

INNOVATING EDUCATION IN THE DIGITAL ERA FOR THE TRADITIONAL FINE ARTS EDUCATION PROFESSIONS, THE APPLIED FINE ARTS TRAINING FIELD IN HANOI, VIETNAM

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Abstract: the digital era on the path of educational innovation in Vietnam today is one of the orientations to keep up with the trend of global development. The professions in education to serve the social needs, especially in the field of Applied Fine Arts training, are in desperate need of combining with science and technology to keep up with the development process so as to create modern products. Looking at the aspect of vocational training in Applied Arts, which is one of the seemingly very narrow fields of society, but in the last three years, 3D printing and design software on digital platforms aims to increase the efficiency of product creation, design and functions associated with social life have been scientifically researched and applied, and they have become popular in the society. In terms of industrialization, globalization, and approaching artificial intelligence, the application of 3D technology with 3D printers, one of the achievements from the development of the 4.0 technology revolution has created the possibility and the ability to support the professionals in terms of product designing and modeling in a wide range of genres, especially associated with traditional product designing training professions such as lacquer, jewelry, and ceramics. In order to increase the artistic effectiveness as well as the cultural and economic values of traditional products, we feel the need for digital technology research and development to innovate education, especially education in the field of Applied Fine Arts training and which is also a target that needs to be developed in the current conditions.

Keywords: Innovating education, traditional fine arts education.

ИННОВАЦИОННОЕ ОБРАЗОВАНИЕ В ЦИФРОВУЮ ЭРУ ДЛЯ ТРАДИЦИОННЫХ ПРОФЕССИЙ ИЗОБРАЗИТЕЛЬНОГО ОБРАЗОВАНИЯ, ОБЛАСТИ ПРИКЛАДНОГО ИЗОБРАЗИТЕЛЬНОГО ОБРАЗОВАНИЯ В ХАНОЕ, ВЬЕТНАМ

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Аннотация: цифровая эпоха на пути образовательных инноваций во Вьетнаме сегодня является одним из направлений, позволяющих идти в ногу с тенденциями мирового развития. Профессии в сфере образования, обслуживающие социальные потребности, особенно в области обучения прикладному изобразительному искусству, остро нуждаются в сочетании с наукой и технологиями, чтобы идти в ногу с процессом развития и создавать современные продукты. Глядя на аспект профессионального обучения в области прикладного искусства, которое, казалось бы, является одной из очень узких областей общества, но за последние три года программное обеспечение для 3D-печати и дизайна на цифровых платформах направлено на повышение эффективности создания, дизайна и функций продуктов, связанных с общественной жизнью, были научно исследованы и применены, и они стали популярными в обществе. С точки зрения индустриализации, глобализации и приближения к искусственному интеллекту, применение 3D-технологий с помощью 3D-принтеров, одно из достижений развития технологической революции 4.0, создало возможность и способность поддерживать профессионалов с точки зрения проектирования и производства продукции. моделирование в широком диапазоне жанров, особенно связанных с традиционными профессиями по проектированию изделий, такими как лакирование, ювелирные изделия и керамика. Чтобы повысить художественную эффективность, а также культурную и экономическую ценность традиционных продуктов, мы чувствуем необходимость в исследованиях и разработках цифровых технологий для инновационного образования, особенно образования в области обучения прикладному изобразительному искусству, что также является целью, которую необходимо развивать в современных условиях.

Ключевые слова: инновационное образование, традиционное художественное образование.

Introduction

In the 4.0 technology era nowadays, applying technology is really necessary in all fields, especially in higher education, at university level. Digital transformation is the opportunity for Vietnam to keep up with and narrow the gap with developed countries. According to Nguyen Hong Linh, digital technology revolution has integrated all smart technologies with now available and future high impact technologies such as 3D, biology, new material, automation,

robot, etc. to optimize procedure, and production methods [1].

