhu, 2021; Zhang & Li, 2020). Digital literacy is regarded as an important foundation for effective technologies in education (Redecker, 2017).

Third, social factors belong to the external support form of universities, including enterprise support, talent demand, and training opportunities. The artificial intelligence application ability is related to industry practice, so it is relatively important. Students who obtain external training, industry expectations, and real design situations are more likely to detect the actual value of artificial intelligence and improve their application ability (Kumar, 2020; Zhou, 2023). In a broad sense, the demand for artificial intelligence skills in the labor market is gradually increasing, strengthening the importance of external support and industry participation (OECD, 2021).

In addition to the three-dimensional factors, demographic variables such as gender and grade may have an impact on the ability to apply artificial intelligence. Senior students may have more learning experience and practical contacts, and gender-related differences may be reflected in aspects such as English proficiency and self-confidence. And to what extent these variables affect the ability to apply artificial intelligence needs to be quantitatively tested. Previous studies often only mentioned these factors separately, and their comprehensive impact on fashion design education has not been fully tested.

3. Hypotheses

Based on the literature reviewed above, this study proposes the following hypotheses. These hypotheses assume that AI application capability in fashion design education is shaped not only by students' own engagement, but also by the degree of institutional support and the opportunities provided by the broader social and industry environment.

H1: Personal factors have a significant positive effect on AI application capability.

H2: School factors have a significant positive effect on AI application capability.

H3: Social factors have a significant positive effect on AI application capability.

H4: Grade level has a significant effect on AI application capability.

H5: Gender differences exist in AI application capability.

Methodology

1. Research Design

This study used a quantitative research design to examine the current status of AI application capability among undergraduate students in Fashion and Apparel Design and to identify its influencing factors. A cross-sectional survey was adopted to collect data and analyze differences and relationships among variables.

2. Participants and Sampling



The participants were undergraduate students majoring in Fashion and Apparel Design at Xianyang Normal University, China. A total of 180 valid questionnaires were collected. Convenience sampling was used because it was practical and suitable for the study context. The sample included students from different grade levels, which allowed comparison across groups.

3. Instruments

Data were collected through a structured questionnaire developed from the literature and the research objectives. All items were measured on a five-point Likert scale. The questionnaire included four main parts: AI application capability, personal factors, school factors, and social factors. It also collected demographic information such as gender and grade level.

AI application capability was measured through students' self-reported evaluation of their current ability to use AI in learning and design-related tasks. This measure was intended to reflect students' perceived capability rather than objective performance. Personal factors included learning attitude, time investment, and subjective initiative. School factors included learning resources, course practicality, and lecture or training support. Social factors included enterprise support, talent demand, and training opportunities.

4. Data Analysis

The data were analyzed using SPSS. Descriptive statistics were used to describe the sample characteristics and the overall level of AI application capability. Independent samples t-tests and one-way ANOVA were used to test group differences. Pearson correlation analysis was applied to examine the relationships among the main variables, and hierarchical regression analysis was used to test the effects of personal, school, and social factors on AI application capability after controlling for gender and grade.

Results

1. Sample Characteristics

It was analyzed that there were 180 valid questionnaires. Undergraduates majoring in costume design at Xianyang Normal University were selected as the respondents. Among the 180 participants, there were 56 males (accounting for 31.1%) and 124 females (accounting for 68.9%). By grade division, there are 60 people in the first grade, accounting for 33.3%; there are 55 people in the second grade, accounting for 30.6%; there are 30 people in the third grade, accounting for 16.7%; there are 35 people in the fourth grade, accounting for 19.4%.

Table 1 Sample characteristics

Variable	Category	n	%
Gender	Male	56	31.1
	Female	124	68.9



Variable	Category	n	%
Grade	First year	60	33.3
	Second year	55	30.6
	Third year	30	16.7
	Fourth year	35	19.4
Total	Valid responses	180	100.0

2. Current Status and Developmental Needs of AI Application Capability

Students' current AI application capability was at a moderate level overall. The self-rated mean score for AI application capability was 3.17 (SD = 1.03). In terms of response distribution, the largest proportions were found in the categories of "general" (32.2%) and "agree" (33.3%), while 26.7% of respondents selected either "disagree" or "strongly disagree." This suggests that although many students had already begun to engage with AI tools, their capability development remained uneven and had not yet reached a consistently high level. This result suggests that students were more concerned with immediate teaching conditions and practical learning support than with more distant industry-level developments.

