Study on the Influence of AI Composition Software on Students' Creative Ability in Music Education

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Abstract: Generative AI technology for human-assisted tools has made great strides in recent years, and studying the impact of this technology on students' compositional abilities plays an important role in promoting changes in music education. Previous studies have focused on the performance of music composition software itself in terms of composition, with less consideration given to the impact of creators' compositional ability after using assistive composition tools. Thus, this paper designs a controlled experiment to investigate the changes in students' compositional ability before and after using AI composition tools. This paper finds that students' compositional abilities in all areas of composition improved to varying degrees after using AI composition tools. This paper compares the differences in compositional abilities of students with and without the education of AI composition tools, which has practical implications for vigorously promoting the adoption of AI composition tools in university music education teaching.

Keywords: Music Education, AI Composition, Composition Ability Assessment
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1. Introduction

The advent of ChatGPT has heralded a new era in generative AI, leading to a surge in the development of language models for artificial intelligence. In the field of education, the powerful capabilities of these models have been met with both amazement and concern regarding their applications (Wilson, 2023). Following OpenAI's launch of ChatGPT, numerous generative AI tools have emerged, including those that generate images from text

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descriptions, create videos from text, and recently, tools that generate music based on text inputs. In China, current AI applications are primarily focused on text reading and generation, as well as image generation from text, with no domestic AI tools available for music creation. Consequently, music education in Chinese universities rarely incorporates the teaching or creation of AI tools. This paper investigates how the integration of music-based AI creation tools in university music education can influence students' compositional abilities.

Existing studies related to music education and AI have mostly focused on the compositional ability of AI software or systems (López-Montes et al., 2022; Maksymov et al., 2023), the generation of compositions in terms of style (KABAYIZA, 2021; Zhou, 2023) and auditory sensation (Guo et al., 2017; Kang et al., 2023) performance, and the effectiveness of AI composition tools for education and teaching (Wei et al., 2022; Xiao et al., 2023). In contrast, existing studies have paid less attention to students' compositional ability, and no scholars have yet considered the impact of music-based AI composition software on college students' compositional ability when it enters the classroom.

The Theory of Technology Integration in Education (TPACK) focuses on how teachers integrate technology, educational content, and pedagogy in their teaching so that they can effectively use technology to teach. Current research on TPACK theory focuses on assessing the effectiveness of teachers' use of technology to enhance teaching and learning, e.g., Bueno et al. (2023) had mathematics teacher trainees use ICT in their teaching and assessed their TPACK development by observing their design and practice of high school lessons. Max et al. (2024) examined the impact of information communication technology (ICT) in the classroom on the teacher trainees' development of TPACK competencies. TPACK theory provides a unique perspective for this study on the impact of teachers' incorporation of technology in the teaching and learning process on the quality of teaching and learning. Based on this perspective, this paper will investigate the impact of university teachers' use of intelligent AI composition tools during music class instruction on music students' compositional abilities, to better reveal the impact of the use of AI composition tools on university music education.

In this paper, a controlled experiment was designed in which two classes of 40 students were set up as the experimental group and the control group respectively. Among them, the experimental group used AI composition software in the teaching process, while the control group used traditional teaching methods without AI composition software in the music teaching process. This study focuses on the following three questions. First, the effect of the use of AI composition tools on music majors' compositional ability; second, which aspects of students' compositional ability are more affected by AI composition tools; and third, why the use of AI composition software has such an effect.

At the theoretical level, this study theoretically broadens the choice of assessment objects; at the methodological level, it provides an actionable direction for future changes in the way university music classes are taught to improve teaching quality, which is of practical significance. The structure of the rest of the paper is as follows: the second part is a literature review, which mainly introduces the content related to music education, composition, and composition ability evaluation related to AI; the third part is the research methodology, which mainly introduces the object of investigation, data source and experimental method of this paper; the fourth part is the experimental results obtained according to the designed control experiment; the fifth part is the discussion, which compares with the previous research and explains the experimental results and the reasons

behind; the sixth part is the paper's methodology. The sixth part is the suggestions based on the research questions; the seventh part is the conclusion.

