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The Reproduction and Reinterpretation of Kandinsky's 'Yellow-Red-Blue' Painting

Kandinsky'nin 'Sarı-Kırmızı-Mavi' Başlıklı Tablosunun Reprodüksiyonu ve Yeniden Yorumlanması

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ABSTRACT
This article examines the interdisciplinary potential between art and science through the reproduction of Wassily Kandinsky's 1925 masterpiece "Yellow-Red-Blue" using the primary colors of paint—Cyan, Magenta, and Yellow (CMY). The research aims to bridge the gap between traditional artistic expression and scientific methodology in a way that informs and enhances both art creation and art education through contemporary color theory. Kandinsky's original "Yellow-Red-Blue" masterpiece uses Red, Yellow, and Blue (RYB) to symbolize the vibrancy and emotional depth achievable through color contrasts and harmonies. In contrast, this study's reproduction using CMY aims to uncover new perspectives on color interactions, perception, and educational values. The research quantitatively evaluates changes in hue, saturation, and brightness when RYB is replaced with CMY, utilizing a methodological approach based on scientific color knowledge, including the color spectrum and comparative analysis. The reproduction process is documented to assess the impact of these color changes on the viewer's perceptual and emotional experience. The findings of the research are expected to contribute to a deeper understanding of Kandinsky's techniques and the theoretical foundations of color use in art. Additionally, the findings are integrated into the STEAM education framework, which promotes pedagogical approaches where art and science dynamically interact.
Keywords: Interdisciplinary artistic and scientific integration, Kandinsky reproduction, modern color theory, STEAM education

ÖZ
Bu makale, Wassily Kandinsky'nin 1925 başyapıtı "Sarı-Kırmızı-Mavi"nin boya ana renkleri olan Cyan, Magenta ve Sarı (CMY) kullanılarak yeniden üretilmesi yoluyla sanat ve bilim arasındaki disiplinlerarası potansiyeli incelemektedir. Araştırma, çağdaş renk teorisi aracılığıyla hem sanat yaratımını hem de sanat eğitimini bilgilendirip geliştirecek şekilde, geleneksel sanatsal ifade ile bilimsel metodoloji arasındaki boşluğu kapatmayı amaçlamaktadır. Kandinsky'nin orijinal "Sarı-Kırmızı-Mavi" eserinde Kırmızı, Sarı ve Mavi (RYB) kullanımı; renk karşıtlıkları ve uyumları aracılığıyla ulaşılabilecek canlılık ve duygusal derinliği simgelemektedir. Buna karşın, bu çalışmanın CMY ile gerçekleştirdiği röprodüksiyonu; renk etkileşimleri, algı ve eğitimsel değerler üzerine yeni bakış açıları ortaya çıkarmayı hedeflemektedir. Bu araştırma renk spektrumu ve karşılaştırmalı analiz de dahil olmak üzere, bilimsel renk bilgisini temel alan metodolojik bir yaklaşım kullanarak, RYB'nin CMY ile değiştirilmesi durumunda renk tonu, doygunluk ve parlaklıkta meydana gelen değişiklikleri niceliksel olarak değerlendirmektedir. Reprodüksiyon süreci, bu renk değişikliklerinin izleyicinin algısal ve duygusal deneyimi üzerindeki etkisini değerlendirmek için belgelenmiştir. Araştırmada elde edilen bulguların, Kandinsky'nin tekniklerine ve sanatta renk kullanımının teorik temellerine dair daha derin bir anlayışa katkıda bulunması beklenmektedir. Ek olarak, bulgular sanat ve bilimin dinamik bir şekilde etkileşime girdiği pedagojik yaklaşımları teşvik eden STEAM eğitim çerçevesine entegre edilmiştir.
Anahtar Kelimeler: Disiplinlerarası sanat ve bilim entegrasyonu, Kandinsky reprodüksiyonu, modern renk teorisi, STEAM eğitimi

