# A Study of Flipped Ceramics Craft Education in an Enhanced Multimedia Learning Environment

## 以強化式多媒體學習環境實踐翻轉陶藝教學

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## Abstract

In the Information Age, various digital devices and media are widely used in the classroom. Teachers are encouraged to take the advantage of multimedia equipment and embed them into curriculum planning. Ceramics craft education is normally guided by the instructor in the studio or classroom to show the handmade techniques. Discussion of information technology and multimedia-based learning environment applied in craft education is hardly seen in the literature. This research investigates and implements the flipped education of ceramics craft class through developing an enhanced multimedia learning environment. A semester-long ceramics craft classes are arranged at Department of Creative Product Design in National Taichung University of Science and Technology to examine the process of flipped learning and multimedia learning environment development. In this enhanced multimedia learning environment, digital devices (mobile phone) and an online social media (Facebook) are applied to involve students in learning activities designed by the author. The required pre-class preparation as well as the evaluation of students' creations are discussed to analyze the learning performance. The result shows the advantage of applying low-cost multimedia learning environment and popular digital device in a handmade-focused craft class to reach the flipped education.

**Keywords**：flipped ceramics education, multimedia environment, digital devices

## 摘要

在資訊時代中，許多數位設備及媒體被大量利用於課堂之中，教師因而紛紛將多媒體設備融入課程規劃中。對於陶藝教學之類的藝術、設計課程，因強調實際手

作的本質，在文獻中較少提及利用資訊科技及多媒體的學習環境。 本研究嘗試以發展強化式的多媒體學習環境導入翻轉陶藝教育。藉由在國立臺中科技大學創意商品設計系開設的陶藝課程中，本研究利用學生常用的數位設備(手機)，及社群媒體(臉書) ，檢視陶藝課程之翻轉教學，提供同學更多元的學習機會。在本文中，說明課前應有的準備、課堂中的教學執行與課後學習成效的評估。本研究結果顯示利用低成本的多媒體學習環境建置方式，及常用的數位設備，亦可在重視實際手作的工藝教學課程中達成翻轉教育。

**關鍵字**：翻轉陶藝教學、多媒體環境、數位設備

# 1. Introduction

The role of information technology in providing educational support for teachers and students is widely recognized. Various hardware and software, from popular digital devices to advanced augmented reality equipment, are embedded in education scenario practice. In addition to traditional teaching equipment such as computer and projector, more digital devices are indeed intensively used in daily activity for students to enjoy their social connection. Mobile phones are especially popular for students born in the so-called Information Age or New Media Age. In terms of cost-effectiveness, mobile phone and social media applications are suitable for teachers to build multimedia learning environment.

Although teachers are encouraged to take the advantage of multimedia equipment and embed them into curriculum planning, the performance of this approach applied in craft education which is tremendously relied on handicraft in the studio is hardly reported in the literature. This situation of scarce discussion related to information technology and multimedia-based learning environment applied in craft education is perhaps due to the nature of required physical touch and handmade process. The ceramics craft education, as an example, is normally guided by the instructor in a top-down manner to plainly show the handmade techniques. The main purpose of this teaching approach is to guide students through detailed explanation of various ceramics skills to help demystify the processes particularly for the beginners. However, it will start with a flurry of activity whenever the class are crowded with students. The instructor is then exhausted and students show their frustration with learning effectiveness. Complementary learning means are urgently required to improve the interaction within a craft education scenario.

To respond to this drawback of current craft-focused pedagogy, the flipped classroom concept provides students with the blended learning environment for active craft class engagement. It gives the instructor a better way to deal with student variety and different learning styles during the class time. In the increasingly technology-rich days, students are more familiar with skills related to the use of information technologies (IT). It's then ideal for the instructor with craft expertise to embed IT or digital devices into curriculum design and flip the classroom activities for improving learning efficiency. With the help of digital equipment and popular society media, more dynamic learning of craft skills can be expected. In addition to traditional pedagogy relied on live skills demonstration, multimedia environment set up for students then inspires teachers of ceramics craft education to flip the learning activities both in and out of the classroom.