Table 2 Response distribution for current AI application capability

Response	n	%
Strongly disagree	10	5.6
Disagree	38	21.1
General	58	32.2
Agree	60	33.3
Strongly agree	14	7.8

With regard to the perceived need for further capability development, the mean scores ranged from 3.12 to 3.49, indicating a generally positive demand for strengthening AI-related competence. The highest scores were found for equipment and technical support (M = 3.49, SD = 1.43), practical case teaching (M = 3.48, SD = 1.18), current curriculum support (M = 3.44, SD = 1.28), and more AI courses (M = 3.44, SD = 1.42). By contrast, future industry development received the lowest score (M = 3.12, SD = 1.23) and was not significantly above the benchmark value of 3 ($p = .203$). This pattern suggests that students were more concerned with immediate learning conditions, course support, and practical teaching than with broader industry-level trends.

Table 3 Current status and developmental needs of AI application capability

Measure	Item	M	SD	p
Current status	AI application capability	3.17	1.03	—
Developmental need	Future industry development	3.12	1.23	.203
	Enhancing design capability	3.32	1.33	.002
	Current curriculum support	3.44	1.28	< .001
	More AI courses	3.44	1.42	< .001
	Practical case teaching	3.48	1.18	< .001
	Equipment and technical support	3.49	1.43	< .001
	Employability improvement	3.43	1.12	< .001

Note. The p-values for developmental needs are based on one-sample t-tests using 3 as the reference value.

The findings indicate that students demonstrated a moderate but uneven level of AI application capability. Compared with abstract discussions of future industry change, students expressed stronger needs for curriculum improvement, practical teaching, technical support, and employability-related development.

3. Group Differences

Significant differences in AI application capability were found across gender and grade level. Female students reported significantly higher AI application capability than male students ($M = 3.32$ vs. 2.82 , $p = .005$). Grade-level differences were also significant ($F = 18.620$, $p < .001$), showing an overall upward trend across academic stages: first-year students had the lowest mean score ($M = 2.60$), whereas fourth-year students had the highest ($M = 4.03$). After comparison and review, the scores of the first grade are much lower than those of the second, third, and fourth grades. The scores of the fourth grade are much higher than those of the second and third grades. There is no obvious difference between the second and third grades ($p = 0.734$). The results show that the development of the ability of the artificial intelligence application program is phased, and it does not grow evenly in each grade.

Table 4 Differences in AI application capability across student groups

Variable	Category	n	M	SD	Test statistic	p
Gender	Male	56	2.82	1.162	t-test	.005
	Female	124	3.32	0.924		
Grade	First year	60	2.60	1.012	$F = 18.620$	< .001



Variable	Category	n	M	SD	Test statistic	p
	Second year	55	3.24	0.666		
	Third year	30	3.17	0.986		
	Fourth year	35	4.03	0.954		

Table 5 Post hoc comparisons of AI application capability by grade

Comparison	Mean difference	p
First year vs. Second year	-0.641	< .001
First year vs. Third year	-0.567	.006
First year vs. Fourth year	-1.429	< .001
Second year vs. Third year	0.074	.734
Second year vs. Fourth year	-0.788	< .001
Third year vs. Fourth year	-0.862	< .001

4. Correlation Analysis

The relevance results show that the artificial intelligence application's ability is positively correlated with 9 factors in the personal, school, and social dimensions. Overall, the correlation of personal factors is the strongest, followed by social factors, and the correlation of school aspects is relatively weak. Among personal factors, the initiative in subjects has the highest correlation with artificial intelligence application ability ($r = 0.420$, $p < 0.001$), followed by time investment ($r =$). In terms of learning attitude, $r = 0.249$, $p = 0.001$. The correlation between lectures and training in school is the strongest, $r = 0.333$, $p < 0.001$. This text is not fully clear. You can review it and complete it completely, and then let me perform an accurate abbreviation. At present, the content cannot clearly and accurately grasp the full meaning to carry out good abbreviation. It is also relatively obvious. Among the social factors, the correlation coefficient of enterprise support is the strongest ($r = 0.373$, $p < 0.001$), followed by training opportunities ($r = 0.313$, $p < 0.001$). There are also talent needs ($r = 0.279$, $p < 0.001$). The study found that the development of students' artificial intelligence application ability depends on personal efforts, institutional support, and the broader industry situation.

Table 6 Correlations between AI application capability and influencing factors

Dimension	Factor	r	p
Personal factors	Learning attitude	.249	.001
	Time investment	.333	< .001
	Subjective initiative	.420	< .001





Dimension	Factor	r	p
School factors	Learning resources	.199	.007
	Course practicality	.160	.032
	Lecture and training	.244	.001
Social factors	Enterprise support	.373	< .001
	Talent demand	.279	< .001
	Training opportunities	.313	< .001

5. Regression Analysis

A hierarchical multiple regression analysis was conducted to examine the effects of different factors on AI application capability.

