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A Preliminary Study of Material Applications in Sustainable Design

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Abstract: In recent years, sustainability issues have been widely recognized by various sectors worldwide; therefore, this concept should be extensively integrated into university education. This study takes the integration of the Sustainable Development Goals (SDGs) and architectural design courses as an example to provide possibilities for the reuse of discarded concrete on campus, seeking opportunities to fulfill sustainable development on campus. Results showed that: (1) The course planning, operation, communication, SDG integration, and overall satisfaction were all well-received by the students. (2) By integrating the SDGs into the architecture design course and inter-school exchange activities, students quickly gained a better understanding of the SDGs and were able to contribute to promoting a sustainable campus. (3) The guidance provided by the teacher is crucial. To focus on the discussion topics, it is recommended to concentrate on one or two topics at a time to have in-depth discussions. (4) It is better to operate the course at a real site to allow students to experience and address real issues. In this case, the proposed solutions can have close ties with the environment of the site to truly embody the spirit of the SDGs.

Keywords: sustainable design; sustainable campus; diverse material applications; SDGs

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1. Introduction

In 2015, the United Nations announced the "2030 Agenda-Sustainable Development Goals (SDGs)", which consists of 17 major goals. In recent years, universities worldwide have been actively promoting the SDGs. However, selecting appropriate SDGs and integrating them into the curriculum is a crucial issue. Regarding the study on promoting SDGs in universities, Rieckmann, M. (2012) [1] first proposed important core competencies required for future-oriented higher education. These core competencies include sustainability and global citizenship consciousness mentioned in the SDGs. In addition, the study also emphasized that higher education institutions need to use different strategies in curriculum design, teaching, and assessment to help students achieve sustainable development goals in learning. Furthermore, Leal Filho et al. (2019A) [2] proposed different models for the role of higher education institutions in regional sustainable development, which can assist regions in achieving better sustainable development. Leal Filho et al. (2019B) [3] continued to focus their study on local development and explained the role of higher education institutions in regional sustainable development, emphasizing that higher education institutions can achieve sustainable development goals through aspects such as research and knowledge transfer, education and training, and policy and planning, as well as community participation and cooperation. Lozano et al. (2017) [4] proposed corresponding teaching methods, including "community engagement," "problem-oriented learning," "action learning," and "experiential learning," in order to effectively help students understand the spirit of SDGs. Mulà et al. (2017) [5] also reached similar conclusions regarding community engagement. They believe that the integration and learning of sustainable development require the

establishment of an interdisciplinary learning environment that encourages students to participate in the community and society to face the challenges brought about by sustainable development. In summary, through curriculum design, students can participate in the community and society and be led to take practical actions for the items required by the course.

Earlier studies have also shown that the promotion of SDGs by universities is closely related to action, environment, and space. Adomßent et al. (2014) [6] believed that universities can play an important role in promoting sustainable development by offering relevant courses and organizing seminars, increasing community awareness and understanding of sustainable development. They also emphasized the need for universities to collaborate with other relevant units to promote regional sustainable development. Edgar & Adisa (2014) [7] also proposed the integration of environment, economy, and society for sustainability assessment, which can effectively evaluate the sustainability of energy systems throughout their entire life cycle. Conversely, Coenen et al. (2012) [8] emphasized that previous studies on sustainability have focused more on technical, economic, and social systems while lacking consideration of geographical and spatial factors. Including geographical and spatial factors in the study of sustainability transformation can provide a more comprehensive approach to exploring sustainable development issues.

In recent years, many studies have investigated the challenges and opportunities faced by higher education institutions in implementing the SDGs, and have proposed specific methods and practical experiences. It has been emphasized that the SDGs should be integrated into the curriculum to enable students to better experience them. In addition, the intention to include the SDGs in the curriculum has led to the proposal of some methods for designing SDG-related courses, including interdisciplinary and cross-departmental approaches, experiential learning and problem-solving methods, cross-cultural learning experiences, and collaboration with stakeholders (Expósito and Sánchez, 2020; Junghanns and Beery, 2020; Karin et al., 2022; Mari et al., 2022; Qaisar and Katarzyna, 2022) [9–13]. In addition, recent studies have also pointed out the importance and specific methods of integrating the SDGs into the curriculum. Therefore, based on this aspect, this study proposes a curriculum that actively incorporates the SDGs as objectives and puts them into practice. The plan is described in the following.

