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Promoting Undergraduate Creativity and Positive Learning Outcomes through a Design Thinking and Visual Thinking Teaching Model

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Abstract

This research aimed to compare creativity and creative performance between an experimental group and a control group studying through the author developed design thinking and visual thinking learning model (DTVTM). Cluster random sampling use determined the sample group, which consisted of a 40 student experimental group and a 40 student control group. The DTVTM learning model was developed as an *Infographic Design Creativity Course*. Student assessment was measured using the Torrance Tests of Creative Thinking (TTCT) and the Creative Product Analysis Matrix (CPAM). Descriptive statistics analysis included the mean, standard deviation (SD), and **one-way** multivariate analysis of variance (MANOVA). The hypotheses testing determined that there was no statistically significant difference in *creative thinking* between groups. However, *the creative performance* abilities of the DTVT Model earning group were higher than the control learning group at the .05 level. The paper contributes to the research for multiple reasons. First, it confirms that *creative performance* can be taught through an easy-to-understand and use online format. Second, the author developed the DTVT learning model that influences creative outputs that exhibit novelty, problem-solving, and aesthetic qualities, primarily through digital tools to support learning. Third, the model encourages students to be more motivated to design creative works, promoting effective learning.

Keywords: Creative thinking, creative performance, design thinking, Thailand, visual thinking

Introduction

Promoting creativity is one of the top three skills needed to develop learners in the 21st century, and it is also among the most in-demand skills in the global labor market. UNICEF has also stated that of the 12 core life skills, creativity is noted as first in importance, with critical thinking

second (Wannapiroon & Pimdee, 2022). Furthermore, various studies have noted the importance of the teacher's role in teaching critical thinking and creative thinking skills (CTS) in preparing for a 21st-century workforce (Changwong et al., 2018; Moto et al., 2018).

Creativity is also a unique process within the human brain, enabling humans to see new alternatives and possibilities (Srikan et al., 2021). Therefore, as core life skills, educators should begin developing these life skills in their students early (Carlile & Jordan, 2012; Dilley et al., 2015). Creativity is also the ability to see things from new perspectives and do things unique or novel. It links things that are not related to each other to create something new.

Creativity or creative performance is critical to the advancement and development of human civilization and plays an essential role in education, society, work, and life (Tang, 2017). Since Alex Osborn introduced brainstorming and creative problem solving (CPS) (Osborn, 1957), processes for their development and teaching have been the subject of constant evaluation and improvement (Parnes, 1967; Sousa et al., 2013).

This is critical as creative thinking skills (CTS) allow individuals to face their fears and solve challenging problems (Srikan et al., 2021). Moreover, creativity drives innovation and increases employee engagement. Henriksen (2014) has also determined that the STEAM (science, technology, engineering, arts, and math) curriculum benefits from the creative aspects and solutions of the arts. This is consistent with research in Saudi Arabia in which the authors determined that CTS significantly contributed to freshmen student outcomes while learning mathematics (Al-Makhalid & Ben-Motreb**,** 2022).

However, the methods and mechanisms being used to teach and learn creative thinking skills are changing rapidly due to a confluence of positive and negative factors. Concerning the negative aspects, since early 2020, the world and its educators have faced the ravages of the global COVID-19 pandemic, which led to the shutdown of most traditional classroom teaching methods across most of the world. From primary education to universities in Thailand, the pandemic has brought about radical change at a dizzying pace (Kanawapee et al., 2022; Khongprakob & Kantathanawat, 2021).

As stated, the change has come in various formats starting with the Thai Ministry of Education (MOE) pronouncements that teaching and learning must shift to an online format and use *digital learning management* (DLM). This is a technological evolution to what was already in place for rural schools through an existing format commonly referred to as eDLTV, an abbreviation used for an electronic and distance learning television learning system and curriculum. One primary objective of eDLTV's implementation was to alleviate teacher shortages, and insufficient teachers qualified to teach specific subjects such as science and math (Petsuwan et al., 2019; Satellite Distance Education Foundation, 2022; UNESCO, 2020). Hwa et al. (2017) has also noted that learning by television (*on-air*) is effective, and when combined with teacher home visits and student homework assignments (*on-hand*), self-study is enhanced.

However, with the COVID-19 pandemic and the total shutdown of Thailand's traditional classroom teaching methods came the highly accelerated need to move education online using digital access devices such as smartphones and tablets. Wannapiroon and Pimdee (2022) also detailed methods for effective online education. These include developing and using an *open online learning system* (OOLS), development of *digital skills*, and *professional learning communities* (PLCs). Therefore, education reforms must be flexible and offer open and new approaches to ideas and processes (UNCTAD, 2018).

