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Importance and performance of SDGs perception among college students in Taiwan

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Abstract

This study explores Taiwanese college students' awareness and action on UN's Sustainable Development Goals (SDGs) launched in 2015. These goals define key dimensions wherein youth's recognition, appreciation, and implementations ignite global citizenship, therefore enhancing both employability and mobility. The SDGs have set a strong presence in higher education, but perhaps not enough as most studies have not assessed a holistic view of undergraduates' SDGs perception. In a well-globalized Chinese society where undergraduate degrees are as widespread as in Taiwan, this study aims to uncover whether higher education institutions (HEIs) in Taiwan have served as enabling environments for the growth of global citizens. Building on the government's educational reforms and individual policies, it asks: on which aspects have Taiwan excelled or receded, why, and what can our example offer the global community in sowing global citizens? The Importance–Performance Analysis (IPA) grid was conducted to assess college students' recognition and implementation of each goal. A list of 17 goals and 68 items were identified from literature reviews and each item was rated using a five-point Likert scale. On the scale, the online survey enables the 1238 college students from HEIs, ranging from research to non-research ones, to rate the relative importance of the items, followed by another performance rating. We aspire analysis of the responses to allow reflection on the implementation of professional and general education, as results indicate the factors contributing to students' cognition of the SDGs. Echoing current policy in Taiwan, we intend to offer insights and recommendations to extend students' SDGs vision, ultimately enhancing youth's international understanding and mobility.

Keywords Education policy · Higher education · IPA · SDGs · Taiwan

Introduction

The development trends of higher education have been interpreted from a number of angles in recent years, such as predictions or analyses based on changes in population and human capital. Some studies have examined university social responsibility, and even the various international competitions and rankings resulting from globalization. At the same time, a trend has emerged to explore the means of reflection and the proper systematic methods regarding university governance and on-campus teaching and learning with sustainability values at the core (Shephard, 2008; Wals & Jickling, 2002).

In Taiwan, it hardly gets into policy makers' decisions when it comes to echoing any international organization's propaganda due to Taiwan's unique international status. Because of the limited global participation, the educators and students at each level literally focus more on the school knowledge than on accessing to international participation.

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However, it seems the situation has changed in recent years. For example, in 2020, Taiwan MOE developed the Education Manual for Sustainable Development Goals (SDGs) to help HEIs understand the meaning and implementation of SDGs. With this initiative, sustainable development is gradually becoming a standard in HEIs and is also linked to HEIs' internationalization. In this research, we will examine this profound concept and its unusual meaning related with internationalization, focusing on college students.

Demaidi and Al-Sahili (2021) conducted a survey on the perception of SDGs among college students limited primarily to Climate Change Awareness and Gender Equality. Through understanding students' SDG-related knowledge and behavior, suggestions on how to increase awareness such as integrating SDG concepts into extracurricular activities were suggested. In addition, Kioupi and Voulvoulis (2020) identified that even environmental programs show gaps regarding environment and sustainability, thus advising HEIs to not only focus on SGD learning outcomes but also incorporate SDG concepts into the university curriculum. After all, only curriculum design integrated with current issues and interdisciplinary pedagogical approaches (Alm et al., 2021) can establish a learning environment that stimulates college students' competencies for sustainability-related issues. As previously described, considering that Taiwan's higher education policy emphasizes internationalization and sustainability, this study attempts to delve into the importance and performance of college students on the 17 SDGs, so as to put forward relevant suggestions, offering a certain degree of academic contribution and enriching existing literature.

Taiwan is located in East Asia, a region that is deeply influenced by the globalization of higher education. According to Huang (2016), several countries in South East Asia have also been actively involved in cross-border or transnational higher education programs and campuses in recent years. It is important to note that the encouragement of international mobility is not a merely rhetorical topic in selected countries in East and Southeast Asia. In view of this, with regard to higher education in Taiwan, where international mobility is increasing, we attempted to understand how their various formal and informal learning experiences on campus influence their SDG performance and to clarify where college students in Taiwan learn about SDGs and gain relevant professional support so as to formulate concrete and in-depth suggestions to facilitate the internationalization of higher education. That is, we employed the SDGs, which are becoming increasingly valued by the international community, as our framework and applied importance–performance analysis (IPA) to examine the perceived importance and perceived performance of SDGs among college students. The findings of this study can further enrich relevant research and literature regarding the international education of college students in East Asia.