2. Literature review

2.1 Music Education

Music education in universities involves the development of specialized knowledge and skills, aiming to create professional workers in the field of music, such as composers. With the development of computer technology, more and more attention has been paid to the use of machines to accomplish less innovative work to save creators' time and energy, and thus more and more scholars in the field of music education have begun to study the impact of music composition tools on music education. The current relevant research mainly focuses on the form of music creation, the effect of AI tools on music education, application scenarios and other aspects. In the form of music creation, Judith et al. (2018) studied how computational thinking can help music students better understand and create music. Mario et al. (2023) explored the effect on students' creative expression after integrating algorithmic music creation into the classroom in the form of programming. In terms of the effects of AI tools in music education, Wei et al. (2022) argue that AI-based music education and teaching (MET-AI) technology is improving with the increasing sophistication of modern technology and is enhancing the quality of music education. Paloma (2023) argues that although AI composition relies on replicating an existing model, with the right guidance, it can enhance the creativity of the creator. Xiao et al. (2023) argued that the integration of AI into traditional music education can enhance the overall productivity of students, regardless of their qualifications and experience. A study by Yuan et al. (2024) found that AI-assisted polyphonic music composition enhanced the academic motivation of college students majoring in music. In terms of application scenarios, Tian (2022) found that the combination of AI and music can create more attractive and situational game music. To alleviate the pressure of the traditional music teaching model in terms of the demand for space, equipment and funds, Qiusi et al. (2022) created an AI-based music education model in which students gave higher satisfaction. To break the traditional music education model, Wang et al. (2022) constructed a vocal music teaching system, which was well received by many students. Li et al. (2023) introduced AI-powered chatbots in piano lessons in schools to improve students' performance.

2.2 AI Composition

2.2.1 Composition content

AI composition refers to a form of creation that uses AI technology to assist songwriters in arranging music. By designing and training deep learning models, neural networks, and other machine learning algorithms, AI systems can analyze a large amount of music data (including elements such as melodies, harmonies, rhythms, and so on), learn and understand the inherent structure and patterns of the music, and generate a new original piece of music or song fragment based on the results of these learnings. AI composition software and platforms are capable of automatically generating music based on the style, mood, instrumentation, and other conditions specified by the creator, and they can draw inspiration from the works of classical masters or adapt to a variety of modern music styles such as pop, rock, electronic, and ethnic. Some advanced AI composition tools are not only capable of generating background music and soundtracks but can even create relatively complex multi-part structured works. Existing research on the content of AI composition mainly focuses on the two aspects of work style and listening sense. In terms of composition style, KABAYIZA (2021) proposed an automatic song melody composition model, which enables automatic composition systems to simulate different composition styles through the collection and classification of sample songs. The Deep Bach

composition model (Deep Bach) successfully composed 2503 hymns after being trained on 352 works composed by Bach (Zhou, 2023). In terms of work listening, Guo et al. (2017) proposed a composition system architecture based on interactive genetic algorithms, which helps the musical works created by AI to reflect more of the composer's subjective emotional color. Elastic change is a key element to humanize the music performed, and Kang et al. (2023) emphasized the importance of "elastic change" in musical compositions, which provides AI programmers, performers, and singers with a clear and referable method to enhance the listening experience of compositions made by AI. Meanwhile, the structural recognition method proposed in the same year brings more possibilities for AI to create more expressive compositions.

2.2.2 Composition Tools

With the rise of Chat GPT and other big language models, artificial intelligence has become a hot topic of discussion, and the use of AI to compose musical works has also received more and more attention. But in fact, AI music is not a completely new thing, the earliest can be traced back to the 1950s.The development of AI composition has gone through the process from composing with computer-aided software or systems to composing with the help of AI software. In the period of non-AI composition, due to the low degree of intelligence of computers, it still requires creators to invest more time and energy in the process of composing tunes. In the computer-aided composition stage, people used digital signal processors (DSPs) to pre-process sounds, and real-time processing of sounds with the help of auxiliary algorithmic composition systems such as kyma, MAX/MSP, etc. (Lin, 2022). The emergence of the OpenMusic auxiliary composition program in the 1990s made it possible to acquire, stitch together, and generate musical compositions in a jigsaw-like manner (Wu, 2010). In the period of AI composition, due to the continuous development of AI technology, the ability of AI composition has been continuously improved, and in this process, numerous AI software for composition emerged. 1987, the EMI composition system based on the algorithm of the "commonality writing period" was launched, which was able to create works similar to the styles of Bach, Beethoven, Chopin, etc. The EMI composition system was also able to produce a variety of compositions. In 2016, the AIVA composition system appeared, focusing on the task of generating music related to classical works. 2019 saw the release of the Amper Score composition system, which focused on generating functional music. 2021 saw the emergence of the Beethoven composition system, which was used to complete Beethoven's unfinished work. In 2021, the"Beethoven"composition system appeared, and people used it to complete Beethoven's unfinished works (Qin, 2023). In 2023, Google released the MusicLM model, and the composition ability of AI was greatly improved again.

