

## ARTS AND CULTURE AS CREATIVE LEARNING OF STUDENTS THROUGH CULTURAL PRODUCT DESIGN

Jong BOONPRACHA  \*

*Department of Industrial Design, Faculty of Industrial Technology,  
Suan Sunandha Rajabhat University, Dusit, Bangkok 10300, Thailand*

Received 28 January 2021; accepted 9 June 2021

**Abstract.** The study explores whether a design activity could promote creative learning expression and development among students regarding arts and culture issues through cultural product design. Therefore, students engage in designing a cultural product model. The study aims to analyze their ability to develop arts and culture through sketches and an appearance model. The research project was conducted to observe students (aged 18–20 years) as they negotiated and shared creative ideas during the process of cultural product design, interaction with fellow students, and the design presentation. The results indicate that design activities significantly contributed to students' arts and culture learning by developing creative ideas through cultural product design. Moreover, students developed reasoning, communication, and collaboration skills during the development of their work.

**Keywords:** arts and culture, creative learning, creativity, cultural product design, cultural product model, design activity.

### Introduction

Learning local culture and wisdom forms part of fostering appropriate attitudes among students (Kujasene, 2001). A few of the essential characteristics of Thai students include international qualifications, an eager perspective, and readiness to learn. To cope with modern times and merge modernity and understanding, essential qualities and attitudes pertain to recognizing the essence of prosperity and realizing local wisdom's value (Tinakul, 2009). The creative learning of arts, culture, and local wisdom among students is an integral part of the creative process for preserving national cultural heritage. Hence, a country's development in various fields should consider the benefits of arts, culture, and local wisdom for students. These aspects can be regarded as tools for developing human capital and immunity from activities and recreation that serve no benefits for oneself or others (Prasertsilp, 2015). Therefore, the study considered these factors to examine students' creative learning through cultural product design to enhance awareness of arts and culture's value. The design activity

---

\*Corresponding author. E-mail: [jong.bo@ssru.ac.th](mailto:jong.bo@ssru.ac.th)

encourages students to produce sketches of ideas and construct an appearance model of a cultural product design. The method involves the presentation of and reflection on the creative ideas of students. Furthermore, the study explores how the design activity can promote creative learning of arts and culture among students through cultural product design.

## 1. Design activity as a process of creative learning

Learning arts and culture is based on the concept of providing students with opportunities to improve cognition in learning by enhancing the experience through the concept of lifelong education (Bumroongrak, 2012). In this regard, design activities present students with opportunities to develop their ability to communicate creative ideas using various presentation techniques, such as sketches and models. Sketching is a method of expressing knowledge and explaining and clarifying an idea. Technical sketches and models could be viewed as a visible evidence of the understanding gained during the design process (Martin, 2017). In the inter-relation between students, sketches and models may be developed and modified as new knowledge is simultaneously gained (Buxton, 2007). However, other forms of experience should be envisioned, such as in sketching, where creative ideas can be visualized without physical materials (de Vries, 2016). Sketches contain knowledge that may not be expressed by words and may lead to an approach in design communication, thus promoting interaction during the design process (Buxton, 2007). As a result, design activities are frequently identified as creative problem-solving activities because such activities initiate cognition in students and encourage them to become innovative problem-solvers as individuals or as members of a group (Barlex, 2006). Creative problem-solving requires the formulation of solutions to common issues, including cognition and skills. Lind et al. (2020) conducted a study on the students (aged 13–14) who negotiated and shared knowledge about technology as they interrelated with their fellow students. The study found that the students expressed knowledge about emerging technology and adopted a sustainability perspective while working in design activity. This meant that the students were able to integrate knowledge on emerging technology.