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Introduction

Science and art, as powerful and elegant tools created by humans, enable us to gain a deeper understanding of nature, life, and its many components. When the synergy between these disciplines is nurtured and developed together, it creates an environment that fosters innovative thinking and supports the examination of new situations from various perspectives. The concept of color, inherently powerful, represents a critical intersection in this interdisciplinary interaction. Recognized not only as a fundamental element of art but also as a core subject in physics, color attracts the interest of both artists and scientists, thus becoming a compelling topic for collaborative discoveries across various fields (Birren, 1976; Ball & Ruben, 2004; Koyunkaya et al., 2019). Additionally, various forms and expressions of art education play a central role in developing an environment that not only appreciates and creates art but also comprehensively understands it (Sweeny, 2013). This integrated approach is embodied in STEAM education, which stands for Science, Technology, Engineering, Art, and Mathematics. STEAM education aims to enrich the diversified outcomes stemming from art workshops, promising holistic improvement in creativity and interdisciplinary collaboration (Rolling, 2016).

The increasing dialogue between art education and science highlights a significant shift towards the integration of multiple disciplines, signaling a new approach in education. In this context, Penketh (2023) emphasizes the vital combination of science, technology, art, and design education, advocating for a holistic method that integrates these fields. This perspective underscores the importance of fostering creativity and innovation, highlighting the role of art and design in the comprehensive understanding of technological and scientific concepts.

Matthews et al. (2023) emphasize the importance of integrating art, science, and technology, arguing that artists play a critical role in collaborations within these fields. Artists are in a vital position to interpret, refine, and ensure the quality of the results. Thus, the integration of art, science, and technology highlights the indispensable value of human creativity in overcoming complex design challenges.

Similarly, Saris et al. (2023) investigate the complexities of learning the creative design process within socio-cultural and historical contexts, using Cultural Historical Activity Theory (CHAT) to reveal how these processes are deeply shaped and embedded by these contexts. Their analysis, based on a study of visual communication design students in an international educational setting in China, highlights the vital role of contextual influences on creative activities. Additionally, they emphasize the importance of considering socio-cultural and historical dimensions in the design process, advocating for a more nuanced understanding of creativity that integrates art, science, technology, and design within a globalized educational landscape. On the other hand, Garcia-Lazo et al. (2024), using a/r/tography—a methodology based in art—underscore the importance of a more integrated and interdisciplinary perspective in art education, particularly within a culturally diverse educational landscape.

Within the framework of this research, an examination and comparison were conducted between Wassily Kandinsky's iconic 1925 work "Yellow-Red-Blue" and its 2021 reproduction using the CMY (Cyan, Magenta, and Yellow) primary color model. Our aim was to illuminate the interdisciplinary connections between art and science, particularly based on contemporary color theory. We propose that by incorporating scientific methodologies into art-focused narratives, fine arts educators and prospective art teachers in higher education environments can enrich their pedagogical content. This approach will not only develop multifaceted thinking skills but also facilitate the exploration of the diverse intersections between various fields of life, thereby broadening educators' horizons.

Method

Kandinsky and His "Yellow-Red-Blue" Artwork

Wassily Kandinsky, known for his dual role as a pioneering artist and theorist, exhibited a profound fascination with color experiments (Ball & Ruben, 2004). Collaborating with Johannes Itten, a significant figure in the early years of the Bauhaus School, Kandinsky offered a unique interpretation of color in art, which has had a substantial impact throughout the 20th and 21st centuries (Katinaitė, 2015).

At the Bauhaus, Itten and Kandinsky engaged in a productive exchange of artistic methods, supported by Itten's educational philosophy that art itself cannot be directly taught, but its techniques can be facilitated (Erden, 2008). Itten's technical approach involved dividing paint colors into 12 segments, resulting in a color wheel containing 12 hues. This color wheel included three primary colors (Red, Yellow, and Blue), three secondary colors (Green, Orange, and Purple), and six tertiary colors (Red-Orange, Yellow-Orange, Yellow-Green, Blue-Green, Blue-Purple, Red-Purple) (see Figure 1). Itten expressed that, in addition to saturated colors, light and dark tones, warm and cool colors, and the interactions of complementary colors on the color wheel create visual dynamics and contrasts in a painting. He suggested that warm colors symbolize advancement, while cool colors express melancholy and sadness (Itten, 1970). Furthermore, Itten's color star was just one of the adaptations of the traditional color wheel that emerged from the pedagogical collaboration among Bauhaus masters and students (Casciato, 2022).

