CAPSTONE PROBLEM DESIGN FOR OPTIMAL LEARNING CURVE IN ARCHITECTURE DESIGN

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ABSTRACT

At the heart of the CDIO (Conceive-Design-Implement-Operate) model is the Capstone project, which helps link up materials from different courses in the curriculum so as to deliver the optimal learning outcomes in terms of students' knowledge, skills and attitudes. However, with respect to the architecture discipline, its Capstone projects have had an even older tradition with certain similarities and differences when compared to the CDIO approach. In any case, a Capstone project in architecture can only be effective as long as the design problems presented in those projects are relevant to the current and future real-world trends and requirements. While every architecture student would prefer working on some original problems for his or her projects, those are not always available. Most of the times, students will have to work on some age-old architecture problems, trying to refine or recreate already-available solutions. So, it is important that architecture instructors should help guide, select and/or develop the right kinds of architecture problems for students' Capstone projects. Of course, the ultimate goal would be to optimize students' learning outcomes based on available design problems and resources rather than to focus only on creating some original architecture design problems. This paper thus will introduce a number of problem design methodologies for architecture projects using the CDIO approach at Duy Tan University (DTU). In essence, it is a significant move toward open-ended and concept-oriented projects in architecture so as to provide students with additional room for creativity and innovation. This problem-design approach would require certain work settings and team synergy for participants to be successful, and we will discuss various sets of training tactics for team members to be successful in open-ended and concept-oriented architecture projects. Certain assessment measures for architecture projects are also essential in preventing students from copying from previous work of other teams or classes in the past. Given that the focus of our CDIO approach is "student-centered" and "outcome-oriented", new evaluation measures for architecture have been developed at DTU so as to ensure that the problem-design methodologies for our Capstone projects do accommodate for the evaluation of both teamwork and individual performance. Last but not least, the allocation of resources at different phases or stages in any architecture project is vital to efficiency and effectiveness in the learning experience of our students, and some of the novel practices at our institution will also be presented and assessed.

KEYWORDS

Architecture, Capstone project, CDIO, CDIO Standard 5, 6, 7 & 8, concept-oriented, student-centered, project deployment process, teamwork assessment

INTRODUCTION

How to integrate innovative values of a standard CDIO Capstone project design into those of an Architecture Capstone project design is a puzzling question to many educators in the field of architecture because Capstone projects for architecture has been around for a long period of time with many of their own defining values. Specifically, their set of goals and focus is on technical reliability, local/international usability, social acceptability, economic feasibility as well as aesthetics. These goals and focus indeed determine how architects approach any one problem and thus, their subsequent design(s) for that problem. Most of the time, great architecture designs appeared to be the work of some exceptional individuals, and for that reason, ordinary architects tend to part themselves from systematic teamwork, collective creativity and constructive argumentation, which are all the benefits of a standard CDIO Capstone project design. While we are in no position to judge what makes up an exceptional architect, we believe that an ordinary to good architect can be trained by and benefited from the CDIO model rather than from the traditional approach in architecture education, which has produced so many "by-the-book" architects with little creativity and limited proficiency in their skills (Bridges Alan, 2007). Thus, the whole purpose behind the proposal to adopt CDIO design for architecture projects is to capitalize on the Conceive features of the CDIO framework besides enhancing teamwork collaboration in architecture projects. In other words, this paper would propose that by following certain CDIO practices in architecture training and by adopting certain CDIO methodologies in project development, good architects can be "made".

TRADITIONAL CAPSTONE PROJECT DESIGN FOR ARCHITECTURE (AT DTU) VERSUS INNOVATIVE CDIO CAPSTONE PROJECT DESIGN

An overview about the traditional approach in architecture education at Duy Tan University will provide a better idea about how academic projects in architecture have always been designed in Vietnam. It should be noted that architecture education in Vietnam was and is still strongly influenced by the French and Russian approaches:

- The design problem or task in traditional Capstone projects for architecture is usually fixed or closed-ended. The reason behind this is to facilitate for accurate assessment and/or evaluation of students' performance on various criteria. Closed-ended projects are not necessarily bad: they can be quite helpful for low-level Capstone projects during the sophomore or junior years.

