

Sustainable Development Goals: Knowledge, Teaching Skills and Commitment of Science Vs Non-Science Undergraduate Teachers of Private Universities

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Abstract

The incorporation of the Sustainable Development Goals (SDGs) into higher education is crucial for developing dedicated teachers who can influence future generations. This study investigates the knowledge, teaching skills, and commitment toward SDGs among science and non-science undergraduate teachers at private universities in Lahore. A quantitative, cross-sectional survey method was used, which is grounded in the positivist paradigm. A standardized questionnaire was used to gather data from 697 teachers. The questionnaire consisted of 44 closed-ended items, and a five-point Likert scale was used to gather the responses. The findings of the present study showed that there were statistically significant differences in knowledge, teaching skills, and commitment toward Education for Sustainable Development (ESD) among undergraduate teachers across various demographics at private universities. These findings highlight the need for carefully designed professional development and training programs that consider subject background, gender, and experience.

Keywords: Sustainable Development Goals, Knowledge, Teaching Skills, Commitment, Science, and Non-Science Undergraduate Teachers

Introduction

As the world dealt with the growing challenges, climate change and environmental degradation, social inequality, and poverty, among others, the Sustainable Development Goals (SDGs), a holistic set of goals to be attained by the year 2030, were launched by the United Nations in 2015. The 17 goals intertwined aim to provide people and the planet around the globe with a roadmap to peace, prosperity and sustainability (UN, 2015). At the heart of the SDGs provision is education for sustainable development (ESD) that empowers people to live out their decisions responsibly and wisely with a clear understanding of their actions to carry out (UNESCO, 2021).

Universities and other institutions of higher learning have become important players in the application of SDGs. In addition to being the facilitators of knowledge creation are potent sources of social change because they develop future generations of leaders and citizens. Many efforts to operationalize sustainability in universities include integrating sustainability into science and practice at different levels: curriculum, research, and campus culture (Purcell et al., 2019; Bhowmik et al., 2017). These initiatives are accompanied by a bottom-up approach to this action, i.e., the importance of education, training, governance, and community involvement, with the faculty playing a decisive role (Kestin et al., 2017).

In the larger context, undergraduate teachers in the private universities can be very helpful in the implementation of SDG ideals. Their sustainability ideas and teaching experiences as well as personal willingness to engage SDGs in teaching are critical in developing the sustainability attitudes of students. Sustainable development has different conceptualizations and implementations across disciplines is what was observed by Lozano et al. (2021). The departments that deal with science tend to focus on environmental and technological aspects, and departments that are not science-related tend to focus more on social equity, policy, and behavioral change (Filho et al., 2019).

This research fills this gap by exploring the knowledge, instructional skills and commitment of science and non-science undergraduate teachers in the different institutions of higher learning towards the SDGs. The research

will help these institutions effectively adopt ESD and expand the embodiment of sustainable pedagogy in higher education by assessing the ways these educators think and apply these values in pedagogy.

The research questions of the study were:

1. What are the differences in terms of knowledge, teaching skills and commitment to integrate SDGs between science and non-science undergraduate teachers at private universities?
2. Do male and female science teachers at private universities show statistically significant differences in terms of their knowledge, teaching skills and commitment toward education for sustainable development?
3. Do female science and female non-science teachers at private universities show statistically significant differences in terms of their knowledge, teaching skills and commitment towards education for sustainable development?
4. Do male science and male non-science teachers at private universities show statistically significant differences in terms of their knowledge, teaching skills and commitment towards education for sustainable development?
5. Do male and female non-science teachers at private universities show statistically significant differences in terms of their knowledge, teaching skills and commitment towards education for sustainable development?
6. Does teaching experience have a statistically significant impact on the knowledge, teaching skills and commitment of science and non-science undergraduate teachers toward education for sustainable development at private universities?