Thus, the study initiated cultural product design and recruited students with pragmatic and theoretical skills that can be used to establish technical sketches in a procedural, conceptual, and context-dependent manner. Conceptual sketches highlight connections and affiliations between objects and enable students to think of solutions and connect knowledge from various fields (Wakefield, 2017). Procedural and conceptual understanding is integrated and included in practical problem-solving and design processes (Svensson & Johansen, 2019). Deliberating design activities that are meticulously combined and integrating procedural and conceptual knowledge may provide students with opportunities to understand the arts and enhance cultural learning (Cross, 1999). Throughout the design activity, the study observed that sketching helped designers address various abstraction levels, formulate creative ideas, encourage communication and analysis, and develop the design through teamwork (Buxton, 2007). Consequently, sketching forms an integral part of the design process on students' current knowledge through cultural product design (Schütze et al., 2003).

### **1.1. Culture as creative learning in product design**

Asino et al. (2017) suggest two critical elements in learning cultural product design: culture and designers' creative learning. Salehi (2012) noted that culture is at the foundation of human existence. Thus, as long as humanity persists and new fields of study arise, the concept of culture will continue to transform in the human mind, and definitions will continue to be sought. Rodgers and Milton (2011) states that culture significantly affects learning outcomes, knowledge transfer, and performance. Frambach et al. (2012), Lucas (2006), and Zhang et al. (2014) concluded that culture influences learning and design conforming to cultural expectations will affect learning and performance.

Although culture is recognized as an essential component of the learning system, product designers should be aware of learning for design inspiration (Busch, 2002) and be aware of the fact that knowledge is often not incorporated significantly into design (Whiteley, 1998). Campos (2006) highlights that designers often do not consider the perspective of learners. They sometimes clearly ignore culture as a necessary element of cultural product design. Hence, product design may not appeal to target consumers with different cultural backgrounds and may even prompt negative experiences (Gaver et al., 1999).

Cultural design learning should consider and incorporate artistic elements of the target audience into product design to gain better recognition in terms of aesthetics and functionality (Brown & Katz, 2009). No cultural product is identical. Some people benefit significantly from cultural relevance with products produced by each country's culture, which is naturally related to the culture (Chen, 2018). Hence, cultural design is necessary for the modern world to understand the context of different cultures and better synthesize the products with the use and way of life of various cultures. The modern world's production capability and mass distribution allow one culture to create objects and artifacts of another culture. Some people feel that culture always finds its way into a product. Despite cultural differences, some believe that the lack of cultural significance in modern products is detrimental to human perception and may almost be erasing the identities and ways of life. Although globalization has led to remarkable similarities of perceptions in lifestyles in some cases, it is culture-driven. Therefore, designers should learn the factors of cultural existence and respond to cultural differences in humans.

### **1.2. Cultural product design**

The inter-relation between design and culture has been passed over time as design is considered a reflection and surrogate of change (Inkong, 2017). Previous studies observed that variations in the adaptation of the culture reflect and define development in the design. The design transforms and concurrently shapes culture (Chen, 2018). For instance, cultural beliefs and local practices create and advocate frames of meaning that impose a product's means of cultural context. Such cultural framings influence whether people use a specific product. Moreover, culture provides product meaning, leads to rituals within which objects are used, and displays values frequently echoed in the form and function of things (Bryman, 2001). Thus, the design is connected to culture through the association of cultural values in products.

Cultural values form the manner of behavior of people in the community. Similarly, consolidated values in products play a role in defining people's attitudes in society. Values embodied in products lend users their cultural identity (Chapman, 2005). In this regard, cultural values can be associated with products through the design of suitable forms or characteristics representative of such values. Moreover, cultural values supply designers with rich and varied sets of materials that motivate innovative design ideas (Chong, 2004), which form a method for identifying relationships among users' traditions. Cultural values are connected explicitly with exploring how future technologies can encourage traditional values to stimulate and drive the appropriation and use of new technology. Thus, designers should acknowledge that cultural values promote the formation of the behaviors and attitudes of users. As such, product designs are likely to lack attraction if they fail to consider users' values.