New methods to achieve teaching creativity and creativity performance online are through the use of *design thinking* (DT) and *visual thinking* (VT), with Chasanidou et al. (2015) reporting that DT is an effective way for organizations to take on challenging problems which can thus lead to the creation of innovation through creativity. In Bangladesh, Muhibbullah et al. (2021) has offered

that DT is an excellent method of developing entrepreneurial and digital skills, both critical skills in the dream for a Thailand 4.0 using digital knowledge workers.

On the other hand, *visual thinking* (VT) concerns connecting ideas through the use of images (Huh, 2016), with images, stated to be the primary component used in thinking (Arnheim, 2004). Fernández-Fontecha et al. (2019) also determined that VT is a superior process in cross-cultural communications in which abstract ideas can be translated easier. Moreover, VT and DT are becoming recognized worldwide as effective methods in teaching creativity, as each encourages learners to be designers and innovative (Deloitte. 2021; UNDP, 2018).

Therefore, from the above overview, the researchers collected additional information and reviewed other studies to apply this information in developing and implementing VT and DT in an Infographic Design Course. The outcome sought was to produce a teaching and learning model in which each student's creativity and creative performance were enhanced and assessed.

Literature Review

Infographic Design Course (IDC)

Turning large amounts of complex information into easy-to-understand visual images with text is no easy task (Namwong & Waythongkhum, 2021), as writing an attractive presentation plan and prioritizing content in infographics requires planning and creativity.

Therefore, the researchers recognizing the importance of Infographic design and online course development now under Thailand's *New Normal* of online education set out to find methods to use VT and DT to increase each student's CTS. Given the background and importance, the researchers also recognized the importance of studying the learning outcomes through the DT process combined with the VT techniques as a guideline for developing effective learning management.

Visual Thinking (VT)

As early as the 1990s, Goldschmidt (1994) identified VT as an active process in problem-solving. It was also an analytical process in which perception, interpretation, and production of visual messages occurred. Huh (2016) also added that VT was the interaction between what was seen, imagined, or drawn. Jaros (2012) has also added that critical-thinking skills can be improved by using VT and research-based teaching methods.

Design Thinking (DT)

According to Promsiri et al. (2018), DT is still in its early stages of application in the practical world and is still relatively new amongst scholars. However, according to Wrigley et al. (2018), the popularity of DT is soaring, both as a method to increase innovation and as a tool for non-designers looking for new ways to achieve a competitive strategic advantage.

In his Nobel Prize-winning book, *The Sciences of the Artificial, one of the most famous essays on DT was made by Simon (2019).* According to Psillos and Kariotoglou (2016), the science of design involves how ideas are evaluated, analyzed, and refined. Therefore, various steps are used in idea creation, assessment, and selection for the best solution in product design or performance.

Others have also viewed DT as a tool in solving problems (Buchanan, 1992), with multiple scholars now using DT as part of their models for innovation creation. These DT models are also involved with CTS and critical thinking (Stanford d.school, 2021). Five steps are outlined in one of the most used and famous models from the Stanford d.school. These include empathize, define, ideate, prototype, and test (EDIPT Model) (Dam & Siang, 2021). Moreover, Brown and Katz (2011) have strongly asserted that DT is a philosophy that connects innovation and organizations.

Creative Thinking (CT)

Creativity has been described as divergent thinking or multi-directional/multi-faceted thinking. CT uses past experiences to form new

ideas, hypotheses, and hypotheses testing. This diversification consists of *originality*, *fluency* in thinking, *flexibility* in thinking, and *thoughtfulness* (Aranguren, 2015). The Torrance Tests of Creative Thinking (TTCT) explicitly evaluated divergent thinking.

Creative Performance (CP)

Creative performance can be viewed as an expression of creative abilities that are innovative, sophisticated, and unique in the form of ideas, concepts, suggestions, processes, prototypes, or figurative works. The creativity of students' performance can be measured using the *Creative Product Analysis Matrix* (CPAM) developed by Besemer and Treffinger (1981). It is also a tool designed to assess student creativity and creative performance using three dimensions: *novelty*, *resolution*, and *style* (Tsai, 2016).

