A Learning System of Problem Solving for Creative Products Designing and Manufacturing

Wei-Yuan Dzan, and Hsueh-Chih Lin

***Abstract*—**With the approach of 21st century, the world current tends to become informationalized and globalized, and we are facing a significant change in our way of life. Education is closely related to the broadcasting of modern science and production skills. Similarly, the relating instruction and training of vocational education also plays a crucial role in the policy on our national competitiveness. For a designer in the modern market, where PLM is growing fast, it is important to make creative designing efficient and coherent from initial inspiration to final manufacturing, considering product life circle, quality, and value at the same time. 3D designing and manufacturing is one of the best tools to enable creative ideas to come out quickly and effectively

***Keywords*—**Creative Product. Product Life circle Management. 3D Designing and Manufacturing.

I. Introduction

GLOBALIZATION and knowledge economy industries are a developing trend, our life styles are facing dramatic changes. In the past, low-cost manufacturing production was an answer but does not ensure industry survival in the new competitive international market. Using our own existing strengths and fostering research, development and design capabilities is now an imperative, along with building a value-added industrial development environment. Technical and vocational education related to education and training and the dissemination of modern science and production technology have close associations. The overall national competitiveness policy also plays a decisive role.

A creative product design and manufacture digital learning system, in which creativity is an important process of the deconstruction of knowledge-based action, considers output from the views of input and creativity in order to create 3D entities and therefore must also consider the values of effectiveness and efficiency. In the fast-growing Product Lifecycle Management (Product Lifecycle Management; PLM) sector of the modern market, design and creativity need to be able to move efficiently from inspiration, to idea to output. There must be coherent and comprehensive consideration of product life cycles, product quality from generation to generation and sequential growth in product values. Modern design creators use these as important indicators of success.

II. Product Design and Manufacture of Thinking and Innovative Approaches

Generally speaking, ways of thinking include values, thought processes and thought and form the three parts of inference [1]. Therefore, 3D designers and manufactures of innovative products need to learn systems, which are in fact, the kinds of mental activities and mental habits of teaching. The design thought process is, of course, when the designer is thinking inside the design process. After the inception of a design conditions, the concept emerges from the design to the image formation, and so a specific design gradually comes to conception. So, the model will be designed in successive 'modify', 'adapt' and 'landscape' steps. The best way to name this whole process is "design thinking process" [2]. Innovative thinking is to grasp the principle of innovation in order to get a fresh creation.

Creative product design and manufacturing methods are formed by dividing them into divergent thinking, convergent and legal systems [3]. The Divergent legislations are such as the 'free association method', convergence methods are such as 'induction' and the legal system such as the 'Delphi' method.

III. Innovative Product 3D Design and Digital Manufacturing Process

The word 'creative' includes a big difference between products and works of art, maybe because of both practicality and productivity. Art exists generally only for the creation of art, without regard to production problems. Products are intended for manufacturers, owners, users and creation, they are both creative and also consider the unique nature of production, economy, acceptance and recognition of the other [4]. So, design is not only arbitrary, according to designers preferences, but must stand up to the mass production process, rationality and consumer tests. Therefore, the innovative product "design thinking process" and the creative product solutions to process problems explain the creative process of product design and 3D manufacturing [5].

With the uniqueness of a products needs in mind and, the brainstorming method is used to generate creative product design and manufacturing processes. Its approach is both one of individual and collective thinking. Brainstorming uses both, for example, Chairmen and Secretaries, for a variety of problem and creative situations. The participation of each designer involves some preparation: they must first gather information on the subject and creative thoughts in advance. In the group

brainstorming session, the most common use of creative thinking, a short period of time yields a ripple effect and synergies and is responsible for a lot of ideas, innovative design, process and product problem solutions.

