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Using the 3D digital orchid design program to cultivate digital talents

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ABSTRACT

As the digital animation industry becomes increasingly important, the industrial demand for digital technology talents will certainly increase. However, under a short supply of talents, it is necessary to cultivate digital technology talents. This study developed a 3D orchid design program using 3ds MAX technology, which allows students to construct the appearance of an orchid. The research results can be used as reference for the study of orchids, and for use in digital archives, in order to improve the competitiveness of Taiwan's orchid cultivation industry in international society. Using the animation technology of 3ds MAX for teaching can enhance teachers' teaching performance and students' learning effects, and facilitate the cultivation of digital technology talents. The supply of the required talents for the industry, as well as an effective combination of education and practice, can promote the successful transformation of traditional industries in Taiwan and improve the overall industrial competitiveness.

KEYWORDS
3D digital orchid; digital technology talents; digital education; added-value of agricultural industry

1. Introduction

With the development of computers and Internet technology, the animation industry has become an important and influential industry in the global economy, and one of the leading industries of the new economy of the 21st century. The animation industry is considered as the most promising sunrise industry [4]. When animation becomes a global best-seller, it will not only bring enormous profits, but will also facilitate public recognition of the animation content of the production country.

1.1. Introduction of orchids

Chinese people are fond of orchids, calling it the gentleman of flowers, and use orchids as a metaphor to describe gentleman. In the Chinese culture, the orchid symbolizes faith and solidness in moral self-cultivation and lofty character, with self-esteem and self-respect. It is clear that the orchid has important status in Chinese culture, and is said to be the representative flower of Chinese culture.

1.2. Digital content industry

The digital content industry is an industry with high growth potential and a future star industry [12]. The Digital Education Institute (DEI) of the Institute for Information Industry [6] conducted an investigation of the demand and supply of professional talents' in the digital content industry from 2012 to 2014. The demand conditions are, as follows:

(1) Creative talents are the core of digital content. The development of a digital content industry in Taiwan needs the continuous support of creative ideas, and must intensify the cultivation of talents in order to improve creativity. The characteristics of the digital content industry require π type talents, with the digital technology and design aesthetics. According to the investigation results, "talents in technology/procedure" and "talents in arts" are the most in demand in talents' occupational category for digital content developers.

(2) The key position fields include: digital games, computer animation, digital audio and video, digital publishing and archives, and digital learning.

(3) In the field of computer animation, the ranking of the most demanded quantity in talent position is "animator", "art director", and "character designer", in which the talents of management personnel and art personnel fall into high importance, while the remaining fall into moderate importance. In the aspect of urgency, only art personnel falls into high importance, while the remaining fall into moderate importance. In the field of animation, the

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importance and urgency of art personnel are the highest. According to the investigation findings of functions, in the animation field, the demand quantity for art talents is the largest, which requires basic art and art software skills, thus, 44.4% manufacturers think that creativity is very important.

(4) In the field of digital publishing and archives, the investigation results showed that the ranking of the most demanded quantity in talent positions is "publishing producer", "digital editor and art designer", and "multi-media engineer".

(5) In the field of archives, the investigation results showed that the ranking of the most demanded quantity in talent positions is "art designer", "product planning", and "marketing manager".

(6) In the field of digital learning, the function investigation results showed that the art talents in this field must have an art basis, industrial concepts, and professional art software skills, thus, 100% of manufacturers think that creativity is very important.

The above results show that diversified professional talents are scarce, and the cultivation of interdisciplinary π type talents must be intensified.

Regarding the effect of industrial trends on talent demand, the manufacturers of digital content have constantly expanded international markets in recent years [13]. The Executive Yuan lists "development of flagship plan of digital content industry" and "development of flagship plan of design industry" as two of the 6 flagship industries. In addition, due to the recession of cost advantage for Taiwan's enterprise manufacturing, enterprises gradually identify with the idea that design aesthetics and digital content are used to improve products' added-value [7], and that industry and university focus on cultivating value innovation and high-quality talents by using function as guidance. It shows that it is extremely necessary to cultivate technically commercial management talents in terms of animation talents, 3D technical talents, content planning, creation of talents, special effects talents, etc.

2. Research motives and purposes

There are less 3D animation products in digital content in the aspect of floriculture, while the "orchid" of gentleman in flowers has special meaning to Chinese culture. Therefore, this study thought the educational data of digitalization and archives were necessary in the following aspects, orchid species of the agronomic flower industry, the presentation methods of the 3D animation orchid theme, and the digital archives and publishing of orchid growth processes. On the other hand, when instructing students in learning to create and design 3D orchid

animation skills, they can more easily understand the cognition for knowledge related to orchids.

The main purposes for this study are, as follows:

(1) To establish 3D orchid materials that provide the value-added application of 3D orchids in digital archives and digital publishing.

(2) To cultivate digital technology applications and talents in creating values of "art" and "technology".

Through the 3D digital archives of value-added applications, orchids can make archives contents become new and diversified in order to further improve the value-added of agricultural products and education data, and cultivate students to be skilled talents. Thus, the combination of learning, application, and cross-industry innovation can lay the foundation for Taiwan's competitive power.

3. Literature reviews

Digital content is the key industry to strengthen Taiwan's cultural soft power and industrial competitiveness. Digital content shoulders the mission of Taiwan's industrial transformation and upgrading, assists the content industry in applying the platform of technology and new media, and assists high-tech products in carrying high-quality content. Secondly, the transformation of the digital content industry from a traditional OEM industry to high value-added industry depends on more input and drive of creative technology talents. Industrial upgrading requires more digital creation talents and key technical talents, such as technical guidance, animators, art designers, visual effects artists, etc. According to enterprises' investigation, animation talents remain one of the most talents in demand by current manufactures of digital content, and professional and interdisciplinary talents with diversified backgrounds are another important demand reflected by manufacturers. The manufacturers of digital content place emphasis on experience-only; therefore, the expected recruitment source for talents is mainly canvassing talents in the same industry. In recent years, manufacturers have gradually eased their demands for experience. Therefore, fresh graduates are another source of manufacturers' recruitment [14]. If fresh graduates have acquired a solid foundation of knowledge in the process of learning, it is good news for enterprises in need of talents.

Lan [16] mentioned that the investment strategy in national human capital should intensify the talent integration and training of cultural creation, tourism, and digital content, as based on the technology, and the cultivation and development of technology

commercialization management talents should be used as value innovation guidance. The continuous cultivation in innovative talents will drive the industry's successful transformation, and improve productivity and employment rates. However, small and medium-sized enterprise innovation in Taiwan is one of the sources contributing to Taiwan's economic vitality. Many entrepreneurs and senior managers are fairly confident regarding business innovation, but when asked "how does your company respond to laborer development, cultivation, and innovation, so as to support the innovation in business strategies?", most entrepreneurs and senior managers lack knowledge regarding cultivating technological commercialized talents. On the other hand, school is the basic skill training unit and should guide basic skilled education to make business circles reduce skill training time in the investment of human capital. Hu et al. [9,10] and Xu et al. [26] proposed a framework of processing multimedia resources.

