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The aid of ChatGPT to dance education: a theoretical exploration based on TPACK

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ABSTRACT

This in-depth exploration delves into the transformative possibilities of integrating ChatGPT into the realm of dance education. Examining its roles as a learning ally, creative mentor, knowledge transmitter, and perceptual guide within the unique context of dance instruction, the study navigates through the Technological Pedagogical Content Knowledge (TPACK) framework. It showcases how ChatGPT can elevate teaching efficiency, provide real-time feedback on dance movements, kindle artistic curiosity, and extend emotional support to students. While emphasizing its positive impact, the study also acknowledges potential risks, underscoring the irreplaceable role of educators in guiding students on effective ChatGPT utilization, ensuring it complements the nuanced aspects of dance education. The supporting framework presented highlights the dynamic synergy between ChatGPT, educators, and students, promising a more engaging and enriched dance education experience.

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1. Introduction

The emergence of new technologies often disrupts traditional practices and requires people to adapt and consider the benefits and downsides of new technologies (Qadir 2022). In studies about ChatGPT's use in education, one of the most discussed topics is whether or not it has a value load. From the instrumentalist perspective, ChatGPT has potential positive effects (Alshater 2022; Kasneci et al. 2023; Qadir et al. 2020; Rahman and Watanobe 2023; Susnjak 2022). Valuation scholars have also confirmed ChatGPT's natural value-loaded nature (Chen and Zhao 2023).

However, ChatGPT has inherent characteristics, including natural language processing, that make it more suitable than other technologies for certain text-processing tasks (Abdelghani et al. 2023; Haleem, Javaid, and Singh 2022; Kasneci et al. 2023). Even so, it is not impossible to apply ChatGPT to dance education. Traditional dance education methods involve an asymmetric and incomplete information game between teachers and students. This incomplete information game often leads to conflicts and discrepancies (Y. R. Wang 2023). The integration of ChatGPT in education transforms the incomplete information game into a complete information game. Students can interact with the

system, acquiring the same information as the teacher, thereby fostering a more equitable and fair interaction between students and teachers. This not only enhances educational outcomes but also optimizes the adaptive learning system for students during the teaching process ([Figure 1](#)).

However, the risk of the complete information game lies in the potential replacement of the role and position of teachers by ChatGPT ([Y. R. Wang 2023](#)). While ChatGPT can provide students with learning materials, answers, and explanations, its output is based on the knowledge it has acquired from its training data, which can sometimes result in misleading responses ([Zhong et al. 2023](#)). Therefore, in its use, educators need to guide students on how to effectively utilize ChatGPT as a digital tutor rather than relying solely on it. Teachers should instruct students on how to pose insightful questions, assess ChatGPT's responses, and encourage further critical thinking and in-depth research. This guidance aids in fostering students' independent learning skills, enabling them to leverage ChatGPT more effectively to expand their knowledge and abilities. Consequently, ChatGPT does not supplant the role of teachers but rather serves as an assistant throughout the teaching process.

Furthermore, education is a prolonged process, necessitating the examination of ChatGPT's impact on dance education development from a dynamic game perspective. Dance features distinctive physical qualities and modes of expression, which may prove challenging to fully integrate into digital learning environments. Relying on digital tools for extended periods may lead students to neglect their abilities for independent learning and problem-solving ([Zhong et al. 2023](#)), potentially diminishing their practical dance skills and performance capabilities. Moreover, dance education encompasses not only technical proficiency and performance but also aesthetic education. Digital tools struggle to convey and assess aesthetic concepts and may overlook this vital aspect. Therefore, aesthetic education still requires enhancement through actual observation and direct experiences with dance. Simultaneously, educators should instruct students on how to

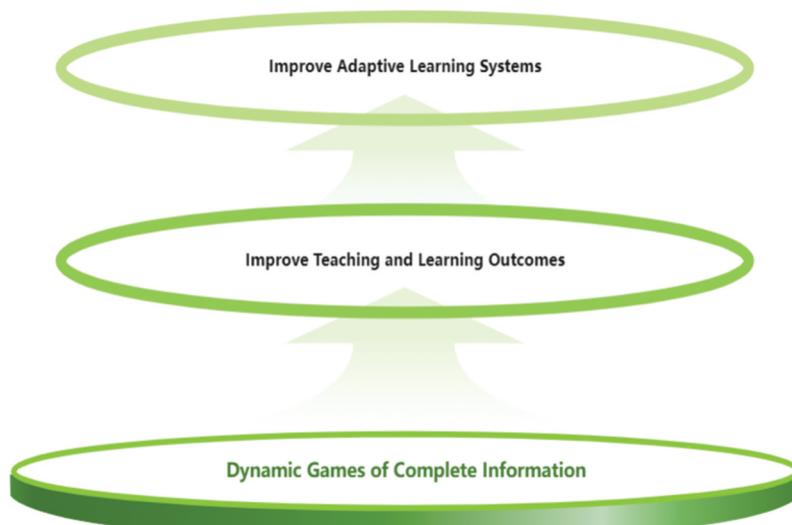


Figure 1. Improvement process.

describe their issues, record videos and images, and utilize ChatGPT for real-time feedback. This personalized guidance can enhance students' skills, build their confidence, and bolster their enthusiasm for learning.