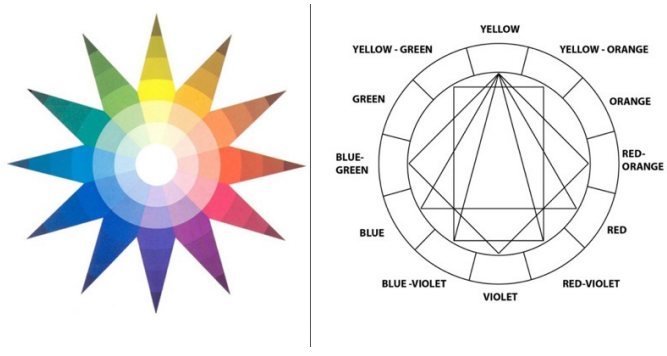

Image 1.
Johannes Itten's Color Wheel (adapted from "The Elements of Color")[1]

At the Bauhaus, Kandinsky adopted an analytical and scientific approach to color composition, thereby playing a central role in color education (Ball & Ruben, 2004). His oil painting "Yellow-Red-Blue" has left a lasting mark in art history as a monumental work illuminating the universe of colors and has maintained its relevance to this day. This artwork, measuring 4x6.5 inches,

1 Johannes Itten's Color Wheel (Retrieved from "The Elements of Color")

holds significant importance as one of the most original pieces housed in the Paris Museum of Modern Art (Baldacchino, 2015). As a leading figure in geometric abstract art, Kandinsky's "Yellow-Red-Blue" created harmonies among the primary colors defined by Itten (1970). Kandinsky strategically used lines to enhance the effects of colors—outlining and defining color boundaries with lines of varying thickness, straightness, and curvature. The background stands out due to an exceptionally thin, fluid paint application that prevents blending with other colors, making the use of white unnecessary. Consequently, the painting's aesthetics are intensified with vibrancy and vividness, achieved through fluid paint applied with fine lines that define the geometric contours of the colors.

Cyan-Macenta-Yellow (CMY) Color System

The investigation of the underlying mechanisms of colors owes much to the pioneering contributions of physicists such as Young, Helmholtz, and Maxwell, who established the connection between physical phenomena and the perceptual experiences of colors (Rosi et al., 2016). In contemporary understanding, the concept of color is based on the principle of complementarity, which can be detected through spectrometry techniques (Babić & Cepić, 2009). While the primary colors of light, RGB (Red, Green, Blue), additively combine to form white, the primary colors of paint, CMY (Cyan, Magenta, Yellow), subtractively combine to form black. All color mixtures obtained with CMY paint colors are found within the color spectrum of the rainbow created by the sun and are perceived by the human eye (Ruiz & Ruiz, 2015). In this context, painting with the primary CMY colors and their mixtures is akin to painting with all the colors found in the details of a rainbow. In this system, the complement of a mixture of any two primary colors is always the third primary color (Meyn, 2008). This conceptualization, developed through complementarity, gains further significance in the historical context of painters' fascination with colors and the mastery involved in the production of pigments and paints being considered a remarkable achievement (Birren, 1976). Historically, the allure of colors and the mastery in their use have made the relationship between color theory and the interplay between art and science even more prominent. In this research, the authors aim to illuminate the synergy between science and art through color, with the goal of enhancing future paradigms in art education.

What Would Kandinsky's Painting Look Like If Cyan, Magenta, and Yellow Colors Were Used Instead of Yellow, Red, and Blue?

This research explores a hypothetical scenario in which Wassily Kandinsky, while creating his iconic "Yellow-Red-Blue" oil painting, opted to use the primary paint colors Cyan, Magenta, and Yellow (CMY) instead of the original Yellow, Red, and Blue palette. To address this question, one of the contributing artists meticulously worked on a reproduction of Kandinsky's masterpiece, adhering to the original dimensions of 4 x 6.5 inches. The reproduction was completed using only the primary CMY colors and their mixtures, without the use of white pigment (see Figure 2).

