Incorporating Futures Thinking in a Civil Engineering Cornerstone Course

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ABSTRACT

The importance of the capacity of civil engineering students to design for the future should go without saying. Civil engineering structures are meant to stand for decades, if not hundreds or even thousands of years, and are to be utilized by future generations. How do civil engineers of the present envision the wants and needs of future generations, especially in this fast-changing world where values often shift rapidly? How do civil engineers safeguard the rights of future generations while fulfilling the wants and needs of the present? How do civil engineering designs of today meet the *different* needs of the stakeholders in the future? How do we prioritize the current needs of the natural environment while designing construction projects? We contend that these are key questions related to the future that ought to be addressed in a civil engineering curriculum.

This paper describes the ongoing efforts and preliminary results of incorporating futures thinking into a cornerstone course at the Department of Civil Engineering at National Taiwan University in Taiwan. The experiment was conducted as one of the two parts of a freshman course, *Civil Engineering Concept Design Studio*, for one of the three classes. The paper will briefly describe the progress of trial teaching in the Fall semester of 2014 as well as that of the pilot curriculum in the Fall of 2015. Major elements of futures thinking and fundamental civil engineering design concepts extracted during the process of incorporation will be presented along with an assessment of student learning. Suggestions for future curricular implementation will also be made.

Introduction

This paper describes an experimental project that introduces futures thinking into a freshman cornerstone course in a civil engineering curriculum in response to calls for reform in engineering education. Through collaboration between civil engineering and futures studies teachers, teaching modules aiming to enhance the capacity of civil engineering students to design for the future were developed as one of the first steps toward a more comprehensive set of curricula, suitable for other engineering teachers to adopt in class in the future.

Background

In light of the rise of globalized economy, emerging technologies, and increasingly intensified uncertainty, engineering education around the world has been compelled in recent years to rethink its curriculum design, teaching methods, and course contents.[1, 2, 11] Engineering education has been criticized for overly emphasizing engineering technicality without using integrated projects or issues to prepare students for the difficulties they might face professionally and personally in the future. It has also been criticized for insufficient

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curricular opportunities to involve students in design, experiences for teamwork and communication, and knowledge and awareness of fields outside engineering.[4, 11]

Among the key elements called for in engineering education reform, three overwhelmingly stand out: (a) softening the disciplinary boundaries and increasing transdisciplinary cooperation and understanding, (b) enhancing engineering students' ability for teamwork and communication, and (c) developing engineering students' creativity at solving engineering problems in innovative and comprehensive ways. It has been largely recognized in most parts of the world that engineers today need to be equipped with not only the engineering skills traditionally defined in engineering professions but also a broader understanding of social, economic, environmental, and legal aspects in order to cope with increasingly complicated problems ahead.[11] Engineering disciplines, therefore, are urged to open up boundaries, collaborate with a wide range of disciplines, and consolidate non-engineering knowledge into the curriculum to prepare students for the complex and dynamic society of the future with knowledge and experiences provided by cross-disciplinary education.[6,7]

Moreover, as challenges become too complex to be solved by a single expert or by experts from a single area and as more effective breakthrough progresses in human development are demanded, engineers of the future will increasingly need to think creatively and work in teams with people from other disciplines. Engineering education, therefore, is obliged to provide students with adequate teamwork experiences and opportunities to advance their communication skills and to foster holistic design capacities and creativity in the new era.[7, 15]

The same challenge also faces the field of civil engineering. In their vision for engineers in 2025, the American Society of Civil Engineers (ASCE) proposed the following roles for civil engineers in the future: (1) planners, designers, constructors, and operators of society's economic and social engine—the built environment; (2) stewards of the natural environment and its resources; (3) innovators and integrators of ideas and technology across the public, private, and academic sectors; (4) managers of risk and uncertainty caused by natural events, accidents, and other threats; and (5) leaders in discussions and decisions shaping public environmental and infrastructure policy.[3] If civil engineers are expected to become planners, designers, leaders, and decision-makers, then civil engineering programs must foster civil engineering students' knowledge in liberal arts, skills in oral and written communications, capacities for critical thinking and analysis, and abilities to speak the language of politicians, lawyers, and businesspeople.[13] If civil engineers are to go beyond the old professional boundaries and fundamentally alter their attitudes in order to effectively solve problems and improve the welfare of the public with their professional expertise, then civil engineering education is obligated to actively infuse with other academic disciplines, such as natural sciences, humanities, and social sciences.[2]

While agreeing to the calls for and trends of reforming the engineering curriculum, the authors contend that engineering students today also need to learn about the future, as engineering structures designed and built by civil engineers are meant to last for not only the present but decades or even centuries into the future. Their designs ought to take the needs of future generations into account. Civil engineers should be able to envision the values in future societies and think long term on behalf of different stakeholders in the future, including the environment.

