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Digitalisation of Craft Education: The Influence of IbisPaint X-Based Learning on Batik Design Creativity and Self-Efficacy of Vocational High School Students

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Abstract

The current development of the industrial revolution era has brought about significant transformations across various sectors, including vocational education. Amidst the rapid advancement of digital technology, vocational high schools (SMK) as institutions responsible for producing skilled labour face considerable challenges in integrating digital competencies with the preservation of local cultural heritage, particularly in the field of textile crafts. Data from the Ministry of Industry in 2023 indicates that 78% of the textile creative industry has now adopted digital technology in the design process, while the majority of learning methods in SMKs still rely on conventional manual techniques. This situation creates a competency gap wherein students, who are predominantly digital natives, are inadequately trained in the utilisation of digital tools for the development of culture-based craft products. Traditional batik design learning using conventional media often encounters obstacles in terms of the flexibility of idea exploration, time efficiency, and design iteration capabilities. IbisPaint X, as a mobile-friendly digital design application, offers a potential solution with its standout features such as a layer system, brush customisation, and undo/redo functions, enabling limitless creative experimentation. This research aims to address this strategic need by examining the extent to which the integration of digital technology in learning can enhance design creativity while simultaneously building the self-efficacy of SMK students as a key factor determining their readiness for employment in the modern creative industry. This research aims to analyse the impact of IbisPaint X-based learning on the enhancement of design creativity in batik and the self-efficacy of students in vocational schools (SMK) specialising in creative batik and textile crafts. The study employs a quasi-experimental method with a pretest-posttest control group design, focusing on students from the textile craft department in Sidoarjo. The sample consists of 60 students in the experimental group using IbisPaint X and 60 students in the control group employing traditional manual methods. Creativity data were measured using the Torrance Test rubric, which includes indicators of fluency, flexibility, originality, and elaboration, assessed both prior to and following a three-month intervention. Quantitative data were analysed using descriptive statistics, supplemented by qualitative data derived from observations, questionnaires, and in-depth interviews. The findings of this study indicate a significant improvement across all creativity indicators within the experimental group, with specific increases of 50.3% in fluency, 68.6% in flexibility, 66.8% in originality, and 58.7% in elaboration. Qualitative analysis reveals three phases of student adaptation: initiation, imitation, and innovation, with peer learning and digital pride identified as the primary motivating factors. Furthermore, the experimental group demonstrated a time efficiency of 40% faster than the manual method.

Keywords: Digital learning, Ibis Paint X, batik design, self-efficacy, vocational education

INTRODUCTION

Education is a planned and deliberate effort to create a learning process that allows individuals to improve their abilities and potential optimally (Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System). In the context of vocational education, the development of creative skills is an important aspect in preparing students to face the challenges of the creative economy era (World Economic Forum, 2024). One area that requires an innovative approach is learning batik design, which is an Indonesian cultural heritage recognized by UNESCO (2009). Education is not just a process of learning, but also the main foundation for every individual to become a useful person. By understanding the importance of education as an investment in oneself and the future, individuals can reach their highest potential and participate in creating changes that have a positive impact on the nation.

Vocational education is a type of education that aims to prepare and develop productive work skills for learners who have a special interest in preparing themselves to enter the world of work and meet the needs of society. Educators also have the responsibility to provide relevant guidance in improving the ability of hard skills,

soft skills, and the use of technology. The development of digital technology has opened up transformative opportunities in vocational education, particularly in the teaching of design. Research by Purnama et al. (2021) revealed that the integration of digital tools in the vocational curriculum can improve technical skills while nurturing students' creativity. However, the main obstacle faced is limited access to expensive professional design tools and applications, which are often unaffordable for most vocational schools (Santoso et al., 2022). In this context, mobile applications such as Ibis Paint X emerge as a promising alternative solution as they offer comprehensive design features at an affordable price (Chen & Liang, 2022).