In addition, based on the essence of the SDGs, issues related to the circular economy and waste management are also worthy of attention. There are numerous materials required in construction projects and their quantities are not easy to manage. However, BIM technology can be adopted to accurately control the quantity of materials, which is beneficial for achieving a circular economy (Beibut et al., 2021; Akanbi et al., 2018) [14,15]. From the perspective of the building life cycle, the importance of the circular economy in architecture has been explored, and it is believed that ICT (Information & Communication Technologies) can help to solve the complexity of building materials and provide good solutions (Yu et al., 2022) [16]. Callum et al. (2022) [17] also stated that in the process of building demolition, most materials become waste, and how to manage waste appropriately and minimize its negative impact on the environment is crucial. They proposed a systematic management approach to effectively increase the recycling and reuse of waste.

The civil engineering department in our university generates a large amount of concrete waste every year (specimens from compression tests). In the past, such waste was handled by contracted waste disposal companies, which was neither environmentally friendly nor cost-effective. Therefore, it is important to find ways to effectively reutilize the waste and link them with the SDGs goals to improve the campus environment. This not only achieves the educational purposes of the SDGs but also achieves the goal of waste recycling. Therefore, this study aims to achieve the important goal of implementing SDG education through actual curriculum design, curriculum implementation, and subsequent reviews. There have been many studies on the addition of other waste materials to concrete, which do not affect the strength of concrete and can reduce the amount of concrete used. How to reuse these waste materials is also a topic worth discussing. For example, using

polyethylene terephthalate (PET) waste in reinforced concrete beams can significantly improve their flexural strength and toughness, providing a new solution to reduce the impact of plastic waste on the environment. Adding a certain proportion of plastic waste to concrete can also reduce the weight of concrete while maintaining good compressive strength. In addition, PET waste has been tested in corrosive environments, and it has demonstrated better resistance to chemical erosion when exposed to corrosive environments. In terms of thermal and acoustic insulation, waste materials such as polypropylene (PP), high-density polyethylene (HDPE), and polyvinyl chloride (PVC) can also achieve a sound-insulating effect and reduce thermal conductivity when used in concrete. Studies have been conducted with the aim of reducing the amount of concrete used and achieving the long-term objectives of the SDGs (Khatib et al., 2019; Saikia and Brito, 2014; Ayoob et al., 2022; Ahmed et al., 2013; A.I. Almohana et al., 2022; Adnan & Dawood, 2020; Awoyera & Adesina, 2020; Babafemi et al., 2018; Belmokaddem et al., 2020; Bui et al., 2018; Foti, 2019; Maku, 2020) [18–29].

In summary, this study aims to achieve the important goal of promoting SDG education through actual curriculum design, curriculum implementation, and subsequent reviews. The specific objectives of this study include (1) incorporating the SDGs into the course design to allow students to realize the importance of the SDGs through campus space transformation and analyzing the learning effectiveness, (2) expanding students' horizons through inter-school exchanges and investigating the differences in teaching methods between schools, and (3) providing feedback and suggestions based on the results of the course planning, implementation, and communication that serve as an important reference for the continuous promotion of the SDGs.

2. Method

As the SDGs consist of 17 goals, in order to focus on topics that are appropriate for operation and allow students to have practical experiences, a first-year undergraduate architecture design course was selected for implementation. Based on the competencies of the students, the course was set up with three main themes: "SDG preliminary understanding, spatial experience, and material recycling". For the design of the topics, the following three targets to be promoted were chosen based on the characteristics of the campus, serving as the prerequisite for design: Target 6.3: reducing pollution and eliminating waste, Target 11.6: paying attention to air quality, urban management, and waste management, and Target 15.4: ensuring the conservation of mountain ecosystems and their biodiversity. The reasons for choosing these three targets are as follows: (1) the campus is located in a hilly area with suitable temperatures and humidity for plant growth, (2) the concrete course generates a large amount of concrete waste every year, and (3) to increase recreational facilities for environmental education purposes.