Cultural product design is another approach to product design for consumption. The connection between culture and product design is becoming more and more apparent. The relevant literature has been optimistic about cultural product design and offers exact reasons why culturally relevant designs should be a top priority (Busch, 2002). Lin (2007) mentions that culture has three layers and discusses the three levels of cultural design corresponding to the three levels of culture. These levels correspond to Albrecht's et al. (2000) three product design levels and are all related to the perception and learning in different cultures. The human brain processes details of the first level, namely, product appearance level, through sight, sound, and touch first. Then it enters the second level through satisfying interactions from the learning gained when understanding and performing the functions of the product. Finally, it enters the third level: perception, feeling, and connection with way of life, society, and cultural context. These principles are essential to all designs, especially cross-cultural design, as a successful product must understand the three levels of culture and combine design concepts with being accessible at all three levels available in the context of the target culture.

The appearance level consists of visible attributes and tangible culture and products, including language, material, shape, place, and climate. As these design elements are essential for the most basic design, the designer often considers them first. In fact, it has been observed that the most cultural design explanations are limited to aesthetic references, such as a shape or national color (Morris, 2016). Some designers incorporate cultural attributes into their products without including deep meanings or values, as those could have a negative impact on the products' success (Rodgers & Milton, 2011).

The behavioral level consists of usefulness, ability to work, and user interaction of products and cultures. This second-level design element is the main factor of every product. Designers need to consider how consumers live, work, and interpret the products around them. Another thing to consider at this level is the way of life, patterns, and population behavior, including expectations regarding display, control, and the relationship between these factors and product usability. For example, the Chinese have a pattern for moving a switch down for "on" and up for "off" that differs from much of the rest of the world. Control and utility may be detrimental to the success of the product or can become a potential danger to users (Brown & Katz, 2009).

The symbolic level contains embedded stories and traditions, memories and emotions, and user values. Capturing emotional and memory-boosting cultural elements will add the

maximum value to the product's connection with traditions and people's stories. It is like weaving a product into a cultural cloth so that the product has the potential to become part of the culture that influences and inspires the product's values (Julier, 2014). Products designed at the level of appearance and behavior can be a best-seller everywhere. However, the focus is on a symbolic level. It is the driving factor for the success of effective products. In design, it affects the user's mood and value. Consumption is motivated by complex emotional drivers and is more than just buying something new for a new challenge. It is a journey toward the ideal self when consumers respond to products with emotional and value levels. They are willing to pay more for a product and collect it as a valuable item (Morris, 2016).

## **2. Method**

The study was conducted at Suan Sunandha Rajabhat University in Bangkok, Thailand, and implemented design activities for eight weeks in a class of 25 third-year students aged 19–20 years. During this study, the students worked on the design process for cultural products and were divided into groups of five participants. The design activity assignment required students to produce a drawing and a model with a 1:1 scale. The students worked with theoretical inputs and applied for the design work. Theoretical input pertained to the methods for designing cultural products in the art and culture context. The researchers presumed that the appearance model assumed that students appropriately comprehended in input and applied their learning into the model during the project. Building a model promotes skills in the design process, such as conception, evaluation, suggestions on how to proceed, identifying strengths and weaknesses, and developing the design (Martin, 2017). Designing a cultural product is context-dependent, which indicates that students' comprehension will be integrated into the design process and developed during the generation process. The design activity can be explained by the following aspects:

- Conceptual design is the initial phase of the design process, where the general frameworks of the function and form of cultural product design are articulated. In this step, students should include the art and culture context as inspiration;
- Idea sketch pertains to concept-mapping that enables students to capture creative ideas and organize them into various alternative designs;
- Idea development is the process of making choices, considering and establishing the most appropriate ideas for the development of a cultural product design;
- The final design aims to prepare the appearance model;
- The appearance model is an actual-size model that mainly analyzes the design's aesthetics and utilizes detailed finishes instead of product function.

In this context, the design activity correlates the aspects of the design process as presented by Middleton (2005):

1. Identifying a problem related to conceptual design;
2. Undertaking research related to the idea sketch;
3. Developing a solution related to the idea development;
4. Evaluating the solution related to the final design;
5. Producing the final solution related to the appearance model.