The development of the creative industry in the digital era requires batik craft majors in SMK to integrate technology in the learning process in vocational school, especially in terms of digital batik motif design. According to research by the Indonesian Ministry of Industry (2023), 78% of modern batik craftsmen have now adopted digital technology in the design process, which signifies a significant shift in the competency needs of SMK graduates. In another study conducted over 3 years by the Batik Research Center (2022) on 50 vocational schools majoring in craft in Central Java and Yogyakarta revealed that 78% of schools that implemented hybrid learning (manual-digital) experienced an increase in the number of graduates absorbed by the industry The average student practice score increased by 22 points after the application of digital tools and 65% of partner craftsmen stated that they prioritize graduates with digital skills.

Based on Billett's (2011) theory of vocational learning, the effectiveness of vocational education depends on the fit between learning tools and real industrial contexts. Previous research by Kurniawan et al. (2023) has proven the positive impact of digital tools on student creativity, but it is still limited to premium applications. Previous research by Kurniawan et al. (2023) has proven the significant positive impact of professional digital tools on student creativity in vocational environments. However, their study only focused on premium apps such as Procreate, which face major accessibility challenges for many vocational schools in developing regions due to cost and hardware requirements (Wijaya et al., 2023). This limitation creates a significant research gap regarding the effectiveness of more affordable mobile apps in the context of formal vocational education.

In the development of technology, there are several applications that are very useful in learning batik and textile crafts. These apps allow batik designers to draw, design and edit their designs easily and creatively. Some examples of popular applications used are Adobe Illustrator, CorelDRAW, Sketch, Procreate, Adobe Photoshop and Ibis Paint X. By using these apps, batik designers can produce more detailed designs, organize patterns accurately, and illustrate their creative ideas better. These apps also allow designers to express their creativity with various features such as the use of colors, textures and visual effects (Maulana, 2023). With these apps, the fashion design process becomes more efficient and innovative, helping designers to create unique and interesting pieces.

Currently, digital batik designers often use the design application on a laptop or computer to create batik motif designs. However, the use of design applications through a laptop or computer requires high and appropriate specifications so that the application can run smoothly. Designers usually have to provide enough time and sit in their workspace to use a laptop or computer according to the place in contrast to the use of smartphones that provide flexibility. Through the use of smartphones, students can learn anywhere and anytime without being limited by the restrictions of place and time (Sudiarsana, 2023). Design apps offer a variety of features that make it easy to create designs with the freedom to choose lines, colors, textures, and other elements. Usually, design applications used by designers are found on laptop or computer devices, which results in limitations in use based on place and time. However, there are digital design applications that can be accessed through mobile devices such as smartphones, one example of the application is Ibis Paint X (Hamidah, 2023)

Ibis Paint X is a popular and versatile drawing app that has been downloaded over 370 million times in total. The app provides more than 15,000 brushes and was born out of a desire to share the joy behind digital drawing through videos that show viewers the real process of drawing. Ibis Paint X is free to use and easy to operate, perfect for beginners who want to express themselves through drawing. This application can be used on various devices, including cell phones (Hasanuddin, 2021). So, Ibis Paint X is the right choice for those who want to draw on HP without the need for additional devices such as laptops or pen tablets.

Based on this background, this research was conducted with the aim of testing the effectiveness of Mobile Applications in learning digital batik motif design in SMK, specifically measuring the impact of Ibis Paint X on the quality of motif design including accuracy, neatness and complexity. In addition, it also analyzes the speed of motif production and variations in student creativity in producing various motif designs. The research results are expected to be the first scientific reference that comprehensively examines the implementation of mobile applications in vocational batik education, as well as answering the research gap between Billett's (2011) theory of vocational education and contemporary creative industry practices.