2.1. Materials and Construction Method

Option 1 is based on the waste concrete generated from the courses of the civil engineering department. Option 2 will use bamboo, a plant commonly found in Taiwan, as the main material, since it is a fast-growing plant and renewable natural resource that can be provided free of charge by people in the surrounding area. For Option 3, since the site where the design will be located is subject to strong monsoon winds and frequent rainfall, southern pine is chosen as the main material; the material can meet the characteristics of the site and is easy to use for construction. All materials are limited to recycled materials, renewable materials, and forest management certification materials to reduce their impact on the natural environment and align with the spirit of the SDGs. The construction method must be manageable by students themselves and not rely on large machinery or equipment to comply with low-carbon requirements. In addition, it is recommended to emphasize the concept of the circular economy in the hands-on course, such as using reusable materials and production methods and reducing the use of disposable materials and products to promote the recycling of resources and sustainable development of the economy. By choosing

sustainable materials, reducing waste, using low-carbon footprint techniques, considering the impact on sustainable development goals, and emphasizing the concept of the circular economy, the hands-on course can fulfill the essence of sustainable development goals and have a positive impact on the environment and society.

2.2. Expanding Participation through Online Discussion

To enhance the undergraduate students' understanding of the SDGs, and under the condition that similar topics of operation were available among various schools, the results were exchanged between schools. In this exchange, each school selected one work for online discussion. Five schools participated, and the following are summaries of three selected works.

Option 1 (the focus of this study): Using waste concrete as the main material, stacking it and fixing it with wire mesh, and reutilizing idle spaces to create a habitat for plants and establish biodiversity (Figure 1).

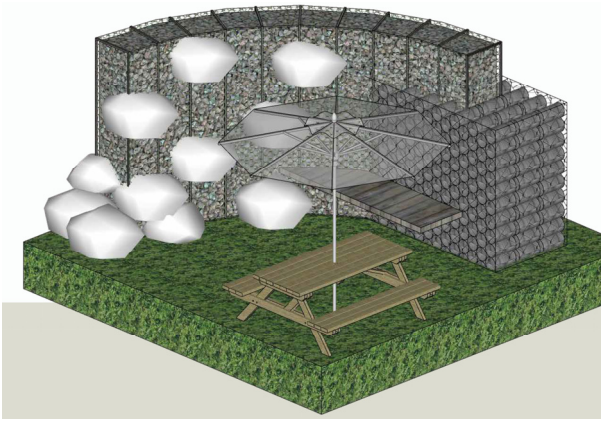

Figure 1. Design result 1 (to be replaced).

Option 2: Using bamboo, commonly found in Taiwan, as the main material to create a recreational space on the campus that offers various usages (Figure 2). The advantages of bamboo include (1) fast growing speed and a natural renewable resource, (2) high durability (resistant to wind and earthquakes), (3) improving climate: high carbon dioxide absorption capacity to effectively improve the climate, suppress global warming, and reduce air pollution, and (4) water conservation: the root system can effectively retain water, making it effective for soil and water conservation and preventing soil erosion.

Figure 2. Design result 2.

Option 3: The campus is located next to a national forest park, which receives heavy rainfall and is greatly affected by seasonal winds. Due to its small size, it lacks recreational space. The strategy is to use wood as the main material and create a higher-quality space based on the characteristics of different campus sites to provide a better learning environment (Figure 3).

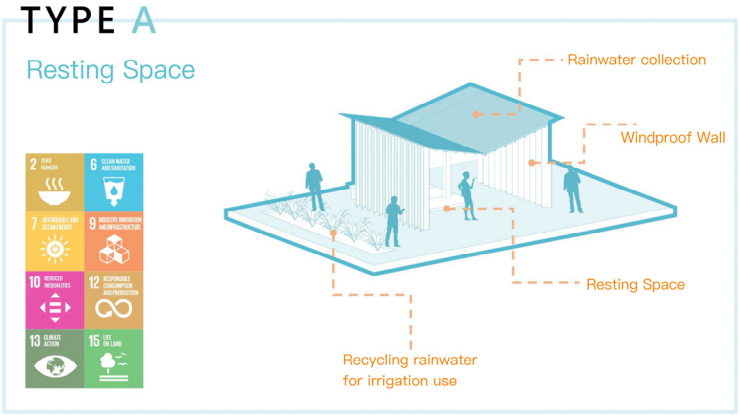

Figure 3. Design result 3 (partial).

2.3. Design of Questionnaire for Learning Effectiveness

The present study aims to strengthen students' understanding of the SDGs by integrating them into the curriculum and through inter-school exchange. Therefore, after the course, an online questionnaire was used to investigate the learning outcome, and the results of the questionnaire will provide clear guidelines and suggestions for the revision of subsequent courses. The questionnaire content is shown in Table 1. The Likert Scale was used for measurement (strongly agree: 7, agree: 6, somewhat agree: 5, no opinion: 4, somewhat disagree: 3, disagree: 2, strongly disagree: 1). The questionnaires were distributed to a total of 176 students, and 172 questionnaires were collected, among which 170 questionnaires were valid and 2 were invalid, with a male-to-female ratio of 54:46. The statistical methods are briefly described as follows. (1) Analysis was conducted using *t*-tests to examine whether there were differences in learning effectiveness perceptions between different genders. (2) Paired-sample *t*-tests were used to compare differences before and after learning. (3) Analysis of variance was used to explore differences between two or more variables.