- The design problems or tasks for senior Capstone projects are usually derived from real-world problems or by local architecture-design agencies, which are more than often limited in their design concept and scope. On the other hand, more junior Capstone projects usually have their problems developed by the instructors, mostly in the format of some case studies, which again are very much similar to real-world scenarios.

- Students go through a series of separate courses on architecture theories and in-lab practices before taking on the Capstone projects. Capstone projects usually come by the end of the second year when students have built up certain basic skills and capabilities. Students develop their competency by learning from good sketches and designs, which are already available before for certain real-world projects (Bridges Alan, 2006).

- Usually, instructors with practical experience are assigned to teach Capstone-project courses. Instructors with different practical backgrounds add up to the knowledge diversity that students will get exposed to.

- For their performance in Capstone projects, students are usually evaluated based on their individual participation, project progress, and end-project outcomes, specifically, through detailed sketches and design attributes and/or features (Dang Thai Hoang, 2010).

Compared to the innovative CDIO Capstone project design, the traditional approach may be short of or inadequate in the following aspects:

- Late exposure to open-ended problem designs (only till the senior Capstone project) may hinder students' creativity because every Capstone project before that already leads students down the road of fixed problems and hence, fixed solutions. The very first standard of CDIO, Standard No. 1, emphasizes the importance of open-ended challenges, and the familiarity to such challenges is even more important in architecture education, a field which requires a great deal of creativity and out-of-the-box thinking.

- Learning through real-world projects from an early stage in architecture is not necessarily a good idea because students will immediately be tied up to end-product concepts while what they really need is to play around with abstract concepts in the beginning to be able to "think different" for future trends of design. The need to create something new is noted in CDIO Standard No. 5 "Design-Implement Experiences".

- Separate courses on architecture theories and practices will create the hassle that the students themselves have to integrate various knowledge and skills together. It would be much better if they can learn both the theoretical content and skills at the same time, as advised by CDIO Standard No. 7 "Integrated Learning Experiences".

- While team members are partially evaluated based on their team's end-project outcomes, team interaction in architecture has never been the subject of evaluation or assessment at DTU. For the CDIO approach, its Standard No. 11 "Learning Assessment" emphasizes the measure of the extent to which each student achieves specified learning outcomes, especially through collective work.

CDIO's PROPOSED IMPROVEMENTS FOR ARCHITECTURE CAPSTONE PROJECTS

For the shortcomings of the traditional approach for Capstone project design in architecture training compared to guidelines from the CDIO standards (as described above), they can be grouped into three big categories of focus for improvement, namely:

(F1) Architecture Design Problem/Task for Capstone projects
(F2) Training Approach and Deployment Process for Capstone projects
(F3) Assessment & Evaluation Measures for Capstone projects

At the heart of the problem, significant improvements can be achieved if the architecture design-problems or -tasks are remade to give students more voice and choice in their thinking and approach. By presenting students with some general design problems rather than assigning only closed-ended design tasks, we aim to force our students into analyzing and formulating their own design task for a certain problem. This actually creates a situation in which there are differences amongst the design tasks of various teams in the same class for the samed design problem, thus, giving way for more discussion and argumentation about the feasibility and rationality of any one design task. In a way, this change toward "problem-centered" orientation has indirectly helped with our active learning efforts. It also should be noted that the design problems of Capstone projects in the sophomore and junior years

should focus mostly on concept designs rather than on actual architectural designs. The aim is to help students build their own style of architecture design rather than following some specific style which is already available. As for the senior Capstone projects in the fourth and fifth years, students are required to work with real-world businesses to create down-to-earth, actual design tasks. Then, no matter what year they are in, students should be required to assess the economic implications of every single one design they create. With these efforts, our students are expected to become:

(A1) more creative in every kind of architecture design, and
(A2) more confident and pro-active even in the face of unfamiliar design challenges (Graaff et al., 1997).

