APPLYING OF PROJECT DESIGN (PD) EDUCATION METHODOLOGY FOR TEACHING OF THE ARCHITECTURAL ACADEMIC SUBJECTS

Dr. Arch Le Vinh An*, MA. Arch Vu Cong Thanh**

* Dean of Faculty of Architecture, Duy Tan University, Vietnam, ** Header of Division, Faculty of Architecture, Duy Tan University, Vietnam

ABSTRACT

The Project Design (PD) is a specialized course of the Kanazawa Institute of Technology (K.I.T), Ishikawa Prefecture - Japan, which has been applied for education program since 1995, was called as Engineering Project Design (EPD) used for teaching of engineering students of K.I.T, then was modified became the PD used for engineering and non-engineering students, still play a role as the backbone of curriculum nowadays. The University's outstanding achievements have contributed to K.I.T becoming the second-highest private university in Japan based on the result of ranking in 2015. For the first time, PD education has been transferred to apply for teaching at the Vietnam-Japan Institute of Technology (VJIT) which belonging to the University of Technology (HUTECH), Ho Chi Minh City - Vietnam since 2015, and has proved its effectiveness not only in Japan but also abroad.

The Faculty of Architecture - Duy Tan University (DTU) has applied the PD education methodology from beginning of 2017 for teaching of the architectural academic subjects (Synthesis Project category) for 4th and 5th year students which focusing on the field of urban planning and urban renovation. The designing process including 5 schemes which is followed the CDIO criteria: ①Problem-finding (Conceive) → ②Problem-clarifying (Conceive) → ③Idea-creating (Design) → ④Solution-evaluating (Design) → ⑤Solution-concreting (Implement & Operate). The applying of this education methodology for architectural academic subjects has helped students to think creatively and simultaneously solve practical problems in a comprehensive and effective way, changing the learning method from passive to active, developing teamwork skills, enhancing effective presentation skills and comprehensive assessment. The experimental project with topic "Development of the Ben Dinh traditional fishing village inside the Vung Tau sea-urban environment based on the preservation and inheritance of its remaining traditional factors" carried out by DTU's faculty members, awarded as the "Best teaching method for architectural academic subjects" by the Vietnamese National Association of Architects in the middle of October, 2017.

Thus, it can be said that the applicability of CIDO criteria is also effect for the architecture and urban planning education field that hasn't been previously applied in Vietnam. For next coming time, Faculty of Architecture of DTU going to continue study on the capacity of PD education methodology to apply for teaching of other suitable-types of architectural academic subjects in DTU.

KEYWORDS

CDIO standards, PD Education, Architecture, Duy Tan University

I. An introduction to the Project Design (PD) education of K.I.T

1.1 Role of PD education in the Curriculum of K.I.T

PD education course is a specialized subject of the Kanazawa Institute of Technology (K.I.T), first version called Engineering Project Design (EPD) used to applied for training of engineering students since 1995, has been adapted for both engineering and non-engineering students since 2002, then continuously used up to the present. This course plays a role as the Backbone of K.I.T's Curriculum, its "Core" element draws nutrients from the "Material classes" to form the particular component of the outcomes [1-3].
Full volume of this course consists of modules: Introduction to PD, PD I, PD II, Practice in PD, Major seminar in PD and PD III, those are continuously taught from first year students to the graduations. Along with these, students will be equipped the knowledge in social sciences, humanities, natural sciences, basis knowledge of engineering and English proficiency [4]. Thus, PD education has been a main pillar of K.I.T's internationally-oriented curriculum (figure 1).

