Infusing Creativity and Technology Through Repurposing Existing Digital Tools and Social Media Apps for Educational Purposes

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Abstract. As an emerging technological and communication form of this century, digital and social media applications are gaining acceptance as platforms for creativity and inspiration in fine arts and graphic design. However, despite the proliferation of social media platforms and digital manipulation and painting apps, repurposing them for pedagogical purposes is yet to be explored as an educational strategy in the traditional painting studio or computer graphics classroom. The essence of this paper is to employ qualitative as well as quantitative research methods to explore the capabilities of digital and social media applications as a technological apparatus for creativity and expressivity in art and design education and practice. The research involves an empirical investigation of the potential offered by digital media applications and social media platforms to enhance the creative learning experience in art and design. The methodological procedures that are discussed in this paper are the result of two experimental studies; the first study explores the use of a digital painting technique – Phone Art– in the fine arts studio, while the second study investigates the use of social media applications in the graphic design classroom. The investigation is undertaken in an experimental educational setting in an attempt to determine how technology can be utilized by educators in order to optimize the creative performance of students.

Keywords: Creativity · Social media · Pedagogy · Innovation

1 Introduction

A growing trend is emerging toward the use of social media in the learning environment. Researchers started looking at specific technological interventions to the creative process involved in various domains in an attempt to improve creative outcomes. Some of them argued that influencing the creative process can change creative outcomes [7], but it is still unclear how to incorporate the emerging social media technologies to improve the creative outcomes in art and design pedagogy and practice. As no other studies appear to exist in the area of repurposing digital and social media for educational purposes, this paper comprises two preliminary experiments that aim to investigate the effectiveness of utilizing digital and social media in enhancing creativity. It

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also aims to prompt an enquiry that could potentially uncover the preferences and patterns of interaction with these social media platforms in art and design educational contexts. In the first section, the paper presents a general overview of the key concepts discussed in the subsequent sections. In the second section, it situates its topic in the context of previous research and relevant literature related to the employment of multimedia-based learning strategies and supportive digital and social media applications in the stimulation and enhancement of student creativity. In the third section, it discusses the experimental procedures and presents the findings and their implications in an attempt to lay the ground for future research on this topic. The eventual aim is for these findings to be used in order to provide valuable insights to educators and aid them in their selection of the most effective applications to utilize during the creative processes involved in graphic design or fine arts. The findings and conclusions, which are discussed in the last section, have implications for future research in better understanding how digital and social media applications can aid students in enhancing their creativity. This research attempts to find answers to the following questions through surveying students at the University of Bahrain, and conducting empirical experiments in the classroom;

1. How can digital applications and social media platforms be repurposed and harnessed to promote a creative mindset in art and design students?
2. To what extent can repurposing these applications have an impact on fostering student innovation and creativity?
3. What are students' preferences and patterns of interaction with social media platforms in art and design educational contexts?

The next section presents the literature review that lays the ground for investigating and propelling a wave of inquiry into the experiences, preferences and interaction patterns of students during the use of social networks and digital applications to foster their creativity in art and design educational practices.

2 Supportive Digital and Social Media Applications for Creative Learning

Previous work has looked at various technological interventions to the creative process to try to improve creative outcomes [7, p. 1]. Tiryakioglu and Erzurum [13] investigated the utilization of Facebook to support learning, and the attitudes of academics towards the use of Facebook for educational purposes. They found that instructors mostly use Facebook to communicate with their students and that *"social networks improve communication skills, enhance participation and social commitment, reinforce peer support, and ensure realization of education based on collaboration. Moreover, social networking sites can be easily and inexpensively used without a substantial support from universities so that they can be integrated into educational process of students*" [13, p. 40]. They argue that educational environments that involve the utilization of social networks will better attract students' attention and lead to more effective educational experiences. In an attempt to design an online environment that enables social interactions adapted to creative processes between artists, Kim,