2.3 Evaluation of Compositional Ability

Compositional ability is evaluated through the compositions created by musicians, reflecting the quality of the compositions made by the creators, and there are two dimensions of evaluating a composition: subjective and objective. The listener's mood, arrangement and orchestration all affect the quality of a tune. From the objective aspect, related studies assess the quality of a piece of music from two aspects, namely, objective indicators and compositional theory. Gauldin (1988) proposed the counterpoint method, which emphasizes the independence of voices, harmonic relationship, and rhythmic balance in music composition. Sun et al. (2018) used the proportion of notes in the whole scale to the total number of notes, the percentage of intervals between an octave, and the triadic chord between an octave to measure the quality of a piece. percentage to measure the quality of the piece. Some scholars (Ke, 2008; Zhang, 2024) further

subdivided the objective indicators into individuality criteria and commonality criteria to evaluate the quality of a musical work more objectively and accurately. From the subjective side, Jing et al. (2020) suggested rating musical works on a Likert scale to measure the quality of musical works. Zhao (2021) studied how people evaluate musical works after the intervention of the human factor of “nostalgia”.

In summary, in order to use AI to create better-sounding tunes, many researchers have explored musical styles and auditory sensations, in order to create tunes that are more varied in style and more “humanized” in sound. At the same time, after years of technology iteration and development, intelligent composition tools from the initial can only be a simple adjustment of the volume and other operations, to the present day can generate a specific style of the tune, AI composition software capabilities have been greatly enhanced. However, existing research has not analyzed the impact of AI composition tools on the creative subject, especially on the creative field of music education at the university level. The use of AI composition tools can bring more inspiration to creators, which indirectly affects the characteristics of the final work. Therefore, this paper considers the impact of AI composition tools on the composing ability of creators and provides feasible ideas for improving the composing ability of creators.

3. Research method

3.1 Sample and sampling method research subjects

The enrollment criteria for the subjects of this study are: Firstly, undergraduate students in domestic universities; Secondly,music majors. Eighty undergraduate students were selected as the subjects of the study, 40 in the experimental group and 40 in the control group. Stratified sampling method was used to ensure that the number of male and female undergraduates was balanced and fairly selected for the experiment.

3.2 Instruments

In this study, to comprehensively evaluate the impact of AI composition tools on students' composition ability, three main research tools were used, including questionnaires, interviews and composition software usage.

Firstly, this article designed a questionnaire that included questions about changes in students’ creative abilities before and after using AI composition tools. According to the American music psychologist James L. Mursell (1934), he once expressed the meaning of "excellent works": "grasp and remember the spirit of an era." "Have emotional profundity..." "Music It has exquisite and perfect texture structure. ""Music lasts longer..."The above summarizes the four aspects of spiritual connotation, emotional expression, compositional expression, and auditory performance. In view of the research questions of this article, they are further refined into rich connotations, infectious, conveying emotions, arousing resonance, and weaving. The self-evaluation questionnaire is designed based on nine questions, including appropriate body, proper structure, timbre matching, good listening experience, and high completeness. The questionnaires are based on Likert scale, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was distributed online through the WeChat class group, thus ensuring rapid and extensive student participation. A total of 106 questionnaires were collected, excluding 26 untested subjects, and 80 valid questionnaires were finally obtained.

Secondly, in order to gain a deeper understanding of students’personal experiences and evaluations, this article also conducted face-to-face interviews. Students in the experimental group and the control group were selected for semi-structured interviews. During the interviews, they were asked about their feelings about using AI composition tools, specific help in the creation process, and satisfaction with the creation results. These interviews helped us capture

details that quantitative data might miss, providing richer context for the study.

Finally, we chose SunoV3, a well-respected AI music tool on the market, often referred to as the "Chat GPT" of the music industry. The tool includes two main music generation modes: Bark focuses on vocal generation, while Chirp is used to generate accompaniments, allowing control students to choose different creative styles and atmospheres based on their individual needs.

Through the comprehensive use of these three research tools, we can evaluate the actual effectiveness of AI composition tools in music education from multiple perspectives, while exploring how these tools specifically affect students' composition skills and creativity. This methodological design not only enhances the validity of the research, but also provides theoretical and practical support for the future application of AI technology in the field of music education.

3.2.1 Grouping and introduction of aids phase

For the undergraduate study stage of the songwriting course, during the semester in accordance with the requirements of the course, to create a personal original song works. After soliciting students' consent, the subject undergraduate students were randomly divided into an experimental group and a control group of 40 students each. The experimental group was taught and introduced to the AI songwriting tool to assist them in their compositions, while the control group was not assisted by this software. Members of both groups performed compositional experiments for the same classroom compositional tasks.