In order to consolidate the national talent pool, in addition to promoting relevant policies and optimizing the labor force, it is quite important and indispensable that enterprises should increase input in human resources development [22]. However, in my opinion, regarding talent development, abundant talents can be established through the prior skills and knowledge cultivated and educated by schools, and through learning and development. Once owning abundant skilled talents, enterprises can create the advantages over competitors and successfully initiate new fields, according to their own industrial and competitive characteristics.

3.1. Orchid industry

The orchid species in Taiwan are rich and diversified, and developing an export oriented orchid industry and will become an important production to supply the global orchid market. According to the data of the Biotechnology Industry Study Centre of Taiwan Institute of Economic Research, the output values of export sales in Taiwan orchid repeatedly hit new highs. In 2012, the export value of Taiwan's flowers, and their seedlings, is USD 177.18 million, the highest in history, in which the export value of orchids is USD 165.66 million, accounting for 93% of flowers' overall export. In 2011, the cultivation area of orchids in Taiwan was 726 hectares, and the output was 83,320,000 pots. From 2007 to 2012, the Compound Annual Growth Rate (CAGR) of output was 9.45% [27]. As a high economic value flower, the orchid is an important agricultural product for export sales in Taiwan, and is also one of the products able to improve Taiwan's international image. The 3D dynamic digital

orchid can further improve the international impression of Taiwan via far and wide network communication.

3.2. 3D animation

International animation organization ASIFA (Association International du Film d'Animation) defines animation as: "animation art refers to the moving image created by using various techniques, except real action or methods, i.e. dynamic image created by artificial method" [18]. In addition, as a kind of communication media, animation is widely used in various fields [19]. Li [17] hoped to bring people a new learning experience by producing animation, in which the narration of boring words and theories are completely put aside, and the indigestible words are transformed into straightaway small animation. In the end, during the process of pleasant seeing and hearing, people naturally acquire the significance conveyed by enterprise culture. Therefore, animation is a kind of art form and also a kind of communication.

Flower gardeners have very painstaking work, and cultivating students to produce 3D animation can help flowers' gardeners in promoting flower network marketing. 3D animation can exert its specialty in the circle of education, television or film, and can also be applied in digital floriculture achieves, advertising, internet, and other platforms for marketing and communication.

3.3. Creative industries

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines creative industries as: "creative industries refers to combining the contents of creation, production, and business presented in the form of products or service. The nature of such contents has the characteristics of cultural heritages and concepts, and has acquired the protection of intellectual property rights; in terms of content, cultural industries can be regarded as creative industries, including industries of newspapers and magazines, music, film, multi-media, tourism, and other industries produced by creation" [24].

The Law for the Development of the Cultural and Creative Industries of Ministry of Culture in Taiwan [20] defines creative industries as: "the industries originating from creation and cultural accumulation have the potential of creating wealth and employment opportunities to promote the overall living environment, through the formation and application of property". Creative industries can promote the development of cultural and creative industries, construct social environments full of rich culture and creative connotation, apply technology and

creative research and development, perfect the talent cultivation of cultural and creative industries, and actively develop domestic and foreign markets. In addition, in Singapore, creative industries are defined as industries having the potential to create economic values via the enlightenment of cultural and artistic creation, as well via the use of intellectual property rights [21]. According to the Hong Kong Special Administrative Region [1], cultural and creative industries refers to "industries cover a group of knowledge-based activities and produce the products and service with the content of culture, art and creation via the basic input elements of creation and intellectual assets". Huang [11] defined cultural and creative industries as: "industries created by accumulated culture via creative development and operation of intellectual property rights for new life value". Moreover, the Master Alvin Toffler of futurology ever said: "cultural and creative industries" is the main policy to drive economic development from central to local economic policy all around the world [5]. Cultural and creative industries have become effective development strategies to promote the economic growth of each country that regards cultural and creative industries as the focus of economic development [8].

The digital archives have archived abundant achievements in recent years, which not only provide rich cultural connotation for creative talents, they also often become the best material resources of industrial application. Therefore, the diversified and rich materials provided by digital archives are applied to produce high value-added products, as well as produce new models for digital archives application [3].

Producing orchids as digital animation not only contributes to the development of cultural and creative agricultural industries, it is also beneficial that software application skills and dynamic media floriculture appreciation increase the purpose of appreciating floriculture and education. In addition, it can commercialize floriculture cultural works of animation, thus, increasing business opportunities and promoting economic growth.

3.4. Digital value

Various countries have universally adopted information technology to save, process, and apply their accumulated cultural heritages in order to speed up knowledge transmission and communication. Various countries, such as the UK, America, Canada, Japan, South Korea, Taiwan, etc., have realized that the digital content industry will be the main indicator to move towards a knowledge economy under the environment of globalization, as they all actively produce and market the digital content industry

[25]. Making good use of digital information technology can develop digital products to accumulate archives, which can share the wisdom of digital skills and create value to improve the competitive advantage of relevant industries of the digital education industry or digital floriculture.

3.5. Value-added application of digital technology

Interdiscipline refers to scientific activities, where a single discipline uses the knowledge, technology, and tools of other disciplines [23]. As research questions become increasingly complex, and under the circumstance of not merely depending on a single discipline's professional knowledge, the higher ability of solving problems owned by interdisciplinary is increasingly valued, and has become the universal phenomenon of scientific knowledge development [2]. Kao & Chen [15] also thought that information will be further digitized by the progress of digital technology, making contemporary people become one part of the "digital era". In a digital era, every object is closely related to digital technology. The development and existence of any field are incorporated in the digitized venation. In educational systems, education performance is increased by virtue of digital technology, thus, digital technology has attracted the attention of technologically advanced countries. Digital learning has also become an important education policy promoted by Taiwan. The digital archives mechanism saves the digitalization of historical relics of numerous interdisciplinary digital technologies, which is combined with digital learning to become the representative characteristic of Taiwanese contemporary education.

Therefore, this study designed the example of 3D orchid animation in order to increase the value of Taiwan's agricultural products through dynamic digital orchids and network marketing, and thus, improve Taiwan's orchid floriculture. Moreover, students' 3D skills can be cultivated to make students understand the benefits of interdisciplinary knowledge and application.