Agrawala, and Bernstein [7] created Mosaic: an online social platform for artists to share their artworks-in-progress. Mosaic, which can be visited at http://www.artsaic.com, allows artists to enhance their own creative processes as well those of others through sharing their failures and their successes. It also allows them to reflect on the various creative possibilities and options, and give and receive feedback from each other. On the other hand, Igarashi [6] believes that current user interfaces are crowded with buttons and menus, and therefore interfere with creativity and exploration. He designed three systems, which contain fluent user interfaces that can facilitate the early exploratory stages of the creative process; *"Pegasus interactively beautifies freeform drawings satisfying possible geometric constraints. Teddy allows the user to design freeform three-dimensional objects by drawing their silhouette shapes. Flatland provides various computational supports for simple note-taking activity on an office whiteboard"*. Chai and Fan [2] investigated the influence of social media technologies on the creative achievements of students in design education. This body of literature shows that using digital and social media applications purposefully to influence the creative process can change creative outcomes, but it is still unclear how to incorporate these applications effectively and strategically into students' learning in order to help them gain creative inspiration. Deeper knowledge of these topics and further exploration of such endeavors is critical in framing the research methods, findings, and the conclusions discussed later in this paper.

3 Experiments and Results

This paper engaged two purposive samples in two experimental settings. In Study 1, a group of seventeen fine arts and graphic design students undertook a digital painting workshop in Phone Art in order to explore the effectiveness of digital tools in fostering creativity in the art classroom. In Study 2, the effectiveness of repurposing digital and social media applications in enhancing creativity were explored in a more natural classroom setting with forty-two students engaged in character design learning activities. The two studies and their results are discussed in this section.

3.1 First Experimental Design and Setting

This part of the study examines the effectiveness of Phone Art in fostering students' creativity. According to Dr. Salman Al Hajiri, an assistant professor who uses this technique with his students at the University of Sultan Qaboos, *"Phone Art is an artistic practice that involves using smart phone apps to create graphic illustrations and designs"*. In addition to interviewing Dr. Al Hajiri, data was collected from multiple sources, including questionnaires, interviews, and empirical observation and analysis. The integration of technology with fine arts was explored in a field setting with students engaged in Phone Art. In order to complement the empirical research with quantitative analysis, online questionnaire were distributed to a purposeful sample of participants who were trained to employ Phone Art by Dr. Al Hajiri. Twenty-three participants, fifteen female and eight male, participated in the survey. The experiment combined digital art with classic art and part of it was conducted in an art studio before

participants painted their artworks outdoors at the University. The participants used mobile phones to take photos and were then taught how to digitally manipulate these photos using the following apps: WeTransfer, ArtRage, Sketches, Prisma, Adobe Capture, Adobe Clip, Adobe Draw, Adobe Sketch, Adobe Scan, Adobe Comp, PS Express, AutoDraw, PaintCan, PicsArt, Layout, and CamScanner. The students then printed their artworks on 40 × 60 cm canvases, and used acrylic paint to add color layers and brush stroke effects and treatments. According to Dr. Al Hajiri this technique, which integrates digital art and classical art, was interesting to the participants who indicated that they were impressed by the idea. He stated that the students have learned how to install a wooden frame for the canvas and how the cloth is pulled on this wooden frame. All these skills are performed by the classical artist, and using the various apps which they have used enabled them to produce attractive results despite the fact that some of them are not artists.