The study adopted Middleton's (2005) aspects of the design process and a part of the model of Ingerman and Collier-Reed (2011) to examine creative learning in students. The method for exploring knowledge and understanding in the design activity involves a process of exploring competence in using subject-specific language during the design activity. Moreover, the study examines how the students' definition of reasoning, arguing, and learning during the design process by observing their discussion and explanations during the design activity to identify and provide examples of students' application of creative ideas in the cultural product design.

### 3. Results

The results focus on the students' integration of creative ideas from the arts and culture perspective into the cultural product design process. Five design models are used to demonstrate the results from the five groups.

#### Group 1

Wat Saket (*Phu Khao Thong* or in English *Golden Mountain*), Bangkok, Thailand is located at the hill's base and serves as an inspiration for designing a cultural product. Its architecture is elegant, especially at night due to the reflection of light from the golden building. It appears loftier on the steep artificial hill base, making it seem like a temple in the sky. For this reason, it served as the inspiration for the design of the lantern in Figure 1.



Figure 1. Group 1 design work inspired by Wat Saket (source: created by author)

#### Group 2

Wat Ratchanatdaram, Bangkok, Thailand is widely known as the *Loha Prasat* (in English: *Iron Castle* or *Iron Monastery*) and is the inspiration for a cultural product designed as a multi-tiered structure with a height of 36 m and 37 metal spires. The structure defines 37 virtues toward enlightenment. The inspiration was used to design a perfume bottle (Figure 2).



Figure 2. Group 2 design work inspired by Wat Ratchanatdaram (source: created by author)

### Group 3

Wat Ratchanatdaram, is the inspiration behind a cultural product that expresses the magical intensity of the metal's color and the grand height of the architecture. When viewed from the bottom up at the base of the castle, it offers a different perspective from the general view. The design uses the shape of a pyramid base, and the topmost part was cut off to show that nothing is so high that the top of the castle cannot be seen. The product designed is an aromatherapy lamp, whose smoke rises to conceal the top of the castle (Figure 3).



Figure 3. Group 3 design work inspired by Wat Ratchanatdaram (source: created by author)

### Group 4

Talipot fan is a palm-leaf fan with a long handle and is the inspiration behind the design of a cultural product, whose shape resembles an upside-down heart and contains lines that emanate from the radius. The design has modified the talipot fan's outline and rearranged it by dividing it into four parts. The parts are connected by disorderly overlapping weaves. The result is similar to a bird's nest linked with leaves. The inspiration was used to design a lamp (Figure 4).



Figure 4. Group 4 design work inspired by talipot fan (source: created by author)

Group 5

Giant sculptures at Wat Phra Kaew (Temple of the Emerald Buddha), Bangkok, Thailand are used to design a bar soap packaging. The color indicates the identity of each giant guard standing at the temple gate. The rich colors of the giant sculptures correspond to five inherent elements of Chinese culture (Figure 5).



Figure 5. Group 5 design work inspired by giant sculptures at Wat Phra Kaew (source: created by author)

In the arts and culture context, groups 1 to 3 selected architectural objects design inspirations, whereas group 4 selected handicraft as inspiration. Lastly, group 5 also selected a sculpture for the design. In these activities, groups 1 and 4 produced a similar design for the lamp, whereas the other groups produced different designs.