4. Research method

The National Chiayi University is the key school cultivating orchids in Taiwan, as well as the cultivation and research center of the world's well-known orchid art and techniques. During the teaching period, I encouraged and led students to attend the orchid art and technique center to enjoy and admire the various orchids, thus, students can directly understand the growth processes and patterns of orchids for thinking and designing.
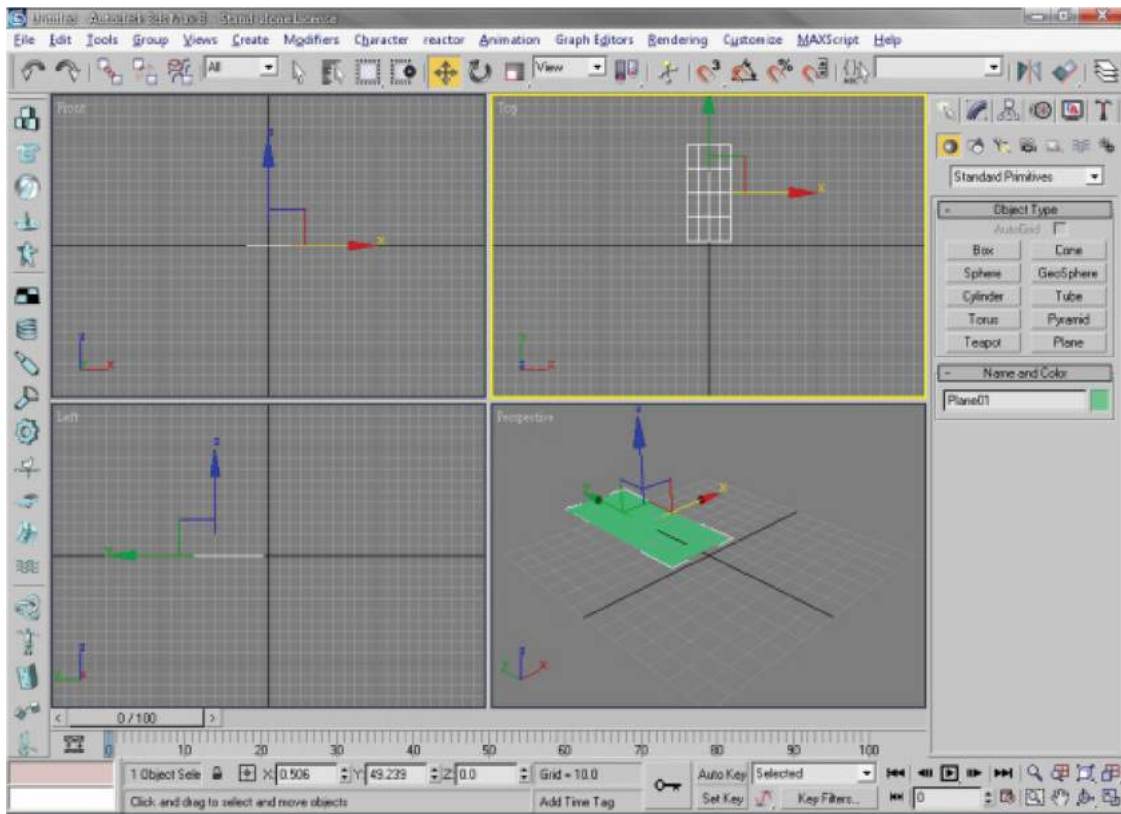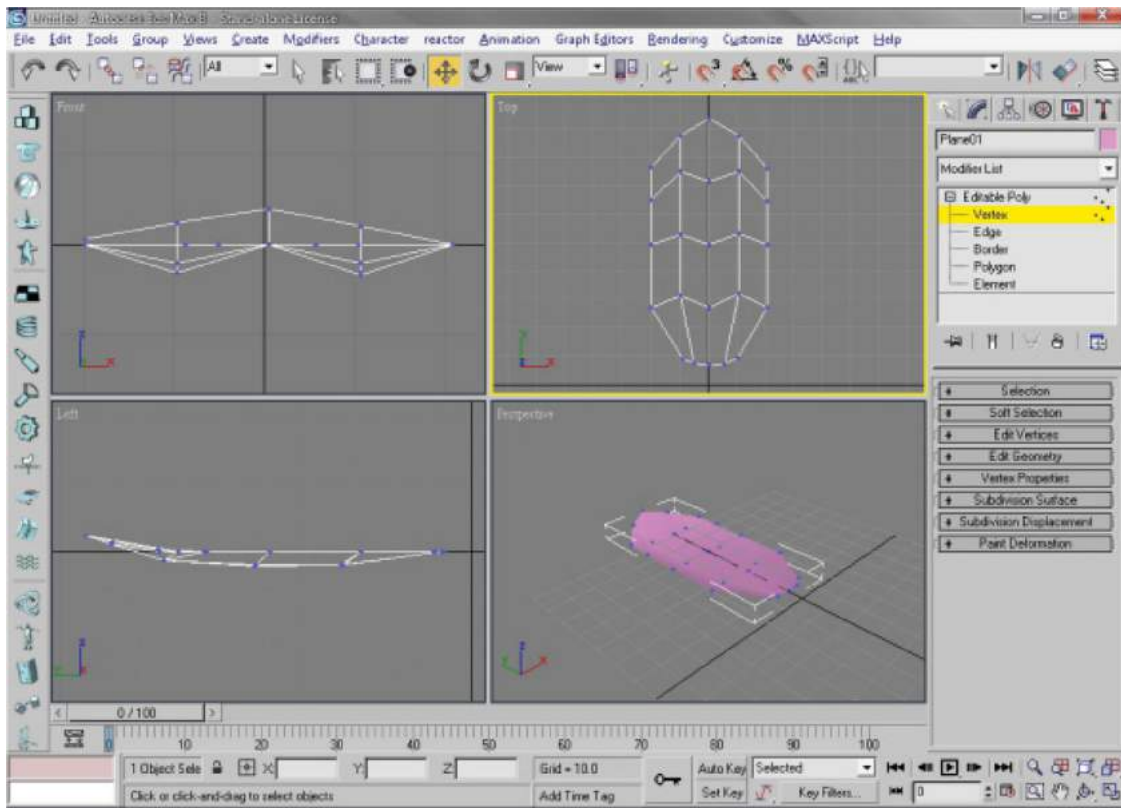
Figure 1. Pulling out a rectangle.

