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Creative Thinking Processes in High School Visual Arts Classes Utilizing New Media Technology

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ABSTRACT

Recent research on creative thinking in education has modeled cognitive, affective, and contextual factors, but little focuses on digitally-enhanced environments. This study explores the use of new media technology in High School Visual Arts classes through a descriptive case study. Twenty-six students were interviewed and their artistic activities were documented in a Creative Process Report Diary. Thematic analysis revealed that new media technology influences the creative thinking process in several ways: its functionality facilitates creative thinking by reducing cognitive load and enabling diverse ideas, while non-functional tools hinder creativity; the psychological meaning associated with new media technology, characterized by positive effects and meanings, enhances task motivation and creative effort; and its empowering nature supports less skilled students in improving their creative output. Furthermore, students' engagement with technology varies depending on their skills, experiences, and personality, showcasing advanced creativity-relevant processes. Although the stages of creative thinking remain consistent, new media technology reshapes the experiences within these stages, enabling more efficient information gathering and faster creation.

The study concludes that new media technology influences high school students' creative thinking through the interaction between the individual, the surrounding environment, and the goal of creation, enhancing their overall creative experience.

Keywords: *creative thinking, new media technology, Art, high school, technology use*

Introduction

Many people believe creativity is binary—you either have it or you don't. However, studies show that everyone is capable of creative thinking. In education, PISA defines creative thinking for 15-year-olds as "the competence to engage productively in the generation, evaluation, and improvement of ideas, leading to original and effective solutions, advances in knowledge, and impactful expressions of imagination" (OECD, 2019, p.8).

Understanding the factors that influence the creative thinking process is essential for supporting students in creative activities. Research has identified various elements that impact creativity across fields. For instance, Marquis and Vajoczki (2012) found commonalities such as challenging assumptions, generating novel ideas, problem-solving, examining phenomena from multiple perspectives, and problem-finding. However, discipline-specific differences also emerged: in Humanities, key factors included challenging conventions, elaborating ideas, and expressiveness; Engineering focused on generating multiple ideas; and Health Science prioritized innovation and flexibility (Marquis & Vajoczki, 2012).

A study explored factors that foster creativity in students across three programs, revealing (1) freedom or fun, (2) self-reflection, and (3) teaching methods that encourage new ways of thinking (Reynolds, et al., 2013). Another study on classroom environments found that students in an advanced graphic design class valued (1) personal teacher-student relationships, (2) less focus on assessment, (3) flexibility and freedom of choice, and (4) in-class activities like divergent thinking exercises as essential for creativity (Cole, et al., 1999). These findings highlight the influence of the environment on creativity. However, with the rise of new media technology, this environment is rapidly changing, impacting human behavior in unforeseen ways.

New media technology is a powerful factor shaping today's educational landscape. In this study, new media technology included all digital tools and platforms (e.g.,iPads, online and offline apps, the internet) that students utilized in creating their artwork. The use of new media technology varies across studies. Some focus on daily classroom engagements that thoughtfully reshape activities (Saba, 2009), while others emphasize pedagogy, exploring how teachers use technology to enhance students' thinking and learning skills (Tosuntas, et al., 2019). Additionally, some literature describes new media technology as a means of integrating educational tools intentionally to develop and manage curriculum delivery (Summak, et al, 2010)

Research on the creative thinking process within digitally enhanced environments is limited. Recent studies suggest that technology, now pervasive in everyday life, may be reshaping creative thinking processes and outcomes (Barajas, Frossard, & Trifonova, 2019). Despite this, the impact of digital tools on the creative thinking process has received limited attention. Few studies explore how new media technology interacts

with students' social and material environments to shape creativity. This paper addresses this gap, investigating whether new media technology facilitates or hinders artistic creative thinking in high school students' creative processes, seeking to answer the following questions:

1. How do high school students describe their artistic activities when using new media technology?

2. How does the use of new media technology in class influence the creative thinking process of students during artistic activities?

3. What are the other factors that influence the creative thinking process of students when using new media technology during artistic activities?

Methods

Research Locale

The study was conducted in a Filipino-Chinese college preparatory school in the Philippines, known for its commitment to holistic student development and leveraging technology to enhance creative thinking. Unlike some schools in the country, which struggle with limited resources and teacher training for new media technology, this elite private school has the budget and infrastructure to integrate technology into classrooms. Since 2006, the school has implemented various initiatives, from 1-to-1computer-based instruction to providing iPads and allowing students to bring their own devices. By 2020, students from Grades 3 to 12 were required to have their own iPads for school use. With its long-standing and well-practiced use of new media technology, this school provides a suitable context for studying students' creative thinking processes.

Participants

All participants were male junior high students, with a total of 60 students—30 from Grade 9 and 30 from Grade 10. Using purposive sampling, these students were selected by their Visual Arts teacher and comprised 15 top-performing and 15 bottom-performing students in Grade 9 and Grade 10 Visual Arts. Table 1 summarizes the participant profiles. This sample was chosen to include both high and low performers in Visual Arts, as high schoolers were expected to provide detailed interview responses and had experience in reflective writing, which facilitated their participation in the creative process report diary.

Parents were emailed consent letters, and 28 students returned them with parental approval, indicating agreement to the conditions. However, only 26 students participated in the meetings and completed the research tools.

Table 1

Summary of Participant Profiles

Participants (N=26)		Performance in Visual Arts Class	
Grade Level		**Low Performance**	**High Performance**
Grade 9	12 (46%)	4 (15%)	8 (31%)
Grade 10	14 (54%)	7 (27%)	7 (27%)
Total		**11 (42%)**	**15 (58%)**

For anonymity, students were assigned pseudonyms: those from the Bottom 15 were coded with an initial letter "B," and those from the Top 15 with a "T." Grade 9 students had a consonant as the second letter, and Grade 10 students had a vowel. Grade 9 students began using iPads for classroom activities in Kinder and brought their own by Grade 6. Their lessons included Basic Graphic Design, Photography, and Architecture and Design. Grade 10 students began iPad use in Prep, bringing their own in Grade 7, except for Taj, who joined as a new student in Grade 7. Their lessons included Graphic Designs, Vehicle Design, and Digital Illustration. Table 2 provides a summarized overview of the participants' details.