In addition, the inherent nature of dance, as a corporeal medium, underlines its intrinsic qualities of expressiveness and sentiment. Dance serves as a medium to convey emotions and thoughts, while AI is generally perceived as devoid of emotions. Therefore, utilizing AI for aesthetic education is not widely accepted by the public (Chen and Zhao 2023). ChatGPT may not autonomously generate emotions, but it can simulate them and accurately perceive users' emotions, providing human-like responses (Chen and Zhao 2023). Consequently, ChatGPT can be considered an adept 'emotional analysis expert.' In the context of dance education, ChatGPT's emotional analysis feature plays a constructive role. It can offer emotional support and encouragement to students, provide personalized opinions and suggestions, engage in discussions on emotional themes, inspire their creative processes, simulate dialogues and expressions of varying emotional states, and offer inspiration and support for students' dance scriptwriting.

This study aims to explore how ChatGPT can be used in the field of dance education. ChatGPT will be explored in terms of how it can support personalized learning, answer questions and provide consulting, aid in dance movement training, and stimulate creativity. Furthermore, we will analyze ChatGPT's potential applications in assessment and feedback, cross-cultural understanding, and art history.

In educational technology, technological pedagogical content knowledge (TPACK) is one of the most creative and foundational ideas (Mishra, Warr, and Islam 2023; Wong et al. 2014). Instead of focusing on a particular technology, TPACK examines the relationship between pedagogy, technology, and content (Mishra, Warr, and Islam 2023). This makes it an appropriate framework for considering how ChatGPT can support dance education. TPACK specifies three types of knowledge (Figure 2):

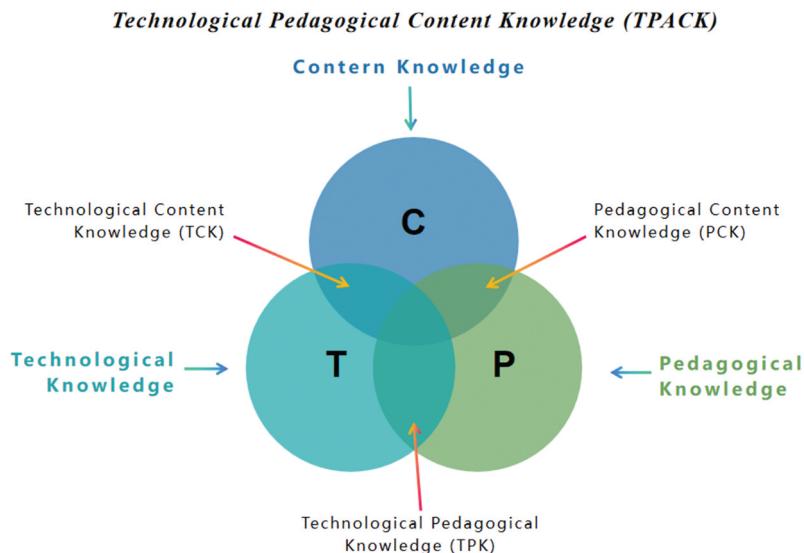


Figure 2. The knowledge components of TPACK.

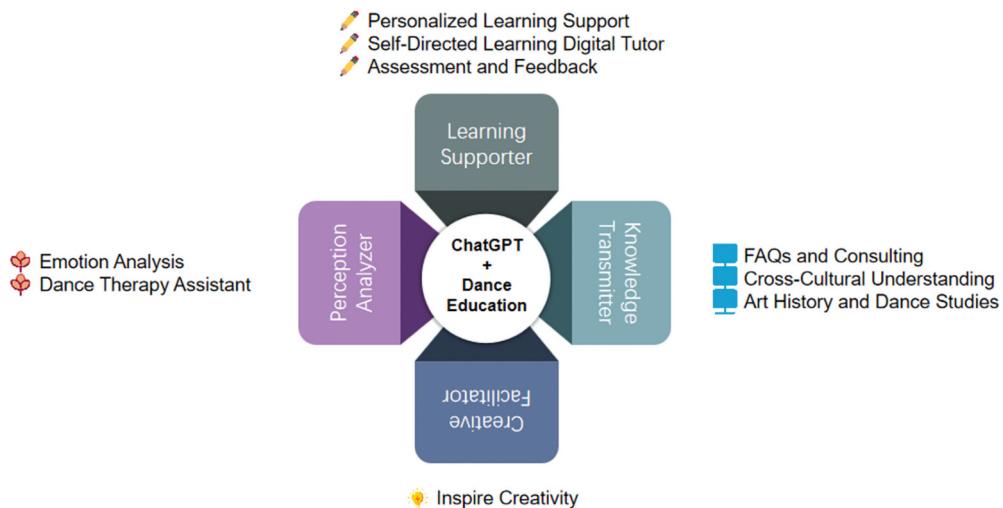


Figure 3. ChatGPT's role in dance education.

technological knowledge (TK), pedagogical knowledge (PK), and disciplinary content knowledge (CK), which are all needed for integrating ChatGPT into a dance classroom.