This project is one of several efforts to reform civil engineering education by introducing futures thinking into a cornerstone course at the Department of Civil Engineering at National Taiwan University (hereafter, NTU-CE). At the end of this three-year project (2015–2018), this transdisciplinary research team will have developed curriculum and pedagogical modules to enhance civil engineering students' consciousness and awareness about the future, improve the adaptability of students' designs in the future, and cultivate civil engineers who can "design for the future" and not merely for the present.

In response to calls for curricular reforms in the field, NTU-CE has been launching a series of curriculum reforms since 1998, devising a series of design-oriented courses throughout students' four years of study, including cornerstone, keystone, and capstone courses. Various experimental approaches have been or are being carried out at NTU-CE. Cornerstone courses aim to enhance students' imagination and provide them with hands-on experience before being exposed to substantial professional technicalities. Keystone courses combine theory with hands-on design project courses. Capstone courses aim to allow students to integrate professional knowledge in design practices, assessing students' overall learning results across their college career. Futures thinking can be integrated in all three clusters of courses, though the levels of futures thinking ought to be adjusted according to students' maturity and levels of professional knowledge in civil engineering. By introducing fundamental concepts and methods in Futures Studies, the curricular experiment aims to help students develop comprehensive and long-term thinking skills while being first exposed to the civil engineering curriculum.

To begin with, the authors chose the introductory course *Civil Engineering Conceptual Design Studio* as the target cornerstone course for incorporating futures thinking, because of its experimental nature. As one of the required courses for freshmen, the course is designed to give first-year students a "taste" of design in civil engineering even before they acquire professional knowledge in the field. The course is composed of three major parts: Case Study, Design Studio, and Field Trip/Presentation, each taking up around one-third of the instruction time throughout the semester. A hands-on design project for every group of three students was assigned as the final project, which was mostly devised in Design Studio. For three hours each over the course of four non-consecutive weeks between September and December 2015, the experimental curriculum of futures thinking was implemented in the Case Study segment.

Owing to the large size of the class, the students were divided into three classes (Classes 01, 02, & 03) with identical instructional teams and curriculum content carried out in different time slots. With this experimental curriculum, however, Class 02 was given a different version of course materials in the Case Study part of the class with an additional instructor for futures-related teaching. The rest of the curriculum arrangement, however, remains intact for Class 02.

Futures Thinking

Futures studies is an interdisciplinary field of knowledge, studying people's concepts of the future while seeking to empower people (students, clients, community groups, even entire nations) to invent and progress toward their preferred future.[5] By advancing through past, present, and future, it helps people scan the overall environment and acquire new perspectives.

When used in education, futures studies seeks to transform students' view of the world by helping them develop informed insights about shifts of value, focus, and attitude and to realize that most negative attitudes toward the future rest on misconceptions.[14] Education, therefore, should utilize futures thinking more actively to foster students' insights and skills that are necessary for thinking critically and creatively about the future.[8] Futures thinking provides multiple orientations or methods to explore possible transformations in different areas and layers of future societies. It helps to offer a variety of alternatives, elucidate possibilities, and evaluate possible consequences of different actions.[12] Moreover, as the focus of futures studies is not to predict the future but to envision several alternative futures,[5] it helps empower students to create the future they desire (individually and collectively) in and outside the classroom.

Integrating futures thinking into a cornerstone course can help achieve many goals in curricular reform in engineering education, including enhancing students' ability in module and system design, to think independently and critically, and to cooperate across disciplines, as well as heighten students' moral responsibilities to society. Futures thinking helps students understand social trends as well as forces of change while utilizing appropriate resources and tools to cope with change. It helps students envision the wants and needs of future generations in order to design structures that fit with human values of the present and future, even hundreds or thousands of years to come. It also helps enhance forward thinking, which can heighten students' innovative and creative capacities by identifying and interpreting weak signals and foreseeing future needs. In addition, as modern futurists stress *participation* when constructing future scenarios in order to accommodate as many varieties of voices as possible,[9, 10] the participatory teaching method for futures thinking adopted in this project naturally enhances collaborative skills among students.