Based on the above, our research questions were as follows:

1. How do the personal backgrounds and learning experiences of college students in Taiwan influence their perceived importance and perceived performance of SDGs?
2. What are the strengths, overkills, secondary priorities, and top priorities in SDG education in higher education in Taiwan?

Literature review

International ties and sustainable development in higher education

In this knowledge-based, innovation-oriented era, high expectations are held towards research in professional fields in HEIs. In pursuit of experiences that can be taken as reference and to break through existing conventions, HEIs around the world are gradually working towards transnational research and contacts to promote international communication in higher education and cooperative institutional relationships (Koehn, 2012). Current understanding of the pursuit of generating and applying collaborative knowledge shows that international academic disciplines or institutions must engage in substantial research to assess and solve problems in diversification and globalization. In terms of higher education, teachers and students must actively take part in collaborations that cross over multiple disciplines, institutions, and knowledge systems in order to obtain fruitful achievements in today's research environment (Koehn, 2014). In 2015, the United Nations promulgated the 17 SDGs, which are a series of mutually connected global objectives that aim to eliminate poverty and hunger, promote education, protect the earth, and ensure prosperity through peace, justice, and partner relationships by the year 2030.

Education (Goal 4) is a goal itself as well as a means of achieving other goals and therefore of upmost importance to sustainable development. Wals (2014) mentioned that HEIs have already begun to make systematic changes by reorienting education, research, and community activities to promote sustainability. Albareda-Tiana et al. (2018) also indicated that with the support of public policy, promoting SDGs offers HEIs an opportunity to incorporate sustainable development education capabilities into teaching and mobilize students to deal with problems. In essence, higher education can promote the progress of sustainable development in society, and sustainable development can be incorporated into courses via different teaching methods.

As HEIs establish ties around the world, cooperation among university faculty members, students, and their widespread stakeholders can promote the achievement of SDGs (Trencher et al., 2014). Moreover, HEIs play a crucial role in promoting reform, while pursuing sustainability and a fairer society, strengthening ties between higher education and commerce, industry, healthcare, community partners, and entrepreneurs (Findler et al., 2019a, 2019b). Thus, the collaborative partnerships of HEIs can help higher education contribute more to the upkeep of the economy, the environment, culture, and well-being of the global community. They further educate the citizens of the world, and provide knowledge and innovation to society, thereby becoming the engine of social transformation (Lozano, 2018; Purcell et al., 2019). Transnational collaborations in higher education can significantly propel local areas or regions towards sustainability, and as the international ties and consensus in higher education grow day by day, the increasing number of HEIs are urging for research agendas to merge with sustainability issues in the real world and for the positioning and satisfaction of local development needs (Crow, 2010; Molnar et al., 2011). To implement sustainability, cross-sectoral partnerships and joint efforts among governments, organizations, and universities are essential (Owens, 2017).

SDGs and learning performance of students

The SDGs have three main characteristics: (1) universality (they encompass all countries, including developed and developing countries); (2) indivisibility (one may not be prioritized over another, they must be simultaneously developed); and (3) transformability (they turn challenges into opportunities) (General Assembly of United Nations, 2015). Nevertheless, past studies have pointed out possible contradictions among SDGs (Brissett & Mitter, 2017). On one hand, they can contribute to social transformation, but on the other, they can be interpreted from the perspective of utilitarianism and contribute to maintaining the current status quo (Brissett & Mitter, 2017). Additionally, SDG promotion is taking more time than expected (Weybrecht, 2017), hence the lack of understanding among many college students regarding the SDGs (Centro de Investigaciones Sociológicas, 2019).

To achieve the SDGs, they should become a common language through which everyone can solve the sustainable development problems of humankind (Weybrecht, 2017). Besides, achieving the SDGs requires students to cultivate special and interdisciplinary skills. For example, students majoring in mechanical engineering should possess basic knowledge regarding renewable energy and understand the environmental impact of energy consumption (interdisciplinary literacy). In a survey of college students majoring in different fields such as engineering, teacher education, and health sciences, Zamora-Polo et al. (2019) found a general lack of understanding of the SDGs among college students and that they received little information regarding the SDGs through various media, including higher education, social media, and social networks. Interdisciplinary development prevents the formation of islands of knowledge; the SDGs should therefore permeate all courses from basic introductory courses to the final, professional ones.