Table 2

Researcher's Observation on Student Participants

Name	Observation Notes
Thor	Grade 9 Top 1, motivated by high grades and other people's opinions. He stated how good he is with both traditional and digital art. He stated that with artistic skills digital art tools help well with enhancement because of the variety of features an app would have while traditional art tool helps well with better details of drawing. Started doing his digital work from Stallion, a school organization when he was Grade 7.
Thomas	Grade 9 Top 2, has more confidence in doing artistic activities because of new media technology. His traditional drawings (sketches) are okay they're not as bad as he describes.
Tyler	Grade 9 Top 3, find the use of new media technology convenient. From a family of architects. He is a lot better with building digital houses compared to drawing.
Tripp	Grade 9 Top 5, loves Art and compares artistic activities with journaling. He has a lot of good traditional and digital drawings but has more traditional ones. He has practice sketch on paper before making a digital one. I think most people around him knows he likes art because of a number of extra-curricular projects given to him.
Tristan	Grade 9 Top 6, inspired by anime drawings and recommendation of teachers. He likes doing free drawing.
Tyrone	Grade 9 Top 13, does artistic activities only when it is required.
Tyrese	Grade 9 Top 14, he believes that his ideas come naturally when he is doing other things. He mentioned he gets inspiration from funny messages in chats.
Treyson	Grade 9 Top 15, likes colors and painting. Creates both traditional and digital painting. He has nice digital drawings.
Brian	Grade 9 Bottom 3, from a family of architects. Merged the required app for building digital houses with an app used by their architectural firm.
Blue	Grade 9 Bottom 4, only does artistic activities to comply. He says he does not really care about grades. He kept on saying that he knows he could do better if he put more effort.
Bjorn	Grade 9 Bottom 12, finds drawing on an iPad hard. He only use iPad for drawing since it is required.
Brix	Grade 9 Bottom 14, he just use his iPads for tracing. He says he use the iPad if drawings are more complicated – since he can trace.

Terrence	Grade 10 Top 1, feels sad when his iPad is being taken away by his parents. He's very good with both traditional and digital art. He said he gets inspired from funny memes or messages. Has a lot of comic type digital art. Really good ones. Started doing his digital work from Stallion, a school organization when he was Grade 7.
Tom	Grade 10 Top 2, likes drawing. He shared that one time, he felt like a rebel passing his work late. He mentioned about how the grade system in Art Education is not so relevant which makes it lose the value of Art.
Tep	Grade 10 Top 3, does artistic activities when required. He stated that once he feels enlightenment in what he wants to do – a rush of ideas come in and he is able to start and finish his work.
Tucker	Grade 10 Top 4, does artistic activities when required. He likes merging apps and is good at drawing traditionally and digitally.
Tony	Grade 10 Top 7, usually has ideas in his head already when creating works. He draws well traditionally and digitally.
Tim	Grade 10 Top 13, feels great when trying to work on projects in Art class. Sometimes thinking how the output may look like. Struggled with digital drawing in the beginning but was able to produce good works.
Taj	Grade 10 Top 14, new student in high school. He prefers to use a desktop than an iPad and so appreciates that some apps can be used in both devices.
Ben	Grade 10 Bottom 2, use new media technology for convenience.
Baylor	Grade 10 Bottom 3, says he cannot draw. However, he is able to produce decent traditional drawings. He says he feels he has more control with using pencil.
Benedict	Grade 10 Bottom 7, finds the use of an Apple pencil a lot better compared to using fingers when drawing. He actually has good drawings.
Bords	Grade 10 Bottom 8, prefers traditional art than digital ones. His answers are safe – say things that he thinks a teacher will approve.
Bowen	Grade 10 Bottom 10, thinks that no idea is better than the thing one has in his head.
Benson	Grade 10 Bottom 12, believes the use of new media technology makes the work feel great. He just utilized the app that was required by his teacher.
Banks	Grade 10 Bottom 14, finds traditional artworks a lot easier than digital works. I find him really persistent in doing his works. He follows every step and technique taught by his teacher. He also does a number of drafts when creating his works.

Instruments

This research employed a focus group discussion guide, an individual interview guide, and an adapted Creative Process Report Diary (CRD). Botella et al. (2018) introduced the CRD as a tool to examine the creative thinking process in everyday contexts, ensuring ecological validity. It featured sections like a 'Media Diary' for daily activities, a 'Tech Tool Map' for documenting technological tools, and an 'Emotion Diary' to track feelings during creation. Participants also noted 'Critical Moments' to highlight key points in their artistic process.

The FGD was used to understand how students created their works in Visual Arts class and the materials they used. The FGD guide was validated by three experts in Educational Psychology and Educational Technology. It was intentionally brief and open-ended, comprising the following questions: 1) How can you describe how you create a project or an artwork? 2) What tools or apps and platforms or websites do you use in your Visual Arts class? 3) Do you have any preferred tools or apps or websites?

The primary goal of the individual interviews was to know the stages of the creative thinking process of high schoolers. Furthermore, the interviews were meant to find out the influence of the use of new media technology in their creative thinking process and the other factors that facilitate or hinder artistic creative thinking of the students. The individual interviews were also used to double check and understand more the answers from the FGD and the diaries for triangulation. The Interview Guide was created based on previous research studies of Botella et al. (2013) & Botella et al. (2018) and was validated by three experts in Educational Psychology and Educational Technology.

Procedures

Since participation was voluntary, the different pages in the Creative Report Diary were not required to be answered by the students. However, students were encouraged to put in answers on each page as often as they could without compromising and adding pressure to their daily responsibilities in school. All 26 students completed the CRD.

For focus group discussions, participants were divided into four groups: Grade 9 top and bottom students, Grade 9 top students, Grade 10 bottom students, and Grade 10 top students. They described how they approached projects, the tools and apps they used in Visual Arts, and their preferences for specific platforms.

Eight students were initially invited for individual interviews, but only seven participated. The interviews posed more detailed questions to further examine the creative thinking stages and new media technology use. They also helped verify and deepen insights from the focus groups and diaries.

Memoing, the process of recording reflections and ideas about data (Given, 2008), was employed to document initial insights during data gathering and to increase awareness of research assumptions and subjective perspectives. To enhance validity, data triangulation was conducted by converging evidence from CRDs, individual interviews, and FGDs to establish themes. Member checking was also employed, allowing participants to review and verify transcribed discussions and interviews to ensure accuracy and follow-up interviews with students clarified their statements.

Data Analysis

FGDs and interviews were transcribed manually, focusing on reducing data to its essentials, and the accuracy of the transcriptions was ensured by comparing them to the recorded files. All collected data, including interviews, group discussions, and diary entries, were thoroughly reviewed to gain an overall sense of the material, identify commonalities among students, and determine which research questions the data could address. Coding, defined as organizing data into meaningful segments (Creswell, 2009), was conducted manually to contextualize terms into chunks of text, such as grouping statements like "I searched the web on stuff related to like the topic" and "I usually research on what I'm gonna do" under the code "Searching the internet." Thematic analysis was employed to extract specific meanings or descriptions from the Creative Process Report Diaries, triangulated with data from FGDs and individual interviews. Interrelated codes were categorized into themes aligned with related literature and theoretical frameworks.

Results

Initial categories included: (1) Stages of the creative thinking process, (2) Reasons for using new media technology, (3) Emotions/attitudes towards work, and (4) Motivations for completing work. These were further refined into themes such as the stages of the creative thinking process (identifying the task or goal of creation, researching, generating and selecting ideas, constructing the artwork, checking feedback, rest or break, and concluding the artwork) and factors influencing the stages of artistic creative thinking, which included the surrounding environment, the use of new media technology, domain-relevant skills, creativity-relevant processes, and task motivation.