The DTVT Learning Model

Various authors have suggested learning models that can help develop creativity. In one study, Srikan et al. (2021) suggested that there were five steps: identification of the problem, its analysis, researching the problem, the problem's presentation, and finally, the summary and its evaluation. The authors' design thinking learning model with visual thinking technique or DTVTM is a model in which the researcher has synthesized numerous concepts and theories from design thinking experts and visual thinking techniques. Furthermore, the researchers propose quantifying the quality of the model by using an educational panel of experts to assess the quality of the format. From a literature review, the authors determined that there were five primary components to a practical model. These included 1) *Stimulation of Ideas*, 2) *Defining the Problem*, 3) *Generating Ideas and Idea Visualization*, 4) *Assessment*, and 5) *Sharing and Presentations* (Figure 1).

Stimulation of Ideas

Teachers play a pivotal role in presenting problems, issues, and case studies to stimulate interest and inspire creative design work. Therefore, teachers need to provide students with content and resources that are suitable and conducive to learning and provide an environment and tools that support learning in online/on-site formats that facilitate knowledge creation.

Learners play a role in collaborative surveys in which they ask questions to analyze problems and formulate solutions. Digital tools can also be used to facilitate collaboration include virtual bulletin boards such as *Padlet* (Kharis et al., 2020) and comment-gathering tools such as boardables' *Virtual Voting*.

Defining the Problem

In Step 2, learners help analyze and synthesize the problem from the use of discussion. The teacher in Step 2 acts as a 'facilitator' and suggests strategies using diagrams or sketches to find the point of the problem. This is consistent with another Thai education study in which the author suggested that defining the problem was essential in teaching creativity in social studies classes (Phuangphae, 2017). This is consistent with Jonassen (2010), who determined that problem-solving models are effective when a problem has been defined and presented. Analysis and synthesis tools such as Persona Software and Journey Map Software are excellent resources for making connections and highlighting essential issues when defining problems.

Generating Ideas and Idea Visualization

In Step 3, students work together to come up with solutions to the problems which have been previously identified (Kurokawa, 2013). This involves the formulation of innovative options by collaborative methods, including identifying core problems and potential solutions. The brainstorming process is often done in small teams, allowing better sharing of the same information and interpretations into more profound insight. Interestingly, the original problem sometimes gets set aside as more complex issues evolve (Hooper, 2021). The new problem may be different, broader, or more nuanced than initially assumed. Sometimes, these insights are summarized in mind maps, personas, or user journals.

These ideas are consistent with other studies, including one from Shih and Olson (2009), who

found that mind-map tools were a particularly effective medium for assisting memory recall and Buzan (1991) reported that mind-maps were an effective method for idea generation brainstorming. In Infographic design, the instructor plays an essential role in planning exciting and easy-to-remember presentations with storytelling strategies integrated through the Infographic design.

Idea visualization can be achieved through a wide variety of both free and commercial Infographic design software packages. Popular software for this purpose includes Adobe Spark and Canva and Piktochart, Snappa, and Infogram.

Assessment

In Step 4's assessment phase, students put their Infographic design up for evaluation after its creation by a small 5-10 student group unfamiliar with the presentation's data or images. Ozdamli and Ozdal (2018) have also suggested that evaluation is vital in assuring quality Infographic designs. Vanichvasin (2013) added that university students viewed using infographics as a visual communication tool as effective after evaluation, leading to greater understanding and permanence. Finally, each instructor finalizes the review of the process with their comments and observations, which are further integrated into the final design prior to its release to the public through social media platforms typically.

Sharing and Presentations.

In Step 5's sharing and presentation phase, each design is disseminated using social media tools like Line and Facebook. This is consistent with other studies that recommended using social media for Infographic sharing (Namwong & Waythongkhum, 2021). Other platforms such as Padlet might provide more accessible viewer feedback without having an account (Kharis et al., 2020).

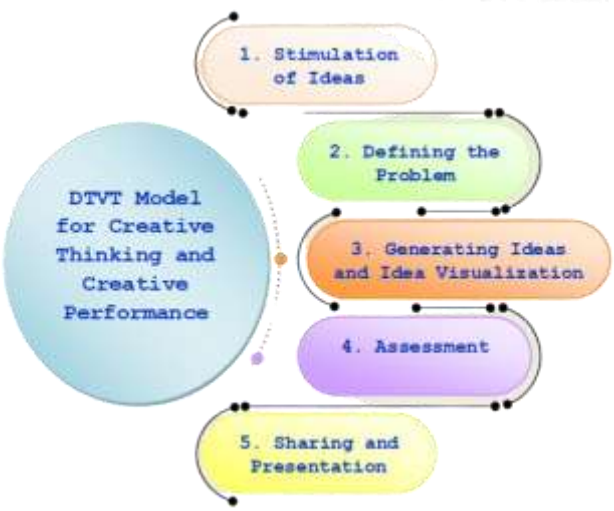
Finally, viewer feedback becomes the last component within the DTVT model's cycle. Here, students reflect on their project's feedback and contemplate how their infographics can be more explicit. The instructor's role is to summarize, evaluate the work, report the assessment results, and help the students reflect on each learning step. Comments are noted and tracked to help improve their subsequent work.