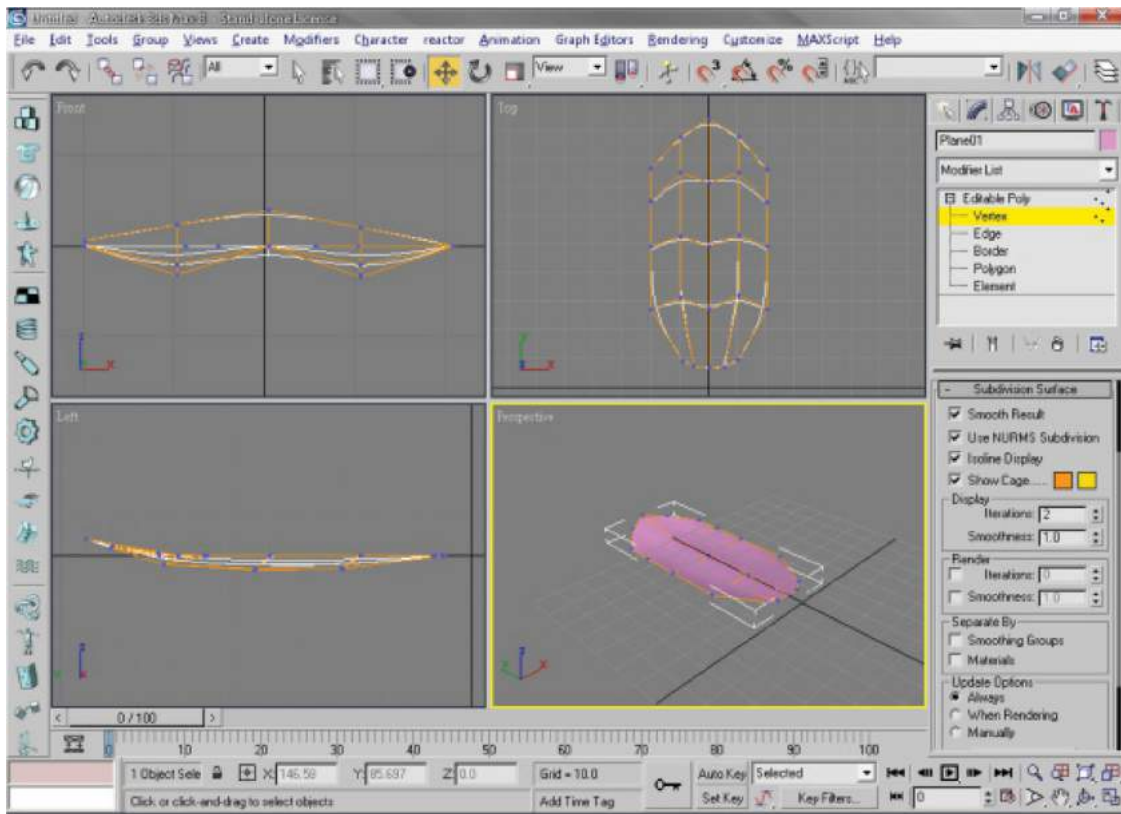**Figure 2.** Editing polygon.

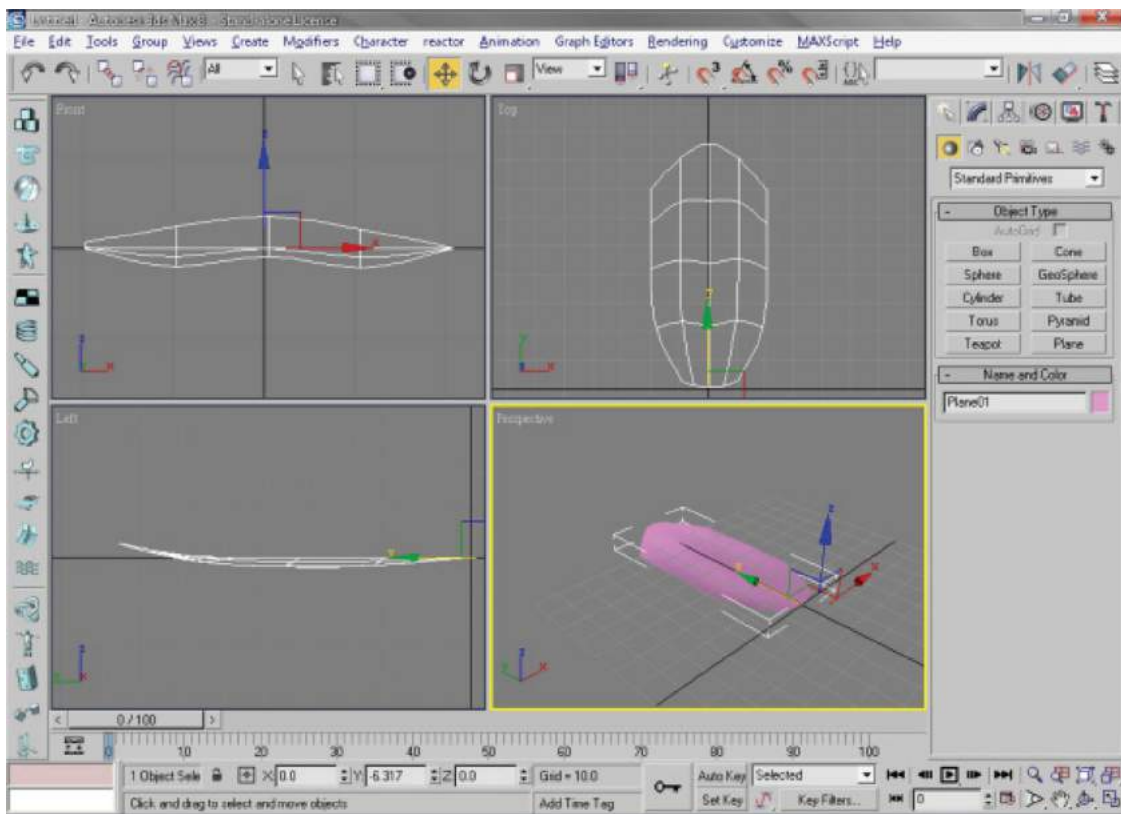**Figure 3.** Planarizing margin.

Figure 4. Adjusting appropriately.

4.1. Technical description

3ds MAX technology was adopted to design and produce 3D orchids, and the main procedures are, as follows:

The orchid layout is (upper left is Front, lower left is Left, upper right is Top, lower right is Perspective). The Plane in the right can adjust Length Segs and Width Segs

(Figure 1). In this procedure, the number of captured points in the Plane is adjusted, drawn out, and then pulled out a rectangle. Then (Figure 2), right-click the rectangle to choose Convert to: Editable Poly (editing polygon).