Through the process of reproducing a work of art, individuals engage with the original form as envisioned by the artist. This interaction provides access to the aesthetic pleasure and spiritual enrichment offered by art, which has significant implications for the field of art education (Schwarcz, 1982). During the reproduction effort, it was revealed that Kandinsky used geometric elements in a constructive technique to form the foundation of his work; within this framework, interconnected networks emerged. Kandinsky's exploration of the RYB (Red, Yellow, and Blue) color spectrum served as focal points in the artwork, positioning these primary paint colors prominently, while secondary and tertiary hues played a supportive role. The differentiation of each color value was achieved by diluting the pigments to create various tones in specific areas. In addition to the strategic contrasts of warm and cool colors, the primary paint colors were freely and fluidly applied in complementary oppositions. The formation of shapes was determined by the use of color: red for squares, blue for circles, and yellow for triangles. The deliberate placement of colors according to their complements and the application of thin or thick black lines to define color surfaces contributed to a composition that draws the viewer's attention with vibrancy and depth.

Image 2.
The Reproduction Process of Kandinsky's "Yellow-Red-Blue" Painting[2]

Kandinsky's Source and Outcomes of the Violet Color

In the reproduction of Kandinsky's masterpiece, precise color matching played a critical role, necessitating the use of a ColorMeter application designed to accurately measure the hue, saturation, and brightness of the colors. This application, used on mobile phones, facilitated the detection of subtle variations in the violet spectrum employed by Kandinsky. Specifically, ColorMeter readings revealed that warm violet contained a higher dominance of magenta, while cool violet had more cyan. This indicates that the color ratios were consciously manipulated to achieve the desired effects (see Figure 3). Kandinsky skillfully achieved harmony by using warm violet and cool violet alongside complementary tones in various parts of the painting. This technique, consistent with the physiological principles defined by Ewald Hering, promoted the perception of gray tones that create a visually soothing balance (Kingdom, 1997). The accurate reproduction of violet, as defined by Itten (1970), required the careful mixing of Cyan and Magenta in precise proportions. Through meticulous examination and imitation of the original work, these colors were faithfully recreated in the reproduction, establishing a deep connection with Kandinsky's color theory and practice, which has helped us better understand the piece (see Figure 3).

2 The Reproduction Process of Kandinsky's "Yellow-Red-Blue" Painting by One of the Authors

Image 3.
The reproduction of Itten's Red-Violet, Violet, and Blue-Violet colors on canvas using the primary paint colors Cyan and Magenta from the CMY color spectrum

Artists harness the power of various color tones to convey emotional depth and create visual illusions, often experimenting with different pigments to compose their works (Blood, 2003). In this context, the artist initiated a detailed and prolonged study through the reproduction of Wassily Kandinsky's "Yellow-Red-Blue," aiming to delve deeper into the complexities of this pioneering work. This process provided an opportunity to closely examine the symbolic features of a particular era and the techniques and pigments used by Kandinsky. The artist's meticulous reproduction, utilizing the CMY primary color model instead of Kandinsky's original RYB primary color model, led to the emergence of several significant findings:

- The reproduction was faithfully executed to reflect the original's dimensions, techniques, and thematic elements.

- Kandinsky used the traditional RYB primary colors, while the reproduction employed the CMY primary paint colors.

- In both works, light tones were created by using liquid materials such as paint and oil in appropriate proportions.

- In the original painting, gray tones were produced by adding white, whereas in the CMY reproduction, white pigment was not used; this method was deliberately avoided.

- Both works employed neutralizations through vibrant color contrasts in various sections.

Comparative analysis (see Figures 4 and 5) indicates two main findings: The reproduction using CMY primary paint colors did not use white pigment, demonstrating that the CMY color theory offers a more comprehensive framework than Itten's RYB model (1970). Additionally, Kandinsky's techniques remain relevant and continue to support the creative efforts of contemporary artists and educators.

Image 4.
Kandinsky, "Yellow-Red-Blue" painting, 1925, 4 x 6.5 inches, oil on canvas[3]

Image 5.
Reproduction with CMY colors, oil painting, production date: 31.10.2019, 4 x 6.5 inches

Results

A comparative analysis of Wassily Kandinsky's "Yellow-Red-Blue" painting and its CMY-based reproduction, focusing on the use of color (see Figures 6 and 7), highlights the artist's profound mastery over color harmony, especially in neutralized areas. The study, conducted using Adobe Photoshop to compare colors in designated areas of both the original masterpiece and the reproduction, predominantly reveals the presence of gray tones and findings that indicate a careful neutralization process. This type of neutralization (achieving a composite gray free from any dominant color reflection) highlights Kandinsky's exceptional expertise in color balance. By using complementary paints, Kandinsky created a harmonious interaction of light (RGB) emanating from the surface of the work, thereby imparting a fundamental aesthetic attribute to the piece. The homogeneous gray coloring in the selected areas of both the original painting and the reproduction has been highlighted through measurements that, upon closer inspection, reveal only minimal differences. This meticulous approach to color application not only demonstrates Kandinsky's mastery but also underscores the significance of the overall visual and aesthetic impact of the artwork.

