

Transdisciplinary thinking

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Introduction

Against the background of the rapid development of contemporary art and technology, the traditional art of painting faces the challenge of marginalisation, while metal music, with its strong emotional tension and complex rhythmic characteristics, offers new possibilities for artistic creation. At the same time, the single-discipline approach gradually exposes the limitation of not being able to effectively deal with complex problems, and transdisciplinary thinking, as a method of integrating multidisciplinary resources, provides a new path to solve this problem. Based on the perspective of constructivism theory, this study explores the connection between metal music and traditional painting in terms of perception and emotional expression, and tries to construct an transdisciplinary framework for the combination of music and visual art, so as to provide new theoretical support and practical paths for art creation and art education. The transdisciplinarity approach not only provides art creators with more diversified expression tools but also enhances the emotional depth and expressive power of artworks through the interaction between music and painting. In addition, in the field of education, transdisciplinarity approaches can help students understand the intrinsic connection between different art forms, stimulate their creativity, and enhance their systematic thinking ability.

In the contemporary context of social and artistic development, the limitations of traditional disciplinary boundaries are gradually revealing their inability to cope with complex problems. The rapid development of technology and cultural diversity has led to an increasing demand for knowledge integration and innovative practices. Traditional painting, as an ancient art form, is facing marginalisation and the limitations of technical expression under the impact of digital technology and emerging art forms. At the same time, metal music, as a unique musical style, with its intense rhythms, complex melodies, and strong emotional tension, shows the potential to be

combined with visual art. How to find a path of dialogue and integration between these two seemingly distinct art forms has become a topic worthy of in-depth exploration. It is in this context that transdisciplinary thinking emerges, which, by breaking down the boundaries of traditional disciplines, provides an open and dynamic approach to research, offering a brand new perspective for the solution of complex problems and artistic innovation.

The text is divided into five chapters. In the first chapter, the relationship between ontological perspectives and transdisciplinary approaches is explored through an understanding of the definition of interdisciplinarity. In the second chapter, this research utilises a transdisciplinary framework to integrate the research object with different disciplinary fields. Chapter 3 further analyses the application of transdisciplinary approaches and their development within this research area. In Chapter 4, the extension and practice of transdisciplinary approaches in related fields are explored. Finally, the study critically assesses the strengths and limitations of the transdisciplinary approach.

1. Definition and Characteristics of Transdisciplinary Thinking

(I) Definition of Transdisciplinarity

Transdisciplinary is an approach to research that transcends the framework of a single discipline and is centred on the creation of a new body of knowledge through the deep integration of multiple disciplines. (Niculescu, 2002) defines it as ‘a way of understanding the world today’, emphasising that the goal of transdisciplinarity is to solve complex problems, which cannot be achieved solely through the integration of a single discipline or a traditional disciplinary framework. In contrast to multidisciplinary and interdisciplinarity, transdisciplinarity focuses on creating new connections and knowledge structures between disciplines. Multidisciplinary refers to the simultaneous application of knowledge from multiple disciplines in problem-solving, but the methods and theories of the disciplines usually operate independently and do not create a new body of knowledge. Art history and physics can work in parallel on a project, but their research objectives and methods are separate. Interdisciplinarity, on the other hand, applies the methods

and tools of one discipline to the problems of another, studying sociological phenomena through mathematical modelling, and despite intersections, the core of the research remains attached to a disciplinary framework. In contrast, an transdisciplinarity approach breaks down the traditional disciplinary boundaries and attempts to form a new paradigm through the reorganization of knowledge and deep integration between disciplines. Such research is not only a combination of tools and methods but also involves the intrinsic connection and interaction of knowledge, culture, and practice in different fields, with the goal of solving real-world problems from a holistic and global perspective.

(ii) Characteristics of Transdisciplinary Thinking

Transdisciplinary thinking is characterised by the openness and dynamism of its knowledge system and the integration between disciplines. It advocates that researchers approach the knowledge and methods of different disciplines with an open attitude and link the seemingly separate parts of various disciplines to generate a new interpretative framework. This openness is reflected in its dynamic integration of knowledge, where the researcher can redefine disciplinary boundaries and knowledge structures according to the specific context of the problem. In addition, transdisciplinary approaches emphasise the interactivity between disciplines. Disciplines are not simply stacked or mechanically combined; rather, a new perspective of knowledge is formed through the process of interaction. In research on the combination of music and visual arts, transdisciplinary thinking is not just about superimposing musical elements and visual symbols, but about reconstructing the understanding of the artistic creation process through in-depth exchanges and transformations between the two. More importantly, transdisciplinary thinking can systematically analyse complex problems and propose innovative solutions. This is because complex problems are often multidimensional and dynamic, making traditional single-discipline research methods inadequate for effective responses. Through the integration of transdisciplinary perspectives, transdisciplinary thinking not only expands the depth of understanding of the problem but also creates entirely new possibilities.