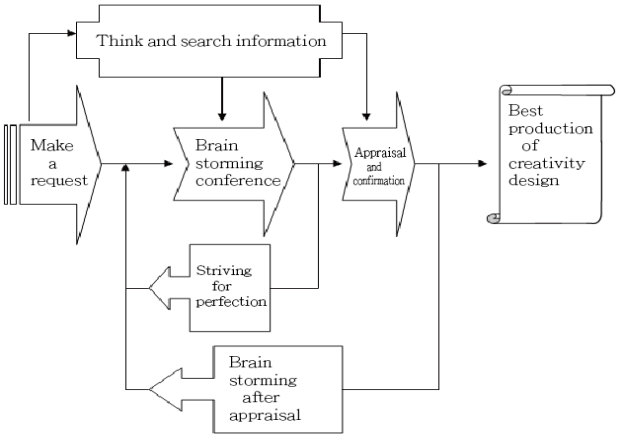


Fig. 1 Product Brainstorming Creation Process

Brainstorming is driven by two major principles and seeks to judge both quality and quantity. Brainstorming ideas, created in the course of development, can be divided into the emerging stage and the idea of concept evaluation stage. That generated in the concept stage avoids criticism of each of the participating designers and they are free to talk about creative ideas, whimsical ones maybe, the more the better and without taboos. In the concept evaluation stage, not easily given up are absurd ideas, flexible uses and of all kinds of conception and conversion ideas. Then there is a verification of the assessments of creativity and fantasy, in order to extract the best creative design products, such as Figure 1, for the product creation process of brainstorming.

IV. Creative Product Solutions to Process Problems

How creative design products, offered by the appropriate process, obtain a good output and consumer receipt, cannot be ignored by creators in an effective process of good planning. From the creative design of product research and development engineering point of view, design theory, applied to the construction work, will take into account the effectiveness of units and entities to predict effective process solutions, productivity, standardization and market competition, and so on. This can be divided into two types of internal logic and external logic analysis.

A. The inherent logic of engineering design

1. Matter logic: includes mechanics, materials, science, environmental physics and visual communication in the colour psychology of learning and form.
2. Object logic: includes material computability, in order to expect and predict possible experimental material. This can be localized, so that the analysis of materials and construction experience of accumulated material can be abstract, to facilitate pre-drawings relating to the later drawings.
3. Composition and creation of logic: includes a combination of graphical methods, combinational methods of mechanical components and material science, procedural design methodology and standard design methodology.

B. Design Engineering external logic

1. Use logic: includes the use of human factors, planning the design of the user manual, use restrictions and the provision of safety factors.
2. Logistics logic: includes cost effectiveness, durable product design, practicality, approachability and innovative design and product design features.
3. Post-modern consumer logic: including the effect of advertisements on leading consumer behavior, consumer market behavior, design and product characteristics, differences in consumer travel logic and the logic of patent protection.

The questions of use of materials forming creative products, creative compositions, productivity and standardization right up to the consumer market and product lifecycle management, should be of primary concern to the creator involved in product design and development practice, as shown in Figure 2, to solve process problems using the brainstorming process to address the process aspects of the problem.

V. Creative Product Design and Manufacture of 3D Teaching Strategies

The Ministry of Education, in 2002, published a White Paper on Creativity Education by creating a "creative country (Republic of Creativity; ROC)", and promoted creative students, creative teachers, creative campuses, creative learning support, creative think tanks, creative camps and the formation of a creative teaching force to found an instructional design course designed to help students master their vision, hearing, speech, multi-line specific words and deeds. It was decided that the content should make it possible to teach design creatively through a practice-based system of learning, combining thoughts of use, and transport [5]. Therefore creative product design and the manufacture of 3D teaching strategies includes phases of 3D design concepts, the product of creativity, research, process design and planning, complete product life cycles and marketing management.