Next, in the promotion of SDGs in higher education, Boni et al. (2016) advocated that the assessment of HEIs should not merely focus on pioneer academic research but also include teaching, commitment to society, governance, campus environments, and other aspects. However, these solutions must be practical teaching methods (Gusmão Caiado, et al. 2018). Nussbaum (2000) and Sen (1992) proposed that SDG education should be understood in the context of transformative education (Dlouhá & Pospíšilová, 2018) to improve the literacies of students (Boni et al., 2016). Literacy can be defined as the integration of applied knowledge, skills, and attitudes under certain circumstances (Lozano et al., 2017; Mateos et al., 2008; Zamora-Polo et al., 2016). Competence development should be the foundation of higher education courses, which combines literacy in abilities both directly associated with one's academic degree and interdisciplinary capacity associated with civic development (Sánchez-Martín et al., 2015). Progress in the SDGs requires the balanced development of both types of literacies. For one, we need experts with professional knowledge, but for another, we need students who know how to orient themselves in a globalized and rapidly-changing world (Boni & Calabuig, 2017). Students should develop literacies such as critical thinking, creativity, and basic implementation methods (Boni & Calabuig, 2017) or other abilities such as moral reasoning and the ability to identify the consequences of their actions (Sánchez-Martín et al., 2015; Zamora-Polo et al., 2016). The true potential of literacy development is its transformability, as it promotes critical abilities and turns students into internationalized citizens (Dlouhá & Pospíšilová, 2018).

In Taiwan's path toward the SDGs, the MOE included sustainability into the University Social Responsibility (USR) Program, encouraging HEIs to promote care for the local community, the environment, industrial ties, and economic sustainability, health, and food safety, cultural sustainability, and other social practices (Center for University Social Responsibility, Ministry of Education, 2019). In 2019, the Times Higher Education (THE) included all 17 SDGs for the first time in its assessments for the World University Impact Rankings, converting university educational, research, and community service potential into a contribution to global sustainable development. As a result, the promotion of global sustainable development has become inseparable from student learning.

Empirical studies regarding the SDGs

Goal 4 (Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all) reflects educational challenges that closely involve the Organization for Economic Cooperation and Development (OECD), such as lifelong learning and equity courses that promote a sustainable future. This goal is the most comprehensive global education goal (Organisation for Economic Cooperation and Development, 2019), and the OECD's education programs play a key role in the achievement and measurement of the SDGs. For instance, the Programme for International Student Assessment (PISA) is a global student assessment hosted by the OECD which examines the progress of education in achieving the SDGs. Thus, a strong correlation between SDG education policy tools and dialog platforms and the OECD exists (Organisation for Economic Cooperation and Development, 2017, 2018). The European Union (EU) is dedicated to collaborations in all fields of international relations. By assisting in the formulation of international measures and maintaining and improving the quality of the environment as well as the sustainable management of natural resources around the world to ensure sustainable development, sustainable development has become mainstream in European strategies in 2020. The EU is also investing efforts in implementing Education 2030 and the SDGs and using multiple stakeholder platforms to support and exchange the best practices for sustainable development (Plesniarska, 2019).

In the SDGs, gender is a crucial indicator. Researchers have asserted that gender equality is a human rights issue as well as a prerequisite of sustainable development as it is determined by the fair allocation of resources. With Goal 5, internationally coordinated efforts are being made to incorporate gender perspectives into the mainstream, empower women, and create more opportunities for women in higher education. However, in academic circles, women continue to be cast in certain roles, thereby limiting work, promotion, and fair play opportunities. Consequently, women show relatively less participation in achieving SDGs than men in various institutions (Hirsu et al., 2021).