## Discussion

The study investigated students' application and development of creative ideas using a cultural product design during collaboration with other students in the design activity. This can be explained that students use brainstorming to generate ideas (Rodgers & Milton, 2011). It is highly effective in creating proposals and more creative than having familiar traditional ideas (Potter, 2002). Consequently, group interactions accounted for the design process's essential components, such as analyzing a problem and developing and accessing a solution to the problem. For instance, when students explained how they applied creative ideas to their models, they identified differences, as demonstrated by group 3, to make their project unique from group 2 using the same arts and culture context as inspiration. They referred to the form of the topmost part of the castle to transform it into the product form. They stated that when they stood and looked up from the castle's base, they could barely see the castle's top. The model was similar to a castle spire high above the sky and covered with clouds. Therefore, they designed the product to be an aromatherapy lamp with a hole to enable smoke to emanate from a small slit on the side, which resembles the clouds floating below the top of the castle. Therefore, they tapered the spikes of the aromatherapy lamp. This process demonstrates that they indeed used the appearance model to clarify their views about conveying their creative concepts. This concept can relate to using the design metaphor technique (Cila et al., 2014). A successful design example is Beijing National Stadium, Beijing, China (Gibbs, 2008), transforming bird's nest into architecture, popularly known as the "Bird's Nest". The Stadium won the international convention in 2002 and viewed the architects as "brilliant aesthetic and structural challenges" (Boess & Kanis, 2008, pp. 316–319).

Furthermore, in several discussions among group 4, the students intended to solve the problem of recreating the talipot fan because it appeared flat. One of the members offered to disassemble and reassemble the fan, to which all members agreed. In the end, the design used connected the four parts using the disorderly overlapping weave, which resulted in a bird's nest-shaped hollow covered by leaves. Thus, the students reached a profound aspect of creative learning by generating ideas through a unique conceptual design. This activity of creative thinking can be compared to the concept of upcycling (Intrachuto, 2013) wherein materials or products that cannot be used for their original function are transformed into new products of high quality and artistic and environmental values. The unused or leftovers items are designed to be a new quality product of high value (Tucker, 2012), such as an old and useless car tyre can be transformed to be a chair (Birkeland, 2002).

Analysis of the design activity indicates that most students accentuated creative ideas through the design process and displayed an adequate understanding of applicable concepts during the interactions. Students' knowledge is transformed into potential action in such situations, suggesting that they can apply and use creative learning in a relevant manner. The students also informed that they acquire knowledge from their friends in the same group. They were able to examine and compare their ideas with other groups through an inter-group discussion. This finding advocates the research done by Khalid (2017). One of the students encouraged creative problem solving to scrutinize and select the suitable method for creative mathematics projects.

In summary, their cultural products' appearance models indicate that they used various forms of information at the beginning of the interactions. They then analyzed, combined, and defined one or more concepts concerning the cultural product and integrated them into the appearance models. In other words, the students used creative learning through design activities to solve problems in the cultural product design process. Nonetheless, many students developed generalized creative learning of the design activity during the group interactions. In certain situations, students can echo different solutions that involve concept design and discover the pros and cons of various ideas. Concurrently, the results clearly indicate that opinions from fellow students can broaden idea creation.

## Conclusions

The results indicate that the design process substantially stimulated students to illustrate and express creative ideas about cultural product designs during group interactions. Evidently, many students in these situations can integrate their creative ideas into appearance models and use them to solve the problems encountered. Thus, the study focused more on applying this research and development in creativity studies in projects that consider other design fields' aspects to promote students' creative ideas. From this point of view, the study demonstrated that integrating the arts and culture context into cultural product design is possible to develop creative ideas in the design process. The study argues that, as the students discussed, explained, and applied different creative ideas on a specific topic, they developed a broader understanding of the design process.

Consequently, most of the students conveyed knowledge on cultural product design, which enable them to estimate how they could utilize their new creative ability on appearance models. The study proposes that as students integrate creative ideas verbally in their models, such ideas could be correlated to the undertaking of a design project on a specific topic. In conclusion, the students implemented creative ideas on cultural product design through appearance models that advocate and reinforce the reasoning about the relationship between arts and culture and cultural products. Furthermore, the study demonstrated that students could develop creative ideas during a meticulously thought-out design activity aiming to associate theoretical input and discussions with practical design works.

The cultural product design model proposed and discussed in this paper is suitable for product design students. It can help design "culture" into modern products and provide students with a valuable reference for transforming the Thai cultural art object features into the current product design. The cultural-based products can lead to the creation of economic cultural capital for communities and the country.