Many respondents (52%, N = 11) indicated that using digital applications helped them in drawing creatively. When asked about the obstacles that they have encountered during their Phone Art experience, 52% (N = 11) of the students indicated that they did not face any obstacles, 24% (N = 5) mentioned that they encountered technical difficulties, while 14% (N = 3) of them indicated that the use of the apps distracted their attention, and also 14% (N = 3) indicated that the time was short. In addition, one of them stated: *"Some applications are specific to the Android system and cannot be installed on the IOS system"*. On the other hand, Dr. Al Hajiri suggested that not only students may face obstacles, but even he faced obstacles while trying to employ and promote this technique. He stated that he faced some resistance due to the lack of understanding of this technique, but he started writing about it and explaining it in various news articles and through conducting many workshops until people gained awareness and started to request these workshops in Oman and abroad. He also added, *"I strongly encourage professors to employ digital painting applications and experiment with them as they can open many possibilities. It is very important to introduce these techniques to students and make them part of the curriculum. The most important starting point is for professors to start using these apps and become experienced in using them and once they do, they shall be able transfer their skills to their students and employ a more digital dimension in teaching fine arts.*" Some art instructors, however, are skeptic about the usefulness of digital tools in fine art practice. According to Annum [1], *"There is documentary evidence to show that some critics expressed skepticism about the validity of using computer as a multimedia apparatus for executing paintings during its early period of inception in the 1960's. The rejection was based on the premise that the art of painting cannot be done on a computer since the device only generates digital graphical images, which are superficial, without depth and of limited artistic value* [5]. *To most traditional artists, computer art is solely a technological craft that is informatively and aesthetically deficient. To them computer generated art is for commercial considerations, dull in outlook, lack innovation and quality hence could not be given a place in fine arts* [12]*"* [1, p. 2]. Yet, Annum [1] implied that digital painters can influence public acceptance and alter the negative perceptions about digital paintings through the creation of artworks that reflect aesthetic values which are consistent with the aesthetic values of spectators. Dr. Al Hajiri, however, does not think that digital art poses a threat to traditional studio painting

techniques or that Phone Art will put an end to manual hand drawing. He stated that hand painting existed since the beginning of civilization when the primitive man drew on caves. According to him, "*Despite the evolution of civilization, the human never stopped hand drawing. Drawing, just like writing, is an intrinsic behavior which the human can never stop. Traditional and contemporary artists draw in order to express their ideas towards various aspects of life. Phone Art is also a form of drawing, but instead of using paper as a drawing surface, an electronic surface is used by the artist, which allows for faster production of artworks"*.

In addition, 52% (N = 11) of students indicated that there are advantages from using digital applications during the drawing process. One of the students mentioned that among the advantages of using digital applications in drawing is that anyone can use them through their mobile phones in order to create artworks in a very short time. Another student stated that *"the use of digital applications in the design process is easy and helpful"*. Most of the participants (76%, N = 16) indicated that they benefited from the Phone Art experiment. One student stated that he *"learned something new and enjoyable"*. Another student added, *"I benefited a lot, and learned how to use many digital applications, each of which has different features"*. When asked to rank the digital apps according to their effectiveness in enhancing creativity during the experiment, most students considered Sketches and Prisma to be the most effective, followed by PicsArt, Adobe Draw, Adobe Sketch, AutoDraw, and ArtRage. They considered the rest of the apps to be significantly less effective in enhancing their creativity (Fig. 1).

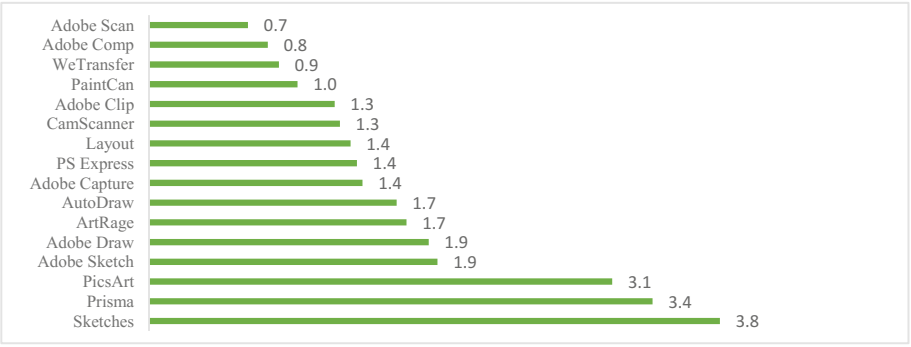

Fig. 1. Rankings of the digital apps according to their effectiveness in enhancing creativity during the Phone Art experiment