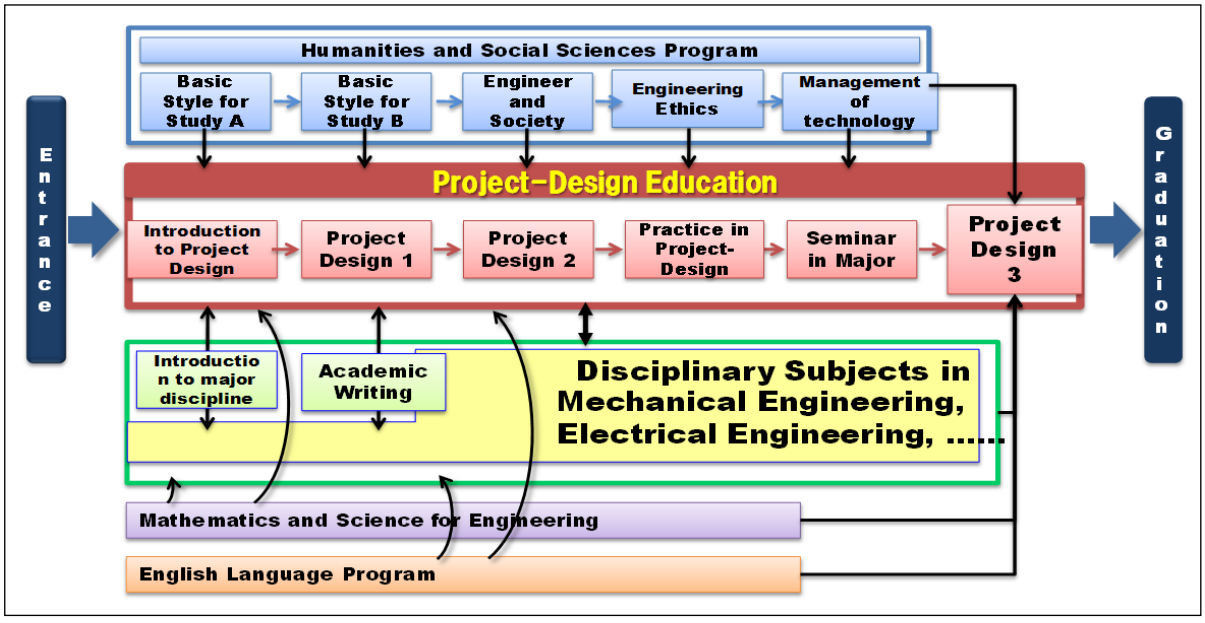

Figure 1. Role of PD education in the Curriculum of K.I.T

1.2 Engineering Design Process and methodology of PD education

The "Core" of PD education is "Engineering Design Process" that has been designed to meet CDIO criteria included 5 schemes: ① Problem-finding (Conceive) → ② Problem-clarifying (Conceive) → ③ Idea-creating (Design) → ④ Solution-evaluating (Design), ⑤ Solution-concreting (Implement & Operate). The specific activities of each stage are presented in table 1.

Table 1. Themes and contents of activities in the Engineering Design Process (K.I.T)

Scheme	Project Design I	Project Design II
① Problem-finding	Find out the problem of the products or services that need to be improved to decide the theme of the Team-project.	
②	Identify the causes of problem and its	

Problem-clarifying	characteristics to determine the designing specifications.	
③ Idea-creating	Creating a number of idea, set the solutions for the project theme = Creation of the basic design solutions.	Review the solution which has been seted up in PDI, then improve them = Better solution creation.
④ Solution-evaluating	Evaluating, selection the best solution for the decision of final solution, sketch the solution in graphic.	Evaluating, choosing the best solution to set up the final design plan.
⑤ Solution-concreting		Idea creation for final design plan = Specify solution with design drawings.

The PD education mainly raises on the "Spiral Spring" method by repeating the stages of the Engineering Design Process with a series of the technical solutions aimed at solving the problems, specifiying problems through the modules mentioned above. Basing on the topics that emerged from the realities of social life, students will learn themself how to face to the real issues, understanding social requirments, collecting and analyzing the customer's needs concerning to products and services on the market, summarizing ideas from group discussions, establishing of documentations, practicing on presentations and completing the homeworks. With a guidance of the instructor, groups of student will learn how to exploit and analyze the root-cause of the problems, experience the Engineering Design Process, then giving the proposed solutions to solve the problems. Through these activities, students gain superior ability in thinking and practicing skills while studying at university.

1.3 Requirments for student in PD education

The PD education course dosen't airm to provide students the knowledge in the particular fields, but it is focusing on the training methods and skills for students from the entrance to the graduation. Below is the requirements for K.I.T's students through PD education course (table 2).