## References

- Albrecht, D., Lupton, E., & Skov Holt, S. (2000). *Design culture now: National design triennial*. Princeton Architectural Press.
- Asino, T. I., Giacumo, L. A., & Chen, V. (2017). Culture as a design "Next": Theoretical frameworks to guide new design, development, and research of learning environments. *The Design Journal: An*

- International Journal for All Aspects of Design*, 20, 875–885.  
<https://doi.org/10.1080/14606925.2017.1353033>
- Barlex, D. (2006). Pedagogy to promote reflection and understanding in school technology-courses. In J. R. Dakers (Ed.), *Defining Technological literacy: Towards an epistemological framework* (pp. 179–196). Palgrave Macmillan. [https://doi.org/10.1057/9781403983053\\_13](https://doi.org/10.1057/9781403983053_13)
- Birkeland, J. (2002). *Design for sustainability: A sourcebook of integrated eco-logical solutions*. Earthscan Publications Limited.
- Boess, S., & Kanis, H. (2008). Meaning in product use: A design perspective. In H. N. J. Schifferstein & P. Hekkert (Eds.), *Product experience* (pp. 305–332). Elsevier Ltd.  
<https://doi.org/10.1016/B978-008045089-6.50015-0>
- Brown, T., & Katz, B. (2009). *Change by design: How design thinking transforms organizations and inspires innovation*. Harper Collins Publishers.
- Bryman, A. (2001). *Social research methods*. Oxford University Press.
- Bumroongrak, V. (2012). *Wattanatham Thang kang Suksa Lae Kan Pattana*. Fine Arts Department.
- Busch, A. (Ed.). (2002). *Design is... words, things, people, buildings, and places*. Princeton Architectural Press.
- Buxton, B. (2007). *Sketching user experiences: Getting the design right and the right design*. Elsevier.
- Campos, C. (Ed.). (2006). *Product design now: Designs and sketches*. Harper Collins Publishers.
- Chapman, J. (2005). *Emotionally durable design: Objects, experiences and empathy*. Earthscan Publications Ltd.
- Chen, Ch.-W. (2018). New product styles and concepts in the bicultural context. *The Design Journal: An International Journal for All Aspects of Design*, 21(6), 771–787.  
<https://doi.org/10.1080/14606925.2018.1516496>
- Chong, M. (2004). Designing the user experience for international web users. In M. Kaplan (Ed.), *Advances in human performance and cognitive engineering research. Cultural ergonomics* (Vol. 4, 281–316). E. Salas (Series Ed.). Emerald Group Publishing Limited.  
[https://doi.org/10.1016/S1479-3601\(03\)04010-4](https://doi.org/10.1016/S1479-3601(03)04010-4)
- Cila, N., Hekkert, P., & Visch, V. (2014). Source selection in product metaphor generation: The effects of salience and relatedness. *International Journal of Design*, 8(1). <http://www.ijdesign.org/index.php/IJDesign/article/view/1382/613>
- Cross, N. (1999). Natural intelligence in design. *Design Studies*, 20(1), 25–39.  
[https://doi.org/10.1016/S0142-694X\(98\)00026-X](https://doi.org/10.1016/S0142-694X(98)00026-X)
- Frambach, J. M., Driessen, E. W., Chan, L.-Ch., & Vleuten, van der C. P. M. (2012). Rethinking the globalisation of problem-based learning: How culture challenges self-directed learning. *Medical Education*, 46, 738–747. <https://doi.org/10.1111/j.1365-2923.2012.04290.x>
- Gaver, W. (B.), Dunne, T., & Pacenti, E. (1999). Design: Cultural probes. *Interactions*, 6(1), 21–29.  
<https://doi.org/10.1145/291224.291235>
- Gibbs, Jr. R. W. (Ed.). (2008). *The Cambridge handbook of metaphor and thought*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511816802>
- Ingerman, Å., & Collier-Reed, B. (2011). Technological literacy reconsidered: A model for enactment. *International Journal of Technology and Design Education*, 21, 137–148.  
<https://doi.org/10.1007/s10798-009-9108-6>
- Inkong, P. (2017). *Kan Ookbaap Palitapan Wattanatham: Neawkid Rupbabb Rae Khanvikraew*. Unlimited Printing.
- Intrachuto, S. (2013). *Upcycling: Pattana Seth Wassadu Yang Saengsan*. National Science and Technology Development Agency.

