

NJU SA 2015-2016

THE YEAR BOOK OF ARCHITECTURE PROGRAM SCHOOL OF ARCHITECTURE AND URBAN PLANNING

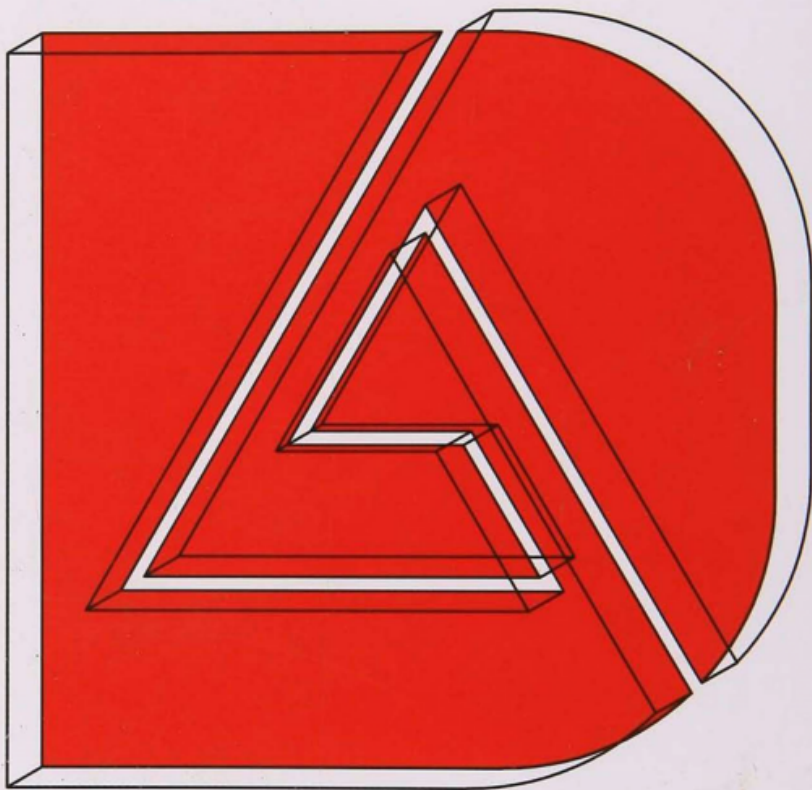
南京大学建筑与城市规划学院建筑系 教学年鉴

王丹丹 编

EDITOR: WANG DANDAN

东南大学出版社·南京

SOUTHEAST UNIVERSITY PRESS, NANJING



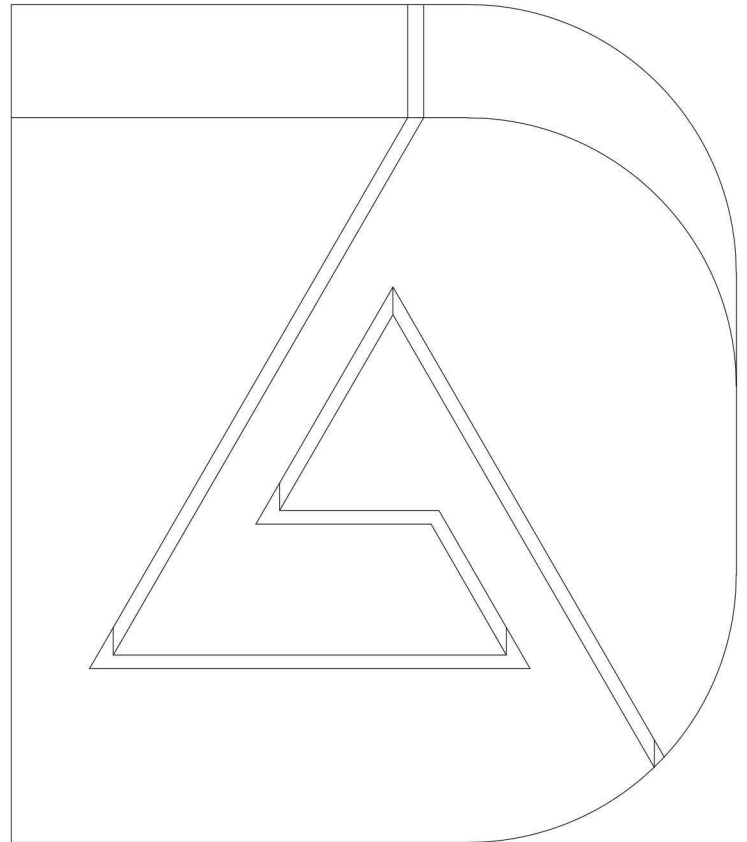
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Architectural Design and Theory