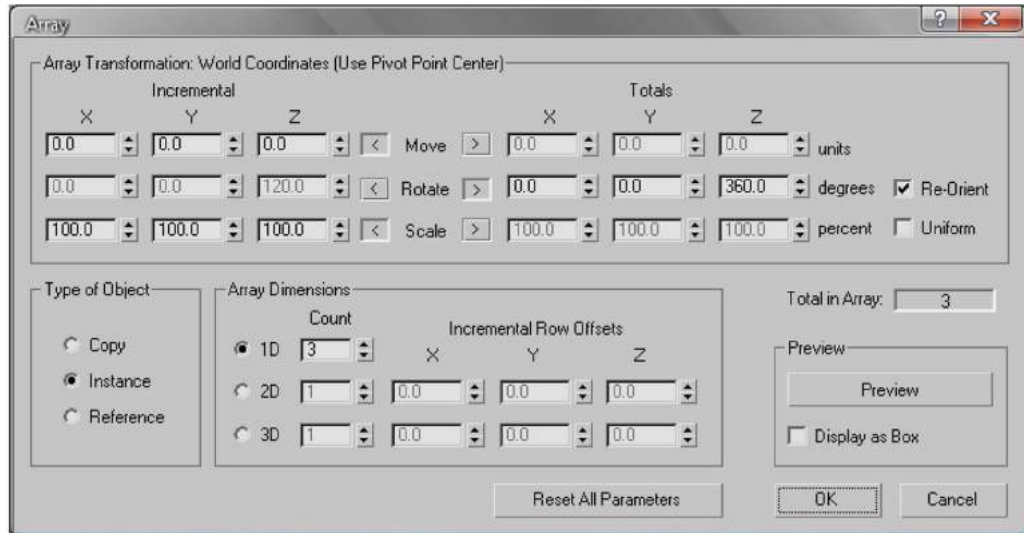See (Figure 3) and (Figure 4) for choosing a Subdivision Surface and ticking Use NURMS Subdivision.
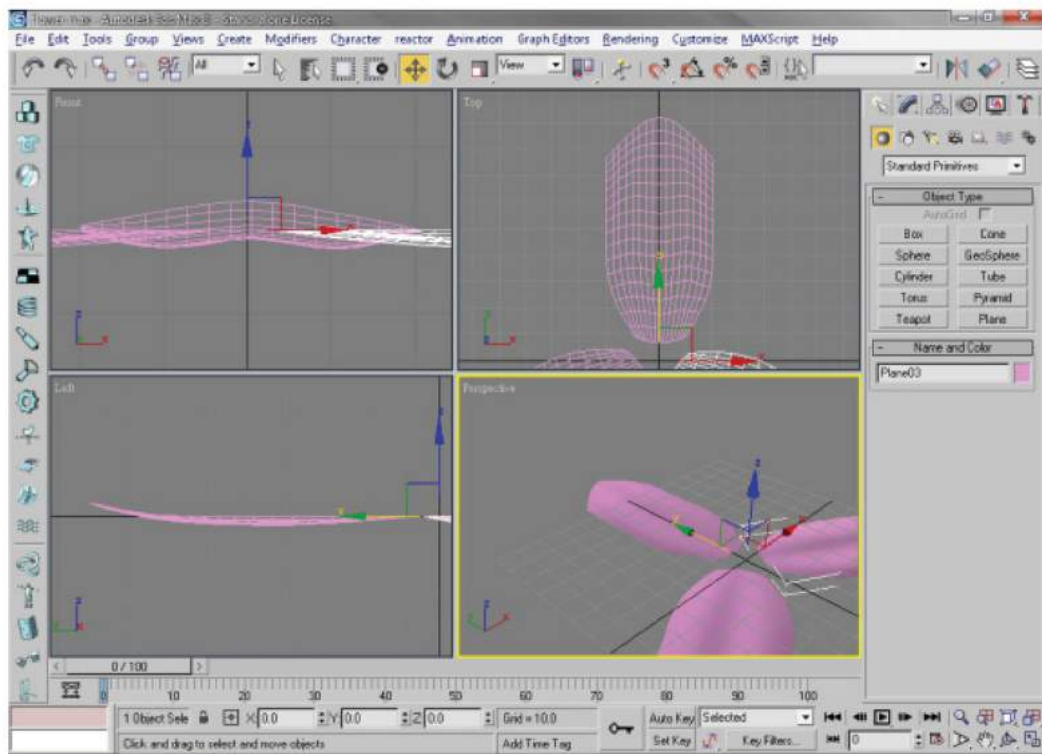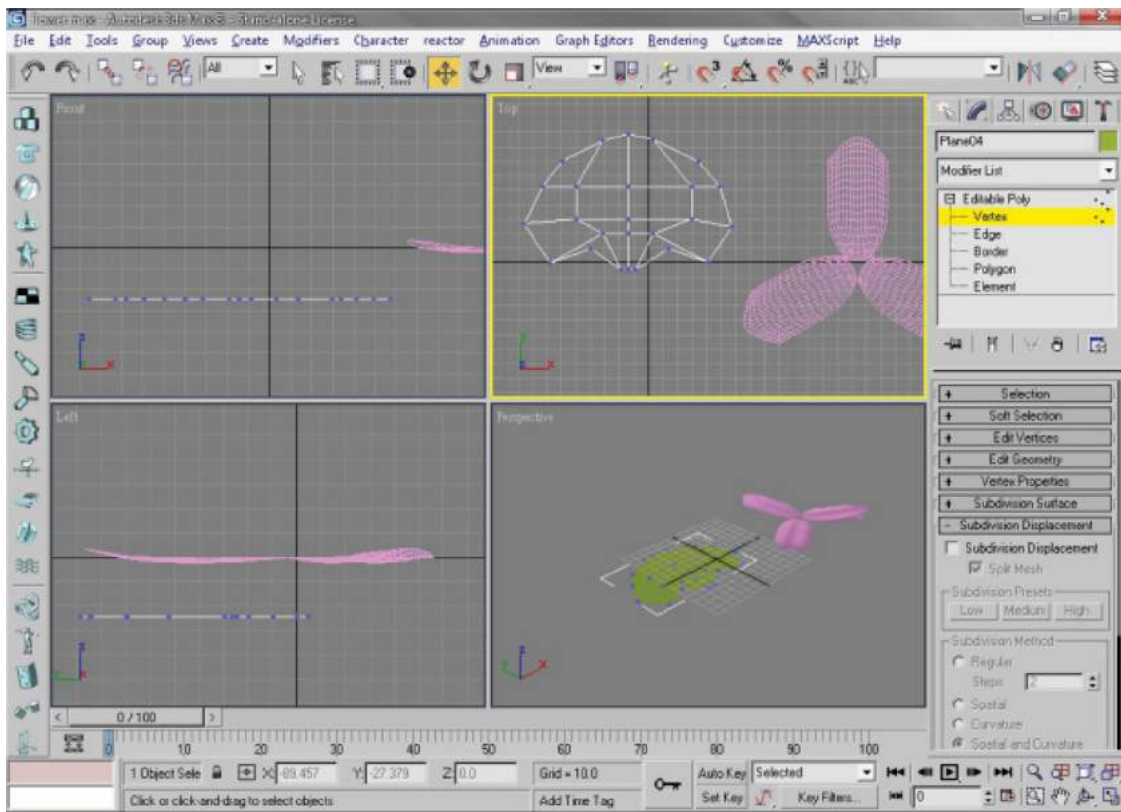