In 1962, E.M. Rogers, a communications theorist at the University of New Mexico, developed the Diffusion of Innovations Theory; abbreviated as DOI. Diffusion of Innovation theory is a hypothesis that outlines how new technology and other advancements spread out to society and culture, from product introduction to adoption to use. Diffusion of Innovation theory seeks to explain how and why new and experimental ideas have been adopted and spread over long periods of time.

Based on that theory, we could understand why new technology is spread and we know about new technology applications and their attraction in any creation. A smart stick for old people when going out to the street, which is created and applied with ICT by Dr. Yoon Jang Wun, Busan Design Association, South Korea, have given such impression. The smart stick is designed in small size by 3D designing software and all small parts are assembled sophisticatedly, especially it is connected with a smartphone. The product is perfect in both technology and application [3]. Through a specific model, we recognize that it's a perfection and a combination of health care, technology and applied art. The president of Sedia Design Association (Industrial Design Association DONGNAM), South Korea have shown clearly the important role of technological integration in the design field of the whole Asian region. It's also the effort of the leaders to predict the development trend of design products in the coming time and directions to develop applied fine art products in the future.

In Vietnam, in the applied fine art training field, especially at specialized training environments like University of Industrial Fine Arts, Interior and Industrial Fine Art Faculty under Hanoi Architectural University, Industrial Styling Faculty of Hanoi Open University, Applied Fine Arts faculty of Hanoi University of Business and Technology, design training is the most important element of the learning program. For the training of applied fine arts in general, the newest and the most modern designing software are always updated and applied widely for disciplines like Graphics, Interior, Industrial Styling, Fashion, most popularly in the past 3 years. It proves that this learning activity is definitely proactive.

Considered as one of the achievements of the 4.0 technology revolution, globally advanced 3D technology is a new step to approach digital era nowadays. In order to realize a design idea for a fully done product in size, ratio, material and its image looks bold, most like a real product, the 3Ds MAX design software is the best to support training in applied fine art. This software can illustrate three-dimension objects by designing 3D models and displaying 3D objects. Then a 3D printer is connected to an appropriate software to support forming and shaping one or many product models using different materials from the design file.

A new technology that combines 3D design of three-dimensions products with an application connected to 3D printer is called 3D technology. This is a new approach that needs to be studied seriously to confirm the benefits in development it brings to each training discipline. 3D technology is being applied and has also made obvious changes in all professional design training disciplines, even with those that are considered traditional such as Ceramics, Lacquer, Jewelry in the field of applied Fine Arts training.

Besides disciplines like Interior Design, Graphic Design, Industrial Styling, and Fashion Design, whole 3D technology is being applied in Jewelry discipline and partly in Lacquer and Pottery disciplines. These are disciplines available in the early stage of Industrial Fine Arts University - a training cradle for applied art of in Vietnam which have had a long training experience such as Jewelry for 60 years, Lacquer and Ceramics for 70 years.

Nowadays, in the world, 3D technology has been applied to support professionals in designing, shaping, figuring models in different materials, especially for ceramics and jewelry products. Lacquer is a traditional and distinctive craft of Vietnam, Japan, China, and South Korea so in each country, this craft possesses their own typical techniques and skills. New technology is rarely applied for this craft. We found very few documents to prove that the countries having paint products like China, Japan, Korea are applying designing lacquer products with 3D MAX technology.

1. Theoretical Basis

Coming back to Diffusion of Innovation Theory by Rogers, he has synthesized results of 508 diffusion research on primary fields to explain different stages of applying technology by different subjects. He classified different groups of customers. The main groups in the Diffusion of Innovation theory are:

- + A group of innovated customers (Innovators): are people open with risks and the first customers dare trying new products.
- + A group of quickly adapted customers (Early adopters): are people interested in testing new technology and establishing applications in society
- + Group of early adopted customers (Early Majority): this customer group open the way for using innovated products in social trend and they are one part of a general community.
- + Group of late adopted customers (Late Majority): is a part of general community and they only use a new product after seeing that most of the people already successfully applied it.