2. Aid to dance education by ChatGPT

ChatGPT is a more accurate AI chatbot, as it has analytical functions, but also understands and creates, resulting in value creation. Through the years, AI has gained more teaching functions as a tool to assist teachers (Z. Z. Chen, Shi, and Wang 2023). The role of AI technology is becoming more deeply entwined with education, as it moves from the sifter and mover of knowledge to the analyzer of data, and then to the generator and creator of knowledge. As a result, AI technology is evolving from a learning tool into an effective helper and then into a virtual subject involved in learning activities. Thus, ChatGPT has the potential to revolutionize teaching and assist the teaching process (Kasneci et al. 2023). In dance education, ChatGPT also participates in the whole process of dance teaching and learning in multiple capacities (Figure 3), including learning supporter, creative facilitator, knowledge transmitter, and perceptual analyzer.

2.1. Learning support

TPK provides a framework that helps educators and students use ChatGPT more effectively in dance education.

First of all, ChatGPT has powerful organization capabilities (Y. M. Wang et al. 2023) from which teachers can benefit. Teachers can use ChatGPT to organize their teaching content to improve teaching materials clarity and increase teaching efficiency (Kasneci et al. 2023). It can also be used to implement the 'Socratic Method' which is a pedagogical method based on discussion, debate, and even Q&A (Zhong et al. 2023).

Wang et al. (2023) gave ChatGPT the identity of a digital tutor. Mayer (2011) proposed four empirical principles for effective practice, one of which is 'immediate

feedback'. To reinforce what a student has learned in dance theory and dance history, students usually turn in assignments after class. When problems arise, they turn to their educators or textbooks. But in reality, not everyone has a teacher sitting next to them at all times. This may be possible with ChatGPT, a natural language processing model that offers new possibilities for question-answering and counseling. ChatGPT can provide information about dance theory, different styles, and famous dance works. For example, a student asked, 'Why did modern dance develop?' Then, the student gets socio-cultural conditions, more in-depth about the philosophy, and something more thoughtful rather than a list of the prominent figures ([Figure 4](#)).

ChatGPT's digital tutor provides real-time feedback to students. Movements, postures, and expressions are practiced and performed in dance education. In order to improve their dance skills and performance, students often need real-time feedback. It is critical for students to know if their posture is correct, if there are potential problems, or if adjustments need to be made while practicing a dance movement. Despite ChatGPT's inability to analyze videos, students can describe their problems or let it analyze pictures. [Figure 5](#) shows ChatGPT's answers to questions about Fouetté Turns and personalized practice strategies. However, ChatGPT said nothing about the ballet bar. Dancers can use it to break down the fouetté into its essential elements, concentrating on each movement separately before integrating them into a cohesive turn. For instance, attention can be directed towards proper placement of the supporting leg, the coordination of arms, spotting technique, and the crucial whipping action of the working leg. By isolating these components during ballet bar exercises, dancers can refine their technique, build muscle memory, and develop a deeper understanding of how each element contributes to the overall execution of fouetté turns. This methodical approach not only enhances the dancer's technical proficiency but also fosters a comprehensive comprehension of the mechanics involved in this challenging ballet movement.

[Figure 6](#) shows ChatGPT's analysis of the dance movements in the picture. By providing real-time feedback, students will be able to improve their dance skills as well as enhance their self-directed learning experience. Because ChatGPT provides personalized instruction based on each student's performance and needs, it makes dance learning more effective and personalized. By doing this, students can progress faster and build confidence during the learning process. Also, learners know they can access instruction and feedback at any time, so they are less concerned about making mistakes. This is one of the most powerful uses of ChatGPT in the dance education field. However, ChatGPT's response to the dance photo is not entirely correct. In [Figure 6](#), ChatGPT says, 'Her right leg is lifted in front.'. Clearly, it is not true. The picture shows the dancer's right leg kicking backward and the left leg kicking forward. In addition, ChatGPT also says: 'dancer's face with eyes closed.' which is not visible in this kind of photo. In summary, ChatGPT relies heavily on extensive text data during the learning process, and its understanding of image descriptions is relatively limited. Therefore, there may be limitations in describing non-textual information such as dance photos. Hence, it is essential to adopt a dialectical perspective on the role of ChatGPT as a learning supporter. A comprehensive approach involves leveraging ChatGPT's textual knowledge alongside the professional guidance provided by teachers.

 You

Why did modern dance develop?