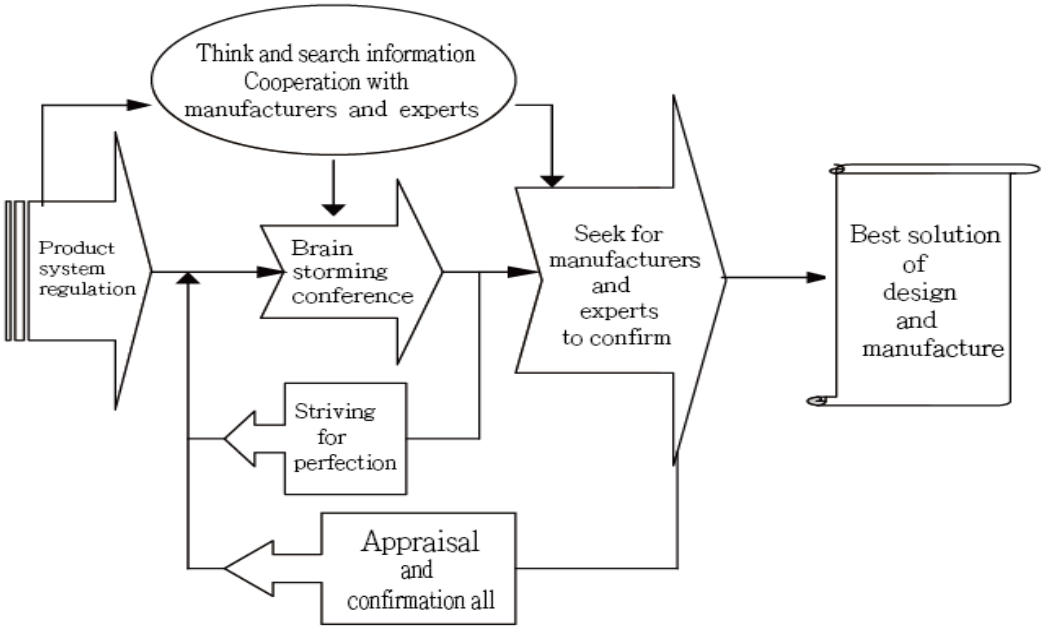


Fig. 2 The problem solving process of the brainstorming process.

Innovative product design and the manufacture of 3D teaching systems, fosters the development of learner self-conceptualisation, in teams of each ones dialogue, and builds a community capacity, which lead to important learning goals: to analyze design, development, implementation and evaluation procedures for the system [6]. Here, "Analysis" speaks of content, including environmental analysis and analysis of potential learners, "design" includes procedures and scheduling programs, "development" is the emphasis on curriculum objectives and assessment criteria, "implementation" should be particularly concerned about the process of observation and organizational learning and "assessment" is the study of monitoring and diagnosis of the main methods (including creative product design and manufacture of 3D works by their products life cycle prediction), shown in Figure 3, teaching 3D innovative product design and manufacture.

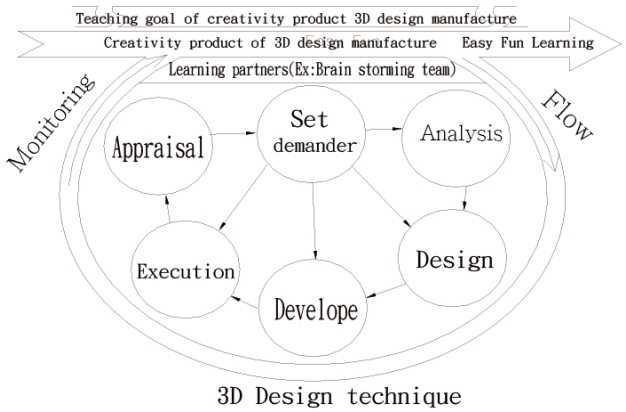


Fig. 3 Creative product design and manufacture of 3D teaching strategies.

VI. Creative Product Design and Manufacture of Digital Teaching Case Study

3D design and manufacture of innovative products teaching, is designed using the creative thinking process (eg brainstorming creativity) to produce the concept design and manufacture of innovative, creative product in 3D methods to extract a simple, fun (Easy Fun) way. The innovative product concept emerges from the design to the formation of images, and thereby the design concept gradually specifies output. Design learning only on paper, or by only limited design methods, neglects design and manufacturing possible complements, as they share commonalities and have close relationships. Therefore, I will use the design and manufacture of innovative plastic product examples to illustrate the design and manufacture of innovative 3D products Easy Fun teaching process, and other creative product design and manufacture features of the 3D Easy Fun Teaching Case Analysis.