The initial trial teaching of this study adopted the basic framework of the "Six Pillars of Futures Studies," which includes various approaches to envisioning the future, such as mapping the future, anticipating the future, timing the future, deepening the future, creating alternatives, and transforming the future.[9] While this framework worked well in helping students picture their personal future, the authors felt more instructional scaffolds were needed to maximize integration between futures thinking and civil engineering, which was especially essential given the limited instructional time. The authors, therefore, started to develop the *Design for the Future* curriculum discussed in this paper.

Research Design

Although the complete research project runs from 2015 to 2018, four trial teaching sessions with a total of 12 hours were carried out in the fall of 2014 to determine the necessity of this project. The purpose of the first year of this project (in 2015), which is reported in this paper, was to assess which key concepts and tools of futures thinking are most suitable for first-year civil engineering students, to develop methods and course modules accordingly, to assess the appropriateness of the teaching modules, and to identify key attributes needed to further develop the curriculum.

Class 02, which the experimental curriculum was implemented in, comprised 42 students. Among them, seven were female and eight were non-freshman students. Class 01 comprised 39 students, with seven female and nine non-freshman; Class 03 had 41 in total with six female and four non-freshmen. Most students were from the NTU-CE, with two students, three students, and one student from other departments in Classes 01, 02, and 03, respectively.

Curriculum Design

Given the limited instruction time (12 hours) and the first-year students' lack of civil engineering background, the authors identified the following elementary features of futures studies to incorporate into this project. Students were exposed to and should be able to understand the following key concepts:

1. Relations between past, present, and future;
2. Causal effects from long-term perspectives, such as the (positive and negative) relations between civilization/development and civil engineering;
3. Changes in value, focus, and attitude over time;
4. Importance of safeguarding the rights and needs of future generations; and
5. Importance of taking a stand for different stakeholders of the present and future.

One of the goals of this experimental curriculum was to assess how to provide sufficient scaffolds for first-year freshman students to develop interests and skills in futures thinking. Higher levels of futures thinking were left out on purpose in order to match the students' needs and proficiency. With that understanding, the following modules were developed for the Fall semester of 2015:

Module I: mapping the history

The main teaching objective of this module was to help students understand civil engineering and its contributions to the development of the country of Taiwan and to Taipei, the capital of Taiwan and the city in which NTU is located.

Module II: mapping the future

Module II focused students' vision on civil engineering and history from the big picture (*i.e.*, the country and the city) to a smaller region relevant to the students (*i.e.*, NTU campus and then a building on campus). The 50-plus-year-old First Student Center at NTU was chosen to be the structure for students' design practice in the next two modules.

Module III: design for the future 1.0

Design practice for the First Student Center was based on the roles assigned to the group. Students were asked to address the present and future wants and needs of the stakeholders that their group was assigned to. Background information on future NTU, based on a possible business-as-usual scenario envisioned by the research team, was given to the students to assist their envisioning of the future.

Module IV: design for the future 2.0

The First Student Center was redesigned on the basis of the same background information and criteria given in the previous Module. The only difference was the change of grouping rules. Students were asked to carry their "stakeholder identity" from the previous week and to re-design the structure with peers representing two other stakeholders.

Data Collection and Analysis

Preliminary results of this study were collected from the following data sources:

1. Focus Group Interviews:
   Focus group interviews were conducted at the end of the semester with students from Class 02 who had volunteered to participate. Students were asked to provide feedback on their experience in taking the Design for the Future sessions. A total of sixteen students participated in two separate sessions lasting 72 and 43 minutes.
2. Interviews with Instructors:
   Semi-structured interviews were conducted with two professors who had participated in the teaching of Case Study sessions in all three Classes in Fall 2015 to give their overall observations on the differences in learning outcomes across the three Classes, especially the differences between Class 02 and the other two Classes. Another interview was conducted with a third professor who had only participated in the teaching of Class 02 in 2015 but who had long-term experience in teaching the Case Study sessions of this course. The interviews lasted 34 to 40 minutes and were an average of 36 minutes long.
3. Design Ideas:
   Students from all three classes were asked to submit as a group a written supplementary statement on their ideas for the final design project, which required the students to design a tree house on a site of their selection within the NTU campus. In the supplement, students were asked to respond to the following three guiding questions:

   a) Please describe how your group saw the NTU campus 20 years from now when your group designed the tree house;
   b) Please list out the needs of the stakeholders (*e.g.*, students, tourists, and the university) that your group considered when designing the tree house;
   c) Please describe how people will see and use your group's tree house in 2035.