 ChatGPT

Modern dance developed as a reaction against the rigid structures and conventions of classical ballet in the late 19th and early 20th centuries. Several factors contributed to the emergence of modern dance as a distinct and innovative form of expression:

1. **Rebellion against Classical Ballet:** Classical ballet, with its strict techniques and formalized movements, was dominant in the dance world. Some dancers and choreographers felt constrained by the traditional rules and sought to break free from the limitations imposed by classical ballet.
2. **Expression of Individuality:** Modern dance allowed for greater personal expression and individuality. Dancers and choreographers wanted to explore and convey a wider range of emotions, ideas, and experiences through movement, rejecting the often stylized and narrative-driven nature of classical ballet.
3. **Influence of Social and Cultural Changes:** The late 19th and early 20th centuries were marked by significant social and cultural changes, including industrialization, urbanization, and shifts in gender roles. Modern dance often reflected these changes and sought to address contemporary issues in ways that classical ballet did not.
4. **Connection to Nature:** Some early modern dance pioneers, such as Isadora Duncan, sought inspiration from nature and the human experience. They believed in a more organic and natural form of movement, in contrast to the structured and artificial movements of classical ballet.
5. **Experimentation with Movement and Space:** Modern dance allowed for experimentation with new movement vocabulary and the use of space. Choreographers were interested in exploring the potential of the human body in motion, breaking away from the prescribed steps of classical ballet.
6. **Collaboration with Other Art Forms:** Modern dance often embraced collaboration with other art forms, such as music, visual arts, and literature. This interdisciplinary approach allowed for a more holistic and innovative approach to performance.

Notable figures in the development of modern dance include Isadora Duncan, Martha Graham, Doris Humphrey, Merce Cunningham, and others. These pioneers and their followers contributed to the establishment of modern dance as a unique and influential art form, distinct from the traditions of classical ballet.

Figure 4. ChatGPT's output.

2.2. Knowledge delivery

ChatGPT has powerful search capabilities (Y. M. Wang et al. 2023) from which teachers can benefit. It can provide teachers with updated teaching methods, techniques, and innovative teaching methods based on the latest developments and technologies in education (Rudolph, Tan, and Tan 2023). Students can retrieve information directly through ChatGPT. Figure 7 shows that Students can ask ChatGPT questions about choreography. ChatGPT answered more than just the question about choreography

X When I do fouette, it always falls over after a few turns. How should I go about practicing?

 Performing multiple fouetté turns in ballet can be challenging, and maintaining your balance during these turns is crucial. Here are some tips on how to practice fouetté turns and improve your balance:

1. **Strengthen Your Core:** A strong core is essential for maintaining balance during fouetté turns. Incorporate core-strengthening exercises into your daily routine, such as planks, crunches, and leg lifts.
2. **Spotting:** Spotting is a technique that helps you maintain balance during turns. Focus on a fixed point in front of you and keep your eyes on that point as you turn. Your head should whip around quickly as you turn, returning to the fixed point each time.
3. **Start Slowly:** Begin with single fouetté turns and work on perfecting them before attempting multiple turns. Ensure that you can maintain your balance and control in a single fouetté before progressing to doubles or more.
4. **Arm Placement:** Your arms play a significant role in fouetté turns. Practice the coordination of your arms and legs. Typically, your arms will start low and then move in a circular motion as you turn. They help generate momentum.
5. **Seek Guidance:** Consider taking classes or seeking guidance from a ballet instructor. They can provide personalized feedback and corrections to help you improve your technique.
6. **Practice in Front of a Mirror:** Practicing in front of a mirror allows you to observe and correct your posture, alignment, and spotting technique. It helps you identify areas that need improvement.
7. **Control Your Turnout:** Maintain proper turnout throughout the turns. Avoid letting your working leg collapse, and ensure that your supporting leg stays strong.
8. **Work on Balance Exercises:** Incorporate balance exercises into your training. Standing on one leg, closing your eyes, or using a balance board or cushion can help improve your proprioception and balance.
9. **Progress Gradually:** As you become more confident with single fouetté turns, gradually work your way up to multiple turns. Focus on maintaining control and balance in each turn.
10. **Stay Patient:** Mastering fouetté turns can take time, and it's normal to struggle with them. Be patient and persistent in your practice, and don't be discouraged by initial difficulties.

Remember that ballet requires dedication and consistent practice. It may be helpful to break down the fouetté turns into their components and work on each aspect separately before putting them all together. Seeking feedback and guidance from a ballet teacher or coach can be immensely beneficial in refining your fouetté turns and addressing specific issues with your technique.

Figure 5. ChatGPT's output.

subject matter. In fact, it provided us with advice on everything from the choice of subject to the production staging. At the same time, ChatGPT also mentioned the historical background of *Eighteen Stanzas in Nomadic Reed Pipe - 'Cai Wenji's life in Han Dynasty China, her capture by the Xiongnu, and her eventual return'*. This suggests that ChatGPT can provide cross-cultural knowledge to support students in all aspects of dance creation.

But ChatGPT has opaque properties that its internal workings and decision-making processes are not transparent to users. Consequently, users do not understand how ChatGPT generates a particular response, and this can cause a variety of problems. For



Please help me analyze the dance move in the picture.