Table 1. Questionnaire for evaluating learning effectiveness.

Questionnaire Content
Q1 Before the course, I had a sufficient understanding of the SDGs.
Q2 During the course, I could feel and understand the specific items of the SDGs integrated into the course.
Q3 The use of a real site and environment helped me understand the spirit of the SDGs.
Q4 Inter-school exchange can broaden my horizon and increase my imagination for the SDGs.
Q5 After the course, I could feel and understand the specific items of the SDGs integrated into the course.
Q6 Overall, I am satisfied with the learning outcome of this course.

3. Results and Discussion

This study focuses mainly on the reutilization of waste materials generated from the concrete compression test (Option 1) based on the spirit of the SDGs and curriculum integration. It can be explained according to the following three aspects: (1) spatial experience, (2) material reuse, and (3) course feedback.

3.1. Space Reutilization

Concrete is one of the most commonly used building materials in modern construction, and waste materials are generated during the construction process. In the teaching of related courses, a significant amount of waste material is produced due to compression and slump tests of concrete, and it is difficult to recycle these waste materials. Therefore, reutilizing these waste materials is an important sustainable development strategy. Previous studies mainly focused on materials, making them sustainable to reduce waste (Kim and Nele, 2013; María et al., 2021; Islam et al., 2022; Wang et al., 2020; Chen et al., 2022) [30–34]. However, these studies rarely place any emphasis on space reutilization. Therefore, in the implementation of the course, the first step is to allow students to know the characteristics of the waste generated by the course, and familiarize themselves with the campus environment through observation. Finally, by adopting spatial experience, students can not only learn the importance of waste material reutilization but also understand the correlation between these waste materials and the environment through practical operations. This will make their understanding of sustainable development more concrete.

Through actual spatial experience (Figure 4), students had the chance to understand the current shortcomings of the campus, and an open-ended questionnaire was provided to allow students to freely list three items in need of improvement. After summarizing the results, the top three most urgent items that need to be improved were determined to be: (1) lack of recreational space (resting, reading, and socializing spaces), (2) disharmony between man-made structures and the surrounding natural environment (man-made structures: campus building styles and structures, retaining walls, and pavement surfaces), and (3) unclear natural environment characteristics (numerous plantings without markings, frequent rain, and dampness). Through spatial experiential activities, students can have a deeper understanding of the concept of SDGs and how to achieve these goals on campus. At the same time, it can cultivate students' attention and sense of responsibility towards sustainable development, which serves as an important foundation (design goal) for subsequent designs.

Figure 4. Site condition.

In addition, it was found through post-interviews with students that they mostly approached observing the campus from a functional perspective. Furthermore, these spaces must be interesting to attract students to stay and use them, and students expected more spaces to meet the diverse needs of their daily lives. Therefore, most students' thinking process involves first generating functional ideas and then incorporating the SDGs. Students are not familiar with the specific operations of the SDGs, and they did not understand the content of the SDGs before entering the university. Thus, it is necessary to provide students with case guidance during the process (or assistance from other courses).

3.2. Material Reutilization

Regarding material usage, only concrete specimens were provided, which include complete specimens (Figure 5) and specimens damaged by testing (Figure 6). Other materials were not restricted, but they must be recyclable and sustainable. To meet the requirements of fixing the concrete specimens and facilitate the construction of the desired shapes, stainless steel wire mesh was chosen as the material for fixing the concrete (Figure 7). The development drawings of various materials are shown in Figure 8. Based on the campus observation results, the top three strategies that need improvement are as follows (design concepts):

1. Building spaces for plant growth: The concrete specimens are stacked and molded to create spaces, which are fixed with wire mesh. The damaged specimens are rearranged to create gaps and narrow spaces where plants can grow, in response to the campus's proximity to the humid mountainous area. The undamaged specimens are arranged in a regular pattern to help users understand the original form of the damaged specimens.
2. Ecological restoration: The structure created through the aforementioned approach will gradually be filled with plants and insects over time, improving the campus, which is currently dominated by man-made objects, and reducing the discordance between man-made objects and the surrounding natural environment (Figure 9).
3. As time goes by, the discarded concrete specimens can be continuously reused each year, and presented in different shapes and functions in other places on the campus using a similar method, achieving the goal of a sustainable campus.