Literature Review

Sustainable development goals (SDGs) are a set of goals, which were set by the United Nations to solve world problems such as education, inequality, environmental degradation, and sustainability by 2030. Higher education institutions (HEIs) are regarded as the primary actors that can

implement SDGs into the societies, meaning teaching, research, community engagement (Leal Filho et al., 2019; Silvia et al., 2018).

Knowledge of SDGs among University Teachers

What teachers know about the SDGs influence how they understand sustainability to be incorporated in their teaching. Research shows science faculty have often shown to be much more familiar with SDG-related matter than non-science faculty, as the correlation between science-related disciplines and topics such as environmental issues and green energy is evident (Mishra et al., 2023; Kumar & Sharma, 2023). In comparison, teaching professionals outside the science field often have difficulty in finding SDG connections in their fields, which illustrates the necessity of cross-disciplinary teacher professional development (Mishra et al., 2023; Saini et al., 2022; Lee and Park, 2022).

Yet, nothing guarantees that awareness can turn into a higher level of understanding. According to Chen et al. (2021), the lack of institutional incentives or a formal support system may not give educators an incentive to otherwise progress beyond awareness. There are also differences that arise between genders as well as experience. According to Lim et al., (2020) and Dunlap & Torre (2020), it can be stated that social-cultural norms might restrict the ability of women to develop professionally, which acts as a factor creating knowledge disparities. In the same way, teaching experience also plays into the familiarity where although early-career faculty may be more open-minded with new paradigms, senior faculty tend to use outdated materials or are not receptive to incorporating new global issues (Garet et al., 2024).

Teaching Skills for ESD Integration

Sustainable education presupposes not only knowledge, but pedagogical competence to make the principles into practice. Study methods, including problem-based learning and cross-curriculum project work, are described as successful in making students interested in the theme of sustainability (Laranjeiro et al., 2022). The confidence in various faculty to teach sustainability is not steady. Members of the scientific community feel more equipped to teach sustainability because of science-specific education,

whereas non-science faculty simply do not have a pedagogical framework to rely on (Moon et al., 2018; Taimur et al., 2022; Hisey et al., 2025)

Cross-gender differences and differences with experience are also present. An example is that Zamora-Polo et al. (2019) discovered that participatory styles that align with the values of Education for Sustainable Development (ESD) are common among female instructors in some cases, especially in science subjects. In line, whereas skilled teachers might be excellent classroom managers, they tend to be less willing to implement new pedagogies without the assistance of professional learning (Smaniotto et al., 2020).

Commitment toward SDG Integration

The issue of commitment to SDG integration goes beyond knowledge and skills as it is related to personal motivation and institutional support. According to Purcell et al. (2019) and Ang et al. (2021), commitment is not only the formal knowledge, but it is also a feeling that a person can change with the help of education. Investigations have shown that the adherence to sustainability can be more profound among the science faculty because of the compatibility of their disciplines and SDGs (Mishra et al., 2023). In contrast, non-science faculty in general, and in public institutions in particular, might not be able to prioritize ESD without explicit incentives (Hamwy et al., 2023).

Gender adds to the complexity of the picture Women educators tend to exhibit personal commitments that are community-focused and caring in nature; however, it may be limited in what people can do because of institutional restrictions (UNESCO, 2019; Dunlap & Torre, 2020). Experience is also a factor as Garet et al. (2024) state that it shall lead to long-term commitment but more so when policy and systems within the institution support this process.

Gender and Inclusivity in SDG Education

Gender-responsive strategies are necessary to achieve equities in sustainability education. According to **UNESCO (2019)**, the integration of a gender perspective into curricula and co-curriculum activities should be done to encourage inclusive leadership and agency. In the same tone,

Dunlap and Torre (2020) urge to use pedagogical interventions that overcome intersectional obstacles to involvement and promote consistent male and female participation in sustainability.