Research hypothesis

The experimental group of students who studied using the DTVT learning model technique achieved higher creativity and creative performance than the control group of students using conventional methods.

Figure 1

DTVT Model for Creative Thinking and Creative Performance



Methods

Population

The population used in the research was undergraduate students in the 2020 academic year at the King Mongkut's Institute of Technology Ladkrabang (KMITL) registered in the Infographic Design Courses, which included three classrooms with a total of 180 students.

Sample Group

The sample group was obtained using random cluster sampling to obtain a sample from two classrooms which contained 40 students as the experimental group and another classroom with 40 students as the control group.

Data Collection

The researchers conducted data collection using the following steps:

1) Clarify details, methods, and experimental procedures of learning management with the DTVTM Model with the sample.

2) Let both sample groups test their creativity before studying (Week 1).

3) The experiment was conducted using an experimental group (Classroom 1) being taught using the DTVT model and the control group (Classroom 2) who learned without using the DTVT Model (Weeks 2-7).

4) The TTCT-Verbal Form was used to assess each student's creative thinking and creative performance after class for both the experimental group and the control group (Week 8).

5) One-way MANOVA statistics evaluated student creative thinking and creative performance data.

Research Instruments

The researchers developed tools to check the quality of the methods used. The details are as follows:

1, The learning management plan consisted of three learning units which ran for six weeks each. The experiential group class was conducted using the DTVT learning model format. The content consisted of three learning units. These included the Infographic layout, the Infographic design, and finally, the Infographic's creation.

2. Three experts evaluated the learning management plan. The overall quality was very good, with an overall mean = 4.68 SD = 0.35.

3. From the experts' input and the researchers' final contribution to the creative thinking and creative performance learning model using design thinking and visual thinking, it was determined that there were five essential steps. These included 1) *Stimulation of Ideas*, 2) *Defining the Problem*, 3) *Generating Ideas and Idea Visualization*, 4) *Assessment*, and 5) *Sharing and Presentations* (Figure 1).

The Torrance Test of Creative Thinking-Verbal (TTCT-Verbal Form)

The TTCT is designed to identify and evaluate creative potential. The verbal part of the two-part test includes seven subtests. These are *asking questions, guessing causes, guessing consequences, product improvement, unusual uses, unusual questions*, and *just suppose*. The actual TTCT examination used by the authors for the study was created and modified by Wiwitkulkasem (2003). The Thai version uses a subjective written response consisting of six activities. Like the original TTCT verbal subtests, the Thai version uses an asking questions activity, a guessing the cause activity, guessing the consequences that will occur activity, productivity improvement activity, unusual uses activity, and finally, a suppose activity.

Prior to class start, a TTCT pre-test was given. After the class completion, a TTCT post-test was also given. The students were given 60 minutes to complete the activity. The Thai students' TTCT-Verbal evaluation was rated on three components of creativity. These included *originality, fluency* in thinking, *and flexibility* in thinking.

The three experts used the inter-rater reliability evaluation method to assess the creative thinking and creative performance model (Zaeema & Hassan, 2016). A commonly accepted value of 75% is used for most disciplines. The correlation coefficient (*r*) was used for the assessment of the

pre-student creativity scores of the experimental group (r = 0.999) and the control group (r = 0.998). The creativity score after class completion for the experimental group was r = 0.999, and for the control group, it was r = 0.999, for a very high correlation.

Creativity Assessment Form (CAF)

The CAF covers content according to the composition of creative performance in three aspects. These include novelty, problem-solving, and design. The form used for this study was adapted from Besemer and Treffinger's eight-item theory using a 4-level creative scale as a rubric scoring model. The criteria used for the CAF was as follows: very good (25 - 32 points), good (17 - 24 points), fair (9 - 16 points), and improved (8 points).

The index of Item-Objective Congruence (IOC) evaluation of three experts obtained IOC values from 0.67 – 1.00, which were then analyzed using the inter-rater reliability using correlation. To find the correlation between the two examiners, the correlation coefficient (r) of the post-study creative performance scores of the experimental group and the control group were 0.995 and 0.994, respectively, which were related very high.