Image 6.
Color comparison of the areas in Kandinsky's original "Yellow-Red-Blue" painting (left) and the reproduction (right)

Area-based color comparison of Kandinsky's "Yellow-Red-Blue" painting and its reproduction (without neutralization).

A color comparison analysis of specific areas of Wassily Kandinsky's "Yellow-Red-Blue" painting and its corresponding reproduction, conducted without the use of neutralization techniques, was performed using Adobe Photoshop. This analysis revealed the presence of tones other than gray in both artworks. Despite

3 Kandinsky's "Yellow-Red-Blue" Painting. Retrieved from https://commons.wikimedia.org/wiki/File:Kandinsky_-_Jaune_Rouge_Bleu.jpg

the prevalent gray composite observed throughout the paintings, certain sections revealed the presence of dominant colors. These dominant hues were strategically used alongside complementary colors in adjacent areas to achieve the reconstructed gray (neutral) composite. This phenomenon is demonstrated in the detailed examination of selected regions (see Figures 8 and 9); the absence of gray in isolated sections indicates the strategic placement of complementary colors elsewhere in the composition. Such an analytical approach not only elucidates Kandinsky's strategies for color orchestration but also highlights the intricate balance and interaction of colors on the canvas, contributing to the overall integrity and visual harmony of the artwork.

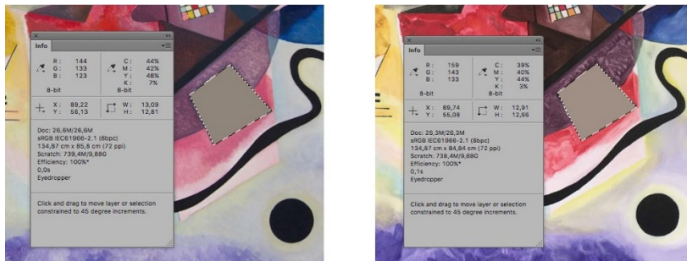

Image 7.
Comparison of colors in specific areas of Kandinsky's "Yellow-Red-Blue" painting, original (left) and reproduction (right)

Image 8.
Comparison of color in specific areas of Kandinsky's original painting 'Yellow-Red-Blue,' with the original work on the left and the reproduction on the right

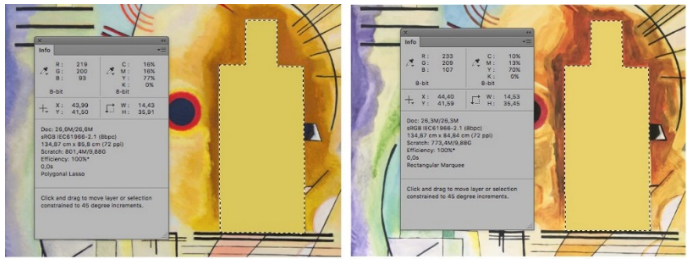

Image 9.
Color comparison of specific areas in Kandinsky's original "Yellow-Red-Blue" painting, original work (left) and reproduction (right)

Association with Learning Standards and Future Learning Experiences

In the evolving structure of art education, an approach that interweaves multi-layered levels of conceptual learning provides a rich environment for individual reflection and interaction within a broader artistic and societal context, as supported by Hanning (2020). This interaction with art deepens when educators implement practices that reflect contemporary realities and leave room for the creation of new meanings (Gude, 2013). Based on our experimental and comparative analyses, asking open-ended questions aligned with the National Core Art Standards can significantly enrich educational environments and invite a dynamic exploration of artistic concepts (National Coalition for Core Arts Standards, 2014).During the creative phase, students might be asked to reimagine the title of Kandinsky's "Yellow-Red-Blue" painting, encouraging them to think about alternative names that reflect their unique interpretations of the artwork. This exercise not only prompts students to delve deeply into the color dynamics of the painting but also encourages them to identify and discuss the presence of primary and secondary colors, thereby enhancing their knowledge and understanding of color theory. If students were to undertake the creation of this painting themselves, further inquiry into their starting points and color choices would illuminate their artistic decision-making processes and conceptual approaches.