Figure 5. Complete specimen.

Figure 6. Damaged specimens.

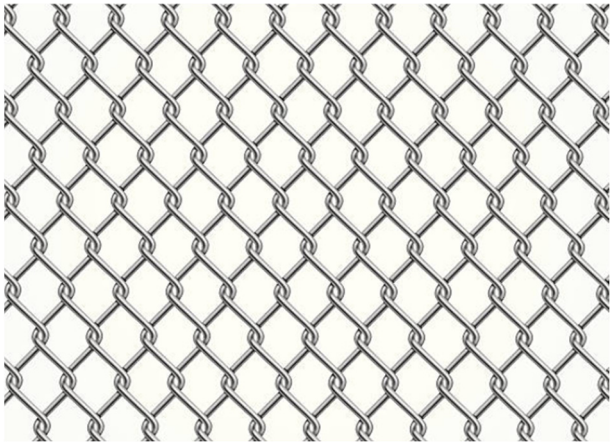

Figure 7. Wire mesh.

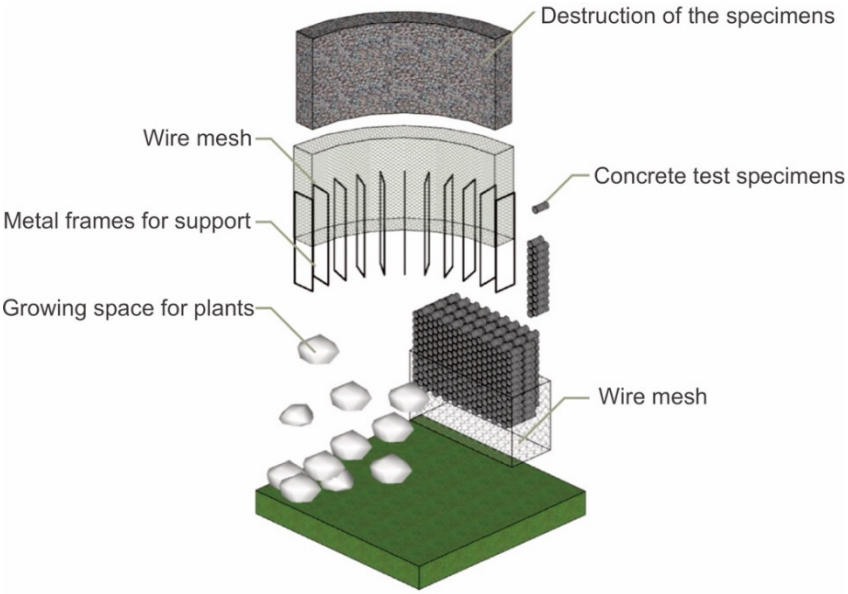

Figure 8. Development drawings of various materials.

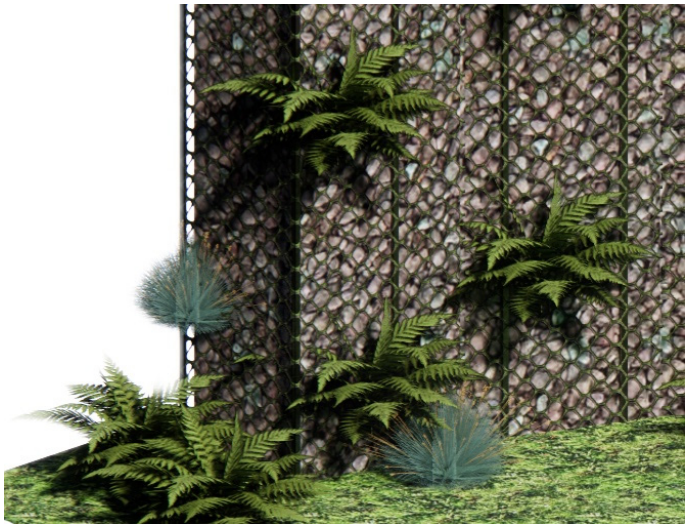

Figure 9. Simulated image of plant growth.