Results

The researcher analyzed the data from the learning model experiments by comparing average scores on *creative thinking* and *creative performance* of undergraduate students. In the Infographic Design Course, the experimental group studied with the learning model using the design thinking process combined with the visual thinking technique, while the control group studied using traditional classroom methods. For this study, the researchers used the multivariate analysis of variance

(MANOVA) to test the two dependent variables, *creative thinking* and *creative performance* (Table 1). MANOVA uses Wilk's Lambda, Hotelling-Lawley's test, Pillai's Trace, or Roy's Largest Root, which later get converted to F statistics to assess the group difference significance (Table 2). Pillai's Trace has the highest statistical power.

As is standard procedure, after a MANOVA test of the combined dependent variables, it is accepted practice to the distribution of data statistically. The Pearson Product Moment Correlation (PPMC) was used to determine if and how much correlation between the variables creativity and creative performance (Table 1). The PPMC analysis determined that there was a weak correlation at the .203 level (Akoglu, 2018). However, .203 indicates that the preliminary agreement test is valid, although weak (Field, 2013).

Also, in Table 2, the significance level (Sig > α) is noted as α (alpha), which is interpreted as 0.05. This indicates a 5% risk of concluding that an association exists between *creative thinking* and *creative performance* when there is no actual association. Also, when p-value ≤ α, the differences between the means are statistically significant. When p-value > α, the difference between the means is not statistically significant.

Also, in IBM's® SPSS® for Windows Version 2x programs, it is possible to conduct *Bartlett's test of sphericity*. For this study, it was determined that it was .001 and statistically significant at less than 0.05, meaning that the data in this section has a relationship between the variables and has a very good level of suitability, which as per the preliminary agreement to perform further component analysis (Hair et al., 2020).

Further validation was followed by the *Box M test*, which showed no significance (Sig > α). Additional normality testing used the *Shapiro-Wilk test*. This is a good choice when sample sizes are small to medium (e.g., n < 300). However, the test may be unreliable for large samples. Testing results from the *Shapiro-Wilk test* indicated that the data distribution was standard across all four groups, with a significance level of .05. Also, in Table 2, the Wilks' Lambda statistic has a sig. value. = .008, which is less than the specified (.05), indicating that the DTVTM learning model has at least one

variable that differs from the traditional classroom learning group. There was a statistical

significance at the .05 level. *Creative thinking* and *creative performance* were compared between students in the DTVT Model study group and the traditional classroom learning group (Foster et al., 2006).

The hypotheses testing determined that there was no statistically significant difference in *creative thinking* between groups. However, *the creative performance* abilities of the DTVTM learning group were higher than the traditional classroom learning group at the .05 level.

Table 3 shows the results of the comparison of student average scores for *creative thinking* and *creative performance* between the two groups. Results revealed that student learning using the DTVTM format resulted in the experimental group's mean score for *creative performance* is significantly higher than the *control group* (F = 8.56, Sig = .004). However, the mean score for *creative thinking* between the two groups was not significantly different (F = 3.35, Sig = .071). From checking the mean scores of *creative performance* in both groups, it was found that the DTVTM *experimental group* (mean =26.00, SD=3.44) had higher scores than the *control group* (mean = 23.47, SD=4.23).

Table 1 *Testing Results of the Dependent Variables*

	Normal Distribution		Pearson Correlation	Box's M Test)Sig.(	Bartlett's Test)Sig.(	**Levene's test**)Sig.(
	Experimental	Control				
Creative thinking	.079	.080	.203**	.268	.001	.746
Creative performance	.208	.105				.137
Results	Normality	Normality	.203 < α	Sig > α	Sig < α	Sig > α

α = .05

Table 2 *MANOVA Testing Results Classified by Learning Style*

Variable	**Statistics name**	**Value**	**F**	**Sig.**
Learning style	Pillai's Trace	.119	5.209	.008
	Wilks' Lambda	.881	5.209	.008
	Hotelling's Trace	.135	5.209	.008
	Roy's Largest Root	.135	5.209	.008

Table 3

Comparative Post-Test Results Using the Mean and SD for Creative Thinking and Creative Performance after Course Completion

Dependent Variable	**Independent Variable**	***n***	mean	**SD**	**F**	**Sig.**
Creative thinking	Experimental group	40	141.30	26.41	3.35	.071
	Control group	40	130.70	25.31		

Creative performance	Experimental group	40	26.00	3.44	8.56	.004
	Control group	40	23.47	4.23		