The presentation and response stages invite students to explore how Kandinsky utilized Itten's color theory and to identify areas where the artist innovatively deviated from this theory. Such discussions not only enhance students' analytical skills but also deepen their appreciation for the evolutionary nature of art. Questions about the role of contemporary science and technology in the reproduction of art masterpieces highlight the multidisciplinary nature of art education and emphasize the intersections between art, science, and technology. This interdisciplinary, inquiry-based methodology advocates for a flexible, adaptive, and open-minded curriculum, essential for integrating new ideas and practices into art education (Marshall, 2006). By integrating art with scientific principles and comparing historical artworks with modern color theories, educators adopt STEAM-centered pedagogies. These approaches, emphasized by the National Art Education Association and supported by Rolling (2016), advocate for interdisciplinary methods that promote a more integrated educational experience. Through such a curriculum, students not only engage deeply with art but also understand its connections to other fields of knowledge and contemporary advancements, thereby embarking on a holistic educational journey.

Discussion

The findings of this study highlight the profound impact of integrating contemporary color theory with art practice and pedagogy, as evidenced by the reproduction of Kandinsky's "Yellow-Red-Blue" painting using primary colors (CMY). This interdisciplinary approach not only offers innovative insights into color interaction and perception but also underscores the educational value of such integrations. The use of CMY in the reproduction of Kandinsky's "Yellow-Red-Blue" painting has shown significant changes in hue, saturation, and brightness compared to the original RYB palette. These changes affect the viewers' emotional and perceptual responses, suggesting that different color models can indeed alter the interpretation of an artwork. The vivid contrasts and harmonies achievable through RYB form the foundation of Kandinsky's expressive style; however, the CMY color palette offers a new visual experience by highlighting different aspects of color dynamics. Integrating the findings of this reproduction into STEAM education underscores the potential for enhancing both artistic and scientific understanding. Exploring the scientific foundations of color theory through artistic creation allows students to more richly appreciate the complexities of artistic choices and their perceptual impacts. As modeled in this study, the practical application of color theory through art-making provides a compelling example for integrating scientific principles into art education

curricula.

Bringing together art and science through color theory facilitates a comprehensive educational approach that fosters creative and critical thinking. The methodology of this study, which combines theoretical analysis with practical application, serves as a model for how art education can incorporate scientific inquiry without compromising its artistic essence. This approach not only enriches students' learning experiences but also provides opportunities to prepare them for a world where interdisciplinary skills are increasingly valued.

Results and Recommendations

This study highlights the profound connection between art and science through the meticulous recreation of Wassily Kandinsky's seminal work "Yellow-Red-Blue" using the Cyan, Magenta, and Yellow (CMY) primary paint color model. Our findings illuminate the enduring significance of Kandinsky's color theories and methodologies, demonstrating that even when using a different color model (CMY) than the original RYB palette, the integrity and vibrancy of the work can be preserved, offering fresh perspectives on the application of color in art (Birren, 1976; Ball & Ruben, 2004). Moreover, this effort reveals the potential for integrating scientific principles, such as contemporary color theory, into art education, fostering interdisciplinary interactions and creativity, and enhancing the understanding of artistic processes (Sweeny, 2013; Koyunkaya et al., 2019). Additionally, experimental applications not only validate the compatibility of art with scientific inquiry but also demonstrate the utility of STEAM (Science, Technology, Engineering, Art, and Mathematics) education in bridging gaps between diverse fields of study (Rolling, 2016).