When HEIs around the world promote sustainability, the obstacles and difficulties that they face may vary. Regarding HEIs on the six major continents, Veiga Ávila et al. (2019) compared their barriers to innovation and sustainable development and discovered that HEIs in South America lacked support from university administration, legislation, and guidelines for sustainability and innovation, research and development, and awareness and concern. HEIs in Europe lacked support from university administration, research and development, appropriate buildings, and awareness and concern. Those in North America lacked support from university administration, appropriate technology, and institutional barriers. Compared to other continents, a large number of researchers in North America are engaging in research associated with sustainable development. HEIs there also have higher research productivity, thus holding top spots in sustainability ranking. The primary barriers of HEIs in Africa are lack of government support, awareness and concern, appropriate buildings, and research and development. Asian HEIs face particularly strong conservatism and lack research and development as well as awareness and concern. HEIs in Oceania lacked support from university administration, appropriate technology, and defined policies and practices.

Research design

Research methods and instrument

According to statistics from the Ministry of Education (2021) in Taiwan, there were a total of 246,845 college students in their third year or higher at the time of this study. Although online surveys have been questioned as insufficient scientific procedures, if conducted properly, online surveys are proved to have significant advantages over other formats, such as low cost, high efficiency, fast recycling, and good confidentiality (Evans & Mathur, 2005). Since most Taiwanese college students are heavy social network service (SNS) users, we decided to use online surveys instead of traditional formats. To overcome the potential weaknesses of representation, we bought keyword ads and put them on the Bulletin Board System (BBS) of 159 Taiwan HEIs, set limitations for the exposure only to college students, held a raffle, and requested respondents to fill out the email.

In addition, to avoid that online surveys' voluntary respondents may predispose certain attributes and affect results, the collection of a large number of samples can reduce the degree of error (Strauss, 1996). According to Dillman (2000), we aimed to recover at least 1,067 valid questionnaires (margin of error of plus or minus 3% at a 95% confidence level). From January 4 to February 28 in 2021, we distributed our formal questionnaire on various university community platforms and forums and recovered a total of 1,238 valid samples. Furthermore, if the samples do not fit the parent population in the background distribution, weighting was used while proceeding *t* test or ANOVA.

The questionnaire in this study contained two major parts: the background variables of the respondents and their perceived importance and performance about the SDGs. The background variables included gender, academic field, year in college, whether they are a preservice teacher, have work experience, take part in university club activities (athletic, art, service, autonomy, entertainment, or composite), and have taken up opportunities offered by their college to study abroad (student exchanges, dual degree programs,

internships, international competitions, international volunteering, international seminars, or teaching Chinese). The perceived SDG importance and performance portion were designed using a five-point Likert scale in which 1 to 5 points were given to the responses and the total score could be calculated.

After drawing up a draft of the questionnaire, we had 12 education researchers and experts with experiences with university SDG practices offer suggestions on the content, structure, and wording of the questionnaire and check the appropriateness of the questionnaire to give the research instrument content validity. A content validity questionnaire designed with five responses, namely, appropriate, slightly appropriate, neutral, slightly inappropriate, and inappropriate, was administered to calculate the content validity index (CVI) and examine the validity of our research instrument. A CVI value of 0.80 served as the criterion for item acceptability (Polit et al., 2007) and reference of questionnaire quality. The results were 0.8 or higher CVI values for all 51 question items in the questionnaire, so no question items were eliminated.

For reliability analysis, we recruited 256 random college students from five HEIs in Northern Taiwan, November 2020, for a pilot test with Cronbach's α in the internal consistency method as our reliability index. This number of participants was consistent with the suggestion that the number of participants is 5 ~ 10 times the number of question items (Comrey, 1988; Tinsley & Tinsley, 1987). During this process, we also examined the coefficients of correlation among the question items and constructs. A correlation coefficient less than .30 indicates that the item is not homogeneous with the construct and should therefore be eliminated. The α values involving importance in this questionnaire ranged from .724 to .895, and the α value of the overall scale was .969, thereby representing internal consistency. The α values involving performance ranged from .741 to .851, and the α value of the overall scale was .960, thereby representing internal consistency. We also tested the discriminative power of the question items using the critical ratio (CR) to analyze the differences between the responses of the high and low score groups. If the CR value of the response difference between the high and low score groups does not reach 3, then the question item has weaker discriminative power and should therefore be eliminated. The 51 question items in the 17 domains all met the criterion, so no items were eliminated.