Stages of the Creative Thinking Process When Using New Media Technology

The first research question of the study is: "How do high schoolers describe their artistic activities when using new media technology?" In the Creative Process Diary, students shared their artworks and how they created them. During FGDs, participants sequenced the stages of their artistic process, discussing the steps they followed when using new media technology. In individual interviews, they detailed how they produced their works, assessed their quality, and shared their motivation and attitudes toward the process.

Identifying the Task or Goal of Creation

In the FGDs, thirteen students emphasized the importance of understanding the task before starting. Tony shared, "First, I read what we had to make." Personal works are often sparked by stimuli such as ideas, feelings, or sounds. Terrence mentioned, "The idea can usually be a friend sending a funny text." Similarly, Tyrone said that he gets his ideas "When I'm in a group chat, and they say something like a pun that can be visualized…" This stage aligns with Mace & Ward's (2002) model, where identifying a thought—implicit or explicit—can lead to an artwork. Tom and Thor described starting their artworks once they had a general idea or theme, emphasizing the initial vague nature of these concepts or themes.

Researching

Sixteen students mentioned using the internet as part of their creative process. Tucker used Google to find prototypes, saying, "I googled what the instruments are like and stuff." Eight students referred to their online sources as "references" Taj said, "I just had lots of image references." This stage was more about finding prototypes rather than in-depth research. Tripp also used his iPad to gather reference images, saying, "The iPad was used to obtain reference images." This stage primarily involved using the internet to find benchmarks or models for their ideas. Researching also helped broaden the ideas of the students. Thomas shared, "I often already have an idea, but when I'm out of ideas, I turn to online sources for help."

Generating and Selecting of Ideas

Fifteen participants discussed working on an idea. Terrence explained, "Make a bunch of sketches for ideas." This stage mirrors Mace and Ward's idea development, where ideas are structured, extended, and restructured (Mace & Ward, 2002). During this stage, students decide to pursue one of the emerging ideas. In many cases, artists choose ideas based on personal preference or requirements (Mace & Ward, 2002), similar to some students' experiences. For instance, Tony selected some photos during his research, "I chose some of the pictures that I think are interesting."

Constructing the Artwork

The realization of the artwork takes place in this stage. All participants discussed producing their works in different phases.

Planning. Mace and Ward (2002) described a preparation stage where the artist plans the setup, materials, and tools for creating the artwork. Thor explained his approach: "I think about what style I'll use and decide where to draw. Most students didn't choose their tools since specific apps were required for school projects. Thomas

shared, “Tinkercad was required, so I used it.” However, some students supplemented the required apps with ones they were more comfortable with.

Drafting. Ten students started with pen and paper drafts. As Tristan noted, “I drew the drawing using pencil and paper.” On the other hand, 16 students began digitally, like Tucker, who used Canva, saying, “I put it on Canva and formatted it with space for the drawing.” Although more students started digitally, some still preferred paper. As shared by Tom, “Starting out with like the paper and pencil is like the best and safest route to go because it’s more like I have a physical sense of what I’m doing…”

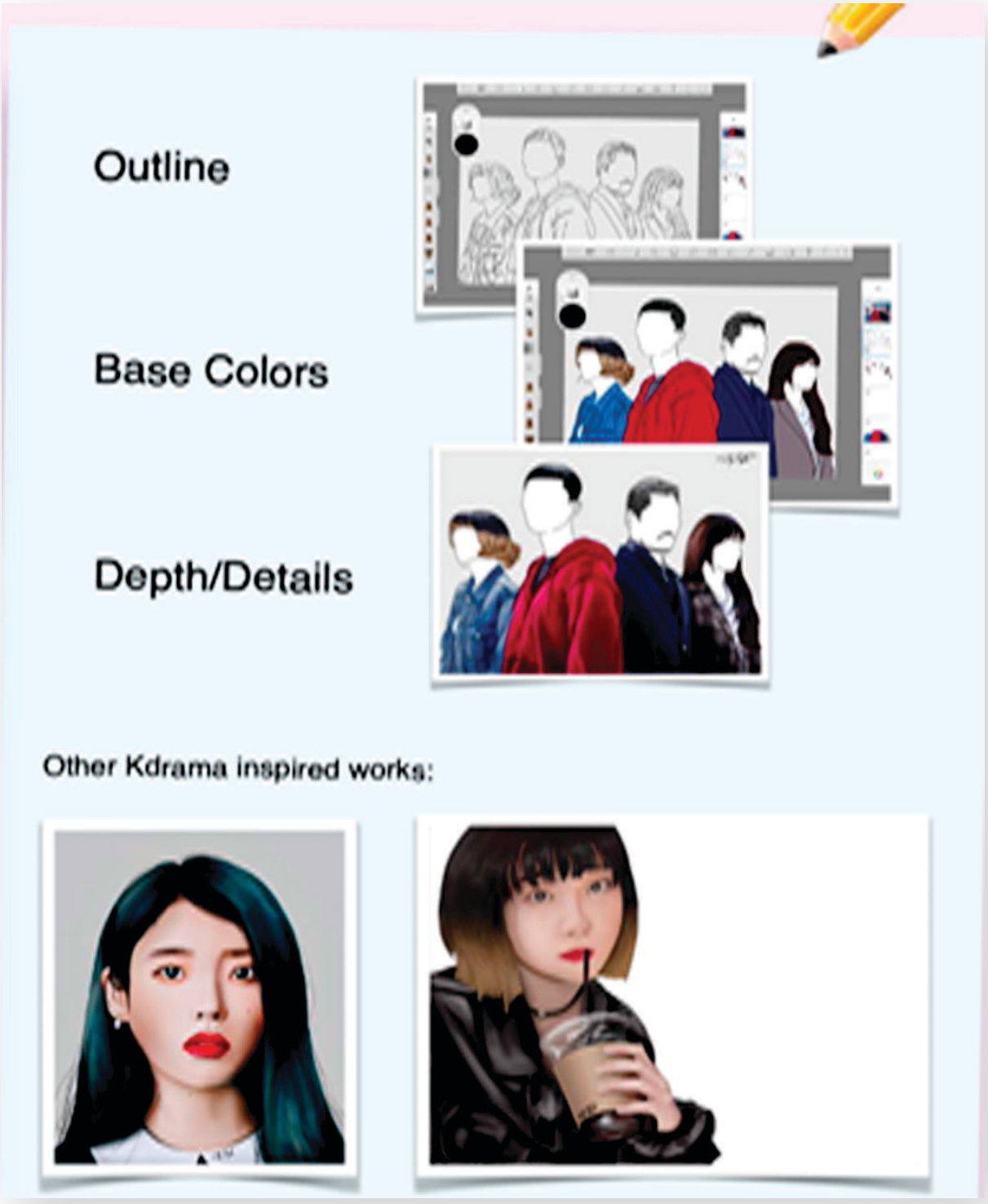
Taking a Picture. Blue, Tristan, Brian, and Thor mentioned taking photos. Blue and Tristan discussed their photography projects, while Brian and Thor used photos to preserve images of their traditional drawings. As Brian explained, “I draw on paper, then I’d picture it so I don’t easily lose it.” This aligns with the documentation stage described by Botella et al. (2018), where individuals accumulate and store information.