To realize the expected benefits from the move toward "problem-centered" Capstone projects, however, certain settings and training methodologies need to be improved. On the "surface" level, we require the Capstone teams to work on their projects in the school's workshops rather than bringing home the work like before. This change in the study settings yet required a sizeable investment on the part of Duy Tan University for more architecture workshops, and later, subsequent change in the working hours of our workshops, which started to allow for students' access to the workshops almost on a 24/7 basis. As for the project deliverables, students are asked to deliver more of wood/glass/iron/composite/… models rather than just drawings and sketches. The implication behind is that by making material models, it is more of a 3-D approach than the traditional 2-D approach through drawings alone. This also helps prevent the dilemma in which some students with good drawing skills can actually "twist" our instructors' perceptions and evaluation by drawing their designs from certain perspectives. 3-D models, on the other hand, are physically-available in shapes and can help facilitate more collective discussion of the usability, reliability, acceptability, and feasibility of the project. In addition, instead of focusing on the end-project outcome only, students are now asked to break down their project into different stages or phases for better progress management and assessment. At a "deeper" level, a series of training activities and requirements are carried out to facilitate with the change requested of our students. Those include additional training sessions on how to manage work projects and how to use equipment like laser engraving system, glass cutting machine, wood cutting tools, etc. For any one project, there are now two courses that always go in pair: one about related design theories and another about related design practices. By learning two supplemental courses for a specific project scope, students will manage to acquire the necessary skills to complete the project, and at the same time, having the time and conditions to really digest related theoretical knowledge. Also, in the process of carrying out the project, students are required to do a number of related field trips and on-site visits for the collection of relevant real-world data and materials. The requirements for change, however, are not only on the side of our students but also on the part of our instructors too. Instructors of the Architecture Faculty at DTU are now required to participate in local and international training programs and seminars for new methodologies and approaches in architecture on a semi-annual basis. In addition, once every two weeks, they meet up for academic discussion of the approved professional practices and project guidance styles in architecture. All of these efforts in training and deployment process of our Capstone projects aim:

(B1) to build students' professional skills in carrying out architecture-design projects,
(B2) to balance between students' learning of theoretical and practical contents about architecture, and
(B3) to level up instructors' capability in active teaching and CDIO project deployment.

For the evaluation and assessment of our students' performance in the Capstone projects, the changes made aim to improve on various "student-centered" aspects. In the past, our architecture students were mostly assessed based on their project participation, project progress, end-project presentation, and end-project outcomes. For the new evaluation plan, we continue to focus on our students' project participation and project progress, but at the

same time, we also concentrate on the the following new items by learning from CDIO Standards No. 2, 5, 7, 8 and 11:

- Frequent evaluation of students' interaction and communication in teams,
- Frequent evaluation of off-campus activities by the teams like field trips and on-site visits,
- Cumulative evaluation of bi-weekly presentations (rather than only focusing on the end-project presentation),
- Evaluation of bi-weekly deliverables (especially on models and prototypes rather than only on drawings and sketches) based on the phase break-down of each team's project (rather than just focusing on the end-project ultimate outcomes) (Temple Stephen, 2005).

The expected improvements from our changes in the performance evaluation plan for the students' projects are that:

(C1) our architecture students will become more flexible and versatile in their project-doing capabilities,

(C2) our students will learn to appreciate the use of 3-D models and project management tools in their project, and

(C3) our students' performance in the Capstone projects will be improved in terms of creativity and effectiveness.

RESEARCH METHODOLOGY

To test whether our CDIO-oriented changes to (F1) the design of Capstone problems/tasks in architecture, (F2) the training approach and Capstone deployment process, and (F3) the assessment and evaluation measures for our architecture Capstone projects, have delivered the above expected improvements of (A1), (A2), (B1), (B2), (B3), (C1), (C2) and (C3) to our students, we need to compare the actual status and perceptions of our students before and after the application of those changes (Table 1). The problem, however, is that students generally take every course only once, so it would be almost impossible to find a set of students who learned architecture by the old standards and then, learned it all over again by new ones under CDIO adoption. The good news, however, is that we have just applied those changes to a high-quality class of students at the International School of Duy Tan University while our Faculty of Architecture still follows the traditional curriculum and methodologies. So, by carrying out a survey to test the difference in perceptions of these two groups of architecture students from the International School and the Faculty of Architecture about various settings of their current Capstone projects, we may very well determine whether our CDIO-oriented changes have done their job.