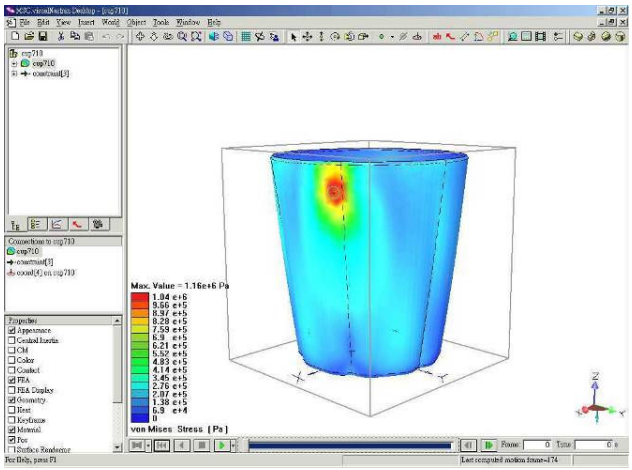
A. 3D design and manufacture of innovative plastic products teaching examples

A creative play space utilising plastic products can be infinitely broad. It covers the objects used in daily life and these can be used as creative content. As long as creative design is focused, creative design can be presented outlining the significance and value in plastic materials that can be adopted within the subject matter, are available everywhere, and are as such easily obtained. The learning systems focuses on everyday items commonly used as a starting point, to play into creative design, then, modern plastic equipment facilities are designed to achieve creative products.

1. The creative product design and manufacture of CAE and 3D mold design

(1)Creative engineering analysis of plastic cups, including the products of mechanical engineering and plastic mold flow analysis and product engineering analysis such as shown in Figure 12.

(2)Creative plastic cup mold design: using Mold Wizard for mold design analysis software to analyze the molds of the original set, such as the mold design and analysis of Figure 13.



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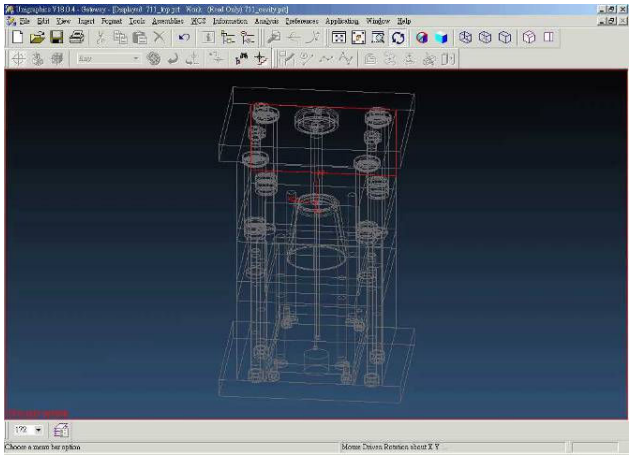


Fig. 13

2. The 3D CAD process of designing and manufacturing for innovative

Creative plastic products born from the concrete mind, are bound to an interface through appropriate facilities and current software for graphic design is numerous. Looking to find suitable design software, though, is no easy task, because the software design must be complete to receive and transform functions and to complete integration with other software to facilitate the next steps for work processing [7]. 3D design and engineering drawings are key and, therefore, we must take into account all the processing details including the processing of rationality and feasibility [8].

(1)3D design: uses appropriate software and hardware facilities and the idea of plastic cup models in 3D and are bound to comply with ergonomic principles, as shown in Figure 4's 3D drawings

(2)3D graphics design: Here, the characteristics, including appearance, of plastic innovative products are given attention to, as is the plastic injection processing characteristics of all the processing required to carefully consider the design as shown in Figure 5's 3D drawings.

(3) 3D mold jacket design: The Futaba standard mold base as a design base; saving expenditure and use of mold base coats within the kernel and isolated practice to facilitate future changes to the product design, as in Figure 6's Die jacket design.

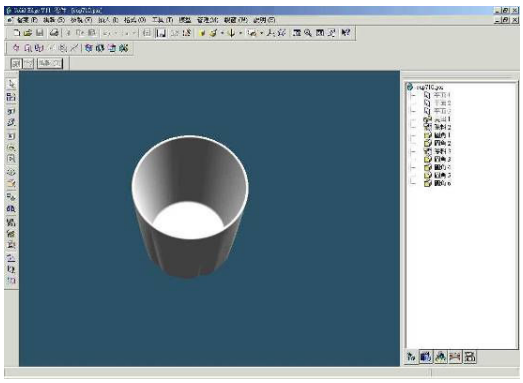
(4)3D mold back plate jacket design: The Futaba standard mold base of the back plate design considers the location of parting line, ensuring smooth material joins, in addition to the premise of cost savings in product design changes. Figure 7 die back plate design.