The goal of this study is to examine the role of digital technology in the context of ceramics craft education. Instead of comparatively expensive VR or AR equipment installment, pervasive mobile phone and frequently used social media are integrated into the ceramics craft classroom. The flipped teaching model, pre-class preparation and the subsequent processes are described in this paper. Students' evaluation on the instructor's teaching paralleled with learning performance assessment analyzed by the instructor are also presented. The result shows the flipped classroom arrangement of using popular digital device and social media to build a low-cost multimedia learning environment in a handmade-focused ceramics craft class is reachable.

## 2. Literature Review

Rapid IT development triggers off its incorporation in teaching and learning process. Nikolić, Petković, etc. (2019) argued that it's an opportunity for teachers to upgrade the lectures and improve learners' performances through the implementation of e-learning and IT in education system. They described several was to accomplish teaching and learning using IT: using e-learning, using educational software and using the internet. Examples can be found in various education disciplines. Robinson, Dusenburry, etc., (2019) described digital innovation maybe adapted in the writing and communication classroom: learning management systems, website and wiki technology, cloud services and storage, smart mobile devices and apps, collaborative productivity software, multimedia sharing and social media. A definition of "teaching in a digital environment" capacity construct and the development of a performance-based test is proposed by Claroa, Salinasa, etc. (2018) to measure teacher's ability in a digital environment. In the area of art and design such as architectural education

has shown an increasing amount of digital technologies being involved in the studio curricula (Kara, 2015). In terms of art creation and exploration, digital environment offers great potential for the improvement of collaborative aspects (Milekic, 2000). Using computer support for collaborative concept design, Tuikka and Kuutti (2000) discussed that artifacts and actions have an important role in communication between design team members. Information technology development also provides abundant applications of multimedia environment in a classroom. Rogers, Scaife, etc. (2002) developed a framework for mixed reality environment for young children to involve in learning activities through combinations of actions and effects along physical and digital dimensions. In a digital teaching environment, co-creativity can be enabled through digital storytelling approach (Schmoelz, 2018).

"From sage on the stage to guide on the side", King (1993) analyzed learning activities to promote cooperative learning. The concept of flipped classroom and the use of the flip teaching methodology has shown a significant impact on education field through multimedia like video combined with other teaching activities (Fidalgo-Blanco, Martinez-Nunez, et al. 2017). Globally, the flipped classroom design has arguably influenced the effects on student performance across disciplines and education levels (Strelan, Osborn and Palmer, 2020). Wang, Jou, Lv, and Huang (2018) presented a model-based flipping classroom learning module for physics by modern teaching technology.

To flip the teaching methodology, curriculums which tremendously relied on handicraft education in art or design school is definitely a candidate appropriate for integrating digital technology to improve the craft learning performance. In addition to manual skills, Autio, Thorsteinsson, and Olafsson (2012) pointed out the focus of craft education in Finland and Iceland are also on developing students' thinking skills that enable them to work through different handicraft processes. Erman (2012) examined the integration of ceramics and humor with different styles to show interesting production. Hu, Wang and Huang (2018) discussed that communication and cooperation are critical aspects of nurturing ceramics talents for industry. These studies implied that students are encouraged to use various learning activities and enjoy sharing both in and out of the classroom to enhance their creativity. Using ceramics craft education as an example, even though students are instructed to physically touch material and practice handmade techniques, adequate use of digital and multimedia environment in a flipped classroom will help students improving their creation from concept to implementation.

# 3. Research Method

## 3.1 A flipped teaching model

This research modifies the concept of micro flip teaching (MFT) model proposed by Fidalgo-Blanco, Martinez-Nunez, et al. (2017). A multimedia environment is organized in two ceramics craft related courses during the semester through combining learning activities arranged in classroom and out of classroom. In addition to traditional teaching lecture and demonstration of handicraft skill, the flipped model for the ceramics craft course embeds "link activity" (LA) both in classroom and out of classroom as shown in Figure 1.