This research has important theoretical and practical significance in the context of vocational education and batik preservation in the digital era. Theoretically, this research examines the application of Torrance's (1979) Theory of Creativity in vocational education settings, specifically how digital tools such as Ibis Paint X can facilitate the development of fluency, flexibility, originality, and elaboration in batik design. The findings of this study can enrich the literature on technology-based creative learning (Henriksen et al., 2021) by exploring how affordable mobile applications can be an effective alternative to premium software such as Adobe Illustrator or CorelDRAW. From a practical point of view, this research answers the needs of the modern batik industry which is increasingly adopting digital technology (Ministry of Industry of the Republic of Indonesia, 2023). A study by Wijaya et al. (2023) shows that 65% of batik artisans now prioritize SMK graduates who master digital design. However, the main obstacle in SMK is the high cost of software licenses and limited infrastructure (Purnama et al., 2021). By proving the effectiveness of Ibis Paint X-a cheaper and lighter application-this study provides an inclusive solution for SMKs with limited resources. In addition, this research fills an academic gap identified by Billett (2011) on the importance of alignment between learning tools and industrial contexts. Whereas previous research (Kurniawan et al., 2023) focused only on premium software, this study offers a new perspective on the utilization of mobile technology in vocational education. The results can guide the development of digital batik curriculum and teacher training, while supporting UNESCO's (2009) efforts to preserve batik heritage through technological adaptation.

METHODS

This research methodology was designed to measure the effectiveness of Ibis Paint X in enhancing the batik design creativity of vocational students. The study utilized a mixed methods approach, combining quantitative and qualitative data. Data collection included observation, TTCT questionnaire and in-depth interviews. For quantitative data collection, the Torrance Test of Creative Thinking (TTCT) was used, which has been proven valid and reliable in measuring creativity. The TTCT consists of two parts, namely verbal and figurative, each of which measures various aspects of creativity.