Granted that awareness of the SDGs is on the increase, their implementation in high learning institutions has been inconsistent. Knowledge, pedagogical skills, and degree of commitment tend to differ considerably across different disciplines and between men and women, and the extent of teaching experience (Zamora-Polo et al., 2019; Smaniotto et al., 2020). In sectors like health and education, some progress has been reported but most programs are yet to be structured or have a pedagogical approach to address sustainability.

It is based on this inconsistency that calls for systemic reforms to enhance knowledge of the faculty, develop pedagogical skills and a long-term institutional commitment towards ESD. Incorporation of SDGs in a more comprehensive way into curricula, methodology of teaching, and institutional design will better prepare universities to create responsible global citizens able to make positive contributions towards sustainable development.

Methodology

In the present study a comparative cross-sectional quantitative research design was used to examine differences among undergraduate science and non-science teachers' ESD knowledge, teaching skills, and commitment. This design was employed as it is the most suitable design to compare the groups that naturally exist like male and female both science and non-science teachers with varying levels of teaching experience. Moreover, the data were collected at one point from the respondents, this approach enabled the researchers to observe how these demographic characteristics relate to variations in teachers' knowledge, teaching skills and commitment. It also helped in drawing meaningful group comparisons, allowing the researchers to examine whether teachers' discipline, gender, or experience had an influence on their level of knowledge, teaching skills, and commitment toward ESD. In other words, this design provided a clear and structured way to examine the group-based differences without manipulating any variables.

A purposive sampling strategy as used to select a sample size of 697 lecturers (288 males and 409 females), that represent a wide variety of disciplines and teaching experience.

The closed ended questionnaire included three key constructs, i.e., knowledge of the SDGs, ability to teach SDGs integration, and SDG-related practice commitment based on the works of Nwangwa and Igbogi (2020), Smaniotto et al. (2019), Sanaye Suoe et al. (2019), and Jacob J. (2020). The level of responses was gauged on a five-point Likert scale. Expert validation offered content relevance and the instrument recorded high internal consistency with Cronbach alpha coefficient values of 0.831 (knowledge), 0.859 (teaching skills) and 0.920 (commitment).

Since there was a non-normal distribution of data, non-parametric statistical tests were utilized. Gender based differences were analyzed by Mann Whitney U test and variation in disciplines and teaching experience using Kruskal Wallase H test.

Results

Table 1

Comparison of ESD Knowledge, ESD Teaching Skills, and Commitment among Teaching Discipline Science and Non-Science

	Teaching Discipline	N	Mean Rank	Sum of Ranks
ESD Knowledge	Non-Science	305	191.99	58557.00
	Science	392	471.16	184696.00
	Total	697		
Teaching skills	Non-Science	305	262.03	79919.50
	Science	392	416.67	163333.50
	Total	697		
Commitment	Non-Science	305	281.32	85802.50
	Science	392	401.66	157450.50
	Total	697		

Table 1 compares ESD knowledge, teaching skills, and commitment across science and non-science teaching fields. Science teachers regularly rank higher across all aspects, with a mean rank of 471.16 in ESD Knowledge and 416.67 in Teaching Skills. Furthermore, science teachers are more committed, with a mean rank of 401.66 vs 281.32 for non-science teachers. These results indicate that science teachers have stronger knowledge, teaching skills and commitment of ESD.

Table 2

Mann-Whitney U Test for Science and Non-Science of ESD Knowledge, ESD Teaching Skills, and Commitment

	ESD_Knowledge	Teaching_skills	Commitment
Mann-Whitney U	11892.000	33254.500	39137.500
Wilcoxon W	58557.000	79919.500	85802.500
Z	-18.210	-10.114	-7.838
Asymp. Sig. (2-tailed)	.000	.000	.000

Table 2 shows Sig. (2-tailed) values for all three variables are .000, which is less than the usual significance level of 0.05. This suggests that there are considerable variances between the two groups. Thus, null hypothesis 1 is rejected.