Discussion

The study's results showed that there was a lack of significant difference at the .05 level in *creative thinking* between the DTVT Model learning group and the control learning group. This could possibly be because both groups had similar basic knowledge and educational and life experiences. Sousa et al. (2013) has suggested that the lack of success in CPS output can be due to the domination of the idea generation stage, in which CPS models require a training phase and team collaboration that may take several days. However, a potential solution is establishing an effective communication structure using a collaboration tool such as Google Groups to ensure a collective awareness in each team (Sousa et al., 2013). Failure in creativity enhancement can also be attributed to external resistance from various sources (Buijs et al., 2009), with a potential solution to open classes to individuals who can promote or block it (Strauss, 2002).

However, the study did determine that there was a significant and statistically significant difference between the control group (mean 23.47, SD = 4.23) and the experimental group (mean 26.00, SD = 3.44) when each student's creative performance was assessed (Table 3). There was a statistically significant difference at the .05 level, indicating that the students' creativity developed accepted that they had new ideas (novelty), had a solution (resolution), including design (style) because the researcher sees the importance of creative performance as a result of the ability to think creatively.

The Thai version of the TTCT-Verbal Form used an 1) asking questions activity, 2) a guessing the cause activity, 3) guessing the consequences that will occur activity, 4) productivity improvement activity, 5) unusual uses activity and finally, 6) a just suppose activity. The use of the verbal TTCT finds great support worldwide, with Said-Metwaly et al. (2020) stating that it is the most frequently used tool in research on creativity skills. However, there is considerable debate concerning its western cultural contexts, which might have contributed to this study's results. From the six primary creative thinking and performance activities evaluated, three additional sub-score were generated on *originality*, *fluency* in thinking, *flexibility* in thinking, and *thoughtfulness* (Aranguren, 2015).

Krumm et al. (2016) conducted a TTCT assessment of creativity for the Spanish-speaking population, which showed that *fluency* in thinking and *originality* scores were higher than *flexibility* in thinking. It was then suggested that people with high imagination or originality could generate more ideas.

Warne et al. (2021) have added that although creativity has been investigated for over 70 years, several fundamental unresolved problems persist. According to the authors, one of these problems is the inability to correctly measure divergent thinking, which is an essential element of creativity in a way that aligns with theory.

Milicevic et al.'s (2020) analysis of graduate-level writing students and their creativity ascertained that creativity could be learned. Somewhat surprisingly, an interdependence sense of community and belonging seemed to enhance students' creativity. These results are consistent with Aranguren (2015), who examined student creativity using the TTCT and determined it was a valuable and accurate creativity measurement tool.

In research from Macau, Tsai (2016) examined the effectiveness of the CPAM on evaluating student creativity processes. Interestingly, the author found that one of the most significant roadblocks to his students' creativity process was their limited knowledge of the tool (Adobe Illustrator). This outcome should be noted by other instructors and educators attempting to use design thinking with software tools.

These findings are consistent with Kassim et al.

(2014), who investigated how computer-based multimedia learning materials affected students' creative performance using the TTCT and Creative Product Semantic Scale (CPSS) as assessment tools. Results revealed that the multimedia tools were helpful for creative thinking and the generation of flexible and original ideas, but not fluent or practical ideas.

In a similar study from Sweden, Lindström (2006) described an approach to assessing creative performance used by Sweden's National Agency for Education (NEA). In the NEA, it was stated that there are two dimensions to creative performance: product and process.

During the study, the researchers examined how the learners learned and found that in the qualitative results, learners indicated that their learning strategies had changed since taking the DTVT learning model classes. However, during the first week, learners had difficulty getting creative and applying the DTVT model concepts. Interestingly, the weekly creative evaluation scores increased as the classes progressed over four weeks. This shows that learners were adjusting to learning with the DTVT Model over time, and at the same time, they can apply the process of thinking research, to extend their knowledge, to design creative works, along with learning other new courses by taking into account the importance of their self-benefit and benefit to society.

Conclusion

A learning model based on the design thinking process and the visual thinking technique can help develop students' creative thinking and lead to better creative performance. Using DTVT processes to enhance creative problem solving (CPS) is a skill that is useful for lifelong learning and skills most employers place at the top of their list for new employee skills. With basic DTVT skills, learners have the basic knowledge as a base for creative performance in the future. Finally, the DTVT learning model is highly flexible and can be adapted for use in an undergraduate classroom, an online format, or a workshop that promotes students' thinking more effectively.

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