Of course! The image depicts a dancer demonstrating a dynamic and expressive leap. Here's a breakdown of the dance move:

1. **Leap:** The dancer is in mid-air, showcasing her ability to gain height. Leaps are a fundamental part of many dance forms, and achieving such height requires both strength and technique.
2. **Front Attitude:** Her right leg is lifted in front with a bent knee. This position resembles the ballet term "attitude," where one leg is raised, either to the front (devant) or to the back (derrière), with a bent knee.
3. **Outstretched Arms:** The dancer's arms are raised above her head and extended fully, creating a line that emphasizes the stretch and length of the entire body.
4. **Arched Back:** Her upper torso and head are tilted backward, adding to the overall aesthetic of the move. The arching of the back not only requires flexibility but also control to maintain the pose while airborne.
5. **Pointed Toes:** The toes of both feet are sharply pointed, which is a hallmark of classical ballet and many other dance forms. This accentuates the line of the leg and adds grace to the move.
6. **Facial Expression:** The dancer's face, with eyes closed, suggests emotion and immersion in the performance. Facial expression is an essential part of dance, communicating the emotion or story behind a movement.
7. **Costume:** The minimalist and form-fitting attire of the dancer allows for a clear view of her physique and lines, emphasizing the contours and definition of her muscles.
8. **Background:** The simple and uncluttered background provides a neutral canvas that draws attention solely to the dancer, allowing viewers to focus on her form and technique.

In summary, the dancer's pose captures a moment of grace, strength, and emotion. It is a testament to her technical skill, physical fitness, and expressive capability.

Figure 6. ChatGPT's output of picture analysis (Picture is the author's own).



I would like to create a choreography based on Cai Wen Ji's poem Eighteen Stanzas in Nomadic Reed Pipe to portray Cai Wen Ji as a great female figure of courage and righteousness. But the poem contains so many elements, how should I do the subject matter?



Creating a choreography based on Cai Wenji's poem "Eighteen Stanzas in Nomadic Reed Pipe" with a focus on portraying her as a great female figure of courage and righteousness is a meaningful and creative endeavor. Given the richness and complexity of the poem, it's important to carefully select and distill the elements that best capture the essence of Cai Wenji's character and the themes you want to convey in your choreography. Here's a step-by-step approach to help you shape the subject matter:

1. **Theme Selection:** Begin by identifying the central theme or message you want to convey through the choreography. In this case, it's Cai Wenji's courage and righteousness. Consider what specific aspects of her life or the poem's content highlight these qualities.
2. **Stanza Selection:** Choose specific stanzas or sections from the poem that best reflect the theme you've selected. Look for verses that describe Cai Wenji's resilience, inner strength, or moments where she exhibited courage and righteousness.
3. **Narrative Structure:** Create a loose narrative structure for your choreography. Think about how you can tell a story or convey the theme through dance. For example, you might start with Cai Wenji's life in Han Dynasty China, her capture by the Xiongnu, and her eventual return.
4. **Symbolism and Imagery:** Consider how you can use symbolism and visual imagery to represent Cai Wenji's character and her journey. For example, the reed pipe, a recurring element in the poem, could symbolize her emotional expression and resilience.
5. **Character Development:** Work with your dancers to develop the character of Cai Wenji. Encourage them to embody her courage, righteousness, and emotions through their movements and expressions.
6. **Emotional Depth:** Dive into the emotional depth of the poem. Capture the moments of longing, sorrow, and strength in your choreography. Make sure the audience can connect with Cai Wenji's experiences on an emotional level.
7. **Music Selection:** Choose music that complements the emotional tone and atmosphere of your choreography. You may want to select music that has both poignant and powerful elements to match the various emotions.
8. **Costumes and Set Design:** Design costumes and sets that evoke the Han Dynasty era and the cultural context of the poem, reflecting the historical and cultural backdrop.
9. **Rehearsal and Artistic Direction:** Dedicate time to rehearsing and refining the choreography, ensuring that the movements and expressions effectively convey the chosen theme and narrative.
10. **Performance and Interpretation:** When performing the choreography, encourage the dancers to connect with the character of Cai Wenji and convey her courage and righteousness to the audience.

By carefully selecting elements from the poem and crafting a narrative that highlights the desired theme, your choreography can effectively portray Cai Wenji as a great female figure of courage and righteousness while honoring the depth of her character and the beauty of the poem.

Figure 7. ChatGPT's output.

The differences in movement direction between Chinese classical dance and ballet can be explained by their historical, cultural, and technical traditions:

1. **Cultural and Historical Traditions:**
 - **Chinese Classical Dance:** The movement style of Chinese classical dance is deeply rooted in ancient Chinese culture and philosophy. In traditional Chinese culture, the earth is seen as flat, with the sky above and the ground below. This perspective is reflected in Chinese classical dance through movements that often involve bending, descending, and connecting with the earth. These movements convey emotions and imagery associated with the earth, soil, and traditional values.
 - **Ballet:** Ballet originated in Europe and was influenced by European culture, courtly dances, and religious rituals. Ballet emphasizes graceful, light, and ethereal movements. Dancers typically stretch upwards to convey a sense of reaching towards the sky or a heavenly realm. This style reflects a European notion of transcending the earthly realm in pursuit of spiritual or aesthetic ideals.
2. **Technical and Artistic Requirements:**
 - **Chinese Classical Dance:** The movements in Chinese classical dance emphasize flexibility, groundedness, and a sense of connection to the earth. Movements often involve squatting and bending at the knees, leading to the saying "the upper body remains still while the lower body is active." This contributes to the stability and depth of movements.
 - **Ballet:** Ballet movements require dancers to exhibit lightness, high leaps, and graceful forms. Dancers often perform high leg extensions, jumps, and turns, which demand upper body extension and body control. These movements require dancers to stretch upwards to highlight their grace and technical prowess.