(5)3D mold base plate design: The Futaba standard mold base of the back plate design; reusable classes are designed to be precise both inside and outside, accuracy and material returns here will affect the expected overall return, such as in the mold base plate design of Figure 8.

(6)3D mold design back plate inside the kernel: the kernel design within the back plate will directly affect the plastic product parting line and considers the accurate location of parting lines, as shown in Figure 9, within the kernel back plate design.

(7)3D mold design seat plate Jen: the mold base plate design was employed with the cylinder class, to enable a smooth heart-shaped assembly and should be used with precision, as shown in Figure 10's plate kernel design.

(8)3D mold design heart: a heart-shaped mold design considers the parting line of the taper of the match, so that it is removed from the injection mold process successfully, in addition to replacement heart-shaped design modifications, as shown in Figure 11's heart-shaped mold design .



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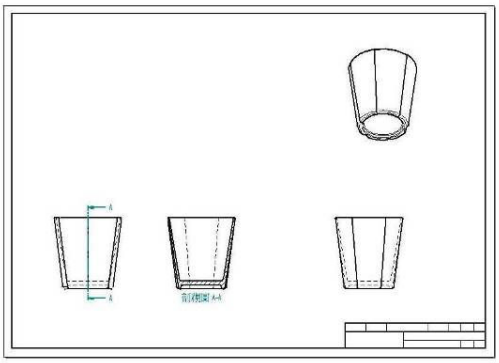

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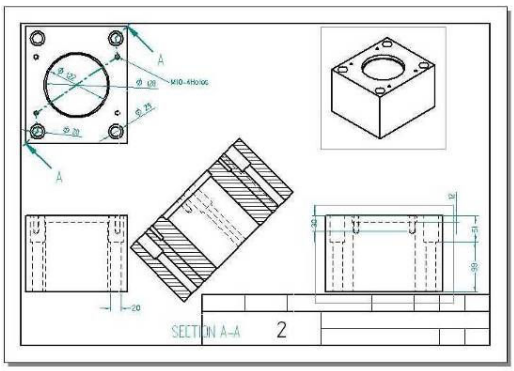

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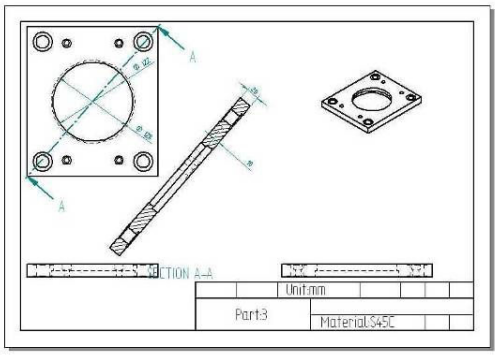

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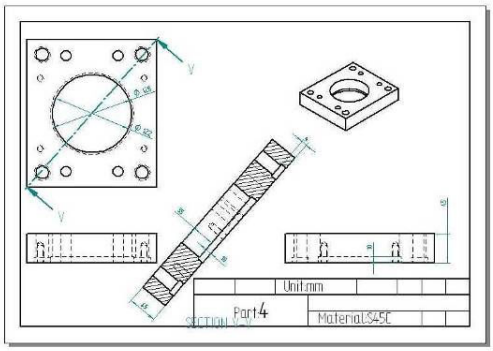

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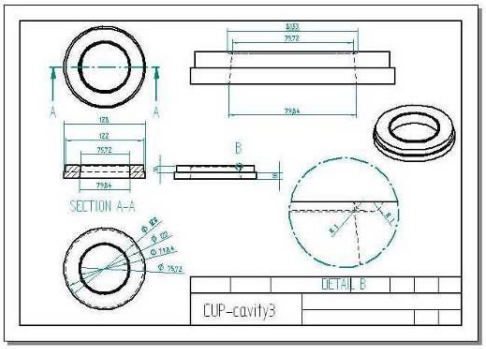

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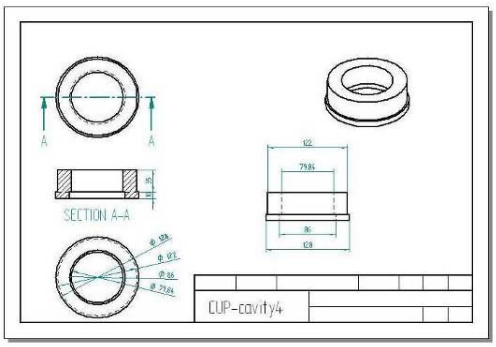