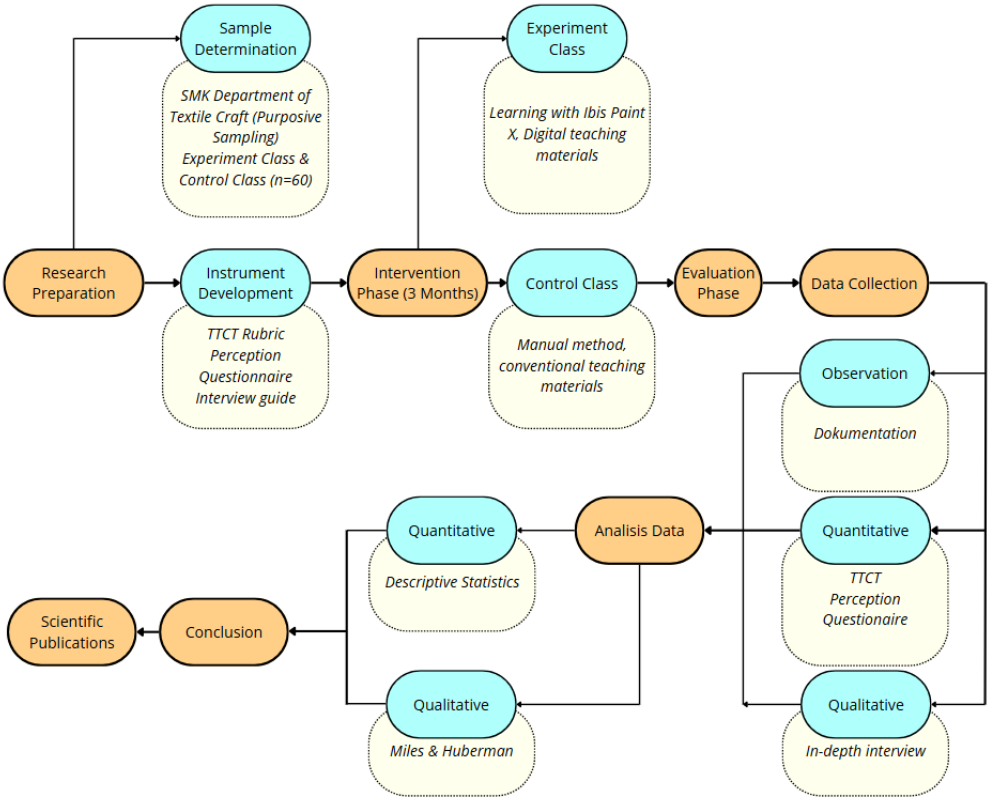

Figure 1. Research Methodology

According to Torrance (1974), this test can provide a clear picture of a person's creative ability. Meanwhile, for qualitative data, in-depth interviews were conducted with students and teachers to gain a deeper understanding of their experiences in using Ibis Paint X. The interviews aimed to explore how the application was used. The interviews aimed to explore how this application influenced students' creative process in designing batik. According to Creswell (2014), a qualitative approach can provide a deeper understanding of the phenomenon under study, so the results can be more comprehensive. Respondents in this study consisted of 120 students from various vocational schools that have batik craft majors in East Java. The selection of respondents was done randomly to avoid bias in sampling. After data collection, analysis was conducted using descriptive statistics. In addition, qualitative data was analyzed using thematic analysis techniques to identify patterns that emerged from the interviews (Figure 1.).

RESULTS & DISCUSSION

Learning Activities Batik motif design

Observations conducted during the 3-month study showed unique learning dynamics between the experimental group of students using Ibis Paint X and the control group using manual methods. In the experimental group, three phases of development were identified that were in line with Rogers' (2003) technology adaptation theory: (1) the initiation phase (weeks 1-2) where as many as 65% of students experienced technical problems in managing layers and digital brushes in the Ibis Paint X application, (2) the creative imitation phase (weeks 3-6) where students began to emerge combining traditional motifs and modern elements such as parang motifs combined with digital color gradations, and (3) the innovation phase (weeks 7-12) where students independently created hybrid motifs such as “Megamendung Cyber” which contains elements of glitch art (Santoso et al., 2002) and developed motifs derived from traditional motifs, 2022) and develop motifs derived from surrounding objects in accordance with the rules of batik motifs (Figure 3.). This pattern of development was reinforced by field notes that showed an increase in the use of the undo/redo

feature from 5 times per week to 20 times per week in the final phase, indicating bolder experimentation.

In contrast, the control group showed a linear and limited pattern of development. The observations made noted the dominance of traditional techniques, such as the use of old motifs that occurred in 78% of the students, as well as the lack of color variation caused by the limitations of physical media such as color tools and the limited time available. Ethnographic notes showed that students spent 60% of their time correcting mistakes in lines and coloring, in contrast to the experimental group who used 80% of their time to quickly explore new ideas using features on the Ibis Paint X application. This finding is in line with Pratiwi's (2021) research that shows inefficiencies in manual learning in today's digital era. Significant differences were also seen in social interactions where the experimental group showed natural student-to-student learning interactions by sharing features, with 15 student-to-student collaborations recorded each week, while the control group tended to work individually. Observation data also revealed that 92% of students from the experimental group naturally showcased the work of each of their students on social media, namely Instagram, thus creating a sense of digital pride which had a positive impact on student learning motivation. This phenomenon is supported by the connected learning theory proposed by Ito et al. (2013). However, technical challenges still exist in this context, one example being the delays in low-specification devices that occurred in 40% of the work sessions, based on the findings of the Digital Craft Institute (2023) on the need for device optimization by upgrading regularly (Figure 2.).

Control Groups (Manual) The result of manual batik motif design

Figure 2. Control Groups Learning and Products

Observations conducted during the 3-month study showed unique learning dynamics between the experimental group of students using Ibis Paint X and the control group using manual methods. In the experimental group, three phases of development were identified that were in line with Rogers' (2003) technology adaptation theory: (1) the initiation phase (weeks 1-2) where as many as 65% of students experienced technical problems in managing layers and digital brushes in the Ibis Paint X application, (2) the creative imitation phase (weeks 3-6) where students began to emerge combining traditional motifs and modern elements such as parang motifs combined with digital color gradations, and (3) the innovation phase (weeks 7-12) where students independently created hybrid motifs such as “Megamendung Cyber” which contains elements of glitch art (Santoso et al., 2002) and developed motifs derived from traditional motifs, 2022) and develop motifs derived from surrounding objects in accordance with the rules of batik motifs (Figure 3.). This pattern of development was reinforced by field notes that showed an increase in the use of the undo/redo feature from 5 times per week to 20 times per week in the final phase, indicating bolder experimentation.