Table 3

Comparison for ESD Knowledge, ESD Teaching Skills, and Commitment across Female Science vs Male Science

	Groups	N	Mean Rank	Sum of Ranks
ESD Knowledge	Female Science	213	167.56	35689.50
	Male Science	173	225.44	39001.50
	Total	386		

Teaching skills	Female Science	213	153.92	32784.00
	Male Science	173	242.24	41907.00
	Total	386		
Commitment	Female Science	213	147.29	31372.50
	Male Science	173	250.40	43318.50
	Total	386		

Table 3 shows that male science teachers outperform female science teachers in all categories. Male teachers rank 225.44 in ESD Knowledge, compared to 167.56 for females. Males score 242.24 vs. 153.92 for Teaching Skills and 250.40 vs. 147.29 for Commitment. This shows that male teachers have more ESD-related knowledge, teaching skills, and commitment.

Table 4

Mann-Whitney U Test for Female and Male Science of ESD Knowledge, ESD Teaching Skills, and Commitment

	ESD Knowledge	Teaching skills	Commitment
Mann-Whitney U	12898.50	9993.00	8581.50
Wilcoxon W	35689.50	32784.00	31372.50
Z	-5.12	-7.84	-9.06
Asymp. Sig. (2-tailed)	.000	.000	.000

The above table 4 shows that there is a statistically significant difference in ESD knowledge teaching skills, and commitment. Male teachers demonstrated significantly greater ESD knowledge, stronger teaching skills for integrating ESD than female teachers. It also shows that male

science teachers are more committed to integrating ESD in their teaching practices than female science teachers. Thus, null hypothesis 2 is rejected.

Table 5

Comparison of ESD Knowledge, ESD Teaching Skills, and Commitment Across Female Non-Science Vs Female Science Teachers

	Groups	N	Mean Rank	Sum of Ranks
ESD Knowledge	Female Non-Science	191	119.72	22867.00
	Female Science	213	276.73	58943.00
	Total	404		
Teaching skills	Female Non-Science	191	172.42	32933.00
	Female Science	213	229.47	48877.00
	Total	404		
Commitment	Female Non science	191	194.89	37224.50
	Female Science	213	209.32	44585.50
	Total	404		

Table 5 shows that in every category, female science instructors do better than female non-science teachers. In terms of ESD knowledge, female science teachers score 276.73, whereas female non-science teachers score 119.72. Likewise, female science teachers get higher scores in commitment (209.32 vs. 194.89) and teaching skills (229.47 vs. 172.42). This suggests that female science teachers have greater commitment, knowledge, and skills in the area of ESD.

Table 6

Mann-Whitney U Test for Female Science and Female Non-Science Teachers among ESD Knowledge, ESD Teaching Skills, and Commitment

ESD Knowledge	Teaching skills	Commitment
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Mann-Whitney U	4531.000	14597.00	18888.50
Wilcoxon W	22867.000	32933.00	37224.50
Z	-13.539	-4.932	-1.24
Asymp. Sig. (2-tailed)	.000	.000	.214

Table 6 shows ESD Knowledge ($p < 0.001$, $Z = -13.539$) and Teaching Skills ($p < 0.001$, $Z = -4.932$) of female science and non-science teachers differs significantly, according to the Mann-Whitney U test. Commitment, however, shows no discernible change ($p = 0.214$). These findings show that while commitment is comparable among groups, female science teachers have substantially greater knowledge and teaching skills. The null hypothesis 3 is rejected.

Table 7

Comparison for ESD Knowledge, ESD Teaching Skills, and Commitment Across Male Non-Science Vs Male Science Teachers

	Groups	N	Mean Rank	Sum of Ranks
ESD Knowledge	Male Non science	120	75.70	9084.50
	Male Science	173	196.45	33986.50
	Total	293		
Teaching skills	Male Non science	120	89.88	10786.00
	Male Science	173	186.62	32285.00
	Total	293		
Commitment	Male Non science	120	84.67	10160.00
	Male Science	173	190.24	32911.00
	Total	293		

Table 7 shows that male science teachers routinely do better than male non-science teachers in the three domains of commitment, skills in teaching,

and education for sustainable development (ESD). Male science teachers had a much better mean rating for ESD knowledge (196.45) than male non-science teachers (75.70); they also have higher mean rankings for teaching skills (186.62) and commitment (190.24).