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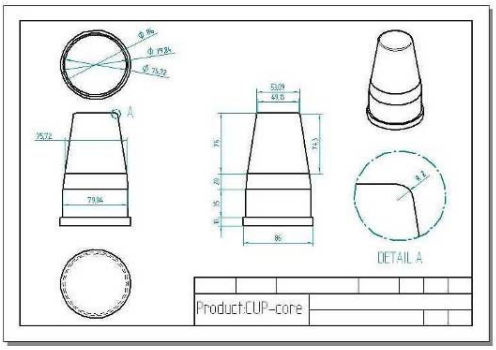


Fig. 11

3. CAD / CAM Manufacturing

CAD / CAM manufacturing process, from the Futaba standard mold base decomposition, mold steel materials, CNC machining center milling the middle mold, CNC machining center milling bottom die holder, CNC lathe turning the middle mold, CNC lathe turning base mold, CNC lathe heart-shaped turning, heart-shaped mold and the test match, CNC lathe turning the middle mold, CNC lathe turning middle hole mold, mold test assembly, mold test mold assembly, mold mix exploded diagram, mold test assembled [9], shown as Figure 14 CAD / CAM manufacturing process.

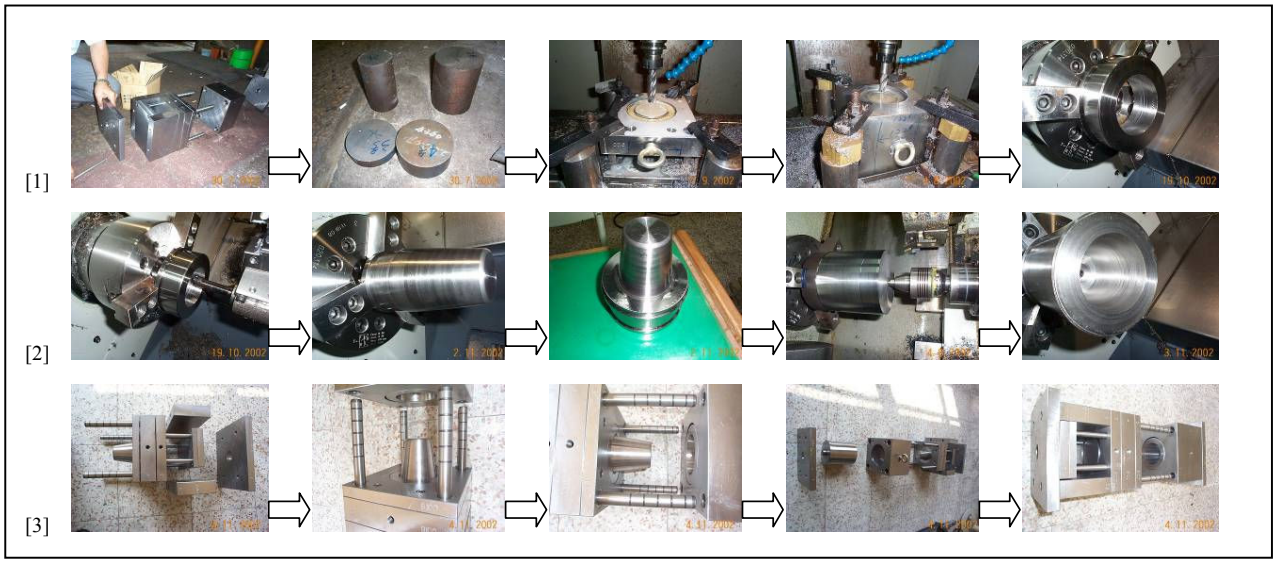


Fig. 14 CAD / CAM manufacturing process

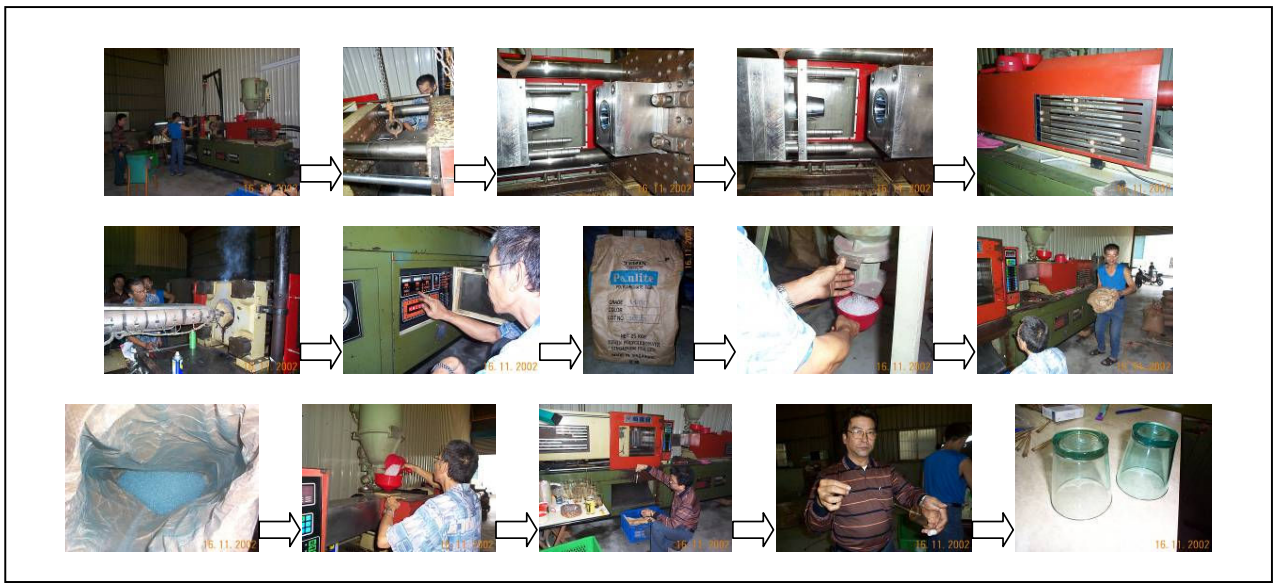


Fig. 15 Plastic products process.

4. Creative injection molding plastic products

Creative process of injection molding plastic products, from 8 ounces of plastic injection molding machine, mold lifting, locking mold, mold test mold non-transport, adjusting the head position, plastic injection, plastic injection head removed more than expected, adjust the time parameters of injection molding temperature, poly carbonate ester (PC) plastic, plastic drying out, add color and plastic, color completion of plastics, plastic injection molding machines to join, plastic test out and adjust, creative plastic cup over the first material injection molding injection molding, plastic cup injection molding product innovation , as shown in Figure 15, injection molding plastic products creative process.