Tracing. Nine participants discussed tracing, with eight believing it improved their work. Taj explained, “I put different images in layers and traced each reference.” Benedict shared that tracing was part of their lesson, saying, “The main thing we learn is the layers and stuff and how to put pictures in the app so we can trace it.” He noted that their teacher introduced tracing in Adobe Sketch to teach the different functions of layers.

Designing and Drawing. Here, students decide on the dimensions of their artwork. Thomas described figuring out details as he progressed, saying, “Determining whether to put a button here or there…” The projects included digital drawings, graphic designs, and digital house models. Benedict explained, “I outlined the images and colored them.” Terrence added, “I use shading and flat colors to enhance the overall look.” Thor said, “I color-code the shapes first, then add colors, shadows, and details.” Figure 1 shows how Thor made his digital drawings. These activities mirror traditional art techniques, showing that while new media technology served as a tool, it didn’t change what students did but how they experienced it.

Figure 1

CRD entry of Thor sharing some of his personal works



Note. Original digital artwork created by a participant. Used with permission.

Editing. Nine participants mentioned editing their works. As told by Terence, "I put on an overlay to just make it better." While Thor edited more details, "Play around with values like contrast, black point, detail, and sharpness until satisfied."

Rest or Break. Twelve participants mentioned taking breaks during their work, with Tyrese likening it to an incubation stage where one isn't consciously thinking about the task, saying, "Normal stuff… I'm doing day-to-day things." Tom, Tyler, and Terrence referred to this as experiencing "art block." Five students mentioned taking breaks after learning about their project, consistent with studies suggesting breaks after preparation stages. However, their comments better reflect Amabile's (1983) observation that incubation may involve selective forgetting, wherein the mind subconsciously processes ideas after setting aside a task, or shifts in motivation, wherein external or internal factors influence one's engagement and creative drive. Tyler further described this stage as a response to frustration after some preparation, aligning with Lubart's (2010) idea that incubation occurs when the mind reaches its limit in problem-solving, explaining, "I need to take a break as I've exhausted my mind. Hoping that some ideas come to mind the following day."

Checking for Feedback. Five of the top performing students mentioned seeking feedback from others about their work. This aligns with Teresa Amabile's concept of response validation, where feedback is sought to improve the work (Amabile, 1983, 2012).

Concluding the Artwork

This is the decision-making stage for finalizing the work. Eleven participants discussed concluding their projects. Mace and Ward (2002) noted that the physical completion of an artwork is shaped by the artist's intended expression. Seven participants shared they finalized their work based on personal satisfaction.

Deadline. Five students mentioned being mindful of deadlines, with some adjusting their timelines accordingly. For instance, Bowen shared that he remained open to new ideas as long as time allowed, saying, "If I find like other new ideas, I would change it before the deadline."

Leaving the artwork. Mace and Ward's research discussed the artist abandoning the work when it cannot be successfully resolved (Mace & Ward, 2002). However, in the study, not all who talked about leaving the artwork meant that the artwork was not accomplished. Two students mentioned leaving their artwork when they are done.

Going back to any stage. Banks mentioned revisiting a previous stage after realizing he had made a mistake, saying, "I had to redo it and rethink." When asked to clarify, he explained that rethinking meant going back to researching and drafting.

Table 3 highlights the alignment between the stages identified in this study and those from existing research. These stages, derived from the students' descriptions and reflections, align with previous models of the creative thinking process (see Table 3).

Table 3

Correspondence between the Stages in this Study and the Existing Stages in Literature

Stages in this present study	Correspondence with existing stages
Identifying the Task or Goal of Creation	Preparation (Wallas, 2014)
	Sensitivity to problems (Guilford, 1956)
	Problem presentation (Amabile, 1983)
	Problem or Task Identification (Amabile, 1996)
	Artwork Conception (Mace and Ward, 2002)
	Goal of creation (Fürst et al., 2012)
	Idea or Vision (Botella et al., 2013)
	Immersion (Botella et al., 2018)
Researching	Preparation (Amabile, 1983, 1996; Botella et al., 2011; Cropley and Cropley, 2012; Wallas, 2014; Sadler-Smith, 2016)
	Conception (Mace and Ward, 2002)
	Documentation and reflection (Botella et al., 2013)
	Research (Botella et al., 2018)
Generating and Selecting of Idea	Insight (Ghiselin, 1952; Gruber and Davis, 1988; Runco, 1997; Carson, 1999; Botella et al., 2011)
	Idea development (Mace and Ward, 2002)
	Ideation (Osborn, 1953, 1963; Carson, 1999; Botella et al., 2011)
	Response generation (Amabile, 1988, 2012)
	Idea or vision (Botella et al., 2013)
	Intimation (Sadler-Smith, 2016)
	Reflection (Botella et al.,2018)
Constructing the Artwork	Transformation (Busse and Mansfield, 1980)
	Making the Artwork; Realization (Mace and Ward, 2002)
	Planning (Treffinger, 1995; Botella et al., 2011)
	Response generation (Amabile, 1988, 2012)
	Production (Treffinger, 1995; Carson, 1999; Botella et al., 2011)
	First sketches and testing; Documentation; Provisional objects (Botella et al., 2013)
	Trials; Realization (Botella et al., 2018)

Rest or Break	Incubation (Osborn, 1953/1963; Dreistadt, 1969; Runco, 1997; Carson, 1999; Botella et al., 2011)
	Break (Botella et al., 2018)
Checking for Feedback	Verification (Busse and Mansfield, 1980; Runco, 1997; Carson, 1999; Botella et al., 2011)
	Validation (Amabile, 1988; Runco, 1997; Botella et al., 2011; Cropley and Cropley, 2012)
	Response Validation and Communication (Amabile, 1996)
	Judgment (Botella et al., 2018)
Concluding the Artwork	Outcome (Amabile, 1988, 1996)
	Finishing the Artwork and Resolution (Mace and Ward, 2002)
	Presentation (Botella et al., 2018)

Note. Adapted from "What Are the Stages of the Creative Process? What Visual Art Students Are Saying," by Botella, Zenasni, & Lubart (2018), *Frontiers in Psychology*, *9*, Article 2266. https://doi.org/10.3389/fpsyg.2018.02266.

Factors Influencing the Stages of Artistic Creative Thinking Process

The second research question is: "How does the use of new media technology in class influence the creative thinking process of students during artistic activities?" To better understand how the digitally enhanced environment influences students' creative thinking processes, this research also explored the role of physical tools like iPads and laptops used in Visual Arts classes. Amabile (2012) acknowledged that while their earlier research overlooked the physical environment, it does influence creative thinking.