3.3. Course Feedback

3.3.1. Space Re-Creation

University campuses are usually of a certain scale. Through practical operations (in-depth observation), students can get to know the campus better (first-year students in the case of this study), bringing creativity to activate the campus (Figure 10). This project offers the possibility of reutilizing discarded concrete specimens, and the space created will become a visual focus and a gathering place for students, which can also achieve the purpose of integrating the SDGs into daily life (The overall dimensions of the work are: 3.2 m in length, 3.7 m in width, and 2.0 m in height. The dimensions of the broken concrete on the left in Figure 10 are: 3.0 m in length, 3.0 m in width, and 2.0 m in height. The dimensions of the concrete specimen on the right in Figure 10 are: 0.9 m in length, 1.8 m in width, and 1.5 m in height).

Figure 10. Completed work (Simulation based on the actual site).

3.3.2. Implementation of SDG Education

As mentioned earlier, it is crucial to integrate the SDGs into the curriculum. In this project, a real site was used to allow students to experience the campus space and to take action to achieve the environmental goals of the SDGs. Compared to classroom teaching, students agreed that outdoor teaching can allow them to better experience the existence of space, and touching materials in real life can allow them to better understand their characteristics, which can effectively enhance learning effectiveness. The requirement to use "recycled concrete specimens" also helps students better understand that the materials should possess the characteristics of sustainability to avoid permanent pollution caused by the use of disposable materials. It also made students realize that in future architectural design, the use of concrete materials should be minimized and replaced by other materials such as CLT (Cross-Laminated Timber).

Encouraging more diverse ideas through inter-school exchanges is also a key focus of this project. Through online discussion, schools can easily exchange information about their works. Option 2: Utilizing the excellent structural characteristics of bamboo to create versatile spaces also allows students to fully understand the characteristics of bamboo structures (Figure 11). Option 3: The correlation between the SDGs and design is clearly described to provide learning opportunities for other schools (Figures 12 and 13).

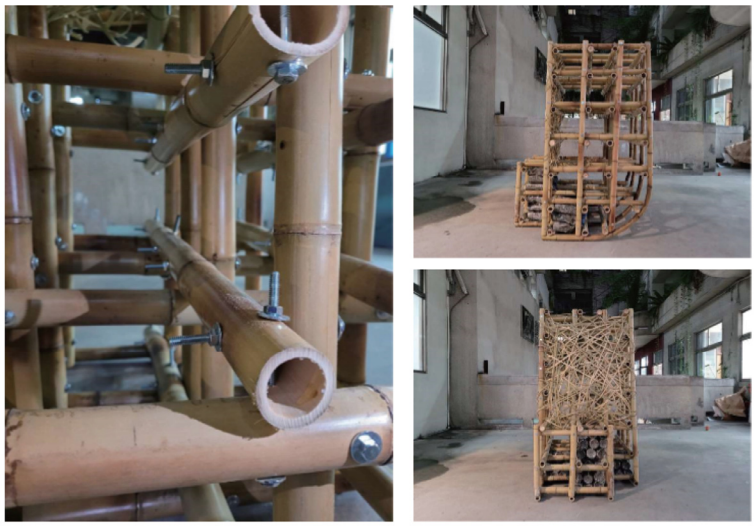

Figure 11. Detailed structure of Option 2.

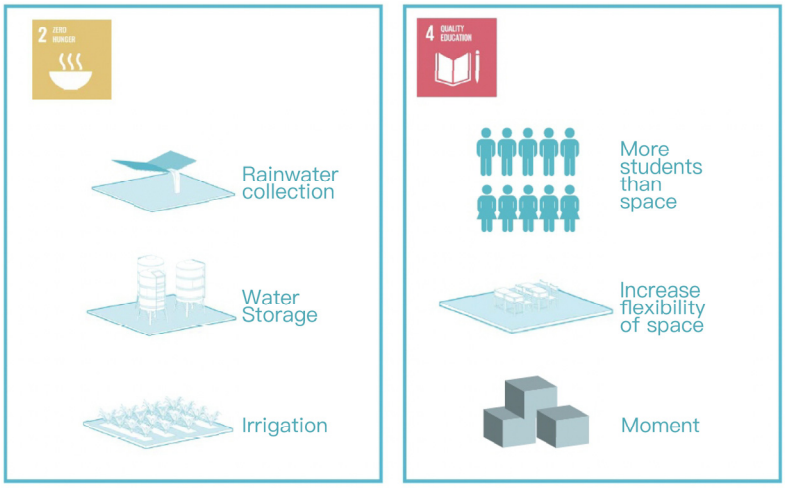

Figure 12. Description of the correlation between the SDGs and design-1.