Table 2. Requirments on the K.I.T's students through PD education course

Scheme	Methods	Skills	Levels of requirment				
			Intro	PDI	PDII	Prac	PDIII
1 (C) Problem-finding	- Market investigation - Garthering of customer's needs - Recording of market information	Investigation on the products and services on the market and other precedents	-	○	○	-	◎
		Survey on the customer' needs	-	○	○	-	○
		Recording, adjusting of customer's needs	-	○	○	-	○
2 (C) Problem-clarifying	- Data base analysis - Problem defending	Classification of the market information	-	○	○	-	◎
		Qualitative evaluation (Customer's demand determination)	-	○	○	-	○
		Quantitative evaluation (Specification of design for produce or service)	-	-	○	-	◎

3 (D) Idea-creating	- Imagining - Multi creation - Converging	Idea creation	-	○	○	-	△
		Idea converting	-	○	○	-	○
		Idea combination	-	△	○	-	◎
4 (D) Solution-evaluating	- Qualitative assessment - Quantitative assessment - Definition of constraint conditions	Adjusting for the solution based on Qualitative assessment	-	○	△	-	○
		Adjusting for the solution based on Qualitative assessment	-	-	○	△	◎
		Feasibility assessment	-	△	○	-	◎
5 (I&O) Solution-concreting	- Scientific & technical verification - Verification from a professional point of view	Project planning and implementation	○	-	△	○	◎
		Safety management (labor), risk control (business)	△	-	△	△	○
		Basis experimental knowledge (accuracy, accreditation, basic knowledge, expertise)	-	-	△	-	◎
Synthesis process	- Communicate - Team work - Promotion discussion	Leader-ship	-	○	○	-	○
		Follow-ship	-	○	○	-	◎
		Report-writing skill	○	○	○	○	◎
		Slide-designing skill	○	○	○	○	◎
		Project-presentation skill	○	○	○	○	◎
		Generating skill	○	○	○	○	○
		Conclusion skill	○	○	○	○	○
		Ice breaking skill	-	△	-	-	-
Note: △: Optional (Self-selection), ○: Force (Required), ◎: Focus (Strong-required)							

II. Experiences from teaching of PD in VJIT

2.1 Role of PD education in the Curriculum of VJIT

Since 2015, the PD education of K.I.T was transferred for teaching at the Vietnam-Japan Institute of Technology (VJIT) which belonging to HUTECH. The education subject has been applied to both engineering and non-engineering students as an additional course to equip for students soft skills and suplemental methods. The applying of this education subject in Vietnam initially encountered certain difficulties due to the following main reasons:

- Differences in education philosophy between Japanese and Vietnamese;
- Unbalanced in scientific and technological foundation between two countries;
- Shortage of experimental equipments for training of the stage-holders.

Therefore, the teaching of this subject at VJIT initially only achieves the goal of training soft skills which helps students to initialize the Conceive (C) and Design (D), hasn't yet achieved the target of Implement (I) and Operate (O) according to the international CDIO criteria [5-6].

2.2 First assessment on the effection of PD education in VJIT

Based on the results of VJIT's survey in March, 2016 which carried out for 7 classes of PDI included 226 survey sheets consist 13 statements were compiled and distributed to the students at the end of the course in order to collect information on student's self-evaluation (table 3). Accordingly, the required level of training was 72.6%, the normal level was 21.3% and the level of failure was 6.7%. Thus, it can be said that the applying of PD education in Vietnam is feasible although there are internal limitations which not easily to be overcome in short time.

Table 3. Investigation on the student's self-evaluation of VJIT

No	Statements	Levels of evaluation				
		1 Not at all	2 Slightly disagree	3 Neutral	4 Slightly agree	5 Strongly agree
1	I understood the course objectives.	2	7	29	101	87
2	I think I have achieved the course objectives.	0	12	65	120	29
3	I understood how/what to do in-class activities and homework assignments.	3	11	58	86	68
4	I always received supports from the instructors when I was in need.	2	13	34	56	121
5	The office hours were effective between the group and the instructor.	3	9	24	74	116
6	The course pressure was appropriate to me.	12	25	70	85	34
7	My presentation skills have improved through the course.	1	11	35	86	93
8	My report writing abilities have improved.	5	9	60	100	52
9	I think I am able to work and handle work in pressure environments.	6	12	43	107	58
10	My group/ team work skills have improved through this semester.	2	5	48	88	83
11	My group/ team meetings were effective.	6	15	47	87	71
12	I think my ability of designing projects has improved through this course.	2	8	48	95	73
13	I liked this course.	5	12	45	75	89
Percentage of evaluation (%)		**6.7**		**21.3**	**72.6**	