3.2.2 Evaluation Phase

The experimental group and the control group's songwriting results were collected and organized and evaluated according to the results, which were divided into self-assessment and other assessment. For the self-assessment stage, the questionnaire star (www.wjx.com) was set up to test and evaluate after the students in the two groups randomly completed their creations. According to James L. Mursell (1934), a renowned American music psychologist commented on the defining characteristics of excellent works. First, grasp and remember the spirit of an era... Second, has emotional profundity ...Third, The music has a delicate and perfect weaving structure... Finally, The music is more enduring... The above summarizes the four aspects of spiritual connotation, emotional performance, compositional performance, and auditory performance. In response to the research questions in this paper, the authors added the questions of creative thinking, motivation, and degree of completeness, and designed a self-assessment questionnaire. The questionnaire is naturally divided into two groups around the question of whether to compose with the help of Ai composition tools. Based on a Likert scale, the above questions were rated from 1 (strongly disagree) to 5 (strongly agree) to indicate the students' evaluation of various aspects of their own creative achievements. The online questionnaire was released through the online WeChat class group, and a total of 106 questionnaires were recovered, excluding the number of non-tested subjects, 26, and finally 80 valid questionnaires were obtained.

In the other stage of evaluation, a manual judge was used to objectively rate the music creation results collected from the two groups. The dimensions of evaluating a piece of music were mainly centered on the spiritual connotation, emotional expression, compositional performance, aural performance, and overall strengths and weaknesses of the song. In this section we also used the form of Likert scale, the assessment of the meter questions and so on into 1 point (strongly disagree) to 5 points (strongly agree) level, designed a total of 9 questions, the total score of the creative integrity of 45 points. In this thesis, 10 professional listeners (x) are selected, which have instrumental credentials or rich music study

credentials; and 10 non-professional listeners (y), which have no contact with any musical instruments or music professional study, so that they can score the collected works, and the scoring weight of the professional listeners is 1.5 times of that of the general listeners (w), and the objective total score of a piece is obtained according to this scheme. The total objective score of a piece of work, which is the score of a particular piece of music, can be expressed by the formula z=1.5x+y.

3.2.3 Research Tools

In this paper, we analyze the impact of AI composition tools on students' creative ability in the process of music teaching, and the latest version of music generation tool SunoV3 is regarded by many as the ChatGPT in the music industry, and after several iterations, the composition effect is very good. Since many musicians at home and abroad have already used it to compose, this paper chooses this artificial intelligence composition software to assist students in their compositions. At present, Suno mainly has two music generation models, Bark and Chirp, focusing on vocal generation and accompaniment generation, respectively, and in the process of composing Suno allows the creator to determine the style and ambience of the music (Mi, 2024). In addition, compositions obtained through the free version of Suno cannot be used commercially, whereas the subscription version can (Li, 2024). Therefore, in this paper,40 students in the experimental group were allowed to use the free version of Suno to generate compositions related to the composition class and were assisted to complete their songwriting based on Suno's Ai compositional sounds and effects. The control group, on the other hand, composed independently according to the classroom learning content, without the auxiliary support of Suno as a composition tool.

3.2.4 Data processing

After cleaning and organizing the raw data in his evaluation stage, SPSS25.0 was used to analyze the data with descriptive statistics, reliability test, validity test, independent samples t-test test; with the help of Stata17.0 software, the weights of the tunes in the 9 evaluation dimensions were calculated according to the entropy weight method and the final composite scores of each song were calculated.

3.3 Piloting test

3.3.1 Reliability test

In this study, the composer's ability to compose was assessed in four dimensions: spiritual connotation, emotional performance, compositional performance, and aural performance. The raters rated each piece on a scale from “Strongly Disagree” to “Strongly Agree” and assigned a score of 1-5 respectively. The results of the reliability test are shown in the table above. The reliability coefficients of spiritual connotation, emotional performance, compositional performance and auditory performance are 0.907, 0.915, 0.904 and 0.900 respectively, all of which are greater than 0.8, which indicates that the research data has a high quality of reliability.

Table 1. Statistical analysis of reliability test

Item	Number of items	Cronbach α's alpha coefficient
Spiritual connotation	2	0.770
Emotional expression	2	0.889
Composition performance	3	0.914
Auditory performance	2	0.900
Overall	9	0.956

3.3.2 Validity Tests

The validity test of the scale is divided into exploratory factor analysis and validation factor analysis, with the former being applicable when the influencing factors have not yet been summarized, while the latter is for dimensions (or influencing factors) that have been clarified prior to conducting data analysis. In addition, validated factor analysis

includes both discriminant and convergent validity. Distinguishing validity is used to verify that two factors that do not belong to the same category are indeed not in the same category; while convergent validity is used to verify that two influential factors that belong to the same category are in the same category. In this study, we assessed the students' composing ability before and after using the AI composing software from the four dimensions of spiritual connotation, emotional performance, composing performance, and aural performance, and thus conducted a validation factor analysis, the results of which are shown in the table below.