Most of the students (57%, N = 12) supported the integration of art and digital applications, thus stressing Dr. Al Hajiri's statement that Phone Art is a new means of practicing art and is considered very close to the younger generation of artists due to their proximity to smart devices and constant use of technology. He believes that these devices allow them to get inspirational ideas at all times and to practice art beyond the limited space of the art studio; while they are in waiting areas, on their way out of lectures, or while they are in restaurants with their friends they can still record their ideas and save their plans in their devices. They can then access this data anytime and

anywhere. In the next study, the same advantage of saving and storing data is also suggested by some of the participants, who expressed their preference to use digital apps rather than papers to sketch their ideas. Furthermore, Annum [1] suggested additional advantages for the use of digital tools for art practice: *"it has most importantly the advantage of the ability to undo and redo applied strokes. The digital painter also has at his or her disposal several tools not available to the traditional painter. The virtual palette for example consists of millions of colour shades from which to choose. He also has the ability to obtain any size of canvas on which to paint […] Studio painters who are not comfortable with acrylics and also suffer allergic reactions to turpentine, a major solvent for oils, can now heave a sigh of relieve since the computer multi-medium apparatus offers a positive alternative for artistic exploration.*" [1, p. 7]

As a result of all the above-mentioned advantages, Dr. Al Hajiri believes that Phone Art enhances students' creativity and their ability to invent technical and artistic solutions through the employment of the various tools provided in digital apps. He suggests that these tools and features encourage the artist to propose and try many ideas, and to draw and paint recurrently and comfortably without calculating the expenses, and without fear of the loss that may result from spoiling the canvas, or damaging the paper as in the case of painting. Thus, Phone Art enhances creativity through allowing for recurrent exploration and production, and also through allowing these digital artworks to be published through social media.

3.2 Second Experimental Design and Setting

This study examines the effectiveness of repurposing digital and social media applications for the purpose of enhancing creativity in design. It was conducted in an experimental classroom setting in a computer lab, and involved 42 students (9 males and 33 females) enrolled in a course titled The Art of Digital Illustration. Their ages ranged between 19 and 23 years and they were in their second academic year. They were engaged for 4 h in a series of learning activities with the ultimate objective to design a unique cartoon character (Table 1). Throughout the different stages of the experiment, students were instructed to use a number of applications including Instagram, Tumblr, Pinterest, Mindly, Reverse Image Search, and My Idol. After the class ended, students filled a questionnaire and were then interviewed by the researchers. The students were also advised to continue posting any photos, videos, or indicators of progress in their character designs, in Tumblr (https://uob-funoon.tumblr.com), after the classroom. In tandem, content analysis was conducted of their engagement (posts, comments, and likes), which was observed and analyzed by the researchers for two months until they submitted their character designs as part of the final project for the course. These were then correlated to the survey findings.

When asked to brainstorm at the beginning of the experiment, most respondents (94%, n = 30) indicated that they used Pinterest to draw inspiration. Instagram (41%, n = 13) and Google Images (41%, n = 13) were used by some, followed by Tumblr (31%, n = 10). Only few students used Google+ (16%, n = 5), Mind Map (13%, n = 4), You Tube (9%, n = 3), Whatsapp (6%, n = 2), Behance (3%, n = 1), and Facebook (3%, n = 1) respectively (Fig. 2). This greater preference score for Pinterest is again emphasized by the survey results when students were asked about the

Table 1. The stages of the experiment, which involved a series of learning activities

Activities	Duration	Description
Non-directed brainstorming	10 min	Students use a digital app of their choice to get inspired and generate ideas for the character
Mind-mapping	4 min	Students use **Mindly** to choose a name for their character and write the traits and features
Directed brainstorming	10 min	Students use **Pinterest** to get inspired
Sharing mind maps	5 min	Students share their mind maps through **Tumblr**
Peer feedback on mind maps	5 min	Students write their suggestions and feedback on their peers' mind maps through **Tumblr**
Sketching	15 min	Students sketch their characters on paper
Sharing sketches	5 min	Students share their sketches through **Tumblr**
Peer feedback on sketches	10 min	Students write their suggestions and feedback on their peers' sketches through **Tumblr**
Searching for a source	5 min	Students use **ReverseImageSearch** to get a source similar to their character
Drawing	1 h	Students draw characters on paper or on Adobe Illustrator
Sharing drawings	5 min	Students share their character drawings through **Tumblr**
Peer feedback on drawings	10 min	Students write their suggestions and feedback on their peers' drawings through **Tumblr**
Drawing expressions and actions	1 h	Students use **MyIdol** to draw the expressions, movements and actions of their characters
Sharing expressions and actions	5 min	Students share their character expressions, turnarounds, and actions with their peers through **Tumblr**