After recovering the questionnaires and removing invalid samples, we analyzed the results by using SPSS 20. First, to determine whether the views of different respondents varied with their background variables, we performed statistical analyses such as *t* tests. Then, to assess the effectiveness of SDG education in HEIs in Taiwan, we employed IPA, which uses importance and performance to prioritize certain assessment items based on their attributes (Martilla & James, 1977). This involved calculating the mean importance and performance scores of each question item and displaying them on a two-dimensional grid. The location where each item falls in the grid is then used to describe the situation of this question item and provide decision-makers with important priority-related information (Details in Fig. 1). Quadrant I (High Importance/High Performance) is labeled "Keep up the good work." The SDGs that fall in this quadrant are the strengths of SDG education in HEIs in Taiwan. Quadrant II (Low Importance/High Performance) is labeled as "Possible overkill." The SDGs that fall in this quadrant are the overkills of SDG education in HEIs. Quadrant III (Low Importance/Low Performance) is labeled "Low priority." The SDGs that fall in this quadrant are the secondary priorities of SDG education in HEIs. Quadrant IV (High Importance/Low Performance) is labeled "Concentrate here." The SDGs that fall in this quadrant are the top priorities of SDG education in HEIs.

Basic information of respondents

Table 1 presents the demographic profile of 1238 respondents in this survey. Among the respondents, 805 (65.0%) were female and 433 (35.0%) were male; 915 (73.9%) majored in non-STEM fields, and 323 (26.1%) majored in STEM ones; 1070 (86.4%) were not preservice teachers, whereas 168 (13.6%) were 631 (51.0%) were in their fourth year of college or higher, and 607 (49.0%) were in their third year; 1,073 (86.7%) had work experiences, while 165 (13.3%) did not.

Besides, 843 respondents (68.1%) took part in college club activities: 216 (17.4%) in athletic clubs, 337 (27.2%) in art clubs, 276 (22.3%) in service clubs, 173 (14.0%) in autonomy

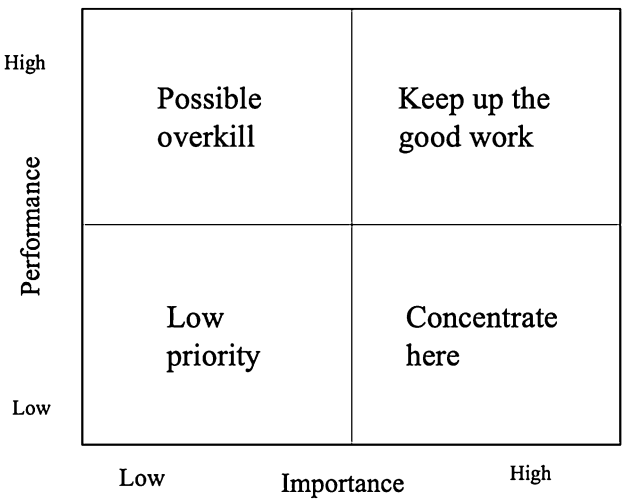

Fig. 1 Grids of importance–performance analysis

Table 1 Summary of the demographic profile of respondents ($N = 1238$)

Variables	No. of sample	Percentage (%)	Cumulative percentage (%)
Gender			
(1) Male	433	35.0	35.0
(2) Female	805	65.0	100.0
Academic field			
(1) STEM	323	26.1	26.1
(2) Non-STEM	915	73.9	100.0
Preservice teacher			
(1) Yes	168	13.6	13.6
(2) No	1070	86.4	100.0
Year in HEIs			
(1) Third year	607	49.0	49.0
(2) Fourth year or higher	631	51.0	100.0
Work experiences			
(1) Yes	1073	86.7	86.7
(2) No	165	13.3	100.0
College club activities			
(1) Yes	843	68.1	68.1
(2) No	395	31.9	100.0
a. Athletic club	216	17.4	17.4
b. Art club	337	27.2	27.2
c. Service club	276	22.3	22.3
d. Autonomy club	173	14.0	14.0
e. Entertainment club	114	9.2	9.2
f. Composite club	111	9.0	9.0
Taken up college-offered opportunities to study abroad			
(1) Yes	256	20.7	20.7
(2) No	982	79.3	100.0
a. Student exchanges	123	9.9	9.9
b. Internships	105	8.5	8.5
c. International competitions	27	2.2	2.2
d. International volunteering	38	3.1	3.1
e. International seminars	28	2.3	2.3
f. Teaching Chinese	15	1.2	1.2

clubs, 114 (9.2%) in entertainment clubs, and 111 (9.0%) in composite clubs. 256 respondents (20.7%) had taken up opportunities offered by their HEIs to study abroad: 123 (9.9%) in student exchanges, 105 (8.5%) in internships, 27 (2.2%) in international competitions, 38 (3.1%) in international volunteering, 28 (2.3%) in international seminars, and 15 (1.2%) in teaching Chinese.