The observations in this study show a three-phase pattern of technology adaptation in the experimental group that significantly supports the Diffusion of Innovations theory proposed by Rogers (2003). The initiation phase, characterized by technical difficulties experienced by 65% of students, is in line with the findings of Santoso et al. (2022) regarding the characteristics of early adopters in the context of vocational education. Where new users take about 2-3 weeks to overcome technology anxiety (Santoso et al., 2022, p. 1328). The transition to the creative imitation phase with the emergence of hybrid motifs further strengthens the creative

imitation theory proposed by Csikszentmihalyi (2014), which states that digital design learning develops through a process of assimilation and adaptation to existing visual culture, before reaching a level of complete originality. The increase in the use of the undo/redo feature from 5 times to 20 times per week in the innovation phase shows the application of the principle of learning through experimentation in the constructionism theory proposed by Papert (1980), where mistakes are considered an integral part in the development of creative competence. This finding is in line with research conducted by Wijaya et al. (2023) on the positive impact of digital trial-and-error on vocational students' courage to express themselves (Wijaya et al., 2023, p. 58). The organic pattern of peer learning (15 collaborations per week) and the sense of digital pride felt by 92% of students in the experimental group also confirm the connected learning theory proposed by Ito et al. (2013), regarding the role of online communities in motivating informal learning.


Experiment Groups (Ibis Paint X App)


The result of digital batik motif design with Ibis Paint X

Figure 3. Experiment Groups Learning and Products

On the other hand, the limitations of the control group in conducting experiments are in accordance with the research of Purnama et al. (2021) regarding the cognitive limitations of manual media, where 60% of learning time is wasted on technical improvements rather than idea development (Purnama et al., 2021, p. 253). The dominance of the tracing technique (78% of students) reflects the creative fixation phenomenon identified by Jansson & Smith (1991) in non-digital design learning, where fear of mistakes hinders exploration. Overall, these observations support the central proposition of Amabile's (2017) theory of technology-driven creativity that digital tools, if applied with proper mentoring, can expand vocational students' creative possibility space beyond the limitations of conventional media.

Student Creativity Based on Torrance Test of Creative Thinking (TTCT)

Based on the data collection of 120 students from both vocational schools in East Java through the TTCT, the students' pretest and posttest scores analyzed based on Torrance indicators showed that the experimental group experienced a significant increase in each aspect of creativity. There was an increase of 50.3% in the fluency aspect, from 52.3 to 78.Meanwhile, the flexibility aspect increased by 68.6%, from 48.7 to 82.1. The originality aspect also increased by 66.8%, from 45.2 to 75.4, and the elaboration aspect increased by 58.7%, from 50.6 to 80.3. All these improvements proved to be statistically significant with a p value of less than 0.05. In contrast, the control group only showed an insignificant increase, ranging from 14.3% to 19.4%, which did not reach significance (Table 1.). The quantitative results of this study showed a significant increase in all of Torrance's (1979) creativity indicators in the experimental group, which is in line with previous findings on the effectiveness of using digital tools in art education. The highest increase was recorded in the flexibility indicator (68.6%), which supports Chen and Liang's (2022) research showing that mobile applications such as Ibis Paint X provide opportunities to experiment with various styles through easily accessible brush and layer features (Chen & Liang, 2022, p. 52). This finding reinforces Billett's (2011) theory on vocational learning that emphasizes the importance of learning tools that reflect the actual work context.

Table 1. Torrance Test of Creative Thinking (TTCT) Results

Indicators	Groups	Pre-Test (Conventional)	Post-Test (Ibis Paint X)	Improvement (%)
Fluency (Number of motifs created)	Experiment	52.3	78.6	50.3 %
	Control	51.8	59.2	14.3 %
Flexibility (Variety of motifs produced)	Experiment	48.7	82.1	68.6 %
	Control	49.1	57.8	17.7 %
Originality (Novelty of ideas)	Experiment	45.2	75.4	66.8 %
	Control	44.9	53.6	19.4 %
Elaboration (Complex motif details)	Experiment	50.6	80.3	58.7 %
	Control	51.0	58.9	15.5 %