applications they will use again in the future; (97%, n = 31) indicated that they will use Pinterest, (67%, n = 21) will use Tumblr, and (44%, n = 14) will use Mindy. Only few students indicated that they will use Myidol (16%, n = 5) or Reverse Image Search (13%, n = 4) again.

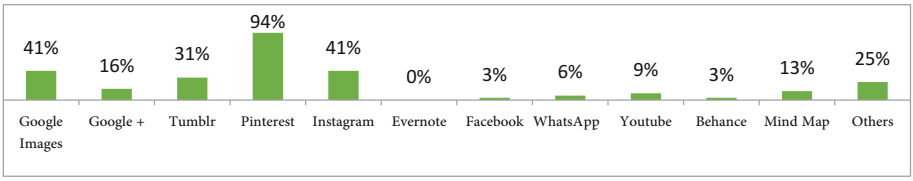

Fig. 2. Rankings of the applications that students used to get inspiration when asked to brainstorm in the beginning of the experiment (respondents were allowed to choose more than one app).

It is worthy to note that students considered Pinterest and Instagram to be the most effective in getting ideas, followed by Tumbler and Mindly, respectively (Fig. 3). Other apps were considered less effective in stimulating creative ideas in drawing characters. Apparently, students have a preference to look for new ideas in a collaborative environment like Pinterest because *"It creates spaces for lightweight social engagement and collaboration that simultaneously enable independent work and access to others' ideas"* [10, p. 9]. Moreover, Pinterest allows a variety of activities such as collecting, discovering, collaborating and publishing, which make it popular and social.

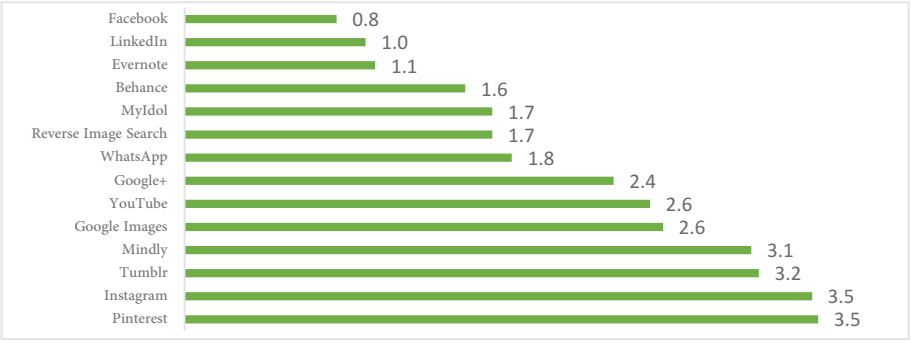

Fig. 3. Rankings of apps according to their effectiveness in generating creative ideas for character design