Table 2. Statistical analysis of validity test

	Spiritual connotation	Emotional expression	Composition performance	Auditory performance
Spiritual connotation	0.815			
Emotional expression	0.795	0.896		
Composition performance	0.748	0.806	0.896	
Auditory performance	0.767	0.897	0.856	0.906

Note: Diagonal blue numbers are AVE square root values

Table 3. Statistical analysis of validity test

Factor	Measured item	Std. Estimate	SMC	AVE	CR
Spiritual connotation	Connotation	0.663	0.440	0.665	0.794
Spiritual connotation	Infectiousness	0.943	0.890		
Emotional expression	Emotion	0.904	0.817	0.802	0.890
Emotional expression	Resonance	0.887	0.788		
Composition performance	Texture	0.941	0.886	0.802	0.924
Composition performance	Structure	0.835	0.697		
Composition performance	Completion	0.907	0.823		
Auditory performance	Timbre	0.937	0.878	0.820	0.901
Auditory performance	Listening	0.873	0.763		

From the results of the test of discriminant validity, the AVE values of the four factors of spiritual connotation, emotional performance, compositional performance, and auditory performance are all greater than the correlation coefficients of the columns in which they are located, which indicates that the scales used in this study have a good discriminant validity and can differentiate between the different concepts. The standardized loading coefficients of each measurement item were above 0.8 and all of them were greater than 0.7. The AVE values were all greater than 0.5, and the CR values were all greater than 0.7, which indicated that the convergent validity of this study was high.

In summary, the results of the reliability test indicate that the scale used in this study is not only reasonable in structure, but also has a high level of internal consistency, which can effectively measure the changes in the composition level of college students before and after using the AI composition tool and its influencing factors.

Table 4. Descriptive statistic

Item	Sample	Minimum	Maximum	Average	Standard deviation	Median
Connotation	80	3.000	4.040	3.509	0.291	3.532
Infectiousness	80	3.104	4.288	3.675	0.314	3.664
Emotion	80	3.000	4.312	3.632	0.374	3.632
Resonance	80	2.816	4.056	3.442	0.332	3.428
Texture	80	3.000	4.064	3.682	0.284	3.720
Structure	80	3.120	4.256	3.687	0.282	3.700
Completion	80	3.216	4.464	3.730	0.352	3.732
Timbre	80	2.952	4.456	3.688	0.378	3.684
Listening	80	3.024	4.800	3.700	0.365	3.668

3.4 Data analyses

Before conducting data analysis, the collected questionnaire and interview data were first cleaned. This includes eliminating invalid or incomplete questionnaires, such as those with obviously conflicting responses or incompletely completed questionnaires. For the interview data, we conducted audio recordings and transcripts and extracted key information for analysis. All data cleaning is designed to ensure the accuracy and reliability of the analysis.

Use SPSS25.0 software to conduct descriptive statistical analysis, including calculating the basic demographic characteristics of the participants (such as age, gender distribution, etc.), as well as the mean, standard deviation, and variation range of students' composition ability scores before and after using the AI composition tool. These statistics provide us with a visual overview of the data and help identify trends and patterns in the data set.

To evaluate the impact of using AI composition tools on students' composition ability, we conducted an independent sample t-test on the post-test data of the experimental group and the control group. This statistical test can help us determine whether there is a significant difference in composition ability between the two groups after using the AI tool.

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to evaluate the structural validity of the questionnaire. The composition of each factor in the questionnaire was determined through EFA, while CFA was used to verify the consistency and stability of these factors. Furthermore, the convergent and discriminant validity of the questionnaire was assessed by calculating the average variance extracted (AVE) and composite reliability (CR).

The entropy weight method is used to calculate the weight of each dimension of the questionnaire, and

then the comprehensive score of each musical work is obtained. The entropy weight method is an objective weighting technique that can determine weights based on the information content of variables, which helps reduce the impact of subjective judgment on scoring.

A detailed content analysis of the interview recordings was conducted, focusing mainly on students' experience of using AI composition tools, feelings during the creation process, and personal evaluation of the creation results. Use qualitative analysis software such as NVivo to code and classify data to extract insights about the effectiveness of AI composition tools in music education.

In conclusion, Through the above data processing and analysis methods, this study concluded that using AI composition tools can significantly improve students' composition ability. These analysis results not only demonstrate the potential of AI tools, but also provide scientific basis for the future integration of technology in music education.