As Everett Rogers has considered and classified subjects applying technology like customers, we make an equal comparison, we can classify levels of applying technology in disciplines of traditional fine arts following this hypothesis:

Jewelry industry is considered the early majority after early adopter. Lacquer and Ceramics industry belong to lower segment, which are not the late adopters but moving toward the early majority in access to technology. The technology mentioned here is 3D designing and printing to make molds for products. Therefore, there are certain difficulties such as the printer should be appropriate and capable to print some kinds of suitable molds for lacquer and ceramics materials. Compared to Jewelry industry, this technology is applied more slowly and less popularly in Lacquer and Ceramics industry because the old methods, which have been used in Lacquer and Ceramics industry for long time, now become an obstacle for change.

With research on educational innovation in the digital era for traditional fine arts education professions and applied arts training fields, we rely on integrated teaching methods to research in various disciplines of traditional art. Learning and training activities in traditional fine arts disciplines such as Jewelry, Ceramics and Lacquer are being carried out with integrated teaching and learning methods, which is a harmonious combination between the requirements of acquiring knowledge and training of skills in the same subject. Therefore, in addition to learning and accumulating specialized knowledge, there is another important aspect that is the practice of applying technology and thereby keeping abreast of the production market so that the product can be circulated outside society.

Empirical research done in the traditional fine arts training disciplines of Lacquer, Ceramics, Jewelry at the University of Industrial Fine Arts in three recent years: 2018, 2019, 2020 shows that in each academic year, there are about 20 students of jewelry discipline, 7 to 10 students of Ceramics and Lacquer discipline. Although the number of students is small, the practical exercises in the major are quite complete and have good results. In each school year, each student will have 8 lessons on product creation and 50% of them will be tested on product samples with real materials, so practice with technology in such majors has all the favorable conditions to develop and students can experiment new ways.

Based on surveys, we have information about learning results, conditions to apply technology and we can assess students' creation and practice process from the leading and experienced lecturers of Industrial Fine Arts University. Then we make statistic and classify data of all students who are studying in all disciplines in 5 years from the first year to the final year to get the research results of how is the technology being applied in different levels. Then we make comparison with the graduate student's creative practice, whether they continue working with those available technologies or not?

We have done investigation with 20 graduates since 2015 up to now. The result is that 70% of the graduates work with profession they were trained and 65% of them are applying technology with 3D design software. Some of them have practiced with those software since they were studying in specialized traditional arts disciplines while others started accessing this technology after graduation. Especially, graduate students from Jewelry discipline have stable jobs in companies like PNJ, SJC, etc. Young designers have to use the most modern Jewelry designing software to create products for nowadays market. For Lacquer and Ceramics discipline, only 50% of graduates work on this narrow profession and not all workshops and manufacturers use technology (3D designing and printing) to experiment and create new products, they usually work with traditional existing procedure. Especially in traditional craft villages like Hạ Thái or Bát Trảng, they have many mass samples but they have no plan to recruit professional designers to renew their samples which are sold to the market for years. This situation likes a barrier for the increase of learners who want to follow traditional trades like Lacquer and Ceramics. This number of learners may have increased in the last years.

2. Results on technological practice in traditional arts education profession

2.1. Methods of practicing technology

3D design technology to produce a product in applied arts training is a synchronous process connected by technology. People and this process has created a design trend in the new direction required in current conditions. First, the most primitive ideas of a design pattern will be formed. After having a clear direction, first step of the process is to sketch 2D drawings on paper. Then the most satisfied model will be selected and put into a dedicated graphics program like 3Ds Max. At the end the process, the result will be a 3D design in three-dimensional space, the product has the right proportions, dimensions and materials that are almost 90% like the real thing. Therefore, the 3D design process helps to create a model that customers can feel very close to and almost like a real product.