This idea is emphasized by Linder, Snodgrass, and Kerne [10, p. 9] who consider Pinterest as a social and collaborative platform which enhances creativity due to its "secret" boards that can be seen only by the user, which remove fear of evaluation, while enabling positive feedback; *"Pinterest provides a sense of unevaluated workspace. In curating, our participants ironically felt nearly anonymous. Users feel free to work on Pinterest without judgement, in contrast to social networks like Facebook and Twitter."* This anonymity and sense of privacy in generating and incubating ideas is similar to "incubation", which is the second stage of the four stages (preparation, incubation, illumination, and validation) of Graham Wallas' creative process model [14]. The boards in Pinterest may also make this platform preferable because they are reminiscent of mood boards, which are considered an ideation or brainstorming tool that helps in gathering *"aesthetic cues for future designs"* [3]. Another feature that might have led to higher preference scores for Pinterest is Pins, which allow users to collect inspirational images. Similarly, Instagram allows the user to "collect" inspirational images by saving them to collections. In a survey conducted by Linder, Snodgrass, and Kerne [10], the majority of participants, saw pins as ideas and referred to collecting Pins into boards as "ideas". This finding is interpreted by the researchers to mean *"that forming and presenting ideas is essential to how everyday ideators use Pinterest as a social medium of curation […] Pins enable ideation, revealing previously unknown concepts and approaches. Everyday ideators use Pinterest to be inspired, not only by newfound ideas, but also by others engaged in everyday design in*

unexpected ways" [10, p. 5]. This is also suggested in a study by Langefels [8, p. 30] where participants uniquely preferred Pinterest in comparison to other social media platforms. The participants expressed, in reference to the pins in Pinterest, "*that they enjoyed the ability to search more easily and collect images to be able to re-visit later"* [8, p. 30]. Langefels also suggested that allowing for the quick and easy search, collection, organization, retention, and sharing of ideas is considered a "unique functionality" in Pinterest [8].

Another factor which might have affected the students' preferences is that Pinterest and Instagram have a "picture-dominant" interface. Langefels' study [8] suggested that an image-dominant interface was a key driver in users' preference to browse through Pinterest instead of other social media. This also applies to Instagram, which relies mainly on visuals and has little menus and buttons. This minimizes distraction and increases the fluidity of interaction as emphasized by Igarashi [6] who indicated that "*Nested menus, arrays of buttons, and dialog boxes interfere with the flexible exploration"* (p. 1). The predominance of visuals seems to be a common feature among Instagram and Pinterest, which the students considered most preferable in generating creative ideas. Other common features among these apps are the social aspects which include sharing, getting feedback, likes, and comments. According to Langefels [8] picture-dominant interfaces could be perceived as more social. This is also emphasized by Lee [9] who suggests that social aspects play an important role in driving loyalty, and that Pinterest has some social aspects that allow users to connect with people who inspire them. Sheldon and Bryant [11, p. 95] seem to agree with Langefels [8] and Lee [9] as they also refer to picture-dominance and link it to creativity: "*There are ample opportunities for users to portray their creative talents on Instagram. Instagram allows users to apply filters to pictures in order to make their posts appear "artsy." Also, Instagram users have the option to post creative captions and hashtags. One potential reason that "Creativity" as a motive came about in this study is due to the fact that Instagram is a visually-based social networking site. While other forms of SNSs have many different features such as status updates, video sharing, and more, Instagram primarily focuses on pictures."* Among the social aspects specified by Lee [9], sharing seems to be especially noteworthy as 43.75% (n = 14) of the surveyed students in this study indicated that there are advantages for sharing their designs through social media, and 43.75% (n = 14) indicated that there are advantages to a certain extent, while 12.50% (n = 4) indicated that there are no advantages. This reflects an increasing awareness among students of the importance of sharing their artworks in enhancing their creativity, and stresses the findings of prior studies, which have noted the importance of sharing work in enhancing creativity. Kim, Agrawala, and Bernstein [7] attempted to promote the idea of designing creative communities that allow creators to share their work in progress rather than just sharing finished work; *"By designing an environment that rewards sharing early work and clear explanations, instead of just rewarding good outcomes, we may create opportunities for creators to not only learn specific techniques from each other but also enable them to reflect more effectively on their own work"* [7, p. 1]. In addition to the sharing feature, the "explore" feature in Instagram and Pinterest may also explain the students' preference scores because this features allows for *"the rapid exploration of alternatives",* which Gross and Do [4, p. 1] mentioned in their research as an important feature in creative interfaces.