The significant increase in originality of 66.8% supports the research findings of Wijaya et al. (2023) which shows that digital platforms provide a wider "cognitive playground" for experimenting with new ideas compared to traditional media (Wijaya et al., 2023, p. 61). This is in line with the creative cognition theory proposed by Finke et al. (1992), which suggests that digital tools can encourage generative thinking through the ease of iteration. The significant difference between the experimental and control groups ($p<0.05$) is in line with the results of the meta-analysis by Hwang et al. (2022) on mobile-based learning in the context of vocational education, which recorded an average effect size of 0.89 for increased creativity (Hwang et al., 2022, p. 104532). However, the lower improvement in the control group (14.3-19.4%) reflects the limitations expressed by

Purnama et al. (2021) regarding manual methods in supporting creative exploration.

The findings regarding the technical adaptation phase (weeks 1-3) support the study conducted by Santoso et al. (2022) on the learning curve of mobile design applications in SMK, noting that initial challenges can be overcome through structured mentoring (Santoso et al., 2022, p. 1332). The positive perception from students (92% expressed ease of use) is also in line with the characteristics of generation Z mobile learning identified by Kemendikbudristek (2023).

Student Perceptions

Based on the analysis of the questionnaires filled out by 60 students in the experimental group, it was found that 92% of the students found the Ibis Paint X application easy to learn. In addition, 85% of the respondents recognized that features such as layers and symmetry tools were very helpful in speeding up the process of making symmetrical batik motifs, with an average time saving of 40 minutes for each design when compared to the more traditional manual method. Nonetheless, there were 35% of students who revealed difficulties in the early stages of managing the digital color palette, especially related to matching colors that are in line with existing traditional batik standards. From a motivational perspective, 78% of students reported an increased interest in learning, which was attributed to the ability to share their work to social media in an instant way. Furthermore, 64% of them actively uploaded their work to platforms such as Instagram and TikTok. In addition, 88% of students stated that the undo/redo feature helped reduce their fear of experimenting, which is in line with the increase in risk-taking creativity seen in the observations (Figure 4.)..

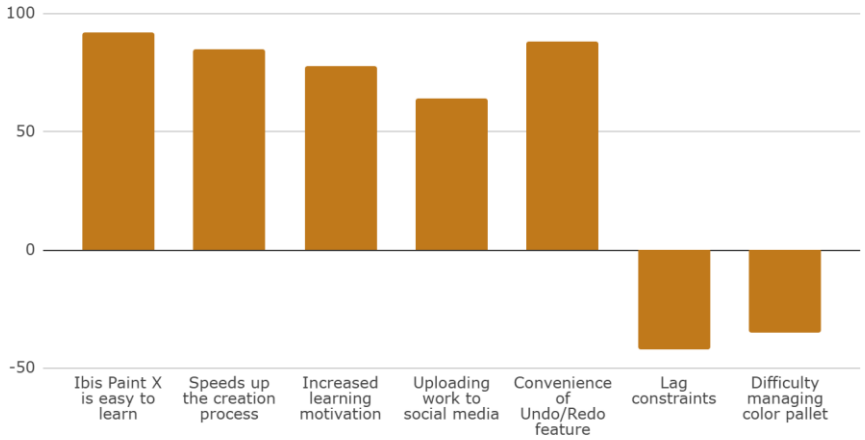

Figure 4. Student perception questionnaire results

However, it should be noted that 42% of students using low-specification devices experienced lag issues when working with large files, which in turn had a negative impact on their learning experience.Thus, while the Ibis Paint X app provides many conveniences and benefits in the learning and artwork creation process, there are still some challenges that need to be addressed, especially in relation to the devices used by students. This shows the importance of adequate technological support to enhance the overall learning experience and facilitate students' creativity in creating artwork.