Use of New Media Technology

New Media Technology in this study encompassed all digital tools and platforms that students utilized to create their artwork. The usage of these technologies varied among students. Researchers examine new media technology through its technical and socio-cultural aspects. In this study, students' use of new media technology revealed three rationales: Functionality, Meaning, and Affect Evoked by New Media Technology, aligning with Jan Dul's Triple Path Framework (Dul, 2019).

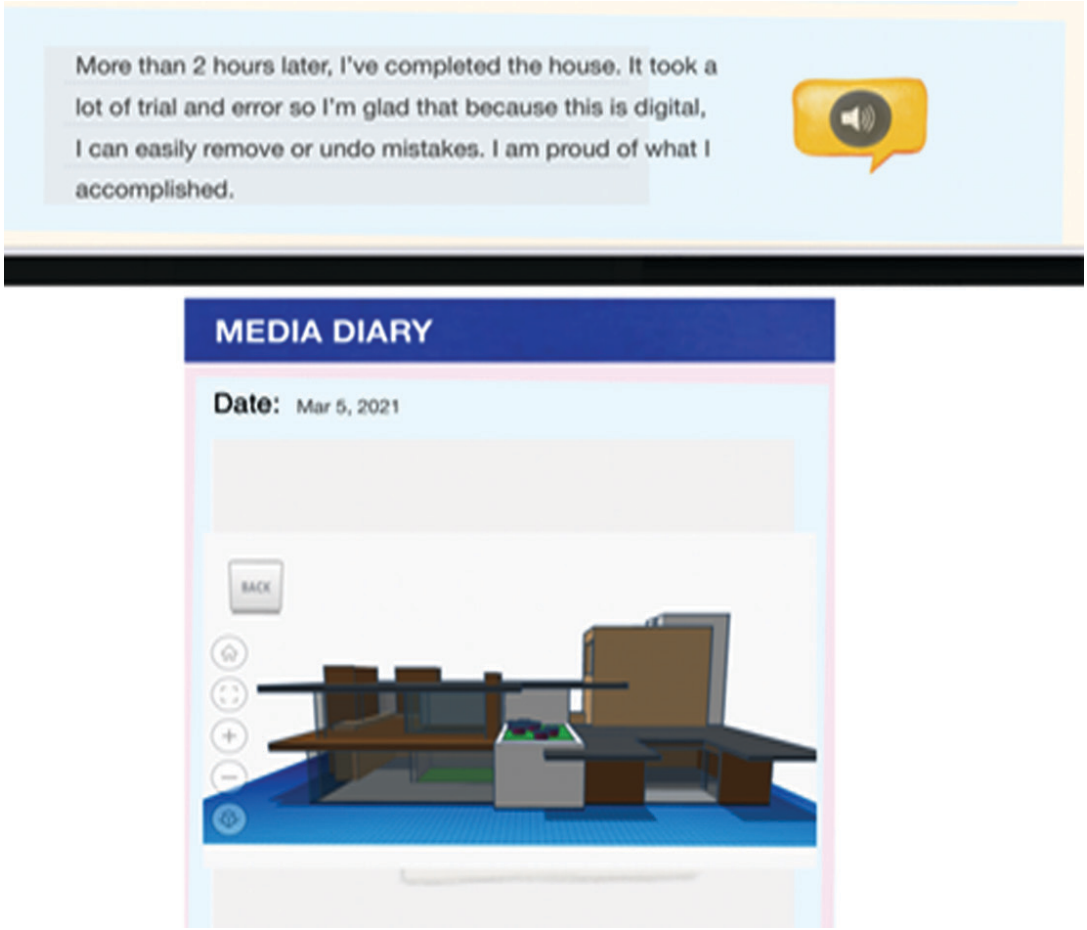
Function of New Media Technology. Functionality refers to the technical characteristics of digital tools that assist in creating artworks. All 26 students used iPad for their digital artworks, with 19 recognizing the apps' supportive functions. Terrence shared, "I have many more tools like layers, blur, and transform options, which help me create."

Furthermore, Terrence shared how he always wanted to create decent human faces but failed, however, the use of new media technology motivated him to explore more, "The use of digital tools is what really got me out and to explore how to draw people" Fourteen students also found these functions beneficial for personal projects. Some students mentioned that an Apple Pencil or stylus improved their drawing ability. Benedict said, "Using the Apple Pencil made it much easier than using fingers." However, not all students had access to these tools. Terrence adapted by using his finger, while Banks and Thor found finger-drawing challenging due to limited control. The effectiveness of new media technology varied based on individual perceptions of its functionality and its alignment with their goals.

Instrumental Functionality. Among the various features, layers, the undo function, and having multiple digital tools in one app were highlighted. Benedict noted, "With Sketch apps, we can instantly use layers and undo or redo." This reflects how new media technology supports creative thinking process by offering functions that meet the user's needs. Figure 2 presents a diary entry which shows how instrumental functionality provided ease that supported the creative thinking process of Tyler during his artistic activity.

Figure 2

CRD Media Diary entry of Tyler



Note. Original diary entry of a participant. Used with permission.

Adaptable Functionality. Adaptable functionality refers to how well new media tools adjust to user needs (Dul, 2019). Eleven students praised the iPad's adaptability. Terrence valued the compilation feature: "Everything is in one place, and you can see all your work." However, some students encountered challenges. Bjorn found the iPad's texture problematic: "Sometimes it's too slippery, and you mess up." These experiences illustrate how functionality can either enhance or hinder creativity. When features meet users' needs, they facilitate creativity; when lacking, they hinder the process.

Meaning of New Media Technology. The data revealed that students attach significant meanings or form relationships with their digital tools, influencing their artistic creative thinking process. Some students combined required apps with those personally meaningful to them. Brian shared, "I use Tinkercad too, but our family has an architectural firm and they use AutoCAD," highlighting his connection to family expertise. On the other hand, Blue finds the use of new media technology for class distracting because he sees his iPad as a tool for gaming. These instances are examples of a socio-cultural characteristic of new media technology described by Hobbs (1998) and Tzu-bin et al. (2013), which states that each medium serves various purposes depending on the person utilizing it.