VII. Other Creative Product Design and Manufacture of 3D Easy Fun Examples

A. Acrylic drip screen Example

Acrylic drip 3D model design, shown as Figure 17, Figure 18 3D group stand design, 3D design screen in Figure 19, Figure 20-screen appearance.

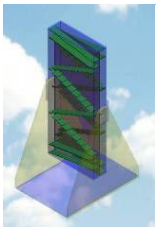
B. Acrylic Wheel Example

Acrylic wheel example shown as Figure 21 Wheel 3D model design, plan 22 3D group stand design, 3D Design Figure 23 Ferris wheel, Ferris wheel appearance in Figure 24.

C. Stainless steel high-oxygen chamber examples

The example shown as high-oxygen chamber in Figure 25 3D

model design, Figure 26 3D group stand design, 3D Design Figure 27 high-oxygen chamber, Figure 28, the appearance of the high-oxygen chamber.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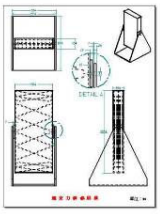
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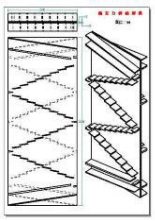
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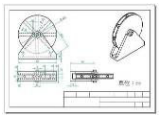
Fig. 20


Fig. 21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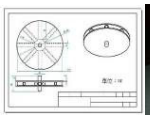
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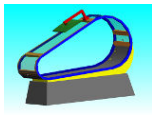
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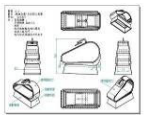
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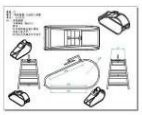
Fig. 27