Table 8

Mann-Whitney U Test among ESD Knowledge, ESD Teaching Skills, and Commitment across Male Non-science and Male Science Teachers

	ESD Knowledge	Teaching skills	Commitment
Mann-Whitney U	1824.50	3526.00	2900.00
Wilcoxon W	9084.50	10786.00	10160.00
Z	-12.13	-9.74	-10.53
Asymp. Sig. (2-tailed)	.000	.000	.000

Table 8 shows that Mann-Whitney U test results show a significant difference between the male non-science and male science groups in ESD knowledge, teaching skills, and commitment. These results show that male science teachers perform significantly better in these areas, indicating a significant difference in ESD knowledge and teaching skills. The null hypothesis 4 is rejected.

Table 9

Comparison of ESD Knowledge, ESD Teaching Skills, and Commitment across Female Non-Science vs Male Non-Science Teachers

	Groups	N	Mean Rank	Sum Ranks	of
ESD Knowledge	Female science	Non-191	149.13	28484.0	
	Male Science	Non-120	166.93	20032.0	

	Total		311		
Teaching skills	Female Science	Non-	191	155.0	29617.7
	Male Science	Non-	120	157.4	18898.5
	Total		311		
Commitment	Female Science	Non-	191	157.9	30168.0
	Male Science	Non-	120	152.9	18348.0
	Total		311		

Table 9 presents that the male non-science teachers outperformed the female non-science teachers in the mean rankings for ESD knowledge (166.93) and skills in teaching (157.4). However, female teachers did have a higher mean ranking than their male counterparts regarding commitment to ESD (157.9).

Table 10

Mann-Whitney U Test among ESD Knowledge, ESD Teaching Skills, and Commitment across Female Non-Science and Male non-Science Teachers

	ESD Knowledge	Teaching skills	Commitment
Mann-Whitney U	10148.0	3526.00	2900.00
Wilcoxon W	28484.0	10786.00	10160.00
Z	-1.704	-.232	-.482
Asymp. Sig. (2-tailed)	.008	.876	.62

Table 10 present the results from the Mann Whitney U test which sought to compare the relative commitment, teaching skills, and ESD knowledge of male and female non-science teachers. Male non-science teachers demonstrated significantly greater ESD knowledge than their female counterparts ($U = 10148.0$, $p = .008$). However, there were no statistically significant differences in the two groups' commitment ($U = 2900.00$, p

=.620) and teaching skills ($U = 3526.00$, $p = .876$). The null hypothesis 5 is rejected.

Table 11

Mean Rank for ESD Knowledge, Teaching Skills, and Commitment across Teaching Experience

	Teaching Experience	N	Mean Rank
ESD Knowledge	Less than 5 years	343	325.13
	5-10 years	148	330.65
	10-15 years	110	381.83
	15-20 years	31	498.06
	Above 20 years	65	390.08
	Total	697	
Teaching skills	Less than 5 years	343	322.67
	5-10 years	148	339.47
	10-15 years	110	401.12
	15-20 years	31	437.11
	Above 20 years	65	379.43
	Total	697	
Commitment	Less than 5 years	343	324.09
	5-10 years	148	342.21
	10-15 years	110	385.75
	15-20 years	31	491.29
	Above 20 years	65	365.87
	Total	697	

Table 11 shows that ESD commitment, skills in teaching, and knowledge increase with teaching experience, reaching a peak between 15 and 20 years. In every category, participants with fewer than five years of experience have the lowest mean ranks, while those with fifteen to twenty years have the highest. The mean ranks for participants with more than 20 years of experience, however, show a little fall, which may indicate that these traits could decrease with extended teaching duration.