The survey included a series of statements asking for students' feedback on how much they agree or disagree with each statement. A 5-point Likert scale, with 1 as Strongly Disagree and 5 as Strongly Agree, was adopted. An initial sample of 100 architecture students with 50 from the International School and 50 students from the Faculty of Architecture was assembled for the surveyed. All students selected were junior students. To ensure the reliability and accuracy of the research, two groups of students were examined independently of each other. The students were selected randomly for the survey. Survey Form can be found in the appendix.

A major question here is whether the two groups of students may have been systematically different in the first place. By looking more into their similarities and differences, the relevance of our study may be better judged: In terms of similarities, first of all, all of these 100 students are Vietnamese students. Secondly, they originally had the same level of capability with the average grade point for national college admission at 19.2 for the group of students from the Faculty of Architecture and 18.9 for that from the International School - the

difference is not significant even though the group of students from the Faculty of Architecture had slightly better academic performance. Thirdly, since they are all junior students, the differences in their training programs have been around for only one and a half years because they shared the same general education coursework. Fourthly, even though they learn from different curricula, by different methodologies and in different languages, the two groups are being taught by the same mix of architecture instructors from both the Faculty of Architecture and the International School. In terms of possible systematic differences, there are two major differences: the groups of students from the International School learned all of their architecture courses in English, not Vietnamese; and the groups of students from the International School are also more financially established because they pay higher tuition fee. Given that the major differences are in their curriculum, studying language, and financial background while their capability, instructors and other aspects are very much the same, it can be assumed that the differences may not hinder or create too much bias in our survey feedbacks and result comparisons.

Table 1. Improvement Focus/Goals and Corresponding t-Test Survey Statement

Improvement Focus	Improvement Goals	Corresponding t-Test Survey Statement
F1. Architecture Design Problem/Task for Capstone projects	A1. Students to become more creative in every kind of architecture design.	7. I feel the same motivation for creativity whether working with available architecture concepts or with new design concepts.
	A2. Students to become more confident and pro-active even in the face of different design challenge.	8. I enjoy creating new design concepts and tasks for already available architecture work or monuments in the real world.
F2. Training Approach and Deployment Process for Capstone projects	B1. To build students' professional skills in carrying out architecture-design projects.	17. I manage to utilize the school's workshops as well as different project management practices and model-making tools effectively for our project.
	B2. To balance between students' learning of theoretical and practical contents about architecture.	18. The balance between theoretical design courses and practical design ones at Duy Tan University is adequate for the development of our skills and knowledge in the field of architecture.
	B3. To level up instructors' capability in active teaching and CDIO project deployment.	19. I noticed improvements in our instructors' professional capability and guidance approach after every semester.
F3. Assessment & Evaluation Measures for Capstone projects	C1. Architecture students will become more flexible and versatile in their project-doing capabilities.	28. I do feel that I am flexible and versatile in my project-doing capabilities.
	C2. Architecture students will learn to appreciate the use of 3-D models and project management tools in their project.	29. I strongly believe that 3D models (by wood/glass/iron/composite/…) and project management tools are essential to the success of any architecture project.
	C3. Architecture students' performance in the Capstone projects will be improved in terms of creativity and effectiveness.	30. I trust that the Capstone-project format of Architecture programs at Duy Tan University helps improve my creativity and effectiveness to become a successful architect later on.

From Table 1, we can see that not all of the statements in the survey were used to test the difference between the traditional approach and the new CDIO-oriented approach for our Capstone projects; instead, only Statements 7, 8 are for that purpose with respect to the design of our Capstone design tasks or problems, Statements 17, 18, 19 with respect to our training approach and Capstone deployment process, and Statements 28, 29, 30 with respect to the effectiveness of new assessment and evaluation measures for our architecture Capstone projects.