Results

Difference analyses

Table 2 shows the summary of the independent t test of perceived importance and performance ($N = 1238$) between

Table 2 Summary of independent *t* test of perceived importance and performance ($N = 1238$) between respondents' backgrounds

Background variable	Content of background variables	Significance of research variable	
		Importance	Performance
Gender	(1) Male (2) Female	$-4.647^{***}(2>1)$	n.s
Academic field	(1) STEM (2) Non-STEM	n.s	2.022*(1 > 2)
Preservice teacher	(1) Yes (2) No	n.s	n.s
Year in college	(1) Third year (2) Fourth year or higher	n.s	n.s
Work experience	(1) Yes (2) No	n.s	n.s
College club activities	(1) Yes (2) No	2.168*(1 > 2)	n.s
Taken up opportunities to study abroad	(1) Yes (2) No	n.s	n.s

*P < .05, ***$p < .001$

respondents' backgrounds. Significant gender differences existed in importance ($t = -4.647$, $p < 0.001$), with female respondents perceiving higher levels of importance than male ones. Significant differences existed between the two academic field groups in perceived performance ($t = 2.022$, $p < 0.05$), with those in STEM fields perceiving higher performance than those in non-STEM fields. Significant differences in perceived importance ($t = 2.168$, $p < 0.05$) existed between respondents that took part in college club activities and those that did not, with the former perceiving higher levels of importance than the latter.

IPA

In all 17 domains of the perceived SDG importance and performance of college students, the importance scores