(iii) Theoretical Foundations

At the epistemological level, the transdisciplinary approach advocates the openness and

fluidity of knowledge, arguing that the sources of knowledge should not be fixed within the boundaries of a particular discipline, but rather that the complexity of a problem can be addressed through integration from multiple perspectives. Knowledge from different disciplines is redefined in mutual collision and cross-fertilisation to form a more adaptive interpretative framework. The emotional tension of music can be analysed through the lens of psychology, and at the same time, it can be expressed through the language of visual arts. This cross-disciplinary flow of knowledge can provide researchers with richer perspectives and tools.

At the ontological level, transdisciplinary thinking is based on the constructivist perspective, which emphasises that knowledge is not a fixed objective existence but is dynamically constructed through the interaction between the subject and the environment. In this view, the answer to a research question is not a simple superposition of existing knowledge within the discipline but is constantly constructed, adjusted, and optimised in the course of practice. Taking the research on the combination of metal music and traditional painting as an example, the auditory experience of music is not an isolated sensory stimulus but is constructed as the basis of visual language in the perception and emotion of the artist. The ontological perspective of constructivism emphasises that this conversion process is a dynamic and evolving process, and the significance of transdisciplinary research lies precisely in the generation of a brand new knowledge system through this interaction, thus providing a more comprehensive solution to the study of complex problems.

2. The Connection between metal music and traditional painting and the construction of a transdisciplinary framework

(I) The Connection between Metal Music and Traditional Painting

The close connection between metal music and traditional painting is based on the common pursuit of emotional communication, cultural symbolism, and social issues. The core of this connection is that metal music creates a highly infectious emotional tension through its strong rhythm, complex melody, and rich timbral layers. Such tension not only has an auditory impact

but can also be transformed and presented accordingly through visual language. As a form of visual art, traditional painting possesses an excellent power of emotional expression. However, the emotional elements in metal music, such as anger, loneliness, and resistance, provide colourful emotional material and inspiration for painting. In the art of painting, these emotions are displayed through sharp colour contrasts, the tension of lines, and dynamic elements in the composition. In metal music, strong drums and fast melodies can be represented through the rough and sharp lines in the picture, while the medium-low, sustained bass sound can be transformed into deep colours or calm compositional layouts in paintings. In addition, the cultural symbols of metal music, such as the promotion of the spirit of rebellion, criticism of social inequality, and in-depth study of the inner emotions of the individual, are naturally consistent with the narrative techniques and symbolic expressions in the art of painting. Such a fusion not only allows the paintings to convey emotions in greater depth but also expands the cultural connotations of metal music through the means of visual art.

In the presentation of social issues and cultural identity, both metal music and traditional painting show remarkable similarities and complementary characteristics. The lyrics and melodies of metal music are often related to social issues, class conflict, ecological problems, or mental health - themes that resonate deeply with the concern for social change found in traditional paintings. Through the use of visual expression in paintings, metal music is able to present social issues more vividly and create a deep emotional connection with the audience. The presentation of individual narratives and identities, the loneliness and rebellious spirit of marginalized groups, and the in-depth analysis of individual inner conflicts in the representation of metal music provide new creative inspirations and sources of inspiration for the traditional art of painting. Painting adopts a pictorial approach to visualize and visualize complex emotions and cultural identities, thus allowing music and painting to complement each other in artistic expression and cultural dissemination.

(ii) Construction of a transdisciplinary framework

A model using a knowledge tree places the emotional attributes of metal music at the centre and connects the language and symbols of the visual arts through extended branches of knowledge. In this model, the beat and melody of music are seen as sensory triggers which can be interpreted

as dynamic lines and colour rhythms in paintings, while the emotional core of music can be conveyed through narrative symbols in paintings. In metal, the common sense of repression and release can be shown through the contrasting light and dark layouts in the paintings, while the repetitive melodies in the music can be expressed through the patterned compositional approach. This ability to expand the tree of knowledge is demonstrated by the passive connection between the core attributes of different art forms, which in turn creates entirely new creative opportunities.