In summary, the differences in movement direction between Chinese classical dance and ballet reflect their unique cultural, historical, and technical traditions. These differences contribute to the distinctive characteristics and aesthetics of these two dance forms.

Figure 8. ChatGPT's output.

example, in answering a question about the differences between Chinese classical dance and ballet, ChatGPT compared cultural traditions and technical performance requirements (Figure 8). However, it only mentions the characteristics of Chinese traditional culture and philosophy in general, which is disturbing to those who do not understand Chinese philosophy and culture and cannot identify the accuracy of the output content, which ultimately leads to an overreliance on the system's response. Throughout Chinese civilization, Confucianism and Taoism have formed the character and culture of the Chinese people, providing them with a complementary philosophical perspective. Chinese art weaves bloodlines and emotions into every day, melting into a unified aesthetic. Rather than cognitive classical Chinese dance emphasizes emotional feelings. Chinese aesthetics focuses not so much on objects and entities, but on functions, relationships, and rhythms. From 'yin and yang' and 'harmony' to 'momentum' and 'rhythm', the emphasis is on penetration and coordination between opposites. In Chinese classical dance, the movement is circular with rigidity and flexibility, coherence and smoothness, similar to clouds and water in general. This defines the 'beauty of the circle',

wanting to be in front of one another, being on the left before the right, and wanting to go in before going out.

Last but not least, ChatGPT's instability involves inconsistencies and temporal correlations when generating responses. ChatGPT answers may vary slightly based on the input question or how it is phrased. As an example, ChatGPT may provide inconsistent answers when a user asks the same question repeatedly. As a result of this instability, the system may also provide inappropriate answers in different contexts depending on the latest question or context. For instance, when we initially ask ChatGPT, 'Why did modern dance develop?' we receive an answer akin to [Figure 4](#). If, on the other hand, we start with the question, 'How did modern dance develop in the early 20th century?' the response aligns more with [Figure 9](#). When beginning with 'why,' the information tends to delve into socio-cultural conditions and philosophical aspects, offering a more thoughtful exploration rather than a mere listing of prominent figures in the movement. If we inquire 'why' first and then follow up with 'how,' the response resembles [Figure 10](#). Clearly, ChatGPT's answers are more comprehensive in such cases, but they may also omit certain details, such as the formation of schools and companies. Therefore, ChatGPT's responses are influenced by the framing of questions and the context provided.

2.3. Perceptual guidance

ChatGPT is designed to mimic human conversations (Abdullah, Madain, and Jararweh 2022). It can respond to the user's emotions, provide empathy, offer friendly conversations, etc. Its social nature makes ChatGPT ideal for use in education, as it can allow students to interact more intimately, as well as provide emotional support and social interaction. [Figure 11](#) illustrates how ChatGPT provides encouragement and understanding, but also empathy for the student's frustration. It creates a strong connection that provides positive emotional support for the student. Students can benefit from this social interaction by overcoming frustration, maintaining a positive attitude toward learning, and boosting their self-confidence. Meanwhile, ChatGPT also offers personalized advice to students.

2.4. Creative guidance

It has been shown that ChatGPT can be used to stimulate curiosity, enhance students' questioning skills (Abdelghani et al. 2023), help students develop creative thinking (Schutte and Malouff 2020) and critical thinking (Nafisa, Sukestiyarno, and Hidayah 2021), and improve students' self-directed learning skills (Sucipto, Ihsan, and Wiyono 2019). It supports active learning and deeper exploration of dance theory and art. In [Figure 12](#), we asked ChatGPT, 'Who was the most influential modern dance choreographer of the 20th century?' ChatGPT answered this question while also illustrating the subjective nature of this question. Then, we asked more questions such as 'What are your evaluation criteria?'. In this way, students are inspired to explore further and pose more challenging questions that will lead to deeper learning and critical thinking. In dance education, this is important for both knowledge transfer and knowledge deepening.

X How did modern dance develop in the early 20th century?