III. Applying of PD education method into teaching of Architectural academic subjects in DTU

3.1 Teaching of Architectural academic subjects in schemes of PD education

The fields of Architecture and Urban Planning are industries built on two pillars: Technique and Art, so the applying of CDIO criteria into these education fields is not simply as a construction of standard-outcome for other fields. In order to achieve the objective harmonious education between technique and art, it is necessary to build the particular methods and training processes appropriate to the characteristics of these fields.

Based on the PD education of K.I.T, Faculty of Architecture of DTU has applied the “Core” of PD education methodology as the schemes of "Engineering Design Process" to develop into the "Process of Instruction for Designing Project" summarized in the table 4.

Table 4. Process of Instruction for Designing Project of DTU

Scheme	Contents of Activity	Outcome	Levels of requirment
1 (C) Problem-finding	- Approach the field, doing investigation on urban areas. - Finding out the problems of urban - Definding the urban challenges.	Investigation skills and status assessment method.	○
		Ability in documentations	○
		Ability in setting-up a group for designing project and teamwork skills	△
2 (C) Problem-clarifying	- Analysing on the real situation of the urban areas along with refer to designing database. - Clarifying the cause of the problems and challenges. - Use support tools (principles, knowledge in major, criterions) to defind the themes of solution	Method of database analysis	○
		Ability in qualitative & qualitative assessment	◎
		Ability of Ice-breaking (1)	○
3 (D) Idea-creating	- Spreaded thinking to create amount of idea for solutions - Exploding personal talent to develop an architectural creation ability (prototype). - Focused thinking to combine the ideas and extract the effective and/or attractive solutions.	Ability on idea creation	◎
		Ability on idea converting	◎
		Ability of Ice-breaking (2)	○
		Ability of architectural creation and prototype assessment	◎
4 (D) Solution-evaluating	- Graphitization the combinative solutions by sketching. - Sefl-forimg the criterions (tecniques, arts, societies, economic) for the evaluation. - Doing evaluation, selection of the optimal solution and/or designing plan based on the criterions.	Skills of basing on qualitative and qualitative evaluation for modifiding of the design.	△
		Ability on evaluation and definding values of the design.	○
5 (I&O) Solution-concreting	- Demonstrating the selected solution into the architectural drawings. - Poster presentation and complete the final designing report.	Verifying methodology of the scientific and effective of the project.	○
		Ability in planning and implement of the designing project.	◎
Note: △: Optional (Self-selection), ○: Force (Required), ◎: Focus (Strong-required)			

3.2 First case study for the Synthesis Project type of Architectural academic subject

First type of the architectural academic subject has been tested by applying the Process of Instruction for Designing Project was Synthesis Project type with the theme of urban planning and rehabilitation, used for 4th or 5th year students in the DTU Architects training program.

Time-line consists of 10 weeks (09 weeks + 01 weeks), each group consists of 3-5 students under the guidance of 2 instructors who specialized in architectural design and urban planning (table 5).

Table 5. Time-line of the Process of Instruction for Designing Project

Week	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10
Scheme	1 (C) + 2 (C) Problem-finding & clarifying			3 (D) Idea-creating		4 (D) Solution-evaluating			5 (I&O) Solution-concreting	

The Synthesis Project type experimented with the topic: Development of the Ben Dinh-traditional fishing village inside the Vung Tau sea-urban environment based on the preservation and inheritance of its remaining traditional factors, which was giving by the Vietnamese National Association of Architects, initiated by DTU faculty members and others, has experimented with the urban planning and rehabilitation mastering guide on this academic subject. Corresponding to the “Class theme” of PD education, the “Keyword” of the course given to students in order to suggest project theme was Transformation of an administrative entity of Ben Dinh- fishing village, Vung Tau city (table 6).