4. Results

In the interview, we interviewed four members of the control group, ABCD four members, and asked them about a series of experiences about AI-assisted

Table 5. Survey questionnaire

Questions	Tool	Avg score
1.Objective evaluation of the spiritual of your composition	Before use	3.56
	After use	4.07
2.The degree to which the created work is emotionally engaging	Before use	3.41
	After use	4.18
3.The texture structure of the created work	Before use	3.41
	After use	4.18
4.The orchestration tone of the created work	Before use	3.41
	After use	4.14
5.Feel that the music you wrote can resonate	Before use	3.26
	After use	4.04
6.Creation idea in composition is higher	Before use	3.22
	After use	4.14
7.The composition is highly innovative	Before use	3.21
	After use	4.07
8.The composition is dynamic and expressive	Before use	3.26
	After use	3.93
9.Interest in music creation is higher	Before use	3.6
	After use	4.14

composition, and the specific contents and results of the interview are as follows: About the situation of AI-assisted composing process help; A replied, “It gives me a large number of styles, timbres, and structures to choose from, and these choices sometimes open up my creative mind. Typically, for example, I form different orchestration choices in my head, and when I'm struggling with which one to use, it can be effortless because the AI directly helps me try it out first. I just need to choose the one orchestration that is personally optimal for my hearing to aid my own creation.” On the reasons why AI aids can be helpful; B replied, “The AI composition software has a rich built-in knowledge base of music theory, and I can better understand the presentation and arbitrary combinations of chord structures, melodic lines, rhythmic patterns, and other elements that make up music. This intuitive way of learning helps me in turn to grasp the theoretical knowledge of composition, and I think that's what has helped me.” Regarding the phenomenon of increased satisfaction with creative works after AI-assisted composition software, C replied, “Before I composed without AI-assisted compositions, my compositions were limited to the traditional knowledge of harmony and orchestration, but after I received the assistance of the AI software, I composed works that boldly used new harmonies and orchestrations, which seemed to be closer to the trend and the characteristics of the times. believe that this is the main reason why the control group members, including myself, were more satisfied with their works.” At the same time the study also found that members of the experimental group, were skeptical of AI-assisted compositions, such as D who replied, “It took the instructions we had instilled in us in non-stop rehearsal and came out with a soulless text that was not at all in-depth and devoid of deep human emotions. Though it did in some of its flip sides allow me to experiment with various combinations of musical elements without risk.” To summarize, in further interviews, it can be learned that AI aids can be a big help in terms of creativity, but lack in terms of deep emotional expression.

Table 6. T test analysis results

	AI tool usage (mean ± standard deviation)		*t*	*p*	Cohen's *d* number
	Before use (n=18)	After use (n=18)			
Connection	3.30±0.20	3.71±0.21	-5.984	0.000**	1.995
Infectiousness	3.48±0.23	3.87±0.27	-4.718	0.000**	1.573
Emotion	3.36±0.26	3.90±0.26	-6.265	0.000**	2.088
Resonance	3.27±0.30	3.61±0.27	-3.621	0.001**	1.207
Texture	3.46±0.22	3.90±0.12	-7.307	0.000**	2.436
Structure	3.47±0.20	3.91±0.15	-7.603	0.000**	2.534
Timbre	3.45±0.20	4.01±0.22	-7.900	0.000**	2.633
Listening	3.48±0.30	3.90±0.33	-4.033	0.000**	1.344
Completion	3.44±0.23	3.96±0.28	-6.153	0.000**	2.051
Overall	30.71±1.69	34.78±1.64	-7.332	0.000**	2.444

*$p<0.05$ **$p<0.01$

4.1 Test of independence test

As can be seen in Table 6, the t-test was found to be ($p<0.05$) showing significant differences, and the Cohen's d values were all greater than 0.80 showing a large effect. After using the AI aids, the samples showed significant differences in terms of richness of meaning, infectiousness, conveying emotion, arousing resonance, proper organization, proper structure, matching of tones, good auditory sensation, high degree of completeness, and total score. Further controlled studies could be conducted.

4.2 Ranking of Common Factors and Composite Score

As can be seen from Table 7, the students' works that received AI composition software assisted composition were in the top rank, and 14 of the top 15 were from the experimental group, of which the top three were all members of the experimental group. This indicates that the experimental group using AI assisted composition had significant results in song composition. At the same time, the weaving structure and orchestration timbre of the works were significantly improved after the use of AI composition software. It can be seen from the composite score that the experimental group occupied 93.33% of the top 15. At the same time, AI assisted students' compositions also successfully stimulated their creative interest and the satisfaction level of their works. One of