In Model 1, gender and grade were entered as control variables. The model was significant ($F = 27.540$, $p < .001$), explaining 23.7% of the variance ($R^2 = .237$). Both grade ($\beta = .437$, $p < .001$) and gender ($\beta = .158$, $p < .05$) showed significant positive effects.

In Model 2, personal, school, and social factors were added. The explanatory power increased significantly ($\Delta R^2 = .151$), with the total variance explained reaching 38.8% ($R^2 = .388$). The model remained significant ($F = 22.080$, $p < .001$). All three factors—personal ($\beta = .216$, $p < .01$), school ($\beta = .217$, $p < .01$), and social ($\beta = .208$, $p < .01$)—had significant positive effects. Grade remained the strongest predictor ($\beta = .383$, $p < .001$), while gender had a smaller but still significant effect ($\beta = .151$, $p < .05$).

The research results show that the capabilities of artificial intelligence application programs are affected by personal participation, institutional support, and external social conditions. A stronger grade effect may lead to the accumulation of artificial intelligence application program capabilities in the academic stage, and a weaker but obvious gender effect reflects the group differences in perceptual ability and learning participation.

Table 7 Hierarchical regression analysis predicting AI application capability

Variables	Model 1 β	Model 2 β
Control variables		
Gender	.158*	.151*
Grade	.437***	.383***
Main predictors		
Personal	—	.216**
School	—	.217**
Social	—	.208**



Variables	Model 1 β	Model 2 β
R^2	.237	.388
ΔR^2	—	.151
F	27.540***	22.080***

Note. β = standardized coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$.

Discussion

This study examined the current status and influencing factors of AI application capability among undergraduate students in fashion design. The findings show that students' AI application capability remains at a moderate level, while their demand for further development is relatively high. This result suggests a gap between students' developmental needs and their current self-rated capability. Similar patterns have been reported in previous studies, which indicate that although AI and digital tools are increasingly emphasized in creative education, students often lack sufficient opportunities to develop practical application skills (Holmes, 2019; Kumar, 2020). Therefore, the issue is not only whether AI is introduced into the curriculum, but whether it is effectively integrated into students' learning processes.

The results show that multiple factors shape the upper limit of artificial intelligence applications, and personal engagement is the core. In terms of personal factors, there is an obvious positive impact consistent with self-determination theory. Students with high initial motivation and high learning investment are more likely to actively explore or apply artificial intelligence tools and can also enhance their abilities (Deci & Ryan, 2000; Ng et al., 2021). Social factors such as enterprise support, training opportunities, etc., also have obvious impacts. This discovery reconnects the educational scenario with the real industrial environment. Compared with pure classroom learning, exposure to external practices provides more direct and effective support for the development of abilities.

Another key finding is that factors related to schools have a positive impact, although it is smaller than the impact of personal factors. This indicates that institutional support (courses, teaching, resources) is still important for artificial intelligence learning. The medium effect size shows that current educational practices may not fully enhance students' actual abilities. This is in line with the need in education that the integration of technology requires not only tools but also effective teaching design (Mishra & Koehler, 2006; Wang & Zhu, 2021). In addition, grade is the strongest predictor, meaning that the ability to apply artificial intelligence will develop with time and is related to accumulated learning experience. The phased mode shows that learning related to artificial intelligence may need more systematic support for many years. The gender





impact is small but significant, which may reflect differences in confidence, engagement, or previous learning, but more research is needed. Since the ability of artificial intelligence applications is measured by self-report rather than objective performance measurement, and the sample is from a university, the research results need to be viewed with caution. In general, the research results show that individuals, institutions, and society need to work together to improve students' ability to apply artificial intelligence, rather than relying on a single dimension.

Conclusion and Recommendations

This study examined the current status and influencing factors of AI application capability among undergraduate fashion design students. The results showed that students' self-rated AI application capability was at a moderate level, while their demand for further development was relatively high. Gender, grade, personal factors, school factors, and social factors all showed significant effects, with grade remaining the strongest predictor. These findings suggest that AI application capability in fashion design education develops progressively and is shaped by the combined influence of individual, institutional, and social conditions.

Based on these findings, three recommendations are proposed. First, AI-related content should be more systematically integrated into fashion design courses, with different levels of learning tasks arranged across academic years. Second, schools should strengthen practical teaching, technical support, and case-based learning, especially in response to students' demand for equipment support and application-oriented instruction. Third, universities should expand cooperation with industry to provide more training and practice opportunities that connect classroom learning with real design contexts. At the same time, the findings should be interpreted cautiously because the study relied on self-reported data from one university and did not include objective performance-based measures of AI application capability.

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