For data analysis, interviews from the first and second sources mentioned above were recorded and then transcribed. Data from all three sources above were subsequently analyzed with NVivo, software that supports qualitative research methods. After free nodes were coded according to the nature of the data, tree nodes were developed to help the researchers formulate preliminary conclusions on the students' learning results.

Since the supplementary statement of the Design Idea is directly related to the group's notions about the future pertaining to their designs, it serves as a good instrument to assess the students' levels of futures thinking. A total of 37 statements were collected from all three classes with an average of 491 words per group. The lengths of the statements ranged from 254 to 1187 words in Chinese (see Table 1). Two researchers analyzed each group's responses on their own merits. Using one sentence as a unit, researchers graded each unit according to the level of futures thinking exhibited.

Table 1

Word count (in Chinese) of students' supplementary statements toward the final project.

Class \ Question	1	2	3	Average
01 (11 groups)	1,470	2,478	2,012	542
02 (14 groups)	1,623	3,525	1,333	463
03 (12 groups)	1,763	2,267	1,688	477

The levels of futures thinking were grouped into five categories: *High Level*, *Slightly Touched*, *Unchallenged*, *Negative*, and *Irrelevant*. Aside from the last category, *Irrelevant* (IR), which refers to statements that do not refer to the future at all, the other four categories have a hierarchical order. *High Level* (HL) futures thinking refers to statements with extended imagination about the future beyond the classroom instruction and discussion, *i.e.*, descriptions of the future that are significantly different from the present, or a consideration for future generations. Statements in the *Slightly Touched* (ST) level demonstrate willingness to consider the future but did not go very far. Writers of *slightly touched* futures thinking sometimes even expressed their inability to envision the future, despite their aspiration to do so.

Unchallenged (UC) statements, on the other hand, were generally "status-quo future," which is literally the same as today. Writers of *unchallenged* futures thinking, however, are typically unaware of their inability to distinguish between the two. *Negative* (NG) futures thinkers regarded futures thinking as unnecessary, impractical, or unimportant. To them, the present was more notable than the future; problems in the future should be left for future generations to deal with. More detailed descriptions of each level are provided in Table 2.

Preliminary Results

In general, the group statements of Class 02 demonstrated higher levels of sensitivity and awareness in the following areas than those of their counterparts (Classes 01 and 03):

- Higher awareness of the needs of future generations instead of just the needs of the present generation;
- More sophisticated interpretation of "progress" or "advancement" instead of allowing technology or the economy to define it;
- More considerations of future needs in their architectural design;
- More discussions on future societies;
- Wider variety of discussion on future society, such as about demography or value shifts instead of limiting it to technology;
- More sensitivity to overall student pressure on campus and a willingness to relieve it with architectural designs;
- Less extravagant architectural designs that are humbler and more in line with nature;
- Greater awareness of the impact of their designs on the environment and stakeholders in surrounding areas.

In addition, students and teachers reported the following benefits from the *Design for the Future* sessions, including deeper learning about teamwork, raised interest in civil engineering, and heightened awareness about the future and stakeholders.

About learning in civil engineering

- Higher incentives in learning: Students reported that the class was helpful in incentivizing them to take future courses in professional training in a more serious way, because it deepened the meaning of being a civil engineer for them. In addition, new learning and thinking experiences brought upon by the *Design for the Future* curriculum motivated students to learn civil engineering expertise in a fresh way.

Table 2

Level of futures thinking: descriptions.