Using the results obtained from the reproduction of Wassily Kandinsky's "Yellow-Red-Blue" painting with the CMY primary color model, this study emphasizes the symbiotic relationship between art and science, particularly focusing on color theory. The findings reveal that an interdisciplinary approach, integrating contemporary color theory and scientific methodology into art education, not only deepens students' understanding of color dynamics but also expands their analytical and creative capacities. Consequently, it is recommended that art education curricula adopt STEAM pedagogies to promote holistic learning environments that combine scientific principles and artistic processes. By encouraging collaborative projects that encompass both art and science disciplines, new perspectives and methodologies can emerge, enhancing students' innovative thinking and problem-solving skills. Additionally, employing scientific methods and technological tools in the examination of artworks can provide a tangible bridge between theoretical concepts and practical application, enriching the educational experience. By adopting these recommendations, educational institutions can develop a learning atmosphere that reflects the complexity and interconnectedness of the world, enabling students to contribute meaningfully to the evolving nature of knowledge. This study reaffirms the holistic relationship between art and science and highlights the innovative potential arising from their interaction. The reproduction of Wassily Kandinsky's "Yellow-Red-Blue" painting using Cyan, Magenta, and Yellow (CMY) primary colors sheds light on the enduring importance and applicability of Kandinsky's artistic principles in the context of contemporary color theory, demonstrating the capacity of art education to transcend traditional boundaries by incorporating scientific methodologies.

The findings of this research underscore the importance of integrating interdisciplinary approaches into art education throughout the lifelong learning process. By involving students in the reproduction of art masterpieces and applying modern scientific outcomes such as the CMY color model, educators can enable students to experience the interconnectedness of different fields of knowledge more profoundly. This approach not only enhances creativity and critical thinking but also prepares learners to navigate the complexities of the modern world with a more holistic and informed perspective. Consequently, the experience of reproducing Kandinsky's "Yellow-Red-Blue" demonstrates that art education must advance in parallel with developments in science and technology.

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Yapılandırılmış Özet

Bilim ve sanat, insanların yarattığı güçlü ve zarif araçlar olarak, doğayı, yaşamı ve onun birçok bileşenini daha derinlemesine anlamamızı sağlar. Bu disiplinler arasındaki sinerji beslendiğinde ve birlikte geliştirildiğinde, yenilikçi düşünmeyi teşvik eden ve yeni durumları çeşitli açılardan incelemeyi destekleyen bir ortam yaratır. Renk kavramı, doğal olarak güçlü olan ve bu disiplinlerarası etkileşimde kritik bir kesişimi temsil eden bir konudur. Renk, sanatın temel bir unsuru olmasının yanı sıra fizikte de merkezi bir konu olarak tanınır. Bu nedenle hem sanatçıların hem de bilim insanlarının ilgisini çekerek, çeşitli alanlarda işbirlikçi keşifler için ilgi çekici bir konu haline gelir (Birren, 1976; Ball & Ruben, 2004; Koyunkaya ve diğerleri, 2019). Ayrıca, sanat eğitiminin çeşitli biçimleri ve ifadeleri, sanatın sadece takdir edilmesini ve yaratılmasını değil, aynı zamanda kapsamlı bir şekilde anlaşılmasını sağlayan bir ortam geliştirmede merkezi bir rol oynar (Sweeny, 2013). Bu entegre yaklaşım, Bilim, Teknoloji, Mühendislik, Sanat ve Matematik (STEAM) eğitiminde somutlaşmıştır. STEAM eğitimi, sanat atölyelerinden kaynaklanan çeşitlendirilmiş sonuçları zenginleştirmeyi amaçlayarak, yaratıcılığı ve disiplinlerarası işbirliğini teşvik eder (Rolling, 2016).

Bu araştırma, Wassily Kandinsky'nin ikonik "Sarı-Kırmızı-Mavi" yağlı boya tablosunu yaratırken, orijinal Sarı, Kırmızı ve Mavi paleti yerine Cyan, Magenta ve Sarı (CMY) ana boya renklerini kullanmayı tercih ettiği varsayımsal bir senaryoyu incelemektedir. Bu soruya cevap vermek için, katkıda bulunan sanatçılardan biri, Kandinsky'nin başyapıtının yeniden üretimi üzerinde titizlikle çalıştı ve orijinal boyutlara sadık kaldı. Yeniden üretim, yalnızca CMY ana renkleri ve karışımları kullanılarak, beyaz pigment kullanılmadan tamamlandı.