To evaluate differences in the perceived training outcomes between the two groups of students, a series of t-tests of the corresponding statements listed in Figure 2 were carried out on the feedbacks from the two groups of architecture students from the International School and Faculty of Architecture. The t-tests were all one-tail tests with the p-value of 0.05, attempting to examine if the feedback mean value for each statement (on the 5-point scale) of architecture students from the International School was *significantly greater* than that of those from the Faculty of Architecture.

t-value Equation:

$$t = \frac{\bar{X}_{IS} - \bar{X}_{Ar}}{\sqrt{\frac{VAR_{IS}}{n_{IS}} + \frac{VAR_{Ar}}{n_{Ar}}}}$$

$\bar{X}_{IS}$: $Mean\ value\ of\ feebacks\ from\ architecture\ students\ of\ the\ International\ School$
$\bar{X}_{Ar}$: $Mean\ value\ of\ feebacks\ from\ architecture\ students\ of\ the\ Faculty\ of\ Architecture$
VAR_{IS}: $Variance\ of\ feebacks\ from\ architecture\ students\ of\ the\ International\ School$
VAR_{Ar}: $Variance\ of\ feebacks\ from\ architecture\ students\ of\ the\ Faculty\ of\ Architecture$
n_{IS}: $Number\ of\ architecture\ students\ of\ the\ International\ School, who\ gave\ feedbacks$
n_{Ar}: $Number\ of\ architecture\ students\ of\ the\ Faculty\ of\ Architecture, who\ gave\ feedbacks$

RESULTS & DISCUSSION

In this section, we will consider whether or not there are differences in the perceived outcomes between the 2 groups or students for the improvement targets in our training through the use of t-test for each survey statement. With the degrees of Freedom of around 88, p value of 0.05, the t-value will fall into the confidence interval between -2.00 to 2.00. If the t-value calculated from the equation expression above is outside the confidence interval (-2.00~2.00), we can say that the difference between the 2 groups was statistically significant. If the calculated t-value falls inside the confidence intervals, we can say that the difference between the two groups was not significant. Table 2 below depicts some of the basic information to be used in our t-tests:

Table 2. Basic t-test values

Number of Tails	1
Degrees of Freedom	88
p-value	0.05

Table 3 shows the results of t-test for Statements 7 & 8. The t-test for Statement 7 shows no significant difference in the mean values of feedbacks of architecture students from the International School compared to that of architecture students from Faculty of Architecture. So, it can be said that both groups of students were that different in terms of their motivation for creativity when working with either new or old design concepts. One thing that should be noted

here is that the mean values of feedbacks from both groups are relatively high at 4.11 for students of the International School and 3.98 for those of the Faculty of Architecture, implying that the general architecture training at Duy Tan University does motivate students to be creative in their work. On the other hand, the t-test for Statement 8 shows significant difference of students of the International School from those of the Faculty of Architecture when it comes to creating new concepts for already-available architecture work and monuments, implying that students of the International School have built up their own confidence when dealing with different design challenges. Of course, this difference is only to a limited extent because its mean value is only a little greater than 3. Moreover, the big variance of feedbacks from students of the Faculty of Architecture suggests that some of its students may share the same kind of confidence.

Table 3. T-test Results for Statement 7 and 8

Statement	$\bar{X}_{IS}$	$\bar{X}_{Ar}$	VAR_{IS}	VAR_{Ar}	SD_{IS}*	SD_{Ar}*	t-value	Significant or Not
7. I feel the same motivation for creativity whether working with available architecture concepts or with new design concepts.	4.11	3.98	0.828	0.749	0.910	0.866	**0.712**	*Not Significant*
8. I enjoy creating new design concepts and tasks for already available architecture work or monuments in the real world.	3.37	2.93	0.649	1.1545	0.806	1.074	**2.219**	**Significant**

* *- SD_{IS}, SD_{Ar}: standard deviation of feebacks from architecture students of the International School and those of the Faculty of Architecture, respectively. SD=SQRT(VAR)*