 Modern dance developed in the early 20th century as a reaction against the strict, formal, and often rigid techniques of classical ballet. It was a significant departure from the traditional dance forms that had dominated the dance world for centuries. Here is a more detailed account of how modern dance developed during this period:

1. **Rejection of Ballet Conventions:** Modern dance emerged as a rebellion against the conventions of classical ballet. Dancers and choreographers wanted to break free from the highly structured and codified movements of ballet, seeking a more natural and expressive form of dance.
2. **Isadora Duncan:** Isadora Duncan, an American dancer, is often credited as the pioneer of modern dance. She rejected the traditional ballet attire, pointe shoes, and formal poses. Duncan danced barefoot in loose-fitting clothing and used free, flowing movements inspired by nature and music.
3. **Denishawn School of Dance:** In the 1910s, Ruth St. Denis and Ted Shawn established the Denishawn School of Dance in Los Angeles. This school became a training ground for many modern dance pioneers and was instrumental in the development of the art form.
4. **Martha Graham:** Martha Graham is one of the most influential figures in modern dance history. She developed her own technique and choreographic style, emphasizing the expression of deep emotions and psychological themes. Her technique, which included contractions and releases, became a cornerstone of modern dance.
5. **Doris Humphrey and Charles Weidman:** Doris Humphrey and Charles Weidman were instrumental in the development of modern dance techniques, including the "fall and recovery" method. Their work explored themes of balance and weight-sharing.
6. **Merce Cunningham:** Merce Cunningham is known for his avant-garde approach to dance. He rejected narrative and emotional content, focusing on pure movement and abstraction. He often collaborated with innovative composers and artists.
7. **Alwin Nikolais:** Alwin Nikolais integrated technology and multimedia into his dance performances, using projections, lighting, and costumes to create abstract and surreal experiences.
8. **World Events and Sociopolitical Factors:** Modern dance was influenced by the socio-political climate of the early 20th century, including the impact of World War I, the quest for personal freedom, and a desire to break with tradition and establish new forms of expression.
9. **Formation of Schools and Companies:** The establishment of dance schools and companies specializing in modern dance, such as the Martha Graham Dance Company and the Alvin Ailey American Dance Theater, helped formalize and popularize the art form.

Modern dance continued to evolve throughout the 20th century and beyond, incorporating new ideas, styles, and movements. It had a significant impact on contemporary dance and remains a vital and innovative form of artistic expression today.

Figure 9. ChatGPT's output.

3. Conclusion

ChatGPT holds significant potential for applications in dance education. Within the TPACK framework, it assumes multiple roles in dance instruction, including a learning supporter, creative guide, knowledge transmitter, and perceptual analyzer.

 You

How did modern dance develop in the early 20th century?

 ChatGPT

Modern dance developed in the early 20th century as a revolutionary departure from the rigid structures of classical ballet. Several key factors contributed to its emergence:

1. **Reaction against Ballet Tradition:** Modern dance was a reaction against the strict techniques and conventions of classical ballet. Dancers and choreographers sought more freedom of expression and a departure from the formalized movements of ballet.
2. **Individual Expression:** Modern dance emphasized individual expression and creativity. Pioneers like Isadora Duncan and Martha Graham believed in using dance as a means of personal and emotional expression, allowing for a broader range of movements beyond the confines of ballet.
3. **Influence of World Events:** The early 20th century was marked by significant social, political, and cultural changes. World War I, in particular, had a profound impact on the arts, prompting artists to explore new forms of expression. Modern dance became a reflection of the tumultuous times and a way to convey the shifting perspectives of society.
4. **Search for Authenticity:** Modern dance pioneers sought a more authentic and natural form of movement. They drew inspiration from everyday life, the human experience, and various cultures, seeking to break away from the artificiality of ballet.
5. **Experimentation with Choreography:** Choreographers like Martha Graham, Doris Humphrey, and Merce Cunningham were instrumental in experimenting with new choreographic techniques. They explored the use of space, time, and movement, pushing the boundaries of traditional dance composition.
6. **Collaboration with Other Arts:** Modern dance often involved collaboration with other art forms, including music, visual arts, and literature. This interdisciplinary approach enriched the dance form and contributed to its evolution.
7. **New Philosophies and Ideologies:** Modern dance was influenced by new philosophical and ideological movements, such as existentialism and feminism. These ideologies encouraged dancers to explore and question established norms and to convey deeper meanings through their movements.

Notable figures like Isadora Duncan, Martha Graham, Doris Humphrey, and others played crucial roles in shaping modern dance as a distinct and influential art form. Their innovations and commitment to breaking away from tradition laid the foundation for the development of modern dance in the early 20th century.

Figure 10. ChatGPT's output.

My classmates were able to do forward salto on their own without teacher's assistance, but I'm still afraid to do the technique on my own after practicing for so long.

It's completely normal to feel apprehensive about trying a forward salto, even if your classmates have mastered it. Overcoming fear in gymnastics or any physical activity is a common challenge. Here are a few tips to help you build confidence and eventually perform a forward salto on your own:

1. **Safety First:** Ensure that you have the right equipment and mats for practicing the forward salto. Knowing you have a safe environment can help ease your fear.
2. **Break it Down:** Break the skill into smaller, manageable parts. Start with basic progressions and drills that lead up to a forward salto. This step-by-step approach can help you build confidence.
3. **Visualization:** Spend time visualizing yourself successfully performing the forward salto. Visualization can help you mentally prepare and reduce anxiety.
4. **Spotting:** If possible, work with a coach or experienced teammate who can spot you during your attempts. Having someone there for support can boost your confidence.
5. **Positive Self-Talk:** Replace negative thoughts with positive affirmations. Tell yourself that you can do it, and focus on your progress rather than your fears.
6. **Practice and Repetition:** Practice regularly and consistently. The more you practice, the more comfortable you'll become with the technique.
7. **Manage Stress:** Learn stress management techniques like deep breathing or progressive muscle relaxation to stay calm during practice.
8. **Patience:** Don't rush the process. It's okay to take your time and progress at your own pace. Every gymnast has their unique journey.

