Charles Darwin University

Sustainable management education and an empirical five-pillar model of sustainability

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Steven Greenland [a,*], Muhammad Saleem [a], Roopali Misra [a], Jon Mason [b]

[a] *Asia Pacific College of Business and Law, Charles Darwin University, 21 Kitchener Drive, Darwin, Northern Territory, 0800, Australia*
[b] *College of Indigenous Futures, Arts & Society – Education, Charles Darwin University, Ellengowan Drive, Casuarina, Darwin, Northern Territory, 0810, Australia*

A B S T R A C T

Management academics, as the primary researchers of business practices and the educators of future managers, play critical roles shaping corporate behaviour and industry response to global sustainability challenges. However, the competencies required to optimise sustainable management education are often lacking and further research is required. Addressing recognised gaps in the literature, this study measured student perceptions of global sustainability to better inform sustainable management education. 59 in-depth interviews with students from an Australian business and law school identified their sustainability concerns. The perceived importance of such concerns was then quantified via a survey with 383 responses. Factor analysis generated five core sustainability dimensions, comprised of 31 items, which inform a new empirically derived five-pillar model of sustainability. This model includes pillars from traditional three- and four-pillar conceptual models of sustainable development, as well as a new fifth pillar of corporate sustainability. The five pillars in order of perceived importance are social, political, environmental, corporate and economic – importance varied between student types. Aligned with the United Nations 17 Sustainable Development Goals, these five pillars and associated items provide a useful planning tool to assist sustainable management educators in structuring their curricula, as well as businesses considering their sustainable corporate impacts.

1. Introduction

Promoting sustainability is essential to resolving the world's environmental and social challenges, including climate change, environmental degradation, conflict and injustice, and poverty and inequality (United Nations, 2019). In articulating the Sustainable Development Goals (SDGs) in 2015, the United Nations (UN) positioned *sustainability* as the critical issue shaping our future. The subsequent COVID-19 pandemic has been hailed a catalyst for management educators to reconsider, and perhaps recalibrate, how best to serve the people and planet by fostering greater compassion and collaboration, to overcome longstanding neglect of ecosystems and social wellbeing (Robinson, 2020). The Russia–Ukraine crisis further stresses the urgency for sustainable management education that instils greater compassion and collaboration among governments and policymakers.

Growing awareness of the global sustainability crisis has fuelled research investigating the determinants of sustainable attitudes and behaviours (e.g. Barbarossa, Beckmann, De Pelsmacker, Moons & Gwozdz, 2015; Nguyen, Greenland, Nguyen, & Vu, 2022). Alongside corporate social responsibility (CSR), key phrases like 'determinants of sustainability' are now embedded within the literature (Onwuka, 2021; Tetrevova, Vavra, & Munzarova, 2021). Moreover, it is almost three decades since Elkington (1994) introduced the 'triple bottom line' – a company's social, environmental and economic impact – as a socially responsible accounting tool and transformational framework for change. This same author has more recently signalled greater sustainability urgency, suggesting that the triple bottom line framework should be recalled because it "has failed to bury the single bottom line paradigm", and to instead apply "a triple helix for value creation, a genetic code for tomorrow's capitalism, spurring the regeneration of our economies, societies and biosphere" (Elkington, 2018, pp. 4–5).

In the context of sustainable attitudes and behaviours research, tertiary education has emerged as the most consistent 'determinant' (Nguyen, Greenland, Lobo, & Nguyen Hoang, 2019). Many of these studies have confirmed the significant relationship between higher education institutions (HEI) and sustainable attitudes and behaviours (e.g. Botetzagias, Dima, & Malesios, 2015; López-Mosquera, Lera-López, & Sánchez, 2015; Meyer, 2015; Nguyen et al., 2019; Patel, Modi & Paul, 2017; Tetrevova et al., 2021). Sustainability education has therefore become widely recognised as a key influencer of more responsible global citizens (O'Flaherty & Liddy, 2018; Swanson & Gamal, 2021). To maximise their impact, it has been suggested that HEI should proactively promote sustainability via appropriate programmes, including more informed curricula design (Barth, Adomβent, Fischer, Richter, & Rieckmann, 2014; Estellés & Fischman, 2021; Gombert-Courvoisier, Sennes, Ricard, & Ribeyre, 2014).

As the primary source of management education within HEI, business schools are commonly perceived as pivotal for imparting competencies in CSR and other sustainable business practices (Findler, 2021; Kolb, Fröhlich, & Schmidpeter, 2017; Weybrecht, 2017). In line with this, in 2007 the UN launched its Principles of Management Education (PRME) initiative, which has facilitated the inclusion of sustainability in business school programmes globally (Maloni et al., 2021; Valente, Sá, Soares, & Sousa, 2021). There has subsequently been significant growth in sustainable management education studies (e.g. Parkes, Kolb, Schlange, Gudić, & Schmidpeter, 2020).

Yet despite such research expansion, adequate understanding to help HEI plan and develop sustainable management education has often been lacking (Farinha, Caeiro & Azeiteiro, 2019; Tejedor, Segalàs, & Rosas-Casals, 2018). There have consequently been urgent calls for further research, to help HEI optimise their positive environmental and social impacts (Nguyen et al., 2019) via effective sustainable management education programmes that expedite the necessary behavioural changes among key stakeholders, including governments, organisations, communities and individuals (Bell et al., 2019).