Figure 5. Copy.
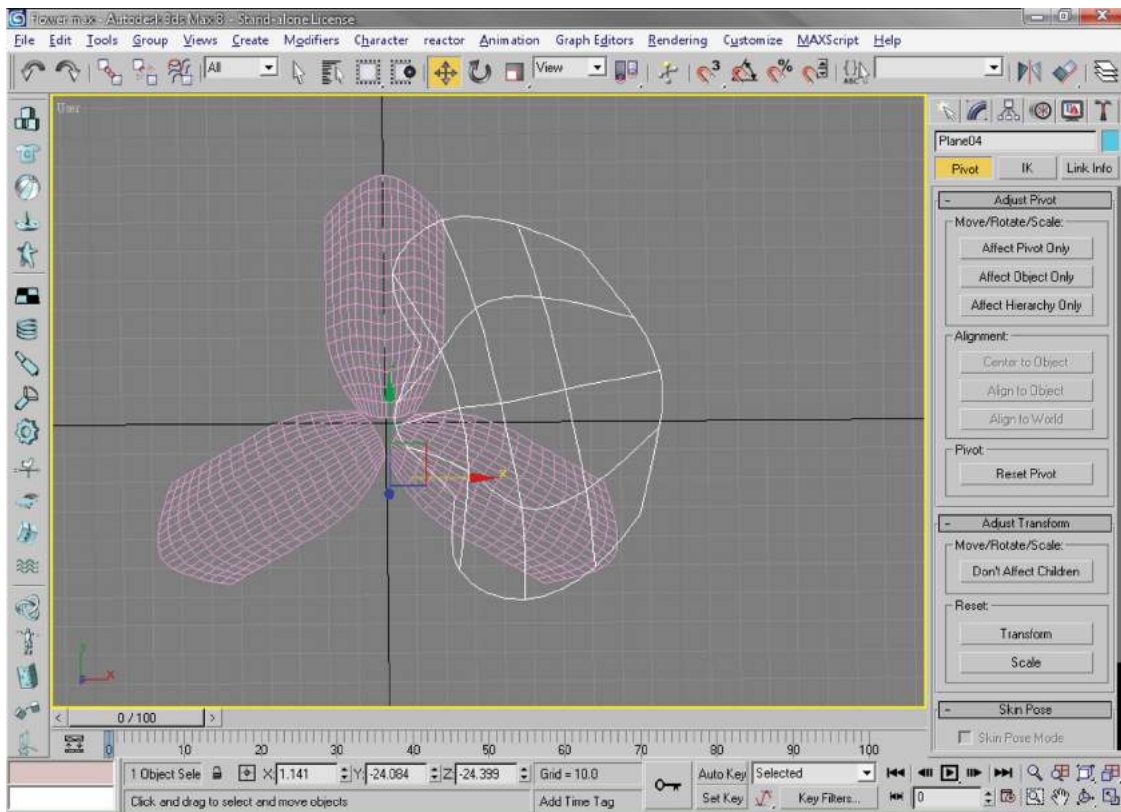
Figure 6. Producing petal.
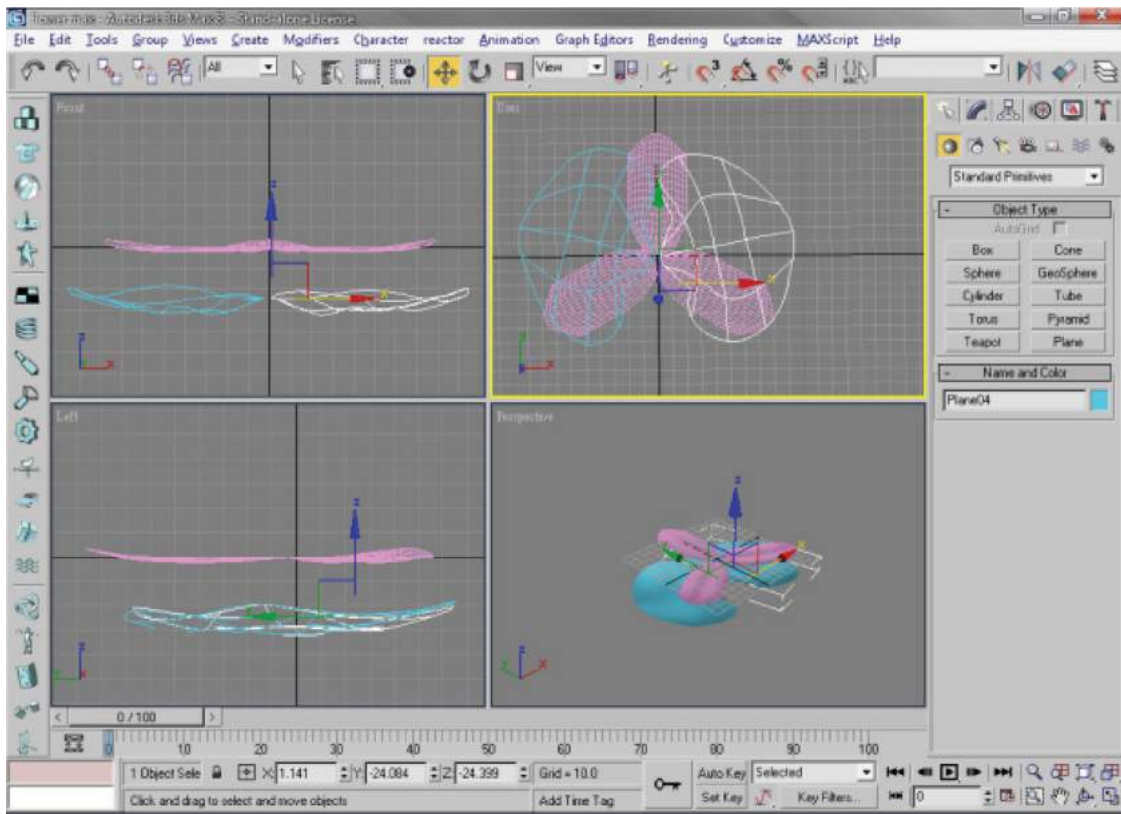

Figure 7. Combining.
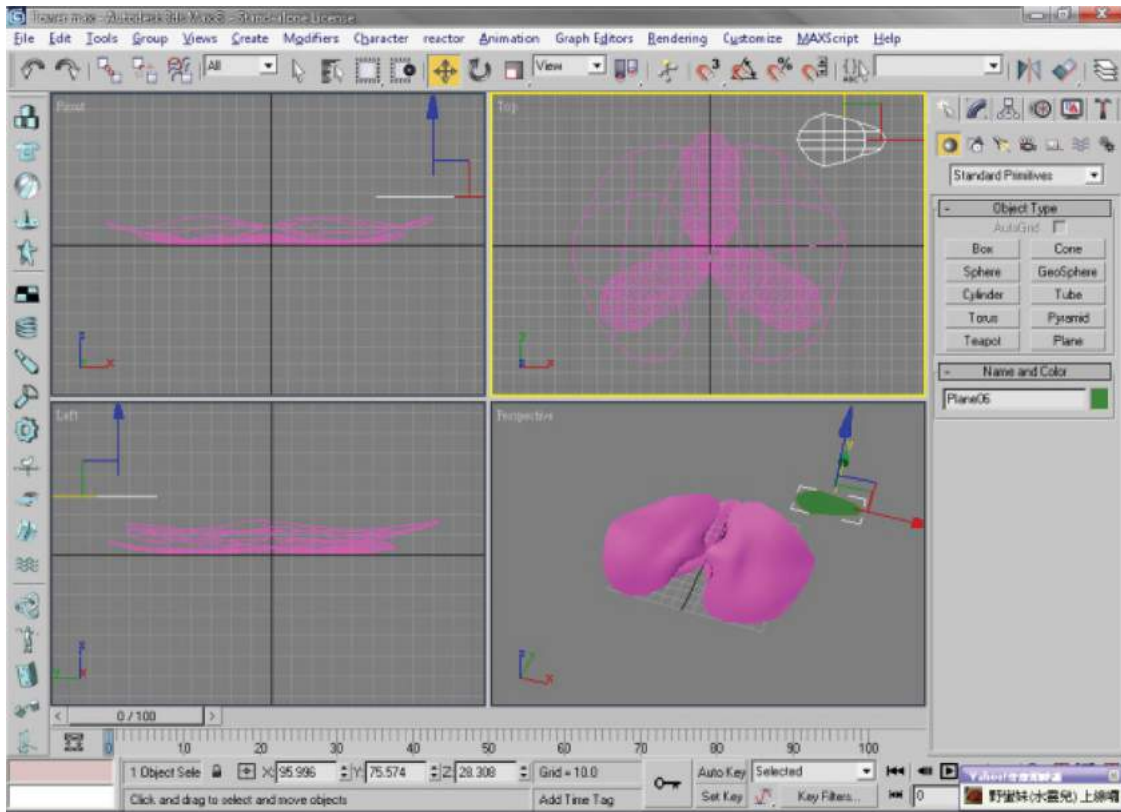
Figure 8. Copying 2 pieces of petals.