- Julier, G. (2014). *The culture of design*. SAGE.
- Khalid, M. (2017). Fostering problem solving and performance assessment among Malaysian mathematics teachers. *Sains Humanika*, 9(1–2), 51–55. <https://doi.org/10.11113/sh.v9n1-2.1098>
- Kujasene, J. (2001). *Manut Lae Sing Wadlom*. Chulalongkorn Book Center.
- Lin, R.-T. (2007). Transforming Taiwan aboriginal cultural features into modern product design: A case study of a cross-cultural product design model. *International Journal of Design*, 1(2). <http://www.ijdesign.org/index.php/IJDesign/article/view/46/26>
- Lind, J., Pelger, S., & Jakobsson, A. (2020). Students' knowledge of emerging technology and sustainability through a design activity in technology education. *International Journal of Technology and Design Education*, 32, 243–266. <https://doi.org/10.1007/s10798-020-09604-y>
- Lucas, L. M. (2006). The role of culture on knowledge transfer: The case of the multinational corporation. *The Learning Organization*, 13(3), 257–275. <https://doi.org/10.1108/09696470610661117>
- Martin, A. (2017). *Visual knowledge for multimodal learning*. Studentlitteratur.
- Middleton, H. (2005). Creative thinking, values and design and technology education. *International Journal of Technology and Design Education*, 15, 61–71. <https://doi.org/10.1007/s10798-004-6199-y>
- Morris, R. (2016). *The fundamentals of product design*. Bloomsbury Publishing Plc.
- Potter, N. (2002). *What is a designer: Things, places, messages*. Hyphen Press.
- Prasertsilp, P. (2015). *Wattanatham Lae Kan Pattana*. O.S. Printing House Press.
- Rodgers, P., & Milton, A. (2011). *Product design*. Laurence King Publishing Ltd.
- Salehi, M. (2012). Reflections on culture, language and translation. *Journal of Academic and Applied Studies*, 2(5), 76–85.
- Schütze, M., Sachse, P., & Römer, A. (2003). Support value of sketching in the design process. *Research in Engineering Design*, 14, 89–97. <https://doi.org/10.1007/s00163-002-0028-7>
- Svensson, M., & Johansen, G. (2019). Teacher's didactical moves in the technology classroom. *International Journal of Technology and Design Education*, 29, 161–176. <https://doi.org/10.1007/s10798-017-9432-1>
- Tinakul, N. (2009). *Kan Bleng-Plang Thang Wattanatham Lae Sungkom*. Chulalongkorn University.
- Tucker, T. (2012). *Upcycling: a new corporate trend*. Trafford Publishing.
- Vries, de M. J. (2016). *Contemporary issues in technology education. Teaching about technology: An introduction to the philosophy of technology for non-philosophers*. P. J. Williams, A. Jones, & C. Bunting (Series Eds.). Springer International Publishing AG Switzerland. <https://doi.org/10.1007/978-3-319-32945-1>
- Wakefield, J. (2017). TEDGlobal: Africa needs more engineers and makers. *BBC News*. <https://www.bbc.com/news/technology-41080479>
- Whiteley, N. (1998). *Design for society*. Reaktion Books.
- Zhang, X., Ordóñez de Pablos, P., & Xu, Q. (2014). Culture effects on the knowledge sharing in multinational virtual classes: A mixed method. *Computers in Human Behavior*, 31, 491–498. <https://doi.org/10.1016/j.chb.2013.04.021>