Bir sanat eserinin yeniden üretilmesi süreci, bireylerin sanatçının tasarladığı orijinal form ile etkileşime girmesini sağlar. Bu etkileşim, sanatın sunduğu estetik zevk ve manevi zenginliğe erişim sağlar ve bu durum sanat eğitimi alanında önemli etkilere sahiptir (Schwarcz, 1982). Yeniden üretim çabası sırasında, Kandinsky'nin eserinin temelini oluşturmak için geometrik unsurlar kullandığı ve bu çerçevede birbirine bağlı ağların ortaya çıktığı ortaya konmuştur. Kandinsky'nin RYB (Kırmızı, Sarı ve Mavi) renk spektrumunu keşfetmesi, bu ana boya renklerini öne çıkaran odak noktaları olarak hizmet etmiş, ikincil ve üçüncül tonlar ise destekleyici bir rol oynamıştır. Her bir renk değerinin ayrımı, pigmentlerin belirli alanlarda çeşitli tonlar oluşturacak şekilde seyreltilmesiyle sağlanmıştır. Sıcak ve soğuk renklerin stratejik karşıtlıklarına ek olarak, ana boya renkleri, tamamlayıcı zıtlıklar içinde serbestçe ve akıcı bir şekilde uygulanmıştır. Şekillerin oluşumu renk kullanımı ile belirlenmiştir: kareler için kırmızı, daireler için mavi ve üçgenler için sarı. Renklerin tamamlayıcılarına göre kasıtlı yerleştirilmesi ve renk yüzeylerini tanımlamak için ince veya kalın siyah çizgilerin uygulanması, izleyicinin dikkatini canlılık ve derinlikle çeken bir kompozisyon oluşturmuştur.

Wassily Kandinsky'nin "Sarı-Kırmızı-Mavi" tablosu ile CMY tabanlı yeniden üretimi arasındaki karşılaştırmalı analiz, özellikle nötrleştirilmiş alanlarda, sanatçının renk uyumu konusundaki derin ustalığını vurgular. Çalışma, Adobe Photoshop kullanılarak orijinal başyapıtın ve yeniden üretimin belirlenmiş alanlarındaki renklerin karşılaştırılmasıyla yürütülmüş ve büyük ölçüde gri tonlarının varlığını ve dikkatli bir nötrleştirme sürecini gösteren bulguları ortaya koymuştur. Bu tür bir nötrleştirme (herhangi bir baskın renk yansımasından arınmış kompozit bir gri elde etme), Kandinsky'nin renk dengesi konusundaki olağanüstü uzmanlığını vurgular. Kandinsky, tamamlayıcı boyaları kullanarak, eserin yüzeyinden yayılan ışığın (RGB) uyumlu bir etkileşimini yaratmış ve böylece esere temel estetik bir özellik kazandırmıştır. Orijinal tablonun ve yeniden üretimin seçilen alanlarındaki homojen gri renk, ölçümlerle vurgulanmış ve daha yakından incelendiğinde, yalnızca minimal farklılıklar ortaya çıkmıştır. Bu titiz renk uygulama yaklaşımı, sadece Kandinsky'nin ustalığını göstermekle kalmaz, aynı zamanda eserin genel görsel ve estetik etkisinin önemini de vurgular.

Bu araştırmanın bulguları, yaşam boyu öğrenme sürecinde sanat eğitimine disiplinlerarası yaklaşımların entegrasyonunun önemini vurgular. Öğrencilerin sanat başyapıtlarının yeniden üretimine katılmaları ve CMY renk modeli gibi modern bilimsel sonuçları uygulamaları, eğitmenlerin farklı bilgi alanlarının birbirleriyle daha derinlemesine bağlantı kurmasını sağlamalarına olanak tanır. Bu yaklaşım, yaratıcılığı ve eleştirel düşünmeyi artırmanın yanı sıra, öğrencilerin modern dünyanın karmaşıklıklarını daha bütüncül ve bilinçli bir bakış açısıyla yönetmeye hazırlanmalarını sağlar. Bu nedenle, Kandinsky'nin "Sarı-Kırmızı-Mavi" eserinin yeniden üretimi deneyimi, sanat eğitiminin bilim ve teknoloji alanındaki gelişmelerle paralel ilerlemesi gerektiğini göstermektedir.