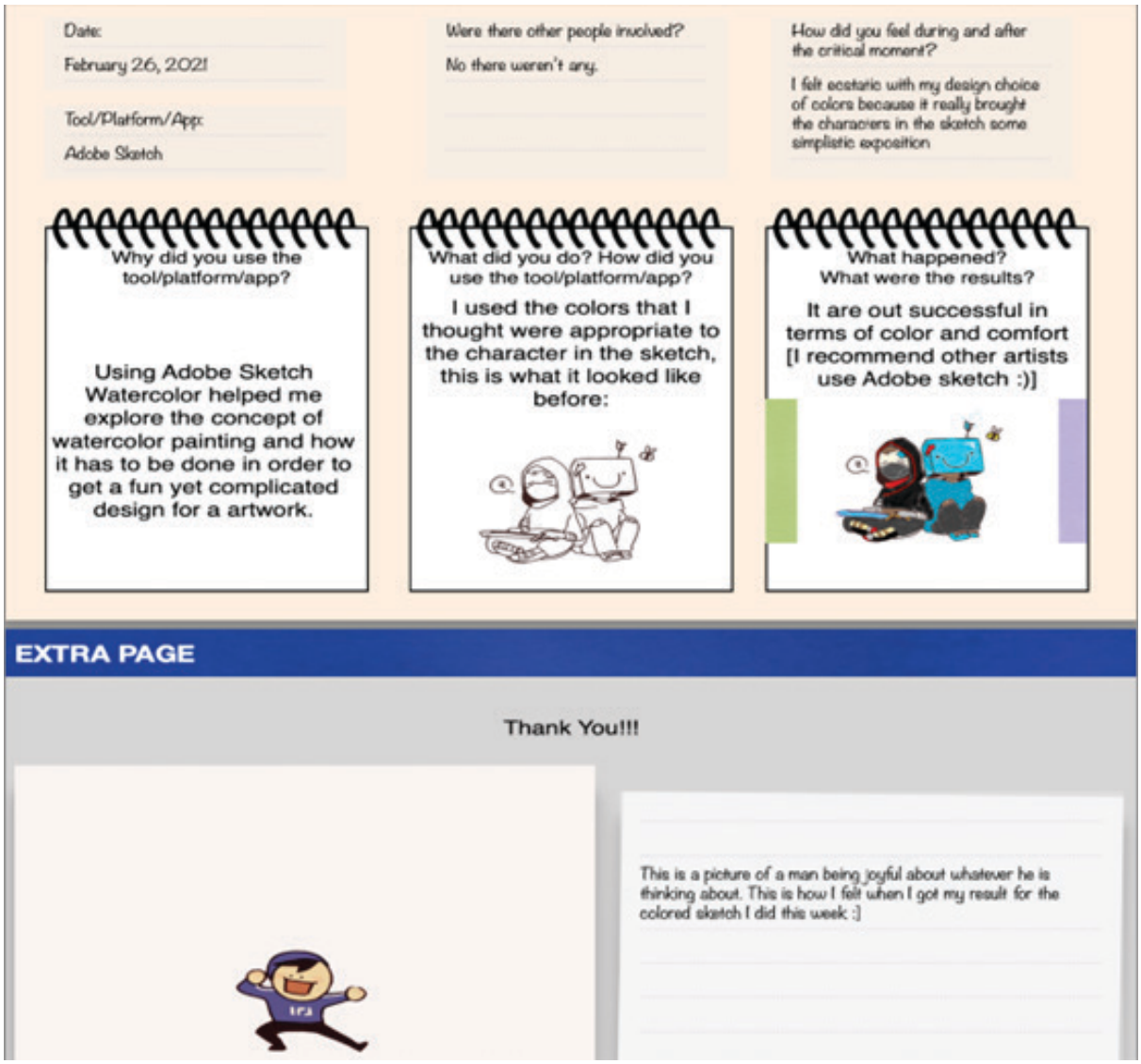
Inspiration. Nine students reported finding inspiration in specific applications and websites. Most students use their iPads to research and download references. For example, Thomas said, "Whenever I'm looking for inspiration, I look for Adobe Behance." Jan Dul (2019) noted that finding inspiration through physical and virtual environments can lead to creativity. Additionally, students noted how apps influence their judgment during research. Tyler follows a Facebook group to see "very nice posts" for ideas.

Ownership. In personal interviews, some students discussed their deep connection with their devices. Terrence mentioned the emotional impact of having his iPad taken away, "My iPad's been taken, and I feel terrible. My drawing motivation has been insanely good this entire December, and now I can't enjoy what I love doing. (There are many very lengthy paragraphs I've written of me wailing, this was an oversimplification)." While, Tom, who would rather do traditional artworks than digital ones discovered his enjoyment in digital arts when his parents gifted him a drawing tablet, "It just feels right with me, it feels like drawing on paper so like they gifted that to me and ever since I tried drawing as much as I could."

Affect Evoked by New Media Technology. This refers to the ability of new media technology to elicit affect such as feelings, emotions, and judgments influenced by new media technology during the creative process. Figure 3 illustrates how a Grade 10 student used Adobe Sketch Watercolor and his feelings about it.

Figure 3

CRD entry of Treyson sharing some of his multimedia artworks



Note. Original digital artworks created by a participant. Used with permission.

Confidence. In an interview, Thomas highlighted how new media technology sparked his interest in design: "I think that new media technology is the reason why I'm interested in design in the first place." He admitted feeling intimidated by visual arts due to his artistic limitations, but technology helped him overcome this fear: "I'm more confident to move on to every next step in my creative process." This aligns with Saba's (2009) findings that positive attitudes toward technology enhance confidence and learning.

Leisurely Mood. The interviews and CRD focused on students' use of new media technology for artistic activities, providing limited data on other uses. However, three students mentioned using technology for leisure activities like watching shows and playing games. Similarly, Blue mentioned viewing his iPad primarily as a gaming tool, which affected how he used it for school, "Maybe you would use an iPad to play games

but not to study." He clarified that while he can complete school tasks using the iPad, it's more enjoyable for non-school activities. This highlights how new media technology evokes emotions that influence its use, potentially hindering artistic creative thinking for Blue.

Humor. Jellen and Urban's (1989) Test for Creative Thinking – Drawing Production includes humor as a key element of creative thinking. Terrence and Tyrese both mentioned feeling inspired by funny messages in digital group chats. A study by Yue and Hui (2015) found that affiliative and aggressive humor are linked to creative traits like novelty and diversity.

Other Factors that Influence the Creative Thinking Process

The third research question is: "What are the other factors that influence the creative thinking process of high schoolers when using new media technology during artistic activities?" To fully understand the creative thinking process of students using new media technology during artistic activities, this study explored not only the direct effects of technology but also other influencing factors. Guided by Teresa Amabile's Componential Theory, which describes how various components of creativity interact to influence creative output (Amabile, 2012), the research sought to identify other factors that either facilitated or hindered students' artistic creative thinking when using new media technology.