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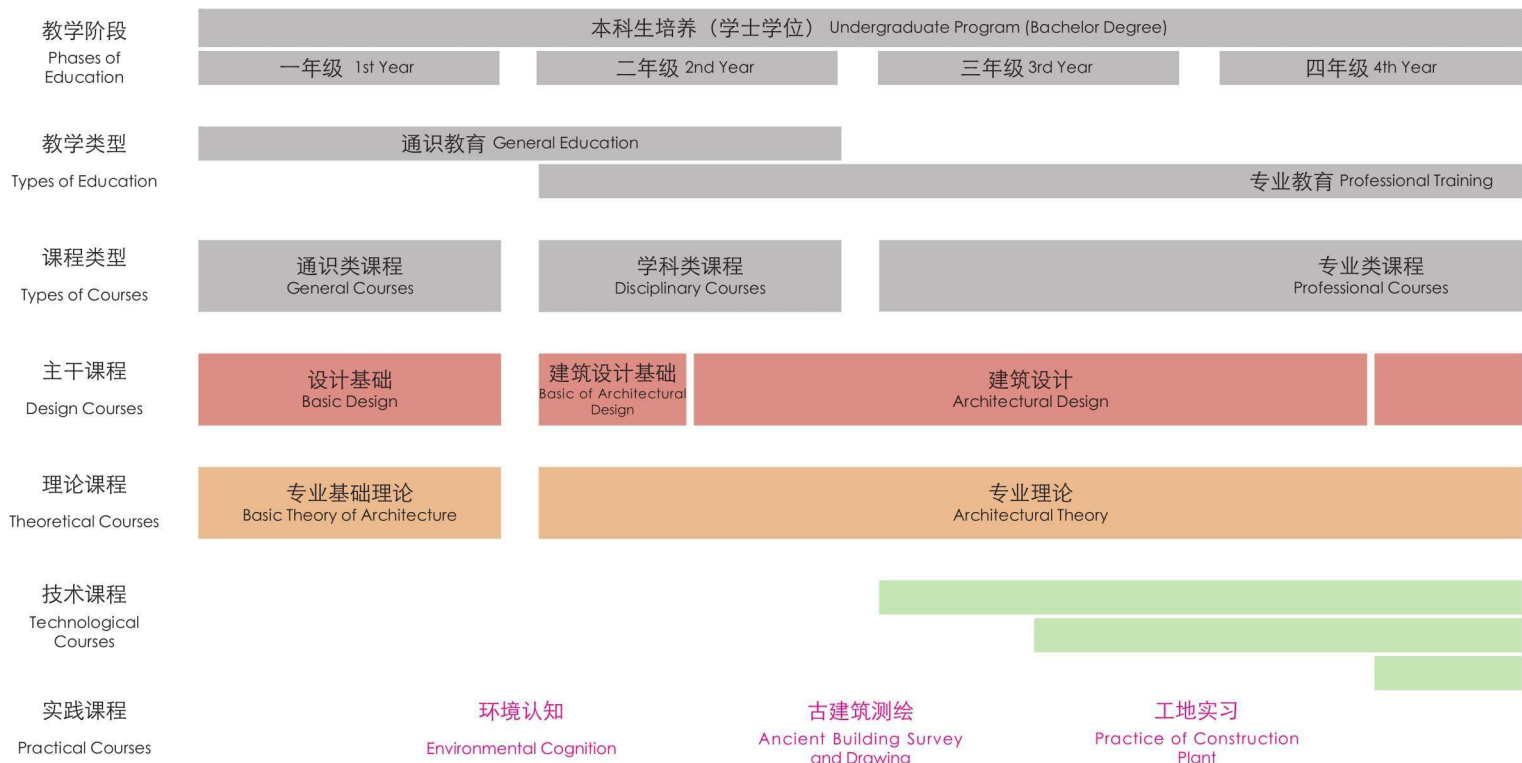
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教学纲要

EDUCATIONAL PROGRAM



研究生培养（硕士学位） Graduate Program (Master Degree)

研究生培养（博士学位）
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学术研究 Academic Research

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学位论文
Dissertation

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专业扩展理论
Architectural Theory Extended

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建筑物理实验室 Building Physics Lab