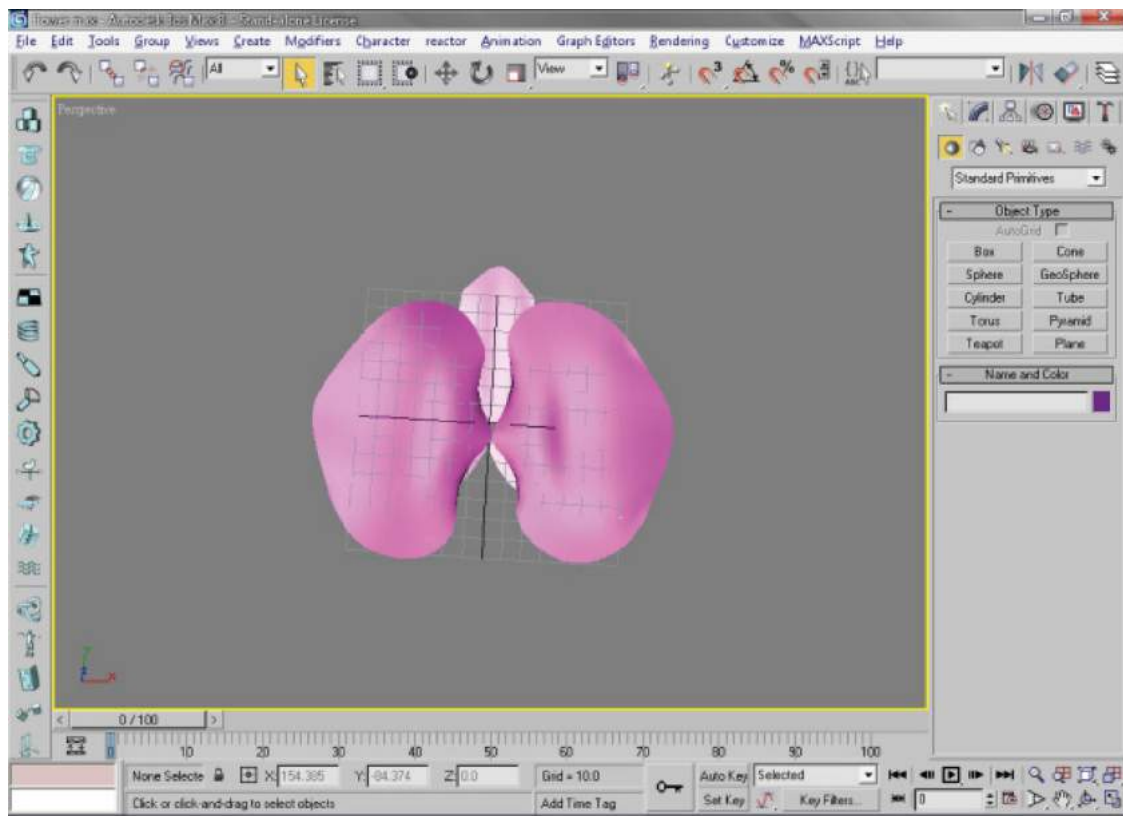
Figure 9. Coloring.