Task Motivation

Teresa Amabile's task motivation theory emphasizes intrinsic motivation, where passion and challenge drive creativity (Amabile, 2012). However, this study found that both intrinsic and extrinsic motivation significantly influence students' artistic creative thinking. Task motivation impacts the Construction of Artwork stage, as effort depends on external incentives or interest. While Thomas noted, "My school requirement work would be just a little bit more polished because obviously, I have to work hard for the grade," Terrence admitted, "I could procrastinate more often with school work." Motivation also affects the Rest or Break stage, as students' decisions to continue or pause work depend on commitment, with Banks stating, "I just wanna continue all the way." Some students completed work due to pressure, for instance, Blue shared, "It's like they give you something or they tell you to do something and you just comply." While others, like Thor and Thomas, were driven by high grades. Many top students, even those who didn't see themselves as artistic, were motivated by academic performance. Satisfaction also played a role, as ten students expressed motivation from seeing their finished work, with Benedict stating, "What motivates me is really the result." Additionally, eight students discussed creating personal artwork, with seven sharing pieces made in their free time, highlighting the role of intrinsic motivation in artistic engagement.

Domain-Relevant Skills

Domain-relevant skills encompass all abilities relevant to a specific field, including responses that can be synthesized into new ones (Amabile, 1983). The data showed that students with strong visual arts skills excel in both traditional and digital mediums. Domain-relevant skills influence how participants approach gathering information in the Research stage. Tristan, who gained knowledge of various art apps through teacher recommendations, shared, "I wanted a homey vibe, so I used references from Pinterest." A February 6, 2021, memo entry from the FGD noted that most Grade 9 students preferred sketching with paper and pencil before transitioning to digital drawing on the iPad. Data analysis revealed that this was their first formal exposure to digital art in class. Their limited knowledge and experience in using the iPad for drawing made them hesitant to start digitally. As Tripp reflected in his diary, "I'm not as informed or familiar with tools and apps in regards to digital art." In contrast, two top students, Thor and Terrence, had already developed confidence in digital art through their involvement in the school organization, allowing them to start directly with digital tools.

Creativity-Relevant Processes

The creativity-relevant process comprises an individual's cognitive style, personality traits, and working style identified with creative behavior (Amabile, 1983, 2012). Further, Amabile (1983) stated that though these heuristic techniques may be noted explicitly, they may also be implied and exercised without direct awareness. The data revealed how students' cognitive and working styles, along with their personality traits, either support or hinder their artistic creative thinking.

Effort. Students' working styles varied significantly. Three participants specifically mentioned effort. Thor and Thomas emphasized how much effort they put in to achieve high grades. In contrast, Blue admitted that he rarely put effort into his work but believed he could improve if he tried harder.

Set-breaking. Set-breaking refers to the ability to go beyond fixed approaches when doing a task. Examples include breaking perceptual sets or deviating from typical steps in a process. Ten students used alternative apps to improve their experience. Terrence shared he would "grab simple concepts and then exaggerate them," making his works stand out compared to others (see Figure 4).

Figure 4

CRD Media Diary entry of Terrence

Note. Original digital artwork created by a participant. Used with permission.

Terrence's work demonstrates factors of creativity highlighted by Guilford, such as originality and elaboration (Kim, 2006). This aligns with Jellen and Urban's (1989) concept of unconventionality.

Using wide categories. Another notable working style is the ability to integrate wide, flexible influences into a cohesive artistic concept. Tom's artwork (Figure 5), shared from his CRD, reflects this approach. In an interview, he explained that one of his projects was inspired by the satisfaction of fulfilling a ramen craving, transforming a personal experience into a creative visual piece.

Figure 5

CRD Media Diary entry of Tom

Note. Original digital artwork created by a participant. Used with permission.

Surrounding Environment

Teresa Amabile (2012) revised her Componential Theory Framework to include the influence of the social environment on task motivation. This study similarly found that students' creative thinking is shaped by their interactions with teachers, friends, and family. Teachers played a key role in students' artistic activities, serving as an external stimulus through instructions and materials, influencing idea generation, and guiding tool selection. As Tom shared, "The first picture or idea is close to the example that Cher gave," while Tristan followed his teacher's recommendation for editing photos. Teachers also played a role in validating students' work. Friends were another source of validation, with Terrence seeking feedback from his artist peers, saying, "I have a group of 10-15 artist friends, and I ask their opinions." Family also influenced students' creative thinking process, whether through direct interactions or exposure to their professions. Banks recalled how his father interrupted his concentration, while Brian discovered an app through his family's architectural firm. Tyler, inspired by his architect father's habit of traveling for inspiration, applied the same approach digitally, stating,

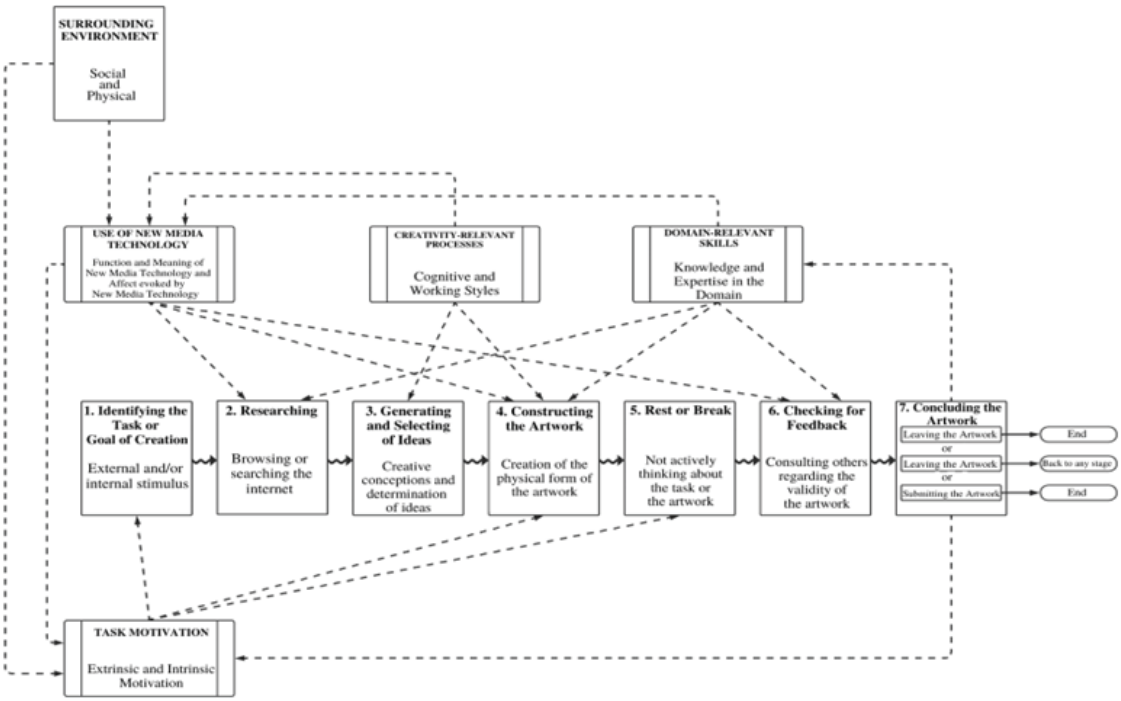
"My dad sometimes, he goes abroad to get inspiration from the architectures of other countries and I think I'm trying to apply that same solution....by going online..." His statement reflects how students increasingly equate physical experiences with virtual exploration. With the advent of technology, students' surrounding environment has transformed, influencing both their social interactions and creative thinking processes.