Table 6. Space and Time for the Designing Project

Time	Past	Present	Future
Space	 Vung Tau city and Ben Dinh-fishing village	 Vung Tau city and Ben Dinh-fishing village	- How the village will be? - What will you do for the village ? and how? - Base on what ? ? ? ?
Keyword	“Transformation”		

In this Process of Instruction for Designing Project, the keyword is "Open-assigment" and the final-solution is "Open-ended". With the project-topic, database (figure 2) and keyword have been provided, students will approach the topic from several different directions, build their own design tasks for their project, operating teamwork to create the general solutions and technical designing options, doing combination of the suiltable packs of solution, setting up the evaluation criterions to select the optimal pack of solution/general solution (table 7).

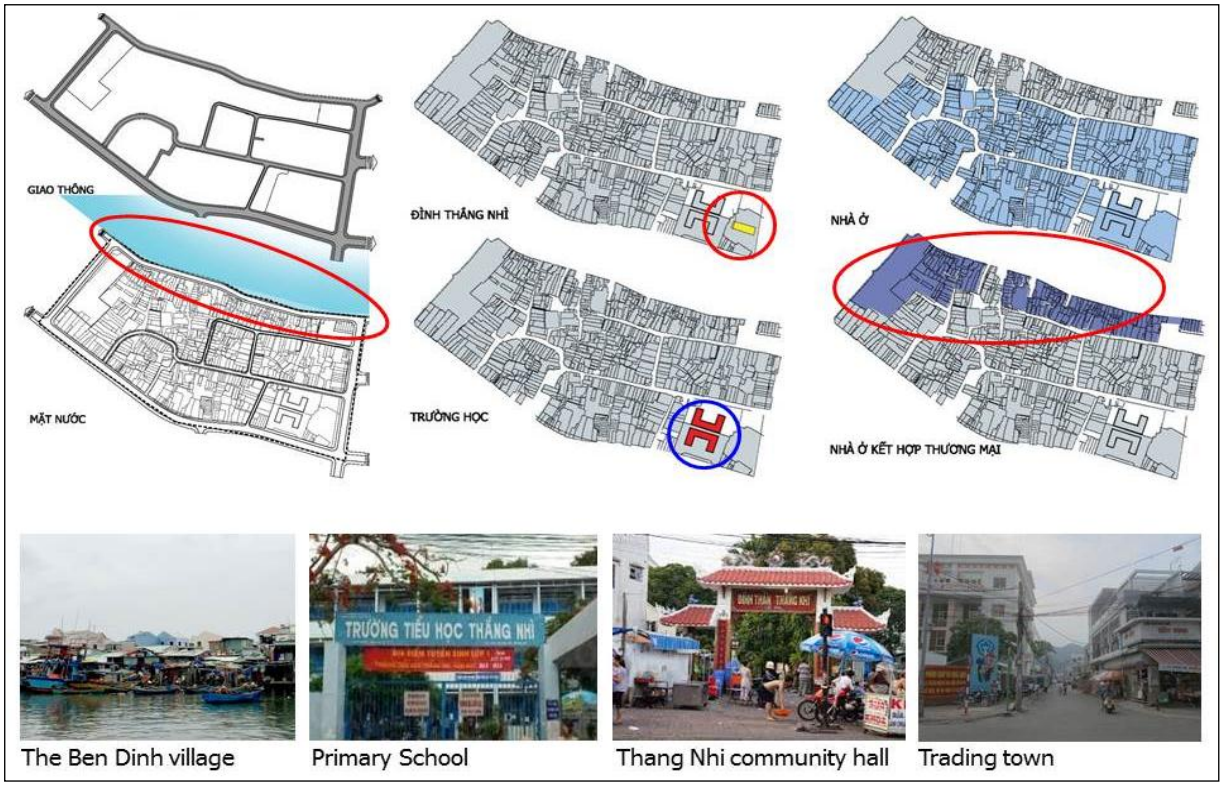

Figure 2. Database providing for the students

Table 7. Experimental example of the Porcess of Instruction for Designing Project