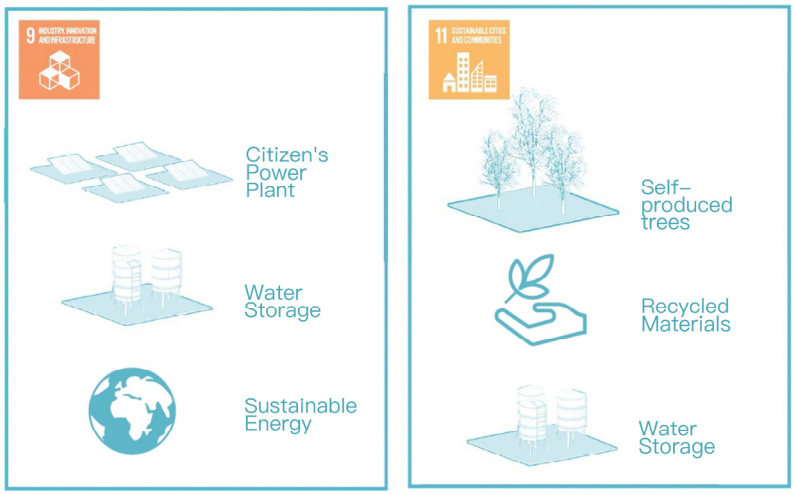

Figure 13. Description of the correlation between the SDGs and design-2.

3.3.3. Investigation of Post-Course Evaluation

To investigate the relationship between course objectives and learning effectiveness, and to understand students' feelings and knowledge acquisition regarding the integration of the SDGs into the curriculum, a post-course evaluation was conducted using a questionnaire (Table 1). The results are analyzed and explained in the following.

Learning Effectiveness and Gender Differences

Gender differences have always been a topic of concern in various studies. Overall, there were only differences in the responses to Q1 between males and females, and no significant differences were found in the responses to other questions (Table 2). Follow-up interviews revealed that differences in SDG knowledge received during high school caused the differences in opinions. Therefore, to ensure that the SDGs can be better applied in professional courses, it is recommended that basic SDG knowledge be appropriately provided in the first-year general courses of the university. Additionally, males had the highest satisfaction in Q5, while females had the highest satisfaction in Q4. Regardless of Q4 or Q5, both were the top two items with the highest satisfaction level for different genders, indicating that inter-school exchanges are helpful in broadening horizons and that the incorporation of the SDGs into the curriculum has been initially accepted by students. Furthermore, the results of the tests for Q2 to Q6 showed no significant difference ($p > 0.05$), indicating that the curriculum design, implementation, inter-school communication, integration of the SDGs, and overall satisfaction can be accepted by students.

Table 2. Analysis of results by gender.

	Q1	Q2	Q3	Q4	Q5	Q6
Male mean value	5.10	5.88	5.98	6.23	6.35 **	6.05
Male standard deviation	1.62	1.35	1.24	0.78	0.94	1.19
Female mean value	5.25	5.79	6.03	6.44 **	6.28	6.11
Female standard deviation	1.57	1.21	1.15	0.85	0.81	1.20
t-test	0.036 *	0.667	0.578	0.221	0.092	0.356

Note: * $p < 0.05$, ** Highest average value.

Understanding of the SDGs before and after the Course

To examine whether there were differences in students' understanding of the SDGs before and after the course (Q1 vs. Q5, Q2 vs. Q5), paired-sample *t*-tests were conducted. The results showed a significant difference (reaching a significance level of $p < 0.05$) in students' understanding of the SDGs between "before the course (Q1)" and "after the course (Q5)", as well as between "during the course (Q2)" and "after the course (Q5)". Additionally, comparing the mean values indicated that Q5 was significantly higher than both Q1 and Q2 (see Table 3), confirming that the course was effective in improving students' understanding of the SDGs. This sets an example for the incorporation of the SDGs in future courses.

Table 3. Testing for differences between "before the course" and "after the course".

	Q1	Q2
Q5	0.004 *	0.016 *

Note: * $p < 0.05$.

Differences between Schools

A total of five schools participated in the exchange program. To understand whether there were differences in students' perspectives among different schools, a one-way analysis of variance (ANOVA) was conducted. The results of the difference analysis, shown in Table 4, indicated that the five schools could be divided into two categories with CC, CU, and KU in one category, and TK and FC in the other. Through post-course review

and discussion sessions, it was found that the teaching time and operation frequency were the same for all schools, and the differences mainly resulted from teaching methods and resources provided by the schools. It was also noted that FC had several years of experience in teaching such topics, which resulted in better performance and effectiveness for their students. Therefore, it can be concluded that inter-school exchanges can provide opportunities for all participating schools to learn from each other and that incorporating the SDGs into the curriculum requires time and experience to achieve better results.