数字建筑实验室 CAAD Lab

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生产实习

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Practice of Profession

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| 专业理论 Architectural Theory | 逻辑学 Logic | 建筑导论 Introductory Guide to Architecture | 建筑设计基础原理 Basic Theory of Architectural Design 居住建筑设计与居住区规划原理 Theory of Housing Design and Residential Planning 城市规划原理 Theory of Urban Planning |
| 建筑技术 Architectural Technology | 理论、材料与结构力学 Theoretical, Material & Structural Statics Visual BASIC程序设计 Visual BASIC Programming | CAAD理论与实践 Theory and Practice of CAAD | 建筑技术（一） 结构与构造 Architectural Technology 1: Structure & Construction 建筑技术（二） 建筑物理 Architectural Technology 2: Building Physics 建筑技术（三） 建筑设备 Architectural Technology 3: Building Equipment |
| 历史理论 History Theory | 古代汉语 Ancient Chinese | 外国建筑史（古代） History of World Architecture (Ancient) 中国建筑史（古代） History of Chinese Architecture (Ancient) | 外国建筑史（当代） History of World Architecture (Modern) 中国建筑史（近现代） History of Chinese Architecture (Modern) |
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Digital Architecture Design
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International Design Workshop

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现代建筑设计基础理论
Preliminaries in Modern Architectural Design
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Methodology of Modern Architectural Design
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Theory and Methodology of Landscape Urbanism

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Studies in Chinese Wooden Tectonic Culture
计算机辅助技术
Technology of CAAD
GIS基础与运用
Concepts and Application of GIS

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Study of Architectural Theory

生产实习（一）
Practice of Profession 1

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Practice of Profession 2

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Architectural Design and Practice

景观规划设计及其理论
Theory of Landscape Planning and Design

东西方园林
Eastern and Western Gardens

地理信息系统概论
Introduction of GIS

欧洲哲学史
History of European Philosophy

微观经济学
Micro Economics

政治学原理
Theory of Political Science

社会学定量研究方法
Quantitative Research Methods in Sociology

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Studies in Architectural History

建筑节能与可持续发展
Energy Conservation & Sustainable Architecture

建筑体系整合
Advanced Building System Integration

规划理论与实践
Theory and Practice of Urban Planning

景观规划进展
Development of Landscape Planning



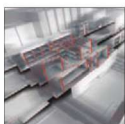
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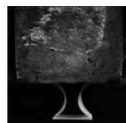
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设计基础(二)

BASIC DESIGN 2

丁沃沃 鲁安东 唐莲



南京大学建筑学本科自2007年设立开始,本科一年级一直以通识教育为主。通识教育夯实学生的知识基础,包括文科、理科与美学三方面的课程。美学课程与南京艺术学院合作开展,第一学期进行视觉训练,第二学期进行空间训练。建筑空间以人为本,空间训练强调以“身体”为核心进行课程的设置,共包括三个部分的练习。练习一“动作-空间分析”通过分析被空间限定的身体动作,训练学生认知身体、尺度与环境的关系;练习三“互承的艺术”通过真实搭建身体能够进入或通过的空间结构,建立学生对建筑结构的初步认识;练习二在前两年“折纸空间”的基础上,将纯粹对纸的操作转化为与身体关系更为紧密的“空间包裹”,训练学生形成建筑学形式操作的基本思维与方法,更系统地衔接练习一与练习三。

1. 课程设置

“空间包裹——折纸的艺术”的教学历时五周,要求用折纸对身体的一个部位进行包裹,完成一件衣服的设计与制作。课程可以理解为基于身体(场地)的形式操作,教学的主要内容是形式设计的逻辑与方法,其中折纸作为实现形式的技术与媒介。为此,在整个教学过程中设置了三个阶段的练习,并开展相应的讲座来指导与配合练习。这三个阶段分别为,折纸单元基础练习(一周)、折纸单元的变形与组合研究(一周)以及折纸包裹空间设计(三周)。

1.1 折纸单元基础练习

阶段一折纸单元基础练习训练学生对材料、形式单元的认知。学生需学习折纸的基本知识,运用单元拼插或者整纸折叠的方式,制作一个直径不小于15cm的空心球。这个练习有助于学生快速掌握折纸技术,了解形式单元与基本形——球之间的构成关系。