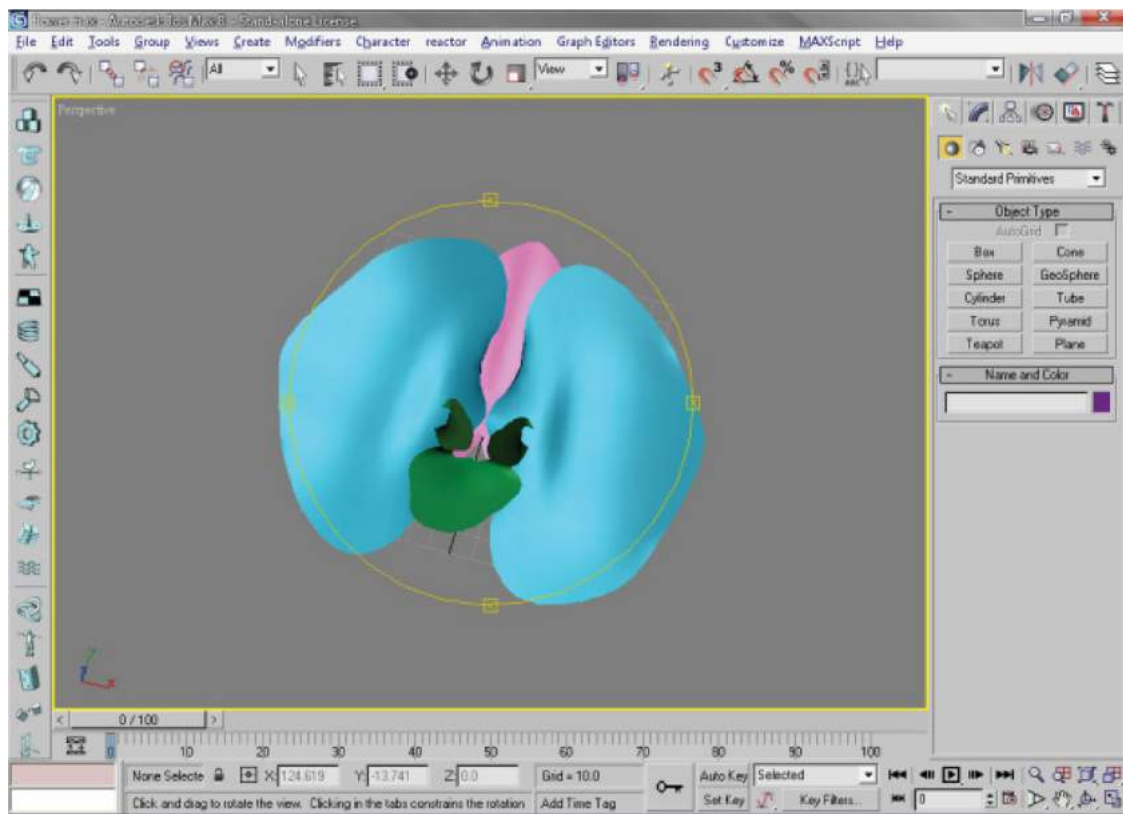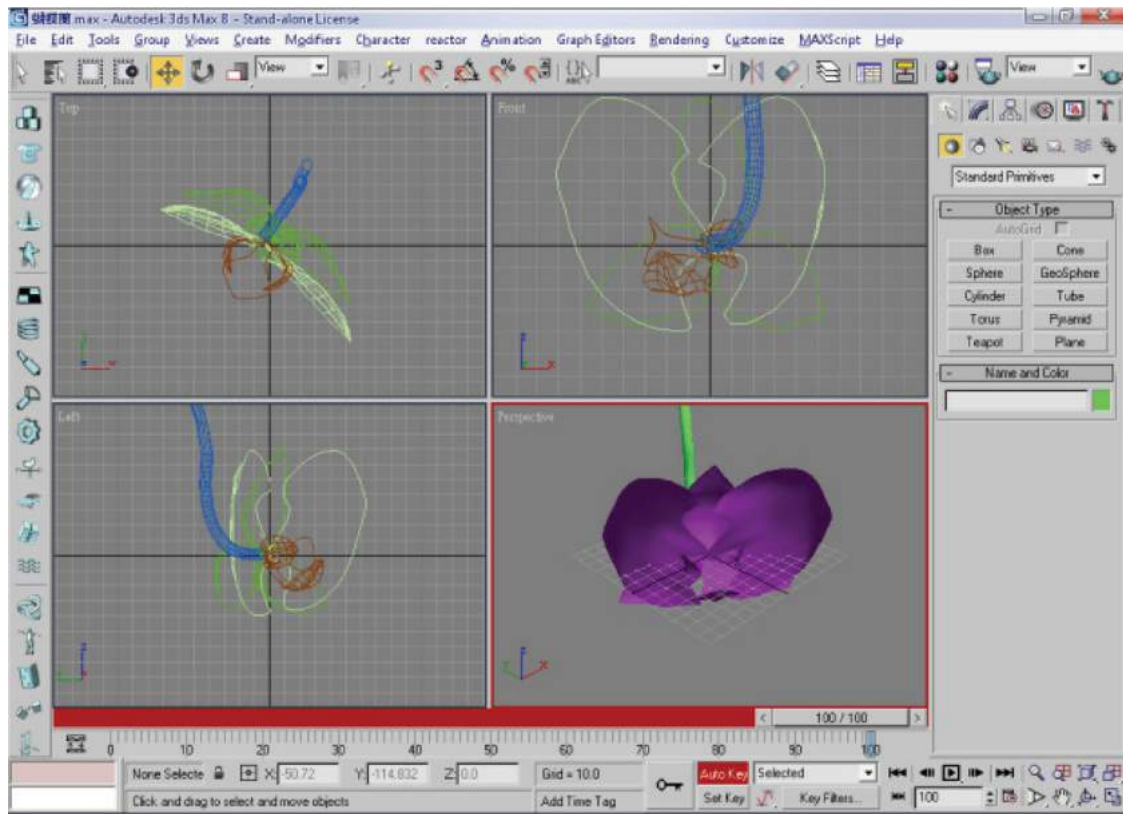**Figure 10.** Rudimentary orchid.

Figure 11. Fundamental form of orchid with front bud shape.

Figure 12. 3D orchid.

The numerical value of Iterations in Display is changed into 2. In this procedure, the margin is planarized and appropriately adjusted.

(Figure 5). Z tune of Tool > > > Array > > > Rotate is 360, and 1D is changed into 3D. Such action is "copy".

Later (Figure 6), as in the above procedures, the orchid petal shape is produced, and petal shape and size are appropriately adjusted. In (Figure 7), the petal is combined in the appropriate position. The white part is selected as the petal shape, which is placed above the pink part in (Figure 7).

Figure 13. General orchid.

Copy 2 pieces of petals and adjust slightly to achieve the combination in (Figure 8). Select the appropriate color for the orchid, and color it in (Figure 9).

The color of the orchid in (Figure 10) is different from that in (Figure 11), as there can be different colors and different species of 3D digital orchids. The front flower bud's shape is produced according to the above production method (this study gives different colors to present their color differences for comparison.). In (Figure 12). a green stem is added to the 3D orchid. (Figure 13) is a general orchid picture. From the comparison, we can feel the similarity in visualization.

5. Conclusions

Regarding the achievements of this study, 3D animation can be produced as an outer package for orchid soaps or dynamic online advertising products. The orchid's new image is reshaped by virtue of digital cultural creation and innovation, which can establish Taiwanese orchid brands, increase the value content of floriculture, and make a contribution to the floriculture industry.

Regarding learning in a digital era, individuals must accept digitized information applications, and integrating information technology and digital archives into teaching will have value-added efficiency on modern

information digital persons. Developing digital dynamic orchid archived resources for integration into the multi-models of art teaching can assist in promoting the fields of art and literature.

Creative animation has become a commodity influencing the integration of spirit, culture, and recreation. 3D animation can market featured local products to various regions through network communications. The value-added creation and design, and interdisciplinary integration characteristics combined with digital economy are used to create an industry with economy value.

Digitized cultural and creative industries, digital information social environments, and the development of 3D technology are closely related, and is life technology fully integrated with sensory experience. The preponderant cultural and creative industries take "technology" as support, "3D floriculture" as appeal, "creation" as the core, and "market" as guidance. By combining production, marketing, services, and a value chain creating competitiveness, flower products and digital products can achieve sustainable development.

6. Suggestions

It is suggested that follow-up research should establish 3D digital orchids of different species, as well as a digital orchid museum for archives, which can be used for education and business. It is also suggested that the follow-up research can discuss 3D orchids' application efficiency in business.

Digital content falls into the industry of new technology, which must continuously update equipment support as free software is not yet universal. However, it is difficult for each school to keep up with such updating of the market. Sharing resources and establishing communications can improve students' production level. Therefore, through the mechanism of the cooperation of the industry and universities, the industry can provide software, while the schools provide materials for research and development. Meanwhile, schools that own relevant departments are encouraged to cooperate with other schools; relevant subjects adopt cooperative course-selection, and begin class by means of accepted credits. Thus, it can promote substantive communication, and students can apply their acquired knowledge.

As the cultivation of 3D digital talents has the interdisciplinary characteristics of humanistic management, science, society, art, etc.; departments in each school should adjust teachers, curriculums, equipment, etc.; however, such slow action cannot save a critical situation. It is suggested to integrate the resources of relevant departments in the same school and cooperate with each other in order to establish management curriculums within the major

of digital content. In addition, senior technical personnel who intend to transform the workplace should be invited by school teachers in the education field, and remain in schools for the long-term in order to train talents.

The activities of flower gardeners are very painstaking. The animation production of 3D orchids' growth and flowering can cultivate flower gardeners to learn secondary work skills and sell 3D orchid products and real orchid products via self-marketing networks.

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