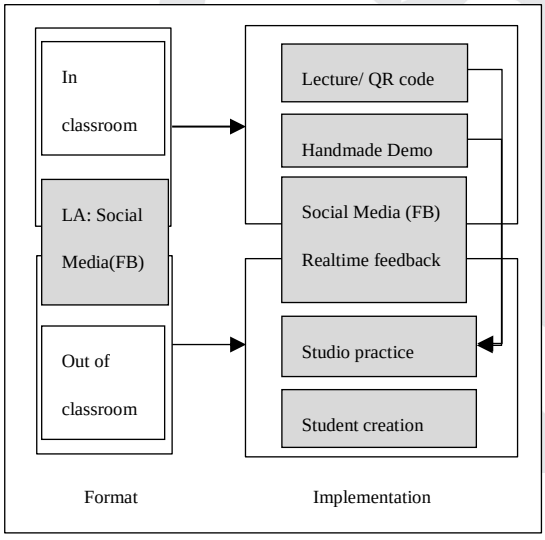


Figure 1. The flipped model for ceramics craft course

In this MFT model，the social media (Facebook messenger) is used to carry out survey, quiz and feedback as the "link activity." During the "in classroom" session, traditional lecture and live demonstration of ceramics skills are given by the instructor. To assist students in enhancing further comprehension of physical and detailed operation regarding clay material, a series of QR codes are provided to students with real time scanning to access complementary teaching archives. More ceramics pedagogies in this teaching archives including handcraft skill demonstration and the teacher's prototypes are prepared before the class. Students can scan those QR codes anytime both in classroom and out of classroom for advanced learning. Students are also encouraged to access Q&A session, share their ideas and creations, and offer feedback on learning activities.

## 3.2 Research setting

Two ceramics craft related courses during the first semester in 2019 academic calendar year at Department of Creative Product (CPD) in National Taichung University of Science and Technology (NTCUST) are chose to examine the MFT model and multimedia learning environment construction. "Ceramics Product Design" (28 students) and "Ceramics Craft Creation" (33 students) are offed to students of five-year junior college ($4^{th}$ year) and two-year senior college ($1^{st}$ year) respectively. Curriculum planning and design includes preloaded teaching materials, photos and video clips of skills demonstration which are collected in the teaching archives and stored in the class fan page (FB). These complementary teaching materials are transferred to a series of QR codes and

introduced to students during the class. Figure 2 and 3 shows an example of QR codes created at the teaching preparation stage for easy access and the classroom scenario for enhance learning.

Figure 2. QR code example of ceramics craft course

Figure 3. Classroom scenario of ceramics craft course

Another pedagogy approach is executing an interesting survey of students' perception of clay material. A question of "50 things I can do with clay" is posted at the class fan page to collect students' imagination and responses using a "verb" either in a physical or conceptual manner. Using brainstorming approach in this session, students interacts with each other to generate terms in "verb" form under the instructor's guidance. In the next step, the result collection of many verbs is rearranged and mapped into totally 72 corresponding ceramics skills. Each of them is interpreted and manually prototyped by the author for the subsequent demonstration.

These exercises are gathered together and continuously embedded in the class accompanied with QR codes scanning whenever students need rehearsal or repeatedly practice. Finally, students are inspired to practice various skills themselves in the classroom, share their creations anytime in the class fan page (FB) and review their skills with the author either orally in the classroom or out of classroom with FB messenger. At the end of the semester, evaluation of students' creations and their feedback on teacher's pedagogy are presented.

## 4. Results

The process executed in two courses during the whole semester examination showed positive and encouraging results. In the beginning, the author prepared related ceramic skills (Figure 4) and recorded them into teaching archives stored in the class fan page. Photos and video clips are taken and relevant QR codes are generated for further reference.

Figure 4. Author's demonstration and preparation

During the session of online survey of students' responses to the question of "50 things I can do with clay", approximately

100 verbs are collected and rearranged to 72 different ceramics skills and imaginations (analogous to ancient Chinese story about power of 72 morphoses owned by the Monkey King). Responses gathered form interactive communication of the class fan page and part of the 100 verbs either in physical or conceptual form are listed in Figure 5 and 6 respectively.