Level	Applicable to Question	Description
High Level (HL)	Q1 & Q3	• Describes extended images or imagination of the future (beyond what was taught in class for Class 02); • Describes certain social values, products, spatial layouts, *etc*. that are significantly or completely different from how they are today; • Clearly describes futures scenarios from different aspects; • Develops future scenarios that challenge the present; • Considers the natural environment and human beings in the future; • Considers the future from different stakeholders.
	Q2	• Considers *future* stakeholders; • Mentions futures-related descriptions; • Considers three or more different stakeholders; • Considers the natural environment, including the weather; • Employs a base survey or user survey.
Slightly Touched (ST)	Q1 & Q3	• Describes the future but does not go beyond what was given in class; • Realizes that the future will be different from now but are unable to imagine it; • Describes certain social values, products, spatial layouts, *etc*. that are slightly different from how they are in the present time; • Mentions ideas of the future but lacks descriptions of it.
	Q2	• Considers two different stakeholders; • Mentions the environment but only superficially.
Unchallenged (UC)	Q1 & Q3	• Linear future, *i.e.*, the development in the future is based on the same development of the present; • Describes a future that is basically the present.
	Q2	• Only considers one group of stakeholders; • Vaguely states that they have considered *all* stakeholders but produce no supporting details; • Does not really consider a group of stakeholders beforehand but find the design can be applicable to the group.
Negative (NG)	Q1 & Q3	• Regards the present to be more important than the future; • Feels matters can be left for people in the future to deal with; • Does not think about the future; • Resists thinking about the future.
	Q2	• Does not consider any stakeholders at all.
Irrelevant (IR)	Q1 & Q3	The statement is irrelevant to the future.
	Q2	Ditto.

About non-linear thinking

- o Understanding and valuing different perspectives: Students learned the importance of understanding the different *definitions* and *purposes* of a building structure in different stakeholders' minds. The location, materials, exterior, and interior of a structure can dramatically change when different perspectives are taken into account.

About preparation for future jobs:

- o Real understanding about teamwork: Students reported that, through actual teamwork tasks, they were able to learn how to play their own roles in the group and how to perceive their peers interaction. It helped one observe and understand oneself. Through actual experiences, they also learned of different experiences and impacts brought about by cooperating with different peers. For instance, different participation levels of teammates or different ways of division of labor have a great impact on the results of the final project.
- o Anticipating task difficulties: To the students, their experiences in the *Design for the Future* class simulated—to a certain degree—possible scenarios in the workplace in the future, including design dilemmas resulting from contradictions in expectations regarding the engineering structure from different stakeholders. Students subsequently reported their heightened willingness to look into what they need to learn professionally in order to develop innovative solutions for potential problems.

About thinking/designing for the future

- o Curiosity about the future: The introduction of futures thinking triggered students' curiosity toward future-related topics such as what future societies might be like, which inventions might have vast impacts, or what the future of civil engineering might be like.
- o Broadening scope: Through futures thinking tools, students began to enlarge the breadths and depths of their thinking.
- o Design for the future: Students are more willing to consider the needs and perspectives of future clients, including the uniqueness and adaptivity of their designs in the future, such as leaving things "blank" or a flexibility to allow future alternations to accommodate changes in the future society.
- o Personal futures: The introduction of futures thinking helped students not only with their creativity in civil engineering designs but also with their personal futures. A student can utilize the tools and stimulations to contemplate choices in his or her personal lives, including whether he or she truly aspires to be a civil engineer, which specialties in civil engineering he or she might be suitable for, or what kind of civil engineer he or she wants to be.

Results from supplementary statements of design ideas

The results of the ratings on the students' supplementary statements show that the futures curriculum had a very positive effect on students' futures thinking for their architectural design. Table 3 presents the percentages of the number of units rated into the five levels of the total number of units collected from each class for each question. As the table shows, Class 02 consistently exhibits the highest percentage of *High Level* (HL) futures thinking among all three classes (42%, 69%, and 35% for Questions 1, 2, and 3, respectively). It also bears the lowest percentage of *Unchallenged* (UC) futures thinking among its peers

(25%, 12%, and 32%, respectively, for the three questions). Groups in both Class 02 and Class 03 produced no statements related to *Negative* (NG) futures thinking, while those in Class 01 did.

Comparison within each class indicated that classes that did not take the futures curriculum (Class 01 and Class 03) had the highest percentage of their statements in the *Unchallenged* (UC) category for both Questions 1 and 3, despite the strong requests to consider the future in the guiding questions (twenty years from now or in 2035). This phenomenon is, in fact, consistent with how the general public generally perceives the future (46% and 56% for Class 01 and Class 03, respectively, for Question 1; 46% and 57% for Question 2). For Class 02, on the other hand, the highest percentages of their statement units fall in *High Level* (UH) futures thinking for all three questions.

Table 3

Results of Rating on Student Groups' Level of Futures Thinking in Their Supplementary Statement by Class (%).