When it comes to the utilization of the school's workshops as well as model-making tools and equipment, given the clear-cut opportunity and advantage, architecture students of the International School did make significantly better use of these facilities for their Capstone projects. Data from Table 4 shows that the standard deviation of each group was consistently much lower than its mean value, which implies that the input data was normally-distributed (Gaussian distribution), confirming the reliability of the input data for our t-test calculations. Also shown by significant statistical difference is the better use of project management skills and practices by students of the International School in their Capstone projects. In addition, the combo of two courses for a Capstone project with one for theories and another for practices seemed to achieve a high point with most architecture students of the International School agreed to the balance between theory and practice training in their curriculum (compared to that of the traditional program of the Faculty of Architecture), which significantly helped develop their professional skills and knowledge. As for students' perception about the improvements of our Architecture instructors over the semesters, there was no clear difference in the perceptions of the two groups of students. However, the relatively high mean values of 3.96 and 3.84 for Statement 19 again implies that our students did believe that our instructors' professional capability and guidance approach improved over the semesters. The only unusual thing here is students from the Faculty of Architecture, rather than those of the International School, noticed more improvements in the instructors' quality and capability even though they have the same mix of instructors. This may have to do with the fact that our instructors could have had more problems giving their instruction and guidance in English.

Table 4. T-test Results for Statement 17, 18 and 19

Statement	$\bar{X}_{IS}$	$\bar{X}_{Ar}$	VAR_{IS}	VAR_{Ar}	SD_{IS}	SD_{Ar}	t-value	Significant or Not
17. I manage to utilize the school's workshops as well as different project management practices and model-making tools effectively for our project.	3.51	2.89	1.1191	0.8737	1.058	0.935	**2.9566**	**Significant**
18. The balance between theoretical design courses and practical design ones at Duy Tan University is adequate for the development of our skills and knowledge in the field of architecture.	3.31	2.89	1.2191	0.6464	1.104	0.804	**2.0736**	**Significant**
19. I noticed improvements in our instructors' professional capability and guidance approach after every semester.	3.96	3.84	0.7252	0.8161	0.852	0.903	**0.6003**	*Not Significant*

As it turned out in Table 5, the new assessment and evaluation plan did help with the knowledge and skill-building of our architecture students. Architecture students of the International School significantly found themselves more flexible and versatile in their project-doing capabilities compared to students of the Faculty of Architecture. The t-value was up to 3.0411 and there was also a big gap between the mean values of 4.04 compared to 3.42, respectively, as shown in Table 5. Students of the International School also came to realize the significant importance of assessment and evaluation based on 3D material models and and project-management tools utilization in their Capstone projects. But still, most students believed that the Capstone format for the architecture programs of both the International School and the Faculty of Architecture did not, to a good extent, help with their creativity or effectiveness as a future architect. The low mean values here, of little more than 3 (i.e., 3.42 and 3.20, respectively) suggest that more work should be done on our part.

Table 5. T-test Results for Statement 28, 29 and 30

Statement	$\bar{X}_{IS}$	$\bar{X}_{Ar}$	VAR_{IS}	VAR_{Ar}	SD_{IS}	SD_{Ar}	t-value	Significant or Not
28. I do feel that I am flexible and versatile in my project-doing capabilities.	4.04	3.42	0.8616	1.0222	0.928	1.011	3.0411	**Significant**
29. I strongly believe that 3D models (by wood/glass/iron/	4.07	3.60	0.7454	0.7000	0.863	0.837	2.6038	**Significant**

composite/…) and project management tools are essential to the success of any architecture project.								
30. I trust that the Capstone-project format of Architecture programs at Duy Tan University helps improve my creativity and effectiveness to become a successful architect later on.	3.42	3.20	0.6586	0.8454	0.812	0.919	1.2155	*Not Significant*