Figure 5. Students' responses to survey (in verb form)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 拍 | 壓 | 槌 | 打 | 摔 | 丟 | 剝 | 撕 | 揉 | 泡 |
| 擠 | 拉 | 黏 | 轉 | 捏 | 瞪 | 睡 | 印 | 私 | 膩 |
| 捲 | 拋 | 磨 | 刮 | 聽 | 陪 | 等 | 修 | 調 | 切 |
| 展 | 灌 | 注 | 扛 | 噴 | 洗 | 曬 | 翻 | 蓋 | 桿 |
| 淋 | 挖 | 敲 | 填 | 調 | 攪 | 和 | 溜 | 待 | 放 |

Figure 6. Part of 100 verbs (in Chinese to response 50 things I can do clay material)

Among those verbs collected from students' responses, examples of that belong to physical perception are throwing, tapping, beating, washing, cutting, adjusting, grinding, stamping, etc. Another part of conceptual perception appears several interesting verbs like sleeping, waiting, exploring, messaging, etc. From the final 72 skills or imaginations, corresponding prototypes made by the author as the teaching samples are shown in Table 1.

Table 1. Author's teaching samples

| | | |
|---|---|---|
|  |  |  |
| 1 : plating | 2 : throwing | 3 : striping |
|  |  |  |
| 4 : kneading | 5 : shaping | 6 : carving |

Table 2. Students' creation corresponding to skills

| 100 things | 72 skills | Glazing and firing sample | Students' creations |
|---|---|---|---|
| Twisting (student A) |  |  70 |  |
| Exploring (student B) |  第 11 堂： 黏肌理 |  40 |  |
| Kneading (student C) |  第 4 堂：手捏成形 |  64 |  |
| Soaking (student D) |  第 27 堂：海綿活用 |  31 |  |
| Expecting (student E) |  第 69 堂：量體+切割 |  14 |  |

In this paper, five of those 72 verbs are presented to show real ceramics creation processes including glazing and firing and provide students with learning samples. Three of them are physical terms: twisting, kneading and soaking;

and others are in conceptual form: exploring and expecting. Based on the flipped teaching model proposed in this research, students are then triggered to develop their own creation inspired by the author. Table 2 shows students' final creations corresponding to five ceramics skills and imaginations.

A final review and evaluation of overall learning performance are listed as follows:

- Multimedia environment help students to rehearse and repeatedly practice
- Learning performance is improved through brainstorming and sharing
- Instructor's samples play the guiding role and are helpful
- Flipped teaching approach can reach more active learning

The feedback of teaching is evaluated by students based on typically 5-pint Likert scale (where, from 1 to 5, represents strongly disagree to strongly agree), and "Ceramics product design" course receives average score 4.7 and "Ceramics craft creation" course receives 4.52 respectively. Among the questions asked in the evaluation, these two courses also obtain fairly high score of 4.71 and 4.36 on "teacher is good at applying multimedia methods in teaching". The pedagogy of these teaching archives got "excellent teaching composition" in reward for the teaching and learning performance in the end of the semester.

# 5. Discussion

Traditionally, craft education is largely relied on the instructor's oral presentation and manually demonstration of craft skills. In this case, digital technology and multimedia teaching environment is hardly applied in craft education field. However, the flipped classroom concept shed some light on the possibility of integrating those technology and devices to assist students in learning craft skills more effectively. For ceramics craft education, in addition to in-class demonstration, multiple learning approaches can inspire students' creation and improve learning efficiency. This paper proposes a flip teaching model with low-cost enhanced multimedia environment and shows positive and encouraging results. Five procedures are included in this model: 1) craft samples prepared by the instructor are stored in popular social media, 2) brainstorming before the class through social media, 3) mapping from ideas to ceramics craft skills, 4) QR-code scanning for complementary learning in the workshop or after school, and 5) inspiring student's creation. The "link activity" between classroom and home through interactive social media communication as well as the application of widely used mobile phone in the class constructs the proposed flip teaching model. More active learning and better learning performance is reachable for craft education. To further the research of

flipping art and craft education, information technology definitely plays the essential role of improve learning efficiency. Issues of students' skill level and influence on learning attitude are expected to further exploration in the future.

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