材料认知是建筑学一项重要的训练内容,折纸练习中,通过对白纸的折叠以及白纸构成构件单元与单元之间的拼接,学生亲身体会了材料与工艺、构件、结构等的关系。白纸的厚薄、质感等特性直接关系到球的制作是否能够成功。另外,从平面的白纸到三维的球的过程,初步训练了学生对形式单元与最终形式关系的理解。球是最简单的空间包裹体,各个方向的弧度完全一致,只需要有规律地重复折纸单元就能完成球的制作。球制作完成后,学生被要求对使用纸张的种类、大小、数量、构成球的构件单元、拼接方式、单元数量等进行统计,将折纸单元尺寸及数量与球的弧度建立链接,最后与其他同学的成果进行比较,分析形式单元的塑形效率。

1.2 折纸单元的变形与组合研究

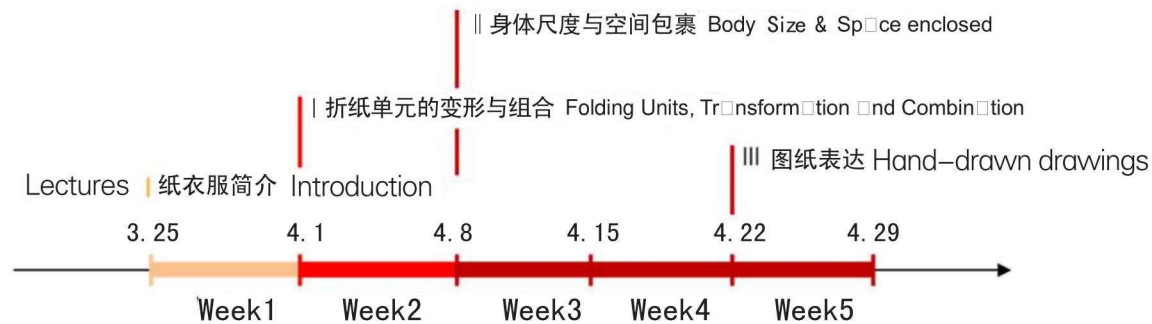
阶段二折纸单元的组合与变形研究训练学生掌握形式变形规律,培养理性的思维方法。该练习要求学生以折纸球的单元为基础选择一种单元进行深入,单元拼插通过单元大小组合、整纸折叠通过折痕线的变化,来研究折纸塑形机制,最终能够做到娴熟地塑形。这个练习在整个教学过程中非常关键,鼓励学生探索与研究,在掌握老师传授的基本原理和知识基础上,学生需要自己选择合理的可发展的折纸单元,对单元进行改进(以做到更稳固的连接或完成更丰富的变化),探索选定单元的组合与变化的所有可能性及适用性,并能够图解清晰的数形关系。学生对塑形机制掌握得越充分,在下一个练习中就能够越娴熟地进行成品设计。

对建筑设计过程的关注,以及对形式生成原因的研究在建筑学训练中越来越被重视。本阶段练习中学生需探索与分析单元操作与形式变化的关系。折纸从平面到三维形式的规律可以通过简单的几何知识进行归纳。学生在练习过程中,除了通过模型来呈现变形与组合的可能之外,还需手绘图解单元几何尺寸、关系,对变形和组合的原理进行图示解析,了解折纸操作中单元的变形、不同组合、峰折、谷折等对于形式控制的意义。

1.3 折纸包裹空间设计

阶段三折纸包裹空间设计训练学生对形式规律的运用及设计能力,要求学生运用掌握的折纸塑形原理,包裹身体的一个部位,最终成品需满足身体尺度的三个层次,并能够改变人的形体。这个过程历时三周,前两周以设计与制作衣服为主,学生需要根据选择的部位以及衣服的设计意向设定概念,设计除了在技术上遵循之前的研究成果之外,也需符合概念的设定,由概念来引导设计造型的走向;后一周学生需要对成品进行拍摄,对制作原理进行手绘图表述,最终完整呈现到一张图版上。

建筑形式不仅仅是一种造型,形式与场地关系密切,需具备合理性,课程要求衣服的设计需顺应身体尺度的需要。身体作为折纸衣服的“场地”,具有三个层次的尺度。首先,基本尺度,人的身体可以理解为多个球面体或多面体的组合,不同部位具有不同的尺寸,且不同部位弧度存在差异。其次,穿戴尺度,人的身体是可活动的,穿戴与活动的最大尺寸、最小尺寸决定了衣服尺寸的可变区间。第三,扩展尺度,在满足前两个层次的基础上,身体的形体可被衣服重塑与改变,还具备可扩展尺度。最终,衣服成品的形式控制是否完成了身体尺度的三个层次、是否遵从折纸单元的塑形