3D technology is understood the process of designing samples. 3D printers are developed later to create products from designs. For traditional trades, this product is not the finished one but just shaping the core mold, specifically with resin mold in the Jewelry industry and plastic reinforcement in the Ceramic and Lacquer industry. 3D printing technology starts from a digital design file, as a blueprint for a physical object. This 3D design is cut into thin layers and then sent to the 3D printer. From 3D designed drawings to working with 3D printers is a sequential and complete process to create one or more products from design files. 3D printing process supports faster design than the traditional process. With the 3D design printed sample, the designer doesn't have to make different experimentations, can save time and get the sample to the exact scale. That's the advantage compared to the old-fashioned process of rendering the product. Thanks to that, if there are investors or customers who need samples to preview and follow the design process, this is an advantage. The CEO of the US 3D Systems Company - Abbe Leiqaetaer said: "Only you cannot think out of that. Impossible that it cannot be printed out". This is an incentive for designers to create products without worrying about whether those products are shown successfully or not.

In training disciplines of traditional fine art, about 3 to 5 years ago, there was no technological process to support product prototyping, so the traditional manual and semi-manual process was often applied. Due to the aesthetic, technical, and output requirements that need to be handled, a prototype model is necessary. This 3D prototype increases the flexibility of the development process by allowing students to interact and experiment from design to prototyping and rendering to the defined look. Therefore, 3D printing technology is very beneficial for creating product samples and molds because it does not depend on the skill of the performer. 3D printers will assist to create models with accurate proportions and shapes in a variety of materials. This is the second most important stage after product design, the execution step to complete the product according to a closed process.

For the Lacquer discipline, 3Ds Max software has been applied by students since 2015, this is also an advancement in a particular industry that seems to be attached only to traditional techniques and materials. Innovative products with 3D design include sets of decorative lights, vases, screens, lacquer decorative modules, etc in following subjects: Design of household lacquer products, design of lacquer interior products.

For the Ceramics discipline, 3Ds Max software is used to create products including: Flat decorative ceramics

(embossed, engraved), household ceramics (applied and decorative categories, gift products), interior and exterior decorative ceramics (ceramic tiles, modular ceramics, industrial ceramics). In all learning subjects like Design of household ceramic products; Design of ceramic art products; Design of architectural decorative ceramic, students have to practice with three-dimensional product designs [2].

For Jewelry industry, designs are created for human body like bracelet, necklace with traditional or modern style, in accordance with different ages and applied spaces. There are also designs for using in different circumstances like in festivals, office or daily life, etc. 3D design using professional programs like Modela Player, 3Ds Max, Rhinoceros, Artcam, Jewelsmith, etc helps to create sophisticated ornamental products which is difficult for human hands to do. Traditionally, jewelry making process always requires high professional skills and deep knowledge relating to profession because each step is complicated, takes time. 3D printing technology can make shape with Resin liquid to create sample for products, replacing traditional procedure of making sample by hand. This is breakthrough step. With 3D printer, a mediate product (resin sample) is made very quickly and can meet all technical and artistic requirements. From the resin sample, following steps like metal casting and product perfection will be carried out. There are many benefits from applying 3D technology with jewelry industry including making mass products precisely, sophisticatedly, and meticulously which only the artisans with experiences for many years can make. From 3D printing technology, many jewelry products are shown, which can be unique, can be mass products similarly to samples of rings, necklaces, bracelet and other accessories, etc.

Compared to Thailand, a country in Southeast Asian Region, 3D technology has been applied in training at King's Mongkut University, North of Bangkok for about past five years. The Ceramic discipline has used sculpture software 3D Zbrush and integrated with Rhinoceros software to create 3D ceramics, then connected with 3D printer and used wet clay to make shape for products with precise ratio. The wet clay product is then mixed with glaze and fired. So, software connecting with 3D printer can make shape for ceramic products, still ensure the characteristic of product material – clay, therefore it is totally appropriate with the next perfection step of the process. The procedure of 3D printing to make ceramic products in Vietnam is very new. Besides, 3D printer can also make plastic mold and then shaping plaster mold in order to pour clay, mixed with glaze and fired. Though our online interview with Miss Sirintra Arjcharoen, Department of Industrial art technology King Mongkut's university technology north Bangkok on August 1st 2021, we learned that at Faculty of Industrial art technology, 3D printing technology is applied to create product mold with both methods for Ceramics discipline. This is a long traditional trade that have moved toward modern industry since 5 years ago.