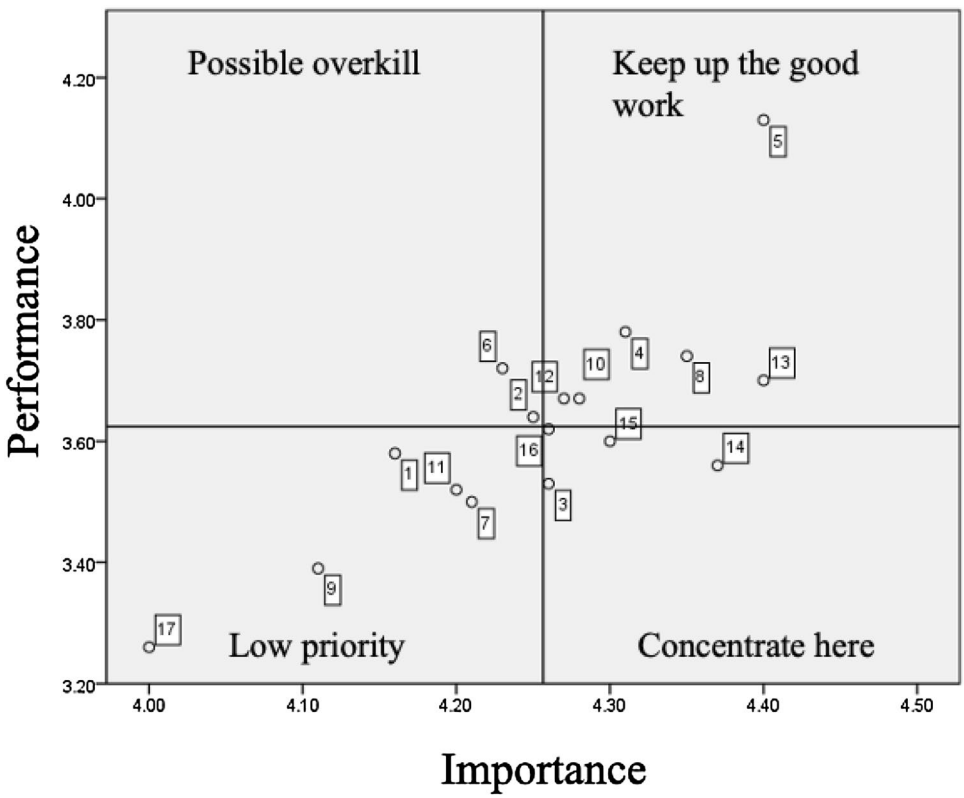

Fig. 2 Importance–performance analysis plot for SDGs

Table 3 Summary table of Quadrant I (Keep up the good work) for IPA

No	Domain	Mean importance	Mean performance
4	Ensure quality education	4.33	3.76
5	Achieve gender equality	4.43	4.16
8	Promote decent work and economic growth	4.37	3.73
10	Reduce inequality	4.30	3.68
12	Ensure responsible consumption and production	4.30	3.66
13	Take action to combat climate change	4.42	3.70

Table 4 Summary table of Quadrant II (Possible overkill) for IPA

No	Domain	Mean importance	Mean performance
2	End hunger	4.27	3.63
6	Ensure clean water and sanitation	4.26	3.71

Table 5 Summary table of Quadrant III (Low priority) for IPA

No	Domain	Mean importance	Mean performance
1	End poverty	4.16	3.56
7	Ensure clean energy	4.22	3.48
9	Promote industry, innovation, and infrastructure	4.14	3.38
11	Build sustainable cities and communities	4.23	3.54
16	Promote peace, justice, and strong institutions	4.27	3.60
17	Strengthen global partnerships	4.01	3.24

were higher than the performance scores. Furthermore, IPA revealed the domains requiring improvement. As shown in Fig. 2, with the mean importance score 4.26 and the mean performance score 3.62 as the origin of the IPA grid.

Quadrant I (Keep up the good work)

As indicated in Table 3, the SDGs that fell within this quadrant included Goal 4 (Ensure quality education), Goal 5 (Achieve gender equality), Goal 8 (Promote decent work and economic growth), Goal 10 (Reduce inequality), Goal 12 (Ensure responsible consumption and production), and Goal 13 (Take action to combat climate change). These results show that college students in Taiwan perceived greater importance and better self-assessed performance in the following sustainable development connotations: (1) understanding the connection between education and their future development, (2) respecting the concepts of gender and gender equality, (3) empathizing with the hard work of all sectors of society, (4) understanding the civic obligations and responsibilities of nations and societies, (5) ensuring sustainable consumption and production models, and (6) reflecting on the impacts and disasters that climate change could bring to the earth. These can be considered the strengths of college students in Taiwan with regard to the SDGs.

Quadrant II (possible overkill)

As in Table 4, the SDGs that fell within this quadrant included Goal 2 (End hunger) and Goal 6 (Ensure clean water and sanitation). These results show that college students in Taiwan perceived less importance but better self-assessed performance in the following sustainable development connotations: (1) understanding the causes of hunger in other countries, reflecting on one's own consumption habits, and cherishing food, and (2) understanding the relationship between quality of life and water resources and reflecting on one's own hygiene. These can be considered the overkills of Taiwanese college students with regard to the SDGs.

Quadrant III (low priority)

As in Table 5, the SDGs that fell within this quadrant included Goal 1 (End poverty), Goal 7 (Ensure clean energy), Goal 9 (Promote industry, innovation, and infrastructure), Goal 11 (Build sustainable cities and communities), Goal 16 (Promote peace, justice, and strong institutions), and Goal 17 (Strengthen global partnerships). These results show that Taiwanese college students perceived less importance and poorer self-assessed performance in the following sustainable development connotations: (1) empathizing with the poor, (2) reflecting on national energy policies, (3) understanding the existential value of national infrastructure and the dilemmas of sustainable development, (4) understanding the connotations of safe and sustainable cities, (5) reflecting on the influence of justice on sustainable development in society, and (6) reflecting on the nation's position in global partnerships. These can be considered

Table 6 Summary table of Quadrant IV (Concentrate here) for IPA

No	Domain	Mean importance	Mean performance
3	Ensure healthy lives and promote well-being	4.29	3.52
14	Conserve ocean resources and ecosystems	4.39	3.55
15	Conserve land resources and ecosystems	4.33	3.61

the secondary priorities of college students in Taiwan with regard to the SDGs.