Remember, fear is a natural response to trying something new or challenging in gymnastics. With patience, practice, and the right mindset, you can work towards overcoming your fear and eventually mastering the forward salto. If your fear is too overwhelming, consider discussing it with your coach or a sports psychologist who can provide additional guidance and support.

Figure 11. ChatGPT's output.

In the section on Technological Knowledge (TK), we underscore the generative and social nature of ChatGPT. These attributes render it a highly versatile and robust tool capable of generating creative content, providing real-time feedback, stimulating students' curiosity and thinking abilities, and offering emotional support.

Within the section on Technological Pedagogical Knowledge (TPK), we not only emphasize the positive impact of ChatGPT in facilitating teacher professional development and enhancing teaching efficiency but also acknowledge its role as a digital mentor in students' autonomous learning processes.

Finally, in the part of Pedagogical Content Knowledge (PCK), we discuss ChatGPT's influence on dance education, including the shift from incomplete information games to complete information games. We also mention potential risks, such as the impact on teacher roles. However, given the existing technical limitations of ChatGPT, educators play an irreplaceable key role in the integration of ChatGPT into dance education. Students require guidance from educators on how to effectively utilize ChatGPT and

 It's challenging to single out one choreographer as the "most" influential in the 20th century, as influence can be subjective and dependent on various factors. However, Martha Graham is often considered one of the most influential modern dance choreographers of the 20th century. She is often referred to as the "Mother of Modern Dance" and had a profound impact on the development of modern dance.

Martha Graham is known for developing a unique technique and choreographic style that emphasized emotional expression through movement and the use of contraction and release in the body. Her contributions to the world of dance, both in terms of technique and choreography, have left a lasting legacy and have influenced countless dancers and choreographers.

That said, it's important to recognize that other choreographers, such as Merce Cunningham, Isadora Duncan, Alvin Ailey, and others, also made significant and lasting contributions to modern dance, and their influence continues to be celebrated in the world of dance. The question of who is the "most" influential may vary depending on one's perspective and the criteria used for evaluation.

Figure 12. ChatGPT's output.

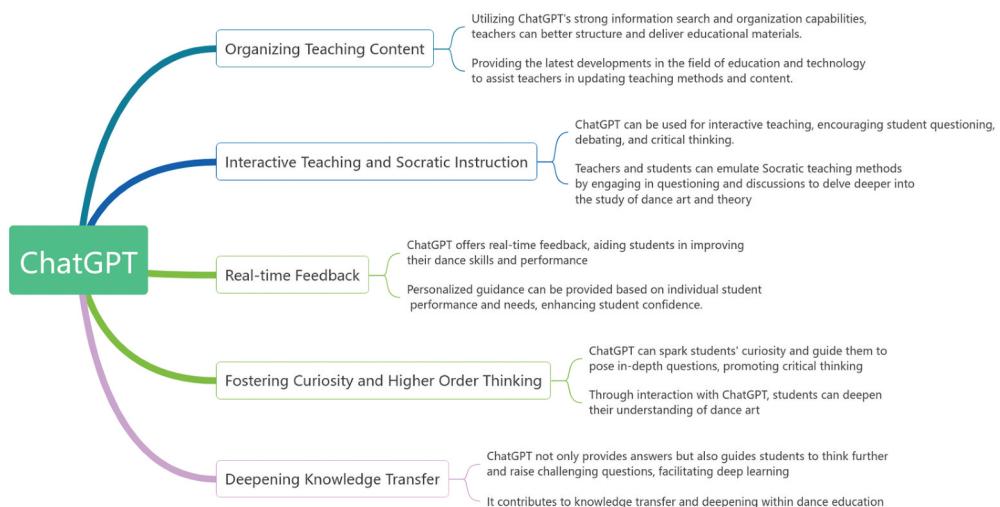


Figure 13. ChatGPT's supporting framework.

maintain their focus on practical dance skills and performance abilities in a technologically augmented environment.

In conclusion, ChatGPT's supporting framework in dance education (Figure 13) emphasizes ChatGPT's multiple potentials for organizing content, facilitating interactive and Socratic pedagogy, providing immediate feedback, stimulating students' curiosity and higher-order thinking skills, and deepening the transfer of knowledge. ChatGPT offers educators and students a powerful digital tool. But its successful integration necessitates prudent guidance from educators and active engagement from students. This approach promotes more effective learning and enriched dance education.

experiences, while also accentuating the increasingly vital role of educators in the teaching process.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

This article does not contain any studies with human participants performed by any of the authors, so consent is not necessary for this paper.

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