Ceramics discipline of University of Industrial Fine Arts began to exchange and cooperate with King's Mongkut University from 2019 and we realized that there was a large technology application gap between us because they used 3D printing technology with ceramic products since 5 years ago but in Vietnam this technology is still quite new and has just started testing. Similar to the Lacquer industry, some experts have begun to research to be able to apply 3D technology to create plastic skeletons for lacquer. This core will be able to replace the composite reinforcement that is being applied today, and if successful, it will shorten some of the manual steps and achieve accuracy in scale.

Coming back to the Diffusion of Innovation Theory which was introduced at the beginning to assess the level of access to technology, we found that there are differences in all three training disciplines however are consistent with our hypothesis:

(1) For the training of Applied Ceramic at Industrial art technology King Mongkut's university, they applied technology at the highest level in very early time (from 5 years ago with 3D printer for pottery product), so we consider them as the Early Adopter: They are interested in experimenting new technologies and have established their widget in society, which results that the 3D printed ceramic products are efficiently created and can be applied immediately in society.

(2) Jewelry design industry in Vietnam belong to one level lower of diffusion – Early Majority. It results in paving the way for using technology (3D design and print) in training traditional fine art and their products also achieves correspondingly with the latest applications in the market.

(3) Lacquer and Ceramic industry belong to lower segment, which are not the late Majority but moving toward the early majority in access to technology. These two disciplines meet certain difficulties because they should find in the market appropriate 3D printers which can print molds for lacquer and ceramic products. At the same time, one more barrier is the old methods with traditional displaying technique have been rooted for long time, difficult to be changed in both disciplines.

2.2. The advantages that technology brings

3D technology in designing and printing can produce complicated shapes and totally uses automatic machines so people don't need to interfere in the production process. That's why there are considerable advantages.

First advantage: saving time and creating economic efficiency

3D printing technology greatly supports in making sample mold. For Jewelry samples that need making resin sample by hand, it takes 1-2 days or more. Applying 3D printing technology to create resin sample takes only a few hours and can create many identical samples. These samples can be even more complicated than the ones made by hand. This is the biggest advantage of 3D technology for the Jewelry industry.

For the Ceramics and Lacquer industry, 3D drawing software MAX can create designs with three spatial dimensions and apply materials quickly on the design to imagine the product. Lacquer and Ceramics industry are both specific industries with quite traditional material elements, so when students use 3Ds MAX design software, it helps to make product images complete in space with color, light and material relatively similar to the real material. If in the near future, the 3D printing technology could create product molds, the process will be complete. 3D design makes it very flexible to

choose a design among the many created templates or edit the template. Creating mold using a 3D printer takes only a few hours compared to the traditional process that takes about 3 days or more.

Second advantage: very clear personalization and few dependencies

As the learners, students will follow the process from product drawing - product mold making - product finishing with materials - market access. In the past, after having a 2D product design, students had to transfer to another person to make the product core by hand, this core was quite dependent on the skill of the performer. Technology and machinery have supported a lot, so the designer can actively solve the problem by himself from the design stage to the completion of the prototype with the help of machines, here is the 3D printer.

2.3. Some difficulties when applying technology

Traditional fine arts training associated with new technology and international integration haven't gained success from the first steps; it also collided with certain initial difficulties. The current training hasn't been synchronized and strongly developed yet due to the following factors:

About the capacity of technology users: Not 100% of students in the three disciplines have accessed to modern technology. Students in traditional art discipline are trained in a small number compared to other training disciplines and need to be built up both in quantity and quality in a long training process. Every year, about 25 to 30 students of all three disciplines graduate, however, this number only accounts for one third of the graduates from the disciplines that are hot and attracting high number of learners such as Graphics, Interior, and Fashion in applied art training schools.