机制以及是否遵从概念的设定，都是评判作品是否优秀的考量因素。

2. 教学成果与讨论

“空间包裹——折纸的艺术”课程取得了较好的教学效果，学生兴趣浓厚，最终作品及图纸完成度较高。由于理性思考与控制的存在，“可以复制”成为最终作品重要的特点，也因此很好地贴合了课程设置的训练目标。对于一学期的空间基础教学来说，“空间包裹”承接了“动作-空间分析”中学生对身体尺度及空间关系的认知，培养了学生理性的形式操作能力，为接下来的“互承的艺术”的真实搭建打下了扎实的基础。学期末“艺术的理性”设计成果展中，学生穿着设计制作的折纸服装，穿梭于亲自搭建的覆盖结构之中，再次感受到材料之美、结构之美、空间之美。至此，三个课程完成了空间基础的整体训练。

“纸”与“身体”作为艺术学院的经典训练项目，强调对服装设计的训练；在本教案中，当“纸”与“身体”变为建筑学训练的载体时，则强调形式构成与形式逻辑训练。“空间包裹”练习中含有建筑学中的多个基本问题，比如场地问题、材料问题、构造问题、结构问题、设计问题等。将身体看做场地，折纸衣服看做建筑，最终完成的折纸衣服既是独立的作品，更是借以思考建筑学问题的载体。对于建筑学来说，好的建筑不仅最终的形式是美的，而且形式的生成应该是理性的，构成形式的构件单元应该是合理的，构件与构件之间的拼插应该是严谨的，这些都涵盖在设计过程中。加强逻辑思维训练，通过设计过程训练设计思维，将延续到建筑学专业训练的全过程。

Since the major of architecture was established at Nanjing University in 2007, general education has always been the focus for first-year undergraduate students. General education can enhance knowledge base for students, which involves courses in three aspects of liberal arts, science and aesthetics. The course of aesthetics is carried out jointly with Nanjing University of the Arts. The first semester is for visual training, and the second semester is for space training. Architectural space is human oriented, so course setup for space training is carried out by emphasizing “human body” as the core, and it consists of three exercises. Exercise 1 is “action-space analysis”, which aims to train students to understand the relations among human body, dimensions

and environment through analysis on actions of human body confined by space; Exercise 3 is “art of mutually-supporting”, which aims to help students establish preliminary understanding on architectural structure through erecting a physical structure of space that can be assessed or gone through by human body; Exercise 2 transforms pure paper operation into “spatial enclosure” that has closer connection with human body on basis of the “folding space” established two years ago, and is intended to train students to shape basic thought and methods for operation of architectural forms, and to link Exercise 1 and Exercise 3 more systematically.

1. Setup of the Course

The teaching process of “spatial enclosure – the art of paper folding” lasts five weeks; it requires students to enclose one part of human body with paper folding to complete the design and manufacture of a piece of clothing. The course can be construed as form operation based on human body (the site), and main teaching content is the logic and methods of form design, in which paper folding is applied as technique and medium to realize the form. Therefore, three exercise phases are arranged in the entire teaching process, and relevant lectures are unfolded to direct and assist exercises. These three phases are basic exercise of folding units (one week), research on transformation and combination of folding units (one week), and design of space enclosed with paper folding (three weeks).

1.1 Basic Exercise of Folding Units

The basic exercise of folding units in Phase 1 aims to train students to understand materials and form units. Students shall learn basic knowledge of paper folding, and make a hollow sphere with diameter no less than 15cm through the way of splicing units or one-paper folding. This exercise can help students grasp folding skills rapidly, and understand the formation relationship between form units and basic shapes—sphere.

Understanding materials is an important item of training content of architecture. During the paper folding exercise, students can experience by themselves the relations among materials, techniques, members, and structure through folding of

white paper and splicing of different member units. Thickness, texture and other features of white paper have a direct bearing on success of fabrication of the sphere. In addition, the process from two-dimensional paper to a three-dimensional sphere trains students to understand the relationship between form units and final form. Sphere is the simplest spatial enclosure, with completely identical arc in every direction, and can be completed only by repeating the folding unit regularly. After the sphere is completed, students need to count types, sizes, and quantity of paper used, as well as member units shaping the sphere, splicing mode, and quantity of units, establish links between sizes and quantity of folding units and arc of the sphere and finally, compare with results of other students, and analyze molding efficiency of form units.