The importance of hearing and seeing in cross-sensory interaction can be further highlighted if a dynamic interaction model is used. In this model, the relationship between metal music and painting is not just one-way; they are interacting through the senses to produce cyclical effects. Emotional touches in the music generate visual associations in the creator's perceptual process, which are not only reflected in the final picture but also influence the creator's experience of the music in a reverse way. This dynamic interaction reinforces the close connection between music and painting, allowing them to drive each other in the creative process. In practice, the model not only provides a solid theoretical foundation for artistic creation but also serves as a reference framework for educational practice, helping to cultivate students' cross-sensory cognitive abilities and creative thinking by stimulating their perception of the interactive relationship between different art forms.

By constructing these transdisciplinary frameworks, the fusion of metal music and traditional painting can provide systematic methodological support throughout the entire practical process, from creation to education. In the process of artistic creation, metal music has the potential to be an important source of inspiration for painting, while painting provides a more intuitive visual expression of metal music. In the field of art education, such integration helps students to better understand the transdisciplinary connections between different art forms, stimulates their visual imagination through the emotional guidance of music, and externalises their emotional expression through the language of painting. The value of this practical framework lies not only in expanding the space for artistic creation but also in highlighting the importance of transdisciplinary thinking in fostering the ability to solve complex problems, thus providing new ideas for future collaborations between the arts and other subject areas.

3.How transdisciplinary approaches enhance research

(I) How transdisciplinary Approaches Promote Artistic Creation

In the process of artistic creation, the transdisciplinary approach greatly activates artists' emotions and perceptions through the integration of music and painting, enabling them to explore multi-dimensional expressions more freely in the creative process. Metal music brings a wealth of creative inspiration to the art of painting due to its deep emotional connections, intricate beats, and vibrant melodies. Artists can capture the emotional ebb and flow and rhythmic shifts of music by translating the aural elements of the music into visual expression, which is revealed in the choice of colours, lines, and compositions. Such a fusion not only deepens the depth of artistic expression but also infuses the work with a stronger infectious force, allowing the viewer to experience the emotional resonance of the music through the painting. In addition, the transdisciplinary approach opens up a new language and creative path for artists, enabling them to find a combination of tradition and modernity in the face of the impact of digital technology and the challenges of new art forms. With an transdisciplinary way of thinking, artists have the opportunity to reshape the way they create art, combining the innovative spirit of metal music with the classical values of painting, thus creating masterpieces of art that are more characteristic of the times.

The text appears to be well-written, with no noticeable spelling or grammar errors. However, I would suggest a few minor punctuation and wording adjustments for clarity and style in British English. Here is the revised text:

(ii) Application of transdisciplinarity in Art Education

In the field of art education, the adoption of transdisciplinary teaching methods opens up new ways to cultivate students' creative thinking and perceptual abilities. By integrating music, especially metal music, into the teaching of painting, students can not only gain intuitive perceptual experience from the emotions and rhythms of music, but also understand the intrinsic connection between different art forms. The emotional tension of music helps students convey their feelings more deeply when drawing, while the rhythm and melody provide them with the ability to control the dynamics of the image. In the process, students come to realise that artistic

creation is not only about expression through a single medium, but also about the interaction and transformation of different media.

In order to achieve this educational goal, art education needs to build a more comprehensive and dynamic teaching method. In the teaching process, we can consider the following steps: firstly, students can gain a deeper understanding of the emotional attributes and rhythmic shifts through the appreciation of metal music; then, during the drawing process, we can translate these emotions into concrete visual expressions, for example, depicting the ups and downs of emotions through contrasts of colour, or demonstrating the strengths and weaknesses of the music's rhythms through changes in lines. In addition to this, teachers have the ability to help students broaden their thinking patterns and enhance their creativity by designing transdisciplinary projects that enable them to experience the fusion of music and drawing in a teamwork process. This teaching method not only enhances students' ability to perceive multi-sensory stimuli, but also improves their skills in handling complex artistic challenges.

(iii) Practical case studies

Wassily Kandinsky is considered one of the first artists to explore the fusion of music and painting. In his creative process, music, especially the works of Wagner and Debussy, had a profound influence on him, and he believed that colours and lines could convey deep emotions like music. In his musical compositions, colours are given a role similar to that of musical notes, while lines and compositions mimic the beats and changes of music. His composition *Composition VII* presents a symphony-like visual effect through sharp colour contrasts and complex geometric lines. The results of this experiment show that combining music and painting can break through the constraints of traditional art media and bring people a richer sensory art experience.