About facilities: This is also one of the most important factors because only having enough new equipment; students can use and master them. According to preliminary statistics of the school years from 2018 to now, despite the support of machines, the facilities are still not enough for students studying in traditional art majors. The supporting equipment and machinery for implementation need to be more sufficient and there should be cooperation between the schools and external establishments to support creating a closed loop of products: design - production - market. Beside that the Jewelry disciplines has 3D printers, the Ceramics and Lacquer discipline still have to carry out experiments outside.

About employment after graduation: Statistics show that about 65% of students can adapt to the aesthetic needs of customers, the remaining 35% are still inactive in thinking and insensitive to requirements of reality. Moreover, outside manufacturers often conceive of using mass samples or slightly modified samples from existing samples, so they have not yet seen the potential of new designs. That's why graduate students see less opportunities to get jobs and have less exposure to businesses as designers.

A few of them are successful and have their own companies like Nguyen Huy Bien, who graduated with a master's degree from the University of Industrial Fine Arts in 2017. He is currently the director of Vdesign R & D Design company specializing in designing decorative products and application with 3D technology. He shares that his company has applied new technology to perform many contracts such as the design of the thermos for the Aurora Lights and Thermos Company, the design of decorative lights and some other applications. But pursuing and succeeding with design work requires passion, personal capacity and especially high professional factors. Having long working time with lacquer material in Ha Thai craft village during his experimentation work after graduation, also with the passion for lacquer material in bold or transparent colors, he shares that his company is experimenting with and wants to revive some of the classic 1970s lacquer jars made by the previous generation of artists with the new technology of 3D printing. With this technology, it is possible to use the 3D scanning tool to scan the entire shape of the lacquer jar sample kept since the 1970s, then create a 3D design file with the correct scale and then connect it to a 3D printer to create lacquer core. Then finish with traditional lacquer techniques such as wrapping the body, finishing the core, painting colors and textures. Thus, traditional techniques and modern technologies will be combined to preserve the items of the past as cultural values.

3. Some general discussions

One question is raised that will new technology bring about the same artistic effect as the traditional process? There are also opinions that new technology cannot make products with the same quality as products of traditional process with the ability of the artisan to create directly product by his skills and long-time experience. That concept has certain mistakes, because if it depends only on the skill of the performer, there are inadequacies due to the problem of time and quantity of products as well as depending on the experience of each person. New technology will go hand in hand with the traditional process, creating fast and accurate designs. When the technology is applied, that means it helps to create new products more flexibly, quickly and designers can experiment many times to actively choose the best models.

Training of traditional trades on the basis of modern technology will help all of our students have certain approach, thus, enhancing the effectiveness of training according to social needs and limiting the state of time and labour wasting when using old and familiar and unchanged technical means. Technology application requires knowledge, experimentation, and then drawing lessons from practical experience with techniques and materials. In addition to experimenting in the training environment, it is also necessary to connect with external institutions to find feedback. External links are links with production facilities, more specifically, with craft villages and sample production units to create a closed process from training to practical application. Products from technology are not only experimental designs and lessons in schools, but also need a certain spread to bring greater value to society. Finished products from new technologies should be known by the society through contests on applied art design or international fairs as professional and valuable designs.

Conclusion

Training traditional professions in the new technology era aims at moving further to establish procedure, standards, necessary and sufficient conditions to promote wide-spread and popular creations thus gaining art achievements meeting art and technique requirements.

Applying 3D technology to make product samples in traditional industries is an applied art design training model updated with modern technology in the digital education era. Research results help to affirm the value and influence of technology on society and confirm that the technology influence has promoted both social and aesthetic creativity which helps us move towards the international integration in the field of applied arts training. In the development of the Industrial Revolution 4.0, technology has influenced much on the education of large and small industries. Finding and developing, promoting and enhancing technology is the right approach to the values and also confirm the spread of technology on the issues related to education, training and developing Vietnamese people.

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