Table 12

Kruskal-Wallis H Test Statistics among ESD Knowledge, ESD Teaching Skills, and Commitment based on Teaching Experience

	ESD Knowledge	Teaching skills	Commitment
Kruskal-Wallis H	28.833	21.221	25.089
Df	4	4	4
Asymp. Sig.	.000	.000	.000

Table 12 shows substantial variations in ESD Knowledge ($H=28.833$), Teaching Skills ($H=21.221$), and Commitment ($H=25.089$) depending on teaching experience, all with p-values of 0.000. This shows that teaching experience has a considerable impact on these three variables. Thus, Null hypothesis 6 is rejected.

Table 13

Hypotheses Result

Sr.No	Null Hypotheses	Results
1	There is no significant difference in commitment, knowledge, and teaching skills between science and non-science undergraduate teachers at private universities in integrating sustainable development goals.	Rejected
2	There is no significant difference in knowledge, teaching skills, and commitment between male and female science undergraduate teachers toward ESD at private universities.	Rejected

3	There is no significant difference in knowledge, teaching skills, and commitment between male and female non-science undergraduate teachers toward ESD at private universities.	Partially Rejected
4	There is no significant difference in knowledge, teaching skills, and commitment between male science and male non-science undergraduate teachers toward ESD at private universities.	Rejected
5	There is no significant difference in knowledge, teaching skills, and commitment between female science and female non-science undergraduate teachers toward ESD at private universities,	Rejected
6	Teaching experience has no significant impact on the knowledge, teaching skills, and commitment of both science and non-science undergraduate teachers at private universities toward education for sustainable development.	Rejected

Discussion

Incorporation of the Sustainable Development Goals (SDGs) in higher learning institutes involves educationists to instill environmental sustainability awareness in learning students and inculcate into their curriculum the tools in solving global issues. The knowledge, teaching capabilities, and dedication of science and non-science undergraduate teachers in the private universities in the implementation of the SDGs was the study. The results indicated a difference on the basis of disciplinary background, gender and teaching experience, which comprise the effectiveness of sustainability education.

The first research question focused on the teachers' awareness about the SDGs and its application to higher education. Findings indicated that science teachers had significantly higher knowledge levels than the non-science teachers, as previous literature studies by Filho et al. (2021) and AlAli and Yousef (202) argued that this difference might have been due to the tendency to incorporate the sustainability concepts to science curriculums, especially in the units of environment and technology. Similar to the findings of the study by Redman et al. (2022), the researchers are sure that the structure of science programs precondition that the educators will find it much easier to work with the SDG themes.

In comparison, non-science educators did not perceive SDGs as disciplinary-specific but as an abstract and broad concept, thinking in terms of a big umbrella (Boeve-de Pauw et al., 2022). Awareness levels were somewhat high to high and there are still gaps in translating the awareness into practice. Smith and Taylor (2023) observed that non-science teachers believe sustainability and emphasize that they do not have training in how to teach sustainability. To address such a need, it is necessary to enable faculty with developed strategic methods to incorporate SDGs into specific curricula (Lozano et al., 2021; Rieckmann, 2022).

The second research question explored the pedagogical abilities of teaching faculty with regard to SDG integration. Results showed that science educators were more aligned pedagogically enabling them to rely on the inquiry-based learning approach, research-based delivery, and experimentation (Azeiteiro et al., 2022). The above strategies are inherently appropriate to create critical thinking in relation to sustainability concerns.

In comparison, the subject matter of social sciences and business teachers felt less easy to relate to the ideas of sustainability (Martin et al., 2022). Wamsler et al. (2021) and Lozano et al. (2021) emphasized a consistent discrepancy between the perceptions by educators that they are teaching about sustainability and the realization of the degree of integration in the classroom. Though positive attitudes toward ESD were prevalent, many of them were not guided by any effective tools and models. One way to fill this gap, according to Sachs and Schmidt-Traub (2022), is by taking a case-based learning approach, project-based learning, or an interdisciplinary

approach, as different means allow educators to incorporate the principles of SDGs authentically.