Fig. 28

VIII. The 3D Design and Manufacture of Innovative Plastic Products Easy Fun Teaching System's Mainly Software and Hardware

In the Easy-Fun Creative computer software, plastic products are used under the principle of assessment. A field trip visits more schools for extra data collection and analysis; priority here is given to achieve computer-aided design and manufacturing, electronic digital and network communications uses e-marketing functions to go through the entire process, from design drawings (CAD), through engineering analysis (CAE), manufacturing (CAM) electronicalization and motorization software of core functions. In order to be able to integrate into the future of "3D design and manufacture of multimedia digital centers", the relevant module contains the existing results and links to product information, including a real-time display of web online marketing, product marketing in the development of customer business processes to achieve a supply chain before and after the transfer of design information, and maintains full integration of its accuracy. Figure 16 for creative 3D design and manufacture of plastic products Easy Fun teaching equipment system diagram.

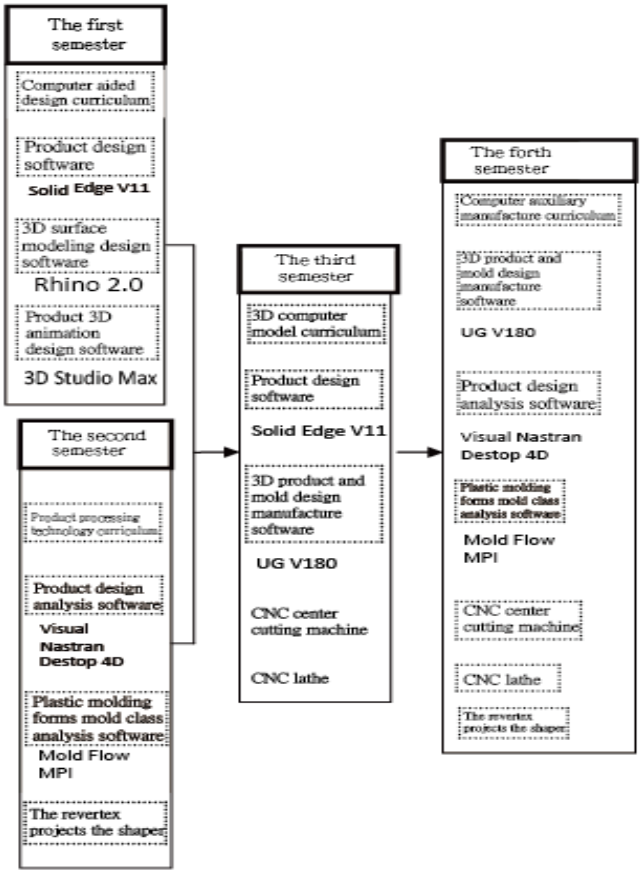

Fig. 16 The creative 3D design and manufacture of plastic products Easy Fun teaching equipment system diagram.

IX. Conclusion

Through the above reasoning, we can see how new product design and manufacturing methods and innovative ways of thinking affects the process of creative design and manufacturing. Students in creative design, not just through teachers teaching or paper work, can achieve success in the creative course (not to mention the proper formation of creative ideas), if not in a deep pool issue, as then the concept of a so-called "beautiful dream" can never be achieved. So, through innovative product design and manufacture of 3D Easy Fun learning system, we can "bring our dreams to life", "turn dreams into reality," and can "make dreams come true." Using the innovative product design and manufacture 3D Easy Fun learning system, learners can not only link to product innovation and design and manufacture of key aspects, but also can turn dreams into physical output in 3D form. 'Complete' teaching and assessment control loops achieve a practical application of knowledge, through both theoretical and technological education goals.

In science and technology education or vocational education systems curriculum development, the content of the teaching and educational process, within product design and manufacturing, has focused on the technical ability to use a teaching resource to realise "Knowledge of the productive

forces," during study. In our modern technological society, what has been especially stressed on is automation and information technology and the competitiveness of the socio-economic system, and this has formed the main body of knowledge. Here, students understand the product from the initial sprouting, through practicing creative output and during design and manufacture, to gain the necessary expertise and technical capacity that form the key points that are the essence of science and technology education.

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