1.2 Research on Transformation and Combination of Folding Units

The research on transformation and combination of folding units in Phase 2 aims to train students to grasp transformation rules of forms, and to cultivate rational thinking methods. This exercise requires students to select one unit for deeper exercise on basis of the unit of paper folded sphere, study molding mechanism of paper folding through combination of different sizes of units to be spliced or through variation of folding lines for one-paper folding, and realize skilled forming control in the end. This exercise is very important for entire teaching process. Students are encouraged to learn, explore and research, and on basis of basic principles and knowledge basis taught by the teacher, students are required to choose reasonable and developable folding units by themselves, improve such units (so as to realize more stable connection or complete more variations), explore all possibility and applicability of combination and transformation of selected units, and illustrate clear relationship between quantity and forms with drawings. The more sufficiently students master the molding mechanism, the more skillfully they can complete design of finished product during next exercise.

Attention on the process of architectural design, and research on reasons of form shaping are increasingly emphasized during training of architecture. In this phase of exercise, students are required to explore and analyze relations between unit operation and form transformation. The rules of paper folding from two-dimensional to three-dimensional forms can be concluded with geometric knowledge in a simple way. In the process of exercise, in addition to possibility of presenting transformation and combination with models, students are also required to draw geometric dimensions and relations of graphic units manually, illustrate principles of transformation and combination with diagrams, and understand transformation of units during paper folding, as well as the meaning of different combinations, peak folding, and valley folding to form control.

1.3 Design of Space Enclosed with Paper Folding

The design of space enclosed with paper folding in Phase 3 aims to train students with the application and design ability for rules of forms. It requires students to apply acquired molding principles of paper folding to enclose one part of human body, and requires that the finished product shall meet three levels of human body dimensions, and can change the shape of human body. This process lasts for three weeks. The earlier two weeks are mainly for clothing design and manufacture, and students are required to set up concepts according to selected body part and intention of clothing design, in addition to following previous research results technically, the design

shall also meet setup of concepts, and guide direction of design and molding with concepts; the next one week is for photography of finished products, and students are required to express fabrication principles with hand-drawn drawings, and finally present them completely on one piece of layout.

Architectural form is not just a type of molding, form and site are closely connected, and should be rational, and the course requires that clothing design must meet the demand of dimensions of human body. As the "site" for paper-folded clothes, human body has three levels of dimensions. The first one is of basic dimensions, and it can be deemed as combination of several spheres or polyhedrons, with different sizes at different locations, as well as difference of arcs at different locations. The second one is of wearing dimensions, human body is movable, and maximum sizes and minimum sizes for wearing and movements determine variable range of sizes of clothes. The third one is of extension dimensions, on basis of meeting requirements of aforesaid two dimensional levels, the form of human body can be re-molded and changed with clothes, and has extensible dimensions. In the end, if form control of a finished product of clothes completes three levels of human body dimensions, if molding mechanism of folding units is followed, and if setup of concepts is observed, all are considerations for evaluating quality of a product.

2. Teaching Results and Discussion

The course "spatial enclosure – the art of paper folding" obtained good teaching effect. Students were highly interested, and completed final products and drawings at a high level. Due to the existence of rational thinking and control, "replicability" has become an important feature of finished products, and it also fit well with training objective set up for the course. For the one-semester teaching of spatial basis, "spatial enclosure" continued the perception on relations between human body dimensions and space in "action-space analysis", cultivated students with ability of rational form operations, and laid down solid foundation for practical erection of the following "art of mutually-supporting". In the design exhibition "rationality of the art" at the end of the semester, students wearing paper-folded clothes that are designed and manufactured by themselves walked through cover structures erected by themselves, and felt the beauty of materials, the beauty of structure, and the beauty of space again. Till now, three courses have completed overall training of spatial basis.

As a classic training item at University of the Arts, "paper" and "human body" emphasize training on clothes; in this teaching plan, when "paper" and "human body" become carriers for architectural training, it emphasizes training on form composition and form logic. The exercise of "spatial enclosure" implies many basic issues of architecture, such as the issues of site, materials, construction, structure, and design. By considering human body as a site, paper-folded clothes as a building, the finished paper-folded clothes are not just independent products, but also carriers for the purpose of deliberating architectural issues. In term of architecture, a good building not only has a beautiful finished form, but also shapes the form with rationality, member units composing the form shall be rational, and splicing of members shall be rigorous. All these are covered in the process of design. Strengthening the training on thinking logic, and training design thinking in process of design will be extended into the entire process of professional training of architecture.