Model of the Creative Thinking Process

This study developed a model adapted from the Componential Theory Framework of Teresa Amabile (2012) to address the gap in previous research, which primarily focused on the social environment while briefly mentioning the physical environment. To bridge this gap, the model incorporates the role of the surrounding environment (social and physical) and the use of new media technology in influencing students' creative thinking process during artistic activities. It outlines the creative thinking process from its initial stages to the end stage and factors that facilitate or hinder creativity. The model illustrates how the social and physical environments influence the use of new media technology and task motivation. It also shows how creativity-relevant processes and domain-relevant skills influence the use of new media technology. Additionally, task motivation influences some stages, such as identifying the task or goal of creation, constructing the artwork, and rest or break. The use of new media technology influences the researching, constructing the artwork, and checking for feedback stages. Creativity-relevant processes influence generating and selecting of ideas stage and constructing the artwork stage, while domain-relevant skills influence the researching, constructing the artwork, and checking for feedback stages. The model also demonstrates how the stage of concluding the artwork influences domain-relevant skills and task motivation. Broken lines indicate the influence of particular factors or. Visual elements such as broken lines indicate the influence of specific factors or stages on others, while wavy lines represent the non-sequential and recursive directions in the creative thinking process.

Figure 6

Creative Thinking Process When Using New Media Technology



Note. Created by the author based on original research.

Discussion

The results of this study largely align with existing theories on creative thinking and the role of new media technology in artistic processes. Amabile's (1983, 2012) Componential Theory of Creativity, particularly the influence of task motivation, domain-relevant skills, creativity-relevant processes, and the surrounding environment, is strongly reflected in the students' experiences. The creative thinking process observed in high school visual arts classes follows well-established models, confirming that essential stages such as idea generation, construction, and feedback remain consistent even in digital environments. Additionally, Jan Dul's (2019) Triple Path Framework is evident in how students' interactions with new media technology are shaped by its functionality, meaning, and emotional impact.

However, this study provides new insights into how new media technology alters students' creative experiences, potentially affecting their outputs. While research on digital art acknowledges the shift from traditional to digital methods, this study highlights how students often blend both, with some preferring to start with traditional sketching before transitioning to digital platforms. This challenges the assumption that digital-native students fully embrace digital tools without incorporating traditional techniques. For instance, 10 out of 26 students, including Tristan and Tom, mentioned drafting their ideas on paper before transferring them to digital platforms, citing better control and familiarity with traditional tools. Conversely, students like Thor and

Terrence preferred digital tools from the start, using features like layering and color adjustments to refine their work. Another key finding is how students' perceptions of technology - whether as a tool for productivity or leisure affect their engagement and motivation. Some students struggled with distractions or associated iPads more with entertainment than academics, which impacted their creative process. Blue admitted that he primarily viewed his iPad as a gaming device, which made it difficult for him to focus on schoolwork. Meanwhile, Thomas and Terrence saw digital tools as essential for improving their artistic skills, particularly in refining shading and exploring different illustration techniques.

The study also found that students' interaction with new media technology varies significantly based on their personal experiences, training, and inherent personality traits. Those with prior exposure to design software or family influences in architecture and digital arts such as Brian, who was familiar with AutoCAD through his family's firm demonstrated greater adaptability and confidence in using digital tools. In contrast, students with limited experience, like Tripp, initially struggled with digital tools and relied more on traditional sketching before transitioning to digital work. Additionally, personality traits influenced how students approached their creative process. Some, like Terrence, actively experimented with exaggerating simple concepts to make their work stand out, while others, like Tyrone, preferred efficiency and relied on Canva's presets to structure their designs quickly. Banks, who had little confidence in his drawing skills, frequently traced images digitally, finding it a practical way to enhance his work. These differences suggest that students' backgrounds and creative styles shape how they navigate digital environments, influencing both their workflow and final outputs.

Unexpectedly, while motivation has been widely discussed as a crucial factor in creativity, this study found that students' motivation fluctuated significantly depending on whether they were working on personal projects or school requirements. Some students produced more refined work for grades but felt less personally invested, while others found personal projects more fulfilling but lacked external pressure to refine them. For instance, Thomas stated that his school projects were more polished because he worked hard for the grade, while Banks admitted that he put minimal effort into school assignments but was more engaged when working on personal projects. This suggests a complex relationship between intrinsic and extrinsic motivation in digital art creation. Additionally, Amabile's (1983) idea of incubation, particularly selective forgetting and shifts in motivation, was evident when students took breaks and returned with fresh perspectives. Tyler mentioned experiencing "art block" and needing time away before generating new ideas, while Tucker described taking a break and later improving his work based on fresh insights. However, some students also experienced prolonged disengagement due to distractions from technology.

These findings have important implications for teaching visual arts using new media technology in high school classrooms. Educators should consider structured guidance on balancing traditional and digital methods, allowing students to leverage both

approaches effectively. Additionally, fostering intrinsic motivation by incorporating more open-ended, personally meaningful projects could enhance creative engagement. Since students' interaction with technology is influenced by their prior experiences and personality traits, differentiated instruction that provides support for students with varying levels of digital proficiency could be beneficial. Finally, addressing distractions and helping students develop discipline in digital environments can optimize the use of new media technology as a tool for artistic growth.

Conclusion

This study began with the observation that little research has examined how students engage in creative thinking when using new media technology during artistic activities. As learning environments evolve, understanding how digital tools influence creative thinking process whether by facilitating or hindering artistic thinking becomes increasingly important. Findings confirm that the core stages of creative thinking remain consistent with prior studies, even as environmental contexts shift. However, new media technologies introduce factors that influence students' creative experiences, potentially affecting their outputs. Like traditional tools, new media technology plays a crucial role in artistic creation, but their effectiveness depends on their functionality. When tools are well-designed, they reduce cognitive load and expand creative possibilities. Conversely, non-functional technology can limit artistic expression. Beyond technical features, the psychological meaning and affect tied to new media technology significantly influence task motivation and sustain creative effort.

This study also highlights how new media technology benefits students who are creative but lack traditional artistic skills by providing accessible tools that support engagement in the creative thinking process. Those with strong domain knowledge and technical proficiency leverage digital tools to enhance their creativity, while students with different levels of experience interact with new media technology in varied ways, influenced by their personal background, training, and personality traits.

Although the stages of creative thinking remain unchanged, the integration of new media technology has transformed how students experience them. Researching, for example, has shifted from traditional to digital methods, streamlining information gathering and accelerating the creative thinking process. Ultimately, creativity emerges from the interplay between the individual, the task, and the environment. Task motivation and the use of new media technology influence this dynamic process, reinforcing that creativity is not an isolated effort but the result of complex interactions within a supportive environment, emphasizing the importance of domain-relevant skills, creativity-relevant processes, and effective use of technology.

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