Table 4. Testing for differences between schools.

	CC	TK	CU	FC	KU
CC	---	0.032 *	0.559	0.002 *	0.896
TK		---	0.034 *	0.878	0.029 *
CU			---	0.001 *	0.636
FC				---	0.015 *
KU					---

Note: * $p < 0.05$.

3.3.4. Suggestions for Follow-Up Courses

The SDGs have become an important issue worldwide, and educational institutions have a greater responsibility to promote and educate the public about the SDGs. In addition to cultivating professionals related to the SDGs, it is also necessary to promote SDG concepts and values and to continuously carry out research and development to provide solutions for achieving the SDGs. This course also found that the issues relevant to the SDGs within the school are relatively limited; therefore, it is suggested to collaborate with the community in the future and expand community participation to achieve sustainable development within the community.

This course is a preliminary attempt to integrate the SDGs into the curriculum, and it is hoped that the SDGs can be implemented through practical actions. During the process, it was found that the horizontal integration of the curriculum is also essential. By combining other professional courses to organize a series of contents, the integration of different courses can strengthen the implementation of the SDGs and lead to better results. Here are the specific course suggestions. (1) The SDGs involve a wide range of topics; therefore, it is recommended to focus on one or two main issues to have a more in-depth discussion. (2) The course includes site survey, design discussion, and practical operation. It is recommended to adopt the small-class teaching approach, with each teacher guiding no more than 10 students. (3) In order to effectively implement the SDGs, it is necessary to collaborate with other professional courses. (4) Inter-school exchanges can broaden horizons and greatly help accelerate the recognition and understanding of the SDGs.

4. Conclusions

This study takes a first-year architecture design course as an example to explore the feasibility of incorporating the SDGs into the curriculum. Through four consecutive weeks of course operations, it has been proven that incorporating specific issues into the curriculum can lead to better learning outcomes for students. This has great benefits for promoting the SDGs through continuing education. In addition, the participation of both teachers and students can also improve the campus environment to gradually move towards a sustainable campus.

4.1. Students' Learning Effectiveness Regarding the SDGs

Incorporating the SDGs into the course objectives allowed students to understand their importance through clear goals. By observing the campus environment firsthand, students were able to learn about the unique characteristics of the school's teaching and environment. Students were able to fully appreciate the correlation between the topic, environment, sustainability, and campus. Focusing on specific aspects of the SDGs also

helped students gain a profound understanding of their importance. Both Q4 and Q5 were among the top two items with the highest satisfaction levels, indicating that inter-school exchanges greatly help broaden students' horizons. In addition, the fact that students identified with the incorporation of the SDGs into the curriculum shows that the course planning, operation, information exchange, and incorporation of the SDGs were acceptable to students. Moreover, the pre- and post-course analysis confirmed that the course was effective in improving students' understanding of the SDGs. This sets an example for the incorporation of the SDGs in future courses.

4.2. The Importance of Inter-School Exchange

Using the campus as a platform for the SDGs education allows participating students to deeply experience the campus environment and contribute to its transformation. Through information exchange, we can understand the issues and approaches to dealing with the SDGs in different schools. In addition, through inter-school exchanges, it is known that differences among schools mainly result from teaching methods and resources provided by the schools. Some schools have been teaching such topics for many years, resulting in better student performance and learning effectiveness. However, inter-school exchanges provide opportunities for all participating schools to learn from each other, which can quickly improve students' understanding of the SDGs. Nevertheless, incorporating the SDGs into the curriculum is not a quick fix and requires time and experience to achieve better results.

4.3. Suggestions for Future Courses

The SDGs cover a wide range of topics; therefore, the guidance provided by teachers is extremely important in teaching. To focus on discussing issues, it is suggested to concentrate on one to two topics at a time, which can lead to more in-depth discussions. It is also recommended that the course operation is based on real-life scenarios, allowing students to face the existence of real problems and solutions that are closely related to the local environment in order to implement the spirit of the SDGs. As for small-class teaching, integration of other disciplines, and inter-school exchanges, these are also important topics that require long-term cultivation, continuous correction, and review to expand learning effectiveness.

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