The third research question concerned the level of teacher commitment of integrating SDGs. The results indicated that the science educators were more inclined to sustainable education than their non-science counterparts, and this observation is similar to the findings made by Bianchi et al. (2021) who noted that most STEM faculty were related to activities on climate change and technological innovations.

There were also gender differences that were revealed. In spite of the homogeneous levels of knowledge and teaching proficiency, the commitment of female faculty members to SDG-related practices was lower. That is indicative of institutional obstacles, unequal work burdens, and absence of leadership opportunities noted by Wamsler et al. (2021) and Sachs and Schmidt-Traub (2022). Leal Filho et al. (2010) also reported that the higher education sphere has male-dominated structure of decision-making that restricts the power of female representatives in enhancing the sustainability agenda. The disparities can be reduced by promoting gender-responsive leadership and the equal enabling of evaluation of professional development opportunities.

The fourth research question concerned how the demographics, especially the gender and teaching experience, influenced the SDG-related knowledge, skills, and commitment. Results established that there is a positive relationship between teaching experience and SDGs interaction, similar to Redman et al., (2021) findings, which indicated that high exposure to the changing dynamics of education increases readiness of faculty to engage in sustainability behavior. Teachers with less than 15 years of experience were very active, whereas teachers with 20+ were a bit more passive, perhaps because they still cling to older types of pedagogy.

Mentoring relationships with more experienced staff members and younger educators can establish a favorable balance between experience and innovation that will spread both experience and new ways of thinking about sustainability (Smith & Taylor, 2023). These efforts have the potential to develop institutional capacity to integrate ESD into all disciplines.

The last research question measured variations between science and non-science teachers in terms of SDG knowledge, teaching expertise and dedication. Findings proved that the highest level of disparity was across disciplines, followed by the differences between genders, with those similar to what Lozano et al. (2021) and Sachs & Schmidt-Traub (2022) reported. These findings can be explained by Theory of Planned Behavior (Ajzen, 1991) because attitudinal feelings regarding SDGs, the perceived control over the subject matter, and the support that teachers perceive that the institution offers to them are considered the key determinants of their preparedness to sustainability practices.

Universities should, thus, conduct policies that help promote positive perceptions of sustainability, as well as deliver specific training and source materials and incentives to the faculty to integrate SDGs into their courses.

In sum, the results indicate that the disciplinary background, gender, and teaching experience have a crucial role towards the educators engaging in sustainability learning. The levels of knowledge, skills, and commitment revealed on the part of science faculty were higher than among non-science teachers, who need more support to improve their level of pedagogical competence in this respect. There are still gender gaps, especially in leadership and in the involvement of their institutions which is a challenge that might be addressed through mentorship programs to address the differences in experiences across the field.

Comprehensive and integrative perspective-concerted efforts are required with faculty training, institutional assistance, and campus-wide policies aligned to support sustainability across all undergraduate degrees. This practice will make universities train students to become responsible global worldly citizens who can contribute towards achieving the SDGs.

Conclusion

To conclude, this research emphasizes the importance of educators in incorporating the SDGs into higher education particularly in private universities and the factors having an impact on their knowledge, teaching skills, and willingness to teach sustainability education, namely, the respondents' academic discipline, gender, and teaching experience. The results show that science educators are more aware, pedagogically skilled, and committed to the inclusion of the principles of the SDGs than non-

science educators, and this finding might be associated with the fact that SDGs sustainability themes are more closely linked to science-course themes and empirical knowledge-practice-based teaching-learning experiences. Faculty who teach non-science courses are aware of wider ideological implications of sustainability, and within some disciplines there may be little or no professional development opportunities to acquire knowledge on how to teach SDG themes in particular.

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