CONCLUSION

In conclusion, it is not easy to recognize to what extent an integration of effective features from the CDIO Capstone project may help elevate the quality of current architecture Capstone projects because Capstone projects in architecture have also been around for a long period of time. Our study has shown that by remaking the design of project tasks and problems toward more of a "problem-centered" structure, we will help improve our students' confidence even in the face of difficult design challenges. Also, by reorganizing our training and Capstone deployment process toward more collective work in the school's workshops, more use of project-management tools as well as model-making equipment, and more integration of theoretical and practical training for Capstone projects, we will effectively help our students develop their professional skills and knowledge in the field. Last but not least, the move toward assessment and evaluation of more on students' interaction and teamwork, more on frequently-scheduled field trips and presentations, and more on frequent deliverables at different stages of the project definitely will make our students become more flexible and versatile in their approach. Even so, many times, our CDIO-oriented improvement efforts did not work out as expected, and additional work does not necessarily imply any future success, but that should be understandable as architecture is not only a discipline of science but also a field of art.

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APPENDIX

DUY TAN UNIVERSITY
Architecture

Student ID:	Student 's Name:	Date:
Student's Program:		Tick One

1: Strongly Disagree - 2: Disagree - 3: Neutral - 4: Agree - 5: Strongly Agree

No.	Design Problem/Task	1	2	3	4	5
1	Our team has to formulate the design tasks for the Capstone projects.					
2	The design tasks for our Capstone projects are given by the instructors.					
3	The design tasks of most teams in our Capstone-project classes are different.					
4	Most teams in our Capstone-project classes are working on the same end-project design tasks.					
5	Our Capstone projects in the first couple of years were mostly on concept design while those for later years are more on real-world projects.					
6	We have the opportunity to work with real-world projects from a very early stage through our Capstone projects.					
7	I feel the same motivation for creativity whether working with available architecture concepts or with new design concepts.					
8	I enjoy creating new design concepts and tasks for already available architecture work or monuments in the real world.					
No.	Training Approach and Deployment Process	1	2	3	4	5
9	Our teams work on the Capstone projects mostly in the workshops rather than at home.					
10	Our teams are still used to working on the Capstone projects at home.					
11	I am used to making my designs through wood/glass/iron/composite /… models.					
12	I am used to making my designs through drawings and sketches.					
13	Our team breaks down our project into different phases and focus closely on the outcomes/deliverables of each phase.					
14	Our team mostly focuses on the end-project outcome because that ultimately determines the success or failure of the project.					

15	Our team does quite a number of related field trips and on-site visits to collect relevant data and materials for our project.					
16	Related field trips and on-site visits are not available or essential to the completion of our project.					
17	I manage to utilize the school's workshops as well as different project management practices and model-making tools effectively for our project.					
18	The balance between theoretical design courses and practical design ones at Duy Tan University is adequate for the development of our skills and knowledge in the field of architecture.					
19	I noticed improvements in our instructors' professional capability and guidance approach after every semester.					
No.	Assessment & Evaluation Measures	1	2	3	4	5
20	Our Capstone-project instructors take time to frequently evaluate our team's interaction and communication.					
21	Evaluation of the team's interaction and communication may not be that important if the end-project outcome is eventually a failure.					
22	Our Capstone-project instructors usually inquire about our off-campus activities like field trips and on-site visits for the project.					
23	Evaluation of our team's field trips and on-site visits (if any) for the project are not always available in our class.					
24	Our Capstone-project instructors require frequent presentations of our project progress, on either a weekly or bi-weekly basis.					
25	Our Capstone-project instructors focus mostly on the end-project presentation.					
26	Our Capstone-project instructors require us to frequently report on our project progress through weekly or bi-weekly deliverables of 3D models/prototypes and drawings.					
27	Our Capstone-project instructors put most of the grading percentile on the end-project deliverable/outcome.					
28	I do feel that I am flexible and versatile in my project-doing capabilities.					
29	I strongly believe that 3D models (by wood/glass/iron/composite/…) and project management tools are essential to the success of any architecture project.					
30	I trust that the Capstone-project format of Architecture programs at Duy Tan University helps improve my creativity and effectiveness to become a successful architect later on.					

BIOGRAPHICAL INFORMATION

Hieu X Luong is the Vice Dean of International School, Duy Tan University. His interest is in green architecture.

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