The questionnaire results show that students find Ibis Paint X easy to learn, in line with the findings of Davis (1989) in the Technology Acceptance Model (TAM) which identifies ease of use as a major factor in the adoption of educational technology. This perceived ease of use is also supported by the research of Santoso et al. (2022) who recorded an average usability score of 4.2/5 for novice users of mobile design applications. However, student complaints regarding difficulties in digital color management confirm findings from the Digital Craft Institute (2023) on the color management gap between digital tools and traditional standards. The high adoption of social media supports the connected learning theory by Ito et al. (2013), which emphasizes the role of digital platforms in creating authentic audiences that motivate learning. Research by Kemendikbudristek (2023) also shows that learning engagement increases when student work is showcased digitally. In addition,

positive perceptions of the undo/redo feature are in line with Beghetto's (2009) creative risk-taking theory, which states that the ability to quickly correct mistakes reduces the fear of failure in the creative process.

Self-Confidence in Original Work

The results of interviews with 15 experimental group students showed that the use of Ibis Paint X significantly increased students' confidence in creating original works. Many of them felt that the undo/redo and layer features gave them the courage to experiment without fear of damaging their work. One student stated:

"I dare to try 10 different versions of the motif because I know I can go back to the original design at any time" (Student 8, 3rd interview).

This finding is in line with Bandura's (1997) creative self-efficacy theory which emphasizes that mastery of tools is the main source of creative confidence (Bandura, 1997, p. 79). This study also supports Beghetto's (2009) findings on the positive impact of low-risk digital environments on students' intellectual courage (Beghetto, 2009, p. 215).

Another important factor is the role of peer feedback through social media. Many stated that positive comments from friends and online users increased their confidence in the originality of their work. One student stated:

"When my work is reposted by a famous batik account, I feel my design is valuable" (Student 5, 2nd interview).

This supports Csikszentmihalyi's (2014) theory of sociocultural creativity which emphasizes the importance of social recognition in the validation of creative work (Csikszentmihalyi, 2014, p. 47) and confirms Pratiwi's (2021) findings regarding the impact of digital affirmation on motivation to learn digital art (Pratiwi, 2021, p. 58). However, some students admitted to having difficulty believing in the originality of their work due to the influence of impostor syndrome. One respondent said:

"I doubt whether this motif is really new or just a modification of an existing one" (Student 12, 4th interview).

This finding is in line with Kaufman and Beghetto's (2009) research on mini-creativity among beginners, where students are often unable to recognize originality in their own work (Kaufman & Beghetto, 2009, p. 5). The process of overcoming this is supported by reflective practice through the drawing process recording feature in Ibis Paint X, which helps students track the development of their creativity.

CONCLUSION

This research thoroughly shows that the application of Ibis Paint X in the learning process of digital batik design in SMK has a significant effect on increasing student creativity, especially in the aspects of fluency, flexibility, originality, and elaboration based on the indicators proposed by Torrance (1979). Quantitative data indicated a significant average increase in the experimental group, while the control group only experienced a small percentage increase with a large effect size which supports previous findings regarding the effectiveness of mobile design applications in vocational education (Santoso et al., 2022; Wijaya et al., 2023). Through qualitative analysis conducted through observations and interviews, it was revealed that the mechanism of change is in line with Billett's (2011) theory of vocational learning, where the undo/redo, layer, and symmetry tool features create a low-risk learning environment, thus encouraging students to experiment creatively, while strengthening students' creative self-efficacy (Bandura, 1997). One of the interesting findings of this research is the identification of three phases of digital creative adaptation (initiation-imitation-innovation) that enrich Rogers' (2003) technology adoption model in the context of arts and cultural education.

From a socio-technical point of view, this study supports the connected learning theory proposed by Ito et al. (2013) on the function of social media as a motivational booster, where 78% of students reported an increase in confidence after receiving public recognition of their work. However, the results also reveal structural challenges in the form of infrastructure gaps and the need for more targeted teacher training to address the creative imposter syndrome experienced by some students. Practically, the findings point to the development

of a hybrid pedagogy model that includes four pillars: (1) affordable digital tools, (2) culturally rooted project-based learning approaches, (3) online creative communities, and (4) collaboration with industry professionals. The resulting policy recommendations include the creation of a digital skills framework that combines traditional and digital competency standards, as well as the allocation of special funds for the procurement of mid-range devices in Vocational High Schools (SMK).

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