Marina Abramović is a performance artist who strives to combine music and visual art in a number of projects, using the emotional depth of music to enhance the expressive power of performance art. In her art project "The Artist is Present," music serves as an emotional bridge between the audience and the artist, further enhancing the immersion of the art experience. Such a fusion reveals how music can be used as a means of emotional expression, infusing visual art with richer depth and layers.

In her music album *Biophilia*, Icelandic musician Björk utilises music, video, and interactive devices to show us a multimedia approach to artistic presentation. Each song is paired with a visual animation in order to better visualise the emotions and rhythmic changes in the music. In the music video ‘Crystalline’, the rhythm of the music is synchronised with the growth of the crystals, which demonstrates the harmonious fusion between the visual and auditory senses. This project not only broadens musical expression but also fuses visual art and music into a complete transdisciplinary experience, thus stimulating the possibility of cross-sensory learning in arts education.

Hao Huang's research shows that some university film and media courses have successfully integrated an transdisciplinary approach to teaching music and visual arts. In this course, students are instructed to explore how film music constructs visual narratives through rhythm, emotion, and melody, and to translate the properties of music into the design of visual effects in a practical, hands-on manner. This teaching strategy clearly enhances students' creative and transdisciplinary thinking skills.

In the past few years, many exhibitions have sought to integrate metal music and visual art, and the exhibition ‘The Visual Language of Metal’ in Berlin in 2019 invited metal bands and visual artists to work together to create visual works based on music. By recreating the emotional and cultural symbols of metal, the exhibition shows how music and painting can work together to communicate social issues and cultural identity. Such a collaborative approach not only allows the cultural value of metal music to be more widely disseminated through painting but also opens up new creative horizons for art creators.

From the examples mentioned above, we can observe that an transdisciplinary approach creates new opportunities for artistic creation and education. In the process of art creation, the integration of music and visual arts greatly enhances the infectious power and expressive ability of the works; in the process of teaching, the use of transdisciplinary teaching strategies not only helps students to establish a systematic mode of thinking but also greatly stimulates their creativity. This series of practical activities provides a strong empirical basis for our theoretical research and application framework, and at the same time highlights the irreplaceability and importance of transdisciplinary approaches in dealing with complex artistic problems.

4. Application of transdisciplinary thinking in other fields

(i) Successful applications in other fields

Music therapy, as a non-invasive therapeutic tool, plays a key role in patients' emotional regulation, stress relief and repair of psychological trauma through the emotional expression and auditory stimulation of music. This therapeutic approach is based on the theory of psychology, using music to awaken patients' sensory and cognitive mechanisms, helping them to convey those emotions and spiritual depths that are difficult to describe in words. Multiple studies have confirmed that in the treatment of depression, autism and post-traumatic stress disorder (PTSD), music therapy is effective in improving patients' psychological well-being and significantly enhancing their quality of life. The core idea of this transdisciplinary approach to practice is to break away from traditional language-mediated psychological treatments and to create a deeper emotional bond with patients through the non-verbal artistic means of music, which demonstrates the innovation and practicality of transdisciplinary means in dealing with psychological challenges.

In the field of education, transdisciplinary thinking and practice have become key scenarios. The traditional model of education is usually based on the categorisation of disciplines and focuses on students' in-depth understanding of knowledge in a particular subject. However, as societal issues become more complex and knowledge structures become more diverse, a single-discipline approach to education begins to reveal its inherent limitations. transdisciplinary programmes are designed to integrate the knowledge and skills of various disciplines to bring about a more holistic and systematic learning environment for students. In some higher education institutions, the transdisciplinary programme 'Science and Art' has been at the forefront of pedagogical reform. By combining scientific experiments, artistic creations and analyses of social issues, students are able to understand the transconnections between different disciplines in a hands-on way. Students not only master the logic of science, but they also nurture their intuition and creative thinking through artistic creation. This transdisciplinary approach provides students with a holistic view of complex problems and enables them to apply knowledge from multiple disciplines to analyse and solve them in depth. The value of this approach is not only in enhancing

the multifaceted abilities of individuals, but more importantly, it lays a solid foundation for future collaboration in multiple fields and promotes a diversified and innovative model of education.