When the surveyed students were asked about the extent to which multimedia applications help generate creative ideas for cartoon character design, 46.88% (n = 15) of them answered "To a great extent", 53.13% (n = 17) answered "To some extent", and nobody answered "not at all". However, the majority of students (84.38%, N = 27) generally think that technology enhances creativity, and also the majority of them (78%, N = 25) found the experiment useful. Despite the aforementioned role of technology and multimedia-based pedagogical approaches in enhancing creativity, there are some obstacles which may be encountered either by the students or their instructors while implementing these approaches. When the students were asked if they encountered obstacles while trying to generate creative ideas through multimedia-supported learning, only two students stated that they faced obstacles. Some students (41.18%, n = 7) stated that the dispersion of attention and shortage of time hindered their work, and only one student stated that technical difficulties hindered his work during the experiment. Another remark which some of the students mentioned is that *"they found it easier to compose hand-written mind maps because using their hands does not obstruct the flow of their creative thoughts"*. However, the rest of the students said that they preferred using Mind Map, because it allows them to save their mind maps without having to worry about losing them. However, due to the exposure to others' ideas while using social media platforms to get inspired, there are increased chances of plagiarism. Concurrently, however, there are increased chances for instructors to detect plagiarism through the same platforms. Pinterest, and many image search apps allow instructors to capture a student's artwork or design and search for similar images on the internet. Regardless of the aforementioned obstacles, there are a number of advantages related to repurposing social media for educational purposes. Through an interpretive analysis of the engagement (posts, likes, comments) on Tumblr in addition to field notes and transcripts of the interviews, the researchers observed that the use of Tumblr to share and provide peer feedback introduces new affordances for peer-supported learning and enables more effective collaboration and improvement of students' work-in-progress. Students were able to reflect on their works and creative processes with their peers through feedback, which enabled them to identify gaps between their creative ideas and plans and how others perceive their execution of these ideas. Moreover, the use of Tumblr to post students' work-in-progress allows them to document their creative processes and artistic journeys. Some of the students, for instance, posted video break-downs that displayed their progress. This documentation helps other students learn from other students' processes, experiences, and the feedback received online either from followers, peers, or the instructor. It also helps the instructor guarantee that the student did not get the assignment done by another person.

4 Conclusion

The main research question, "How can digital applications and social media platforms be repurposed and harnessed to promote a creative mindset in art and design students?" was investigated deeply and meaningful findings and conclusions were extracted from the information provided by fine arts and graphic design students who were involved in two multimedia-based experimental settings. The paper developed a new understanding

of how social and digital media can support art and design educators in their pedagogical endeavors and leverage students' creativity. It demonstrated the potential benefits of repurposing social and digital media applications for educational purposes, and discovered that social and collaborative platforms can foster students' creativity due to a number of factors and features that are imbedded in these platforms including sharing, exploring, commenting, and collecting inspirational images. Therefore, students particularly preferred using Pinterest and Instagram while brainstorming possibly because these applications contain all the previously mentioned features in addition to their interface, which is "picture-dominant". On the other hand, students' use of a number of digital painting applications as a complementary technique to hand-painting, allowed them not to only enhance their creativity but also reflect on their creative artmaking process. The preferences of the participants and their patterns of interaction with a number of digital and social media applications in art and design educational contexts, which were interpreted through this study, can offer several considerations for educators and students in the future. First, by providing educators with insights to the most effective digital applications that they can employ to enhance their students' creativity. Second, by providing ways in which students can repurpose these applications to aid them in the creative process of producing their artworks. This paper focused specifically on illustration and painting, but the discussed preferences and patterns may generalize to learning environments centered around many creative domains including media, film, photography, animation, interior design, and architecture. Further follow-up studies would provide additional ways of approaching the research topic to discover the visual, technological, social, or educational factors that influence the participant's usage and preferences of social media platforms and various digital tools in creative tasks and contexts. Valuable insight could be gained by looking deeper into the ways students and even artists and graphic designers connect and interact with social media, and with the potential to suggest ways to improve these apps or develop new ones that may reach increased or even specific usage by designers and artists.

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