Approach / Scheme	Urban planing	Architecture	Environment	Society & Policy
1 (C) Problem-finding	 Traffice jam !!!	 Unsettled !!!	 Pollution !!!	- Investment isn't synchronized - The industry isn't suitable
2 (C) Problem-clarifying	- Too much motorbike - Narrow road - Population is overloaded	- No sustainable design - Backward habits - Livelihoods	- No drainage system - Mismanagement - Unconscious	- No planning project - Lack of investment
3 (D) Idea-creating	- Good-separator Overpass - Traffic Guide - Traffic police	- Low-rise townhouse - High apartment - Sea-Town	- Drainage system - Robot garbage collection - Environmental rules	- Re-planning - Investment - Embellishment Additional rules
4 (D) Solution-evaluating	Overpass + Traffic guild	Sea-Town	Drainage system + Robot garbage collection	Embellishment + Additional rules

5 (I&O) Solution-concreting	 Individual-work  Teamwork

3.3 As a conclusion

This Process of Instruction for Designing Project helps students to think more creatively and simultaneously to solve practically problems in a comprehensive and effective way, developing from passive to active in gaining knowledge and experience, practicing teamwork skills, enhancing effective presentation skills and comprehensive assessment. In the training course "Creation in Teaching of Architectural Academic Subject" took place in Vung Tau city in October 2017, the Process of Instruction for Designing Project was awarded as the "Best teaching method for architectural academic subjects" by the Vietnamese National Association of Architects and Clubs of Architects Training Schools of Vietnam [7-9].

REFERENCES

[1] Kanazawa Institute of Technology (K.I.T), *Student Manual of Engineering Design I (Japanese), Instructor Manual of Engineering Design I (Japanese),* Ishikawa, Japan, 2002.

[2] Kanazawa Institute of Technology (K.I.T), *Student Manual of Engineering Design II (Japanese), Instructor Manual of Engineering Design II (Japanese),* Ishikawa, Japan, 2002.

[3] Masakatsu Matsuishi (ASEE/JSEE), Kazuya Takemata (JSEE/JECE), Tetsuro Furukawa (HTSJ/JSER), Shigeo Matsumoto (JSEE/JSME), *Introductory Design Project in Engineering Design Course to Freshmen at Kanazawa Institute of Technology (Session 2793)*, "Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition Copyright © 2002, American Society for Engineering Education", USA, 2002.

[4] Keiichi Sato-Vice President for Education of Kanazawa Institute of Technology (K.I.T), *Engineering Education Program at Kanazawa Institute of Technology,* HCMC, Vietnam, 2015.

[5] Muneaki Sakamoto (K.I.T), Yoshiuyki Matsumoto (K.I.T), Takao Ito (K.I.T), Nguyen Hung (K.I.T), Le Vinh An (VJIT), Yutaka Hirai (K.I.T), *Initiatives in developing "Project Design" Education for Vietnam-Japan Institute of Technology*, Japanese Society for Engineering Education (JSEE), Vol.64, No.5, ISSN 1341-2167, Japan, 2016.

[6] Le Vinh An (VJIT), *Report on the feedbacks from VJIT's students,* HCMC, Vietnam, 2015.

[7] Vietnamese National Association of Architects & Clubs of Architects Training Schools of Vietnam, *Creation in Teaching of Architectural Academic Subject*, Vung Tau, Vietnam, 2017.

[8] Le Vinh An, *Certificate of Training in Creation in Teaching of Architectural Academic Subject*, Vung Tau, Vietnam, 2017.

[9] Le Vinh An, Truong Ngoc Quynh Chau, Tran Quoc Hoan, Nguyen Nam Thanh, *Certificate of the "Best teaching method for Architectural academic subjects"*, Vung Tau, Vietnam, 2017.

BIOGRAPHICAL INFORMATION

Le Vinh An is an Expert on the field of Architectural Heritage Study and the World Cultural Heritage Conservation, graduated from Waseda University, Tokyo-Japan, Dean of Faculty of Architecture, Lecturer of Duy Tan University, Da Nang City, Viet Nam. His current research focuses on the field of Architectural Heritage Conservation; Capacity of applying Project Design education methodology for teaching of Architecture and Urban Planning academic subjects in Viet Nam.

Vu Cong Thanh is a Registed Architect of Viet Nam, Header of Architectural and Urban Division, Lecturer of Faculty of Architecture, Duy Tan University, Da Nang City, Viet Nam.

Corresponding author

Dr. Arch. Le Vinh An
Faculty of Architecture
Duy Tan University
03 Quang Trung street, Hai Chau district,
Da Nang city, Viet Nam
levinhan@dtu.edu.vn