	Class	HL	ST	UC	NG	IR	Total
Question 1							
	01	10	18	46	21	5	100
	02	42	32	25	0	1	100
	03	24	20	56	0	0	100
Question 2							
	01	44	28	22	6	0	100
	02	69	15	12	0	4	100
	03	36	29	36	0	0	100
Question 3							
	01	22	19	46	8	5	100
	02	35	26	32	0	7	100
	03	21	9	57	0	13	100

In addition to demonstrating much larger percentages of statements with higher levels of futures thinking for Class 02, its *High Level* futures thinking also came from a greater number of groups than it did for the other two Classes. As shown in Table 4, *High Level* (HL) statements came from as many as nine groups out of fourteen for all three questions for Class 02, while they came from much fewer groups for Classes 01 and 03. This indicates that the effects of futures thinking are more evenly dispersed for Class 02 than for its counterparts.

In summary, the analysis of the students' supplementary statements toward their design projects shows that the futures curriculum did have a positive impact on the students' futures thinking when they designed the tree house. The class that undertook the futures curriculum produced more statement units with higher levels of futures thinking than the classes that did not. The Class 02 students also produced fewer statement units with unchallenged or negative futures thinking.

For the two classes that did not take the futures curriculum, their futures thinking patterns were rather consistent with laypersons' perceptions of the future, *i.e.*, an unchallenged thinking of the future. Class 02, however, moved away from that pattern and demonstrated more concerns about the environment and people (*i.e.*, present and future stakeholders). The effects of the futures curriculum can also be seen in the contribution of a wider variety of high-level futures thinking statements in Class 02.

Table 4

The Numbers of Groups Contributing to Each Level over the Total Number of the Groups in Each Class

Class	HL	ST	UC	NG	IR
Question 1					
01	1/11 (.09)	3/11 (.27)	10/11 (.91)	3/11 (.27)	2/11 (.18)
02	9/14 (.64)	10/14 (.71)	11/14 (.79)	0/14 (.00)	1/14 (.07)
03	4/12 (.33)	6/12 (.50)	10/12 (.83)	0/12 (.00)	0/12 (.00)
Question 2					
01	6/11 (.55)	5/11 (.45)	4/11 (.36)	1/11 (.09)	0/11 (.00)
02	9/14 (.64)	4/14 (.29)	2/14 (.14)	0/14 (.00)	1/14 (.07)
03	5/12 (.42)	4/12 (.33)	4/12 (.33)	0/12 (.00)	0/12 (.00)
Question 3					
01	2/11 (.18)	4/11 (.36)	8/11 (.73)	0/11 (.00)	2/11 (.18)
02	9/14 (.64)	7/14 (.50)	10/14 (.71)	0/14 (.00)	1/14 (.07)
03	5/12 (.42)	4/12 (.33)	10/12 (.83)	0/12 (.00)	5/12 (.42)

Next Steps

With the preliminary findings of the study, the following steps are proposed for the next stage of the project:

- Given the positive feedback on futures thinking in the cornerstone course, further development of more teaching modules should be planned while teaching manuals should be written for the current modules.
- The differences in design tasks between the two parts (*i.e.*, the Case Study and Design Studio) weakened the learning outcomes of the experimental curriculum. A possible re-arrangement of the curriculum or assignments should be considered for ultimate learning outcomes for *Design for the Future*.
- With a teaching method that places heavy emphasis on cooperative learning, a more sophisticated grading system should be devised in order to boost student interests in the work of other groups.
- The preliminary findings provide a sketch on how to further develop the teaching modules as well as student assessment tools in the subsequent stages of the research.
- The preliminary findings also provide a baseline for developing a quantitative questionnaire in the next stage in order to measure the impacts of futures thinking on civil engineering students.

Conclusion

This experimental curriculum attempts to extend the imagination and design capacity of civil engineering students from the present into the future. In the original course design of *Civil Engineering Conceptual Design Studio*, the main goal was to provide actual design experiences for first-year students. With some stimulus of their imagination, students can go through the design process itself and actualize their designs with actual models at the end of the semester. This experiment tries to build on the original course design by extending not only the lengths but also the scope and sophistication of students' thinking by introducing methods and tools from futures studies. From the preliminary results, it is clear that incorporating futures thinking is a good approach to motivate first-year civil engineering students into thinking for the future, thinking for the present, and raising awareness about people and society. It provides a good stepping-stone for civil engineering students to develop their capacities to design for the future. Additional efforts to further and deepen students' learning, however, will continue to be pursued.

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