Table 7. Final scores based on the entropy weighting method

Weight		0.117	0.113	0.129	0.102	0.069	0.097	0.173	0.097	0.104	Score	Rank
Tools	No.	Connection	Infectiousness	Emotion	Resonance	Texture	Structure	Timbre	Listening	Completion		
After	22	4.04	4.288	4.312	3.96	4.024	4.12	4.464	4.416	4.256	0.944	1
After	29	3.856	4.04	4.248	3.984	3.888	4.04	4.2	4.168	4.128	0.819	2
After	27	4.04	3.92	4.272	3.864	4.024	3.88	4.328	4.248	3.776	0.819	3
After	36	3.744	4.016	3.976	4.056	4.024	3.952	4.144	4.456	4.104	0.794	4
After	31	3.984	4.088	4.208	3.936	3.92	3.96	4.088	3.968	4.024	0.791	5
After	35	3.744	4.144	4.08	3.872	3.816	4.024	4.224	4.208	4.024	0.785	6
After	19	3.792	4.08	4.192	3.528	4.064	4.256	3.808	4.024	4.128	0.739	7
After	28	4.024	3.856	3.984	3.744	3.632	3.768	4	3.904	3.96	0.681	8
After	25	3.6	3.936	3.728	3.504	3.96	3.88	4.112	3.88	3.904	0.637	9
After	26	3.808	3.848	3.688	3.52	3.912	3.856	3.984	4.024	3.912	0.636	10
After	33	3.6	4.064	3.792	3.568	3.928	3.92	3.968	3.648	3.76	0.619	11
After	21	3.544	3.736	3.672	3.336	3.904	3.68	4	3.84	4.8	0.606	12
After	30	3.52	3.816	3.608	3.4	3.92	3.816	4.088	3.92	3.96	0.591	13
Before	3	3.768	3.872	3.904	3.68	3.832	3.312	3.976	3.912	3.408	0.579	14
After	20	3.544	3.96	3.88	3.448	3.928	3.792	3.656	3.632	3.632	0.539	15

the things to be noted is that the listeners scored according to their personal preferences and musical feelings, in order to ensure the fairness and accuracy of the scoring, this study calculated the weights of 9 evaluation dimensions according to the entropy weighting method, based on which the final scores of each work created by the students were calculated, and the scores were ranked in the order from the highest to the lowest, and the final results are shown in the table below.

5. Discussion

This study aims to explore the impact of using AI composition software in music education on students' composition ability. Through online questionnaires, controlled experimental design, evaluation methods that combine self-evaluation and other evaluation, and the experimental group (using AI composition tools) and the control group (without using AI composition tools), the following research findings were obtained.

Firstly, the experimental results clearly show that students who use AI composition tools show significant improvements in all aspects of composition ability. This finding strongly confirms the positive role of AI composition tools in improving students' composition skills. Compared with students who did not use AI tools, the works of students in the experimental group received higher evaluation scores in multiple dimensions such as spiritual connotation, emotional expression, composition performance, and auditory performance. This shows that AI composition tools can not only assist students in generating High-quality musical works and play a positive role in cultivating students' understanding of musical structure and style, as well as their mastery of emotional expression and musical logic. This result is consistent with the existing literature on AI improving teaching quality in music education (Wei et al., 2022; Paloma, 2023; Xiao et al., 2023; Yuan et al., 2024), further verifying the role of AI technology in music education application potential in the field.

Secondly, using AI composition tools as students' learning aids not only significantly improves the overall quality of students' music creation, but also stimulates students' interest in learning and enthusiasm for creation, and enhances the integrity and innovation of the works. This phenomenon is similar to the improvement in student performance after the introduction of AI chatbots in piano teaching by Li et al. (2023), which once again confirms the important value of AI technology as a teaching aid to optimize the teaching process and improve learning effectiveness. Therefore, this study provides an empirical basis for the introduction of AI composition tool courses in the field of music education in major domestic universities and provides a practical direction for the innovation of music composition classes.

Finally, this study reveals the great potential of AI composition tools in improving the quality of music education and promoting the development of students' composition abilities and provides several inspirations for further research. Overall, this study reveals the significant role of AI composition tools in improving students' composition ability through empirical data and provides theoretical support and practical reference for the introduction of AI technology in the field of music education. However, the application of AI in music education is still in its infancy and requires continuous exploration and optimization to fully realize its potential and properly deal with possible challenges.