Quadrant IV (concentrate here)

As in Table 6, the SDGs that fell within this quadrant included Goal 3 (Ensure healthy lives and promote well-being), Goal 14 (Conserve ocean resources and ecosystems), and Goal 15 (Conserve land resources and ecosystems). These results show that college students in Taiwan perceived greater importance but poorer self-assessed performance in the following sustainable development connotations: (1) understanding the idea of ensuring healthy lives and promoting well-being and (2) conserving and sustainably using ocean and land resources. These should be the focus of strengthening and improvement and can be considered the top priorities of Taiwanese college students with regard to the SDGs.

Implications

The results reflect the current social, political, economic, and environmental scene in Taiwan and valuable insights may be extracted to guide future curriculum design, institutional focus, and government policy.

The analysis of this particular IPA differs from its traditional conclusions, as the object of study (SDGs) are part of a greatly complex and interdisciplinary ensemble. The SDGs that fell within Quadrant I represent an aspect where the perceived importance and performance of students were in balance. Further analysis to identify the enabling factors of such state would be of value both nationally to "keep up the good work" and internationally as a reference on how to improve on a particular SDG. Following, SDGs in Quadrant II have to be understood in the context of a developed country and not mistaken as trivial because of a "possible overkill" label. Quadrant III must be interpreted cautiously. "Low priority" may implicate minor importance in Taiwan's current macro-environment, but scarce exposure and thus importance seems likely as "lack of awareness and concern" is one of the main barriers for SDGs implementation in Asian HEIs (Ávila et al., 2019). Perhaps the most interesting lies in Quadrant IV, where we detect a gap between the issues college students perceive as important (demand) and the related university activities available (the supply) which in turn hinder students' perceived performance. This may be interpreted as insufficient courses, student clubs, events, conferences, etc. HEIs in Taiwan are advised to consider increasing their activities and resources in relation to Goals 3 (Ensure healthy lives and promote well-being), 14 (Conserve ocean resources and ecosystems), and 15 (Conserve land resources and ecosystems).

We also find insightful patterns from the difference analysis. In this study, female respondents showed higher levels of perceived importance compared to male ones, while women are argued to have relatively less participation in achieving SDGs than men (Hirsu et al., 2021). This may show our uniqueness of the research that Taiwan, as one of the democratic societies, has improvements on the steps toward gender equality. The SDGs require an interdisciplinary approach, however, STEM fields perceived higher performance than Non-STEM fields. University efforts toward the empowerment of Non-STEM students are required; more incentive initiatives, social entrepreneurship competitions, or volunteer plan scholarships may serve such purpose. Following, respondents that took part in college club activities perceived higher levels of importance than those who did not. College clubs provide positive spaces for students to pursue interests while socializing with members from other departments, fostering grounds for interdisciplinary experiences. Thus, the research suggests greater support from HEIs regarding student clubs, as do the conclusions from Demaidi and Al-Sahili (2021). In addition, the 1st quadrant (keep up the good work) receives nearly 6 items while the 4th quadrant (low priority) also receives the same number of the items. This indicates that the cognition of college students on SGDs is relatively polarized. Goal 17 (strengthen global partnership) appears with the lowest score, which means building global partnership is the least one in students' priority setting. For an island country and its emphasized global status, students' response may leave policymakers some space to reflect.

Understanding the interdisciplinary and interconnected components of the SDGs is key to reaching them. The collaboration among HEIs and international organizations should be emphasized as the best means to create change. As the incubators of future citizens, HEIs have the opportunity to advance interdisciplinary literacy and taken together with the results of this study, strengths, weaknesses, gaps, and opportunities have been identified for the future scheme in Taiwan. Future studies on the current topic are therefore recommended in different contexts to establish an understanding of different countries' approaches to advancing

sustainable development, serving as models for the global community.

Even though many scientific methods to collect extensive large samples and avoid the problem of unrepresentativeness, the samples still did not completely fit the population distribution in the backgrounds of academic fields and genders. It is speculated that because members of the research team are all from Non-STEM, it is more likely to attract Non-STEM college students as respondents. Furthermore, the proportion of female college students from the field of Non-STEM in Taiwan is much higher than that of males. Although the use of statistical weighting can partially resolve the problem, it is nevertheless a limitation of this study, and further consideration is advised to future researchers who intend to follow-up.

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