(ii) Impact of transdisciplinary approach

With the help of the integration and dynamic construction of knowledge, the transdisciplinary way of thinking breaks through the boundaries of traditional disciplines and provides researchers with the opportunity to understand and deal with complex problems from a more macroscopic perspective. Its open and flexible nature opens up new paths for academic exploration, allowing knowledge from various fields to grow and evolve in the process of cross-fertilisation. In medicine, the convergence of biology, engineering, and data science has facilitated the advancement of precision medicine, which significantly enhances the effectiveness and efficiency of treatment through in-depth analysis of genomic data and the development of personalised treatment plans for patients. Similarly, in the study of climate change, cross-disciplinary collaboration between ecology, economics, and the social sciences has provided a solid scientific basis for the planning and implementation of global sustainable development goals.

The challenges facing modern societies often cut across multiple dimensions and domains. The global climate crisis is not just a purely scientific issue, but also touches on a number of areas such as economic growth, social justice, and policy formulation. While it is difficult for single-disciplinary research methods to address these intertwined and complex issues, transdisciplinary research methods provide a more comprehensive and multi-perspective approach to problem-solving by integrating knowledge and resources from multiple fields. A transdisciplinary way of thinking does not only emphasize the integration of knowledge; it also emphasizes innovative thinking in practical operations, which helps to apply research results more effectively in practice, thereby bringing about real progress and change in society.

(i) Advantages of an transdisciplinary approach

One of the significant advantages of the transdisciplinary approach is that it can break through the traditional boundaries between disciplines and integrate resources, knowledge, and perspectives from various fields to create innovative solutions. This approach builds a broader thinking structure for researchers, giving them the ability to analyse and solve complex problems

from multiple perspectives. Through transdisciplinary collaboration, researchers are able to find new entry points at the transsection of various disciplines, organically combining the emotional expression of music, the symbolic language of the visual arts, and the cultural context of the social sciences. The integration of music and psychology not only provides a solid scientific foundation for emotion management but also creates a new approach to mental health interventions through the involvement of the arts. In addition, the transdisciplinary research approach provides a rich set of tools and methodologies for practical application, thus enabling research results to be translated into practical applications more quickly. This research approach, with its high degree of integration and flexibility, provides researchers with the ability to respond to the rapidly changing needs of society, especially in a multicultural and technologically updated context, where transdisciplinary research methods have demonstrated great adaptability and innovation.

(ii) Limitations of the transdisciplinary approach

Although the transdisciplinary approach advocates the integration of knowledge structures from multiple disciplines, in practice, unclear boundaries between disciplines may lead to a fragmented research direction. Each discipline has its own unique theoretical framework and research methodology, and it becomes a great challenge to find useful commonalities among these differences. In scientific research, objectivity and reproducibility of data are highly valued, while in art research, people prefer subjective experience and emotional expression. This difference in methodology may trigger conflicts and communication barriers during transdisciplinary collaboration. In addition, conducting transdisciplinary research often requires more time and resources to be invested, as it involves the learning, integration, and application of multidisciplinary knowledge. Researchers not only need to have an in-depth understanding of various disciplines but also need to spend a lot of time coordinating cooperation between different disciplines, which undoubtedly sets a higher standard for their individual research skills and teamwork abilities.

Conclusion

With transdisciplinary thinking at the core, this study explores the connection between metal music and traditional painting in terms of perception and emotional expression, as well as its application value in art creation and education. The study shows that metal music, with its strong rhythm, emotional tension, and cultural symbols, provides new creative inspiration and expression for traditional painting and enhances the emotional depth and expressive power of artworks through an transdisciplinary approach to the transformation of auditory and visual language. Taking constructivism as the theoretical basis, the study constructs an transdisciplinary framework for the combination of music and painting from three levels: perception, emotion, and culture, and argues for the facilitating effect of such an approach on the development of traditional art in a modern context.

In the field of art education, transdisciplinary thinking stimulates students' awareness of the connections between multiple art forms through the combination of music and painting, and enhances their creativity and systematic thinking abilities. This approach not only provides a practical path for art education design but also promotes the diversification and innovation of the teaching mode. This study concludes that transdisciplinary thinking provides innovative solutions to complex art problems through knowledge integration and dynamic construction, while injecting new possibilities for the diversified development of art creation and education. The study further points out that transdisciplinary approaches are equally important in promoting cultural dissemination, solving social problems, and fostering academic innovation, demonstrating the potential for wide application and practical value of cross-disciplinary cooperation.

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