Integrating AI composition tools into music composition classes represents an innovative approach that significantly enhances the resources and methods available for teaching. These tools offer technical support to help students navigate challenges encountered in traditional composition processes, while also enhancing class interactivity and engagement. With real-time feedback and access to a vast database of music styles, AI composition software can immediately illustrate the practical application of

music theory, aiding students in comprehending and mastering complex musical concepts. However, to utilize these tools judiciously under the supervision of professional educators. This ensures that students do not replace their own creative efforts with AI-generated outputs, thereby maintaining respect for originality and personal achievement. By introducing AI composition tools into music classes, educators can substantially enrich teaching content and methods, enhance instructional efficiency and quality, and foster a more open and innovative learning environment. This integration of educational technology not only revitalizes traditional music education but also opens new avenues and possibilities for its future development. Furthermore, the paper recommends that university music programs should introduce specialized courses on AI tools, taught by experienced music instructors. This would help students ethically and effectively harness these advanced technological resources in an ethical and educational framework.

AI composition tools play an important role in enhancing the originality of composition classes. These tools inspire innovative thinking and experimentation in students by providing unlimited possibilities for musical combinations and variations. Students can try different music styles and techniques with the assistance of AI and explore areas that are difficult to cover in traditional classroom teaching. In addition, AI's non-linear thinking and processing capabilities provide new perspectives and inspiration for creation, helping to break the rules and push students to create truly unique and innovative musical works. In terms of teaching, teachers can use AI composition tools to conduct case teaching and demonstrate how to integrate innovative elements into works, thereby enriching students' creative methods and expression forms.

Human-machine cooperation is not a new concept. Licklider (1960) introduced the concept of symbiotic computing. This can also be applied in the field of music, the cooperation of music creation and AI composition tools, which is not only a technical help, but also an innovation in the way of artistic creation. By working with AI, creators can focus more on artistic expression and creative expansion, while technical, repetitive work is left to AI. This collaborative model has greatly expanded the boundaries of music creation, allowing music to transcend traditional limitations and reach unprecedented complexity and diversity. In the future, with the further development and optimization of AI technology, we can foresee that human-machine co-creation will play an increasingly important role in music creation and become an important means to train a new generation of music creators. Similarly, this is also reflected in the field of music education, and a new education model can be considered in the classroom. Chen (2022) adopt the term of Human AI Cooperation (HAC), as to achieve the effect that neither human nor AI can complete independently. To get the best results of music creation.

6. Conclusion

This study reveals several key findings by exploring the use of AI composition tools in music education and their impact on students' composition abilities. Experimental data shows that students who use AI composition tools show significant improvements in all aspects of their creative abilities, including technical proficiency, creativity, and the overall quality of their works. This proves the practicality and effectiveness of AI tools in music education, especially in improving students' composition skills and creative motivation.

The research findings of this article mainly include three parts: including the improvement of composition ability, students who use AI tools have significantly improved their composition ability in all aspects, especially in the understanding of music structure, harmony processing and melody creativity; in addition, it is found that in The learning motivation

and interest of students in the experimental group increased, and the AI composition tool stimulated students' learning interest and creative enthusiasm, indicating that the integration of AI technology can effectively increase the attraction of learning and participation in education; finally, the integration of AI technology improved The quality of music education, students are able to achieve better results in music theory and practice.

Using the Technology Acceptance Model in Music Education, the findings reinforce the applicability of the Technology Acceptance Model in the field of education, particularly in assessing the acceptance and use of new technologies (AI composition tools) by the educational community.

This study provides a specific case of the implementation of AI composition tools in music education, and provides a certain reference for the introduction of new music composition software to assist classroom teaching in music education classrooms; based on the research results of this article, music educators and curriculum developers are encouraged Consider incorporating AI tools into teaching plans to innovate teaching methods and improve teaching effects; the research results can provide data support and theoretical basis for education policymakers when considering how to integrate advanced technologies into the education system.

This study used questionnaire surveys and interview, as well as controlled experiments to test the impact of undergraduate students' use of AI composition software on their composition ability, providing a certain reference for creative education in music classes. Although this study adopted a rigorous experimental design and diversified evaluation methods, there are still certain limitations, including: the small size of the research sample may affect the universality of the study; considering the typicality of the sample, the interview subjects and the experimental subjects mainly focus on undergraduate students, and the coverage is relatively insufficient. In response to the above problems, future research can use the research model constructed in this article to extract variables, combine relevant theories to formulate scales and experiments, and use large-scale questionnaires and experimental verification; finally, it can specifically conduct research on graduate students, or compare undergraduate, master, and the differences between different levels of gambling.

Future research can expand the sample scope to include more types of music majors to enhance the universality and representation of the research results. At the same time, long-term tracking of students who use AI composition tools to observe the lasting improvement of their composition abilities and their actual performance in the music industry after graduation will help to more comprehensively evaluate the long-term impact of AI composition tools on music education. Finally, future research should continue to deepen the study of the impact mechanism of AI composition tools in music education, while paying attention to its application strategies and effect evaluation in actual teaching situations, to promote the in-depth integration and innovative development of music education and AI technology.

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