Evaluating stakeholder perceptions and understanding of sustainability has been identified as one of the most relevant research avenues (Alsaati, El-Nakla, & El-Nakla, 2020; Birdsall, 2014; Saqib et al., 2020; Savelyeva & Douglas, 2017). In particular, better understanding of student perceptions of sustainability has been deemed necessary for informing sustainable education strategy (Wersun et al., 2020) and curricula development (Boarin, Martinez-Molina, & Juan-Ferruses, 2020; Kagawa, 2007).

Recognising and responding to these student sustainability perceptions aligns with constructivist learning principles, where eliciting prior knowledge is considered the essential first step in education design (Baviskar, Hartle, & Whitney, 2009). Once students' pre-existing conceptions of global sustainability are ascertained, appropriate sustainable education can then be developed to build on this knowledge and close any gaps. Furthermore, constructive alignment with global sustainability agendas, such as the 2030 agenda for sustainable development (United Nations, 2015), could facilitate improved sustainability frameworks or typologies that will deepen understanding and serve as useful planning tools (e.g. Biggs, 1996, 2014; McDonald, Weerawardena, Madhavaram, & Sullivan Mort, 2015; Treleaven & Voola, 2008).

This research makes important contributions via its mixed-methods examination of student sustainability perceptions at an HEI business and law school, which will inform sustainable management education design and strategy. More specifically, this research addresses sustainable management education literature gaps by responding to the calls for further investigation of:

1. HEI students' awareness and perceptions of sustainability and sustainable development (e.g. Saqib et al., 2020; Savelyeva & Douglas, 2017), including whether these vary across different education contexts (Emanuel & Adams, 2011; McDonald et al., 2015; Savelyeva & Douglas, 2017), such as students from developed countries versus less developed countries (Saqib et al., 2020)
2. Sustainability-based typologies to further improve HEI understanding of global sustainability dimensions (McDonald et al., 2015).

This study's comparison of Higher Education (HE) students' sustainability perceptions against the established literature and models of sustainability facilitates, inter alia, the identification of gaps in student knowledge and potential approaches or frameworks for informing sustainable management course design. In this context, the following section presents a review of sustainable management education literature. Subsequent sections outline the research method applied, followed by discussion of the research findings and conclusions.

2. Sustainable management education literature review

2.1. Traditional sustainable development frameworks

Over the past few decades, future sustainability has been framed as requiring equilibrium or a balance between societal, environmental and economic interests (Hansmann, Mieg & Frischknecht, 2012). Sometimes cast as 'people, planet and profit', these interconnected dimensions have served as the classic three-pillar framework guiding sustainability, including sustainable management

education and triple bottom line corporate reporting (Elkington, 1994, 1998; Savelyeva & Douglas, 2017).

The economic pillar of sustainable development encompasses the global economy, as well as corresponding business activities responsible for many negative environmental and social impacts, such as industrial pollution and unsustainable consumption (Greenland, 2019). It has therefore been recognised that future sustainability requires the education of governments, businesses and consumers to more consciously create positive environmental and societal outcomes, rather than only focusing on financial outcomes (Hunter, Smith, Schipanski, Atwood, & Mortensen, 2017). Financial targets have often been realised via production cost-cutting, fuelled by an excessive consumption culture that demands low prices. Since environmentally-friendly manufacturing practices and corresponding sustainable products are generally more costly and less convenient, these options are often overlooked by governments, businesses and consumers (Greenland, Levin, Dalrymple, & O'Mahony, 2019). Educators therefore need to consider how they can facilitate a shift away from these unsustainable attitudes and behaviours (Robinson, 2020), which could include a global citizenship pathway and improved sustainability curricula (Estellés & Fischman, 2021; Khoo & Jørgensen, 2021).

The environmental pillar of sustainable development is often undermined by governments, businesses and consumers, such as via poor waste management and pollution. Climate change driven by greenhouse gas (GHG) emissions has been recognised as the most urgent sustainability challenge (IPCC, 2018), which is linked to rises in global temperatures and drought frequency. With water and food insecurity consequently forecasted to cause future international conflicts (CDP, 2016), combatting climate change by reducing GHG emissions is a critical future sustainability objective that sustainable management educators will need to focus on (Nguyen, Lobo, & Greenland, 2017).

A key challenge for the social pillar of sustainable development is the rising global population, which is predicted to increase from 7.5 billion in 2020 to 9.8 billion by 2050 (United Nations, 2017). Emerging markets, where populations continue to explode, are of particular concern given they will experience the most significant increases in waste and pollution due to rapidly escalating energy and product consumption rates (Greenland et al., 2019).

In addition to the impacts of rapid population growth, poor lifestyle choices including the consumption of harmful products such as tobacco, alcohol and junk foods, present another major societal sustainability challenge. Harmful product consumption is driving the non-communicable disease (NCD) epidemic, which is the world's leading cause of chronic ill-health and death (Moodie et al., 2013), far surpassing COVID-19 (Sheldon & Wright, 2020). Sustainable management educators therefore need to re-educate consumers, businesses and governments on more responsible and sustainable consumption habits and production practices associated with harmful products (Greenland, Lužar, & Low, 2020).

Fig. 1. United Nations SDGs (United Nations, 2019)
Note: The UN Department of Global Communication has declared that the above UN SDG logo and tiles, are free to use and are not protected under copyrights - https://www.un.org/sustainabledevelopment/news/communications-material/.

2.2. Contemporary sustainable development frameworks

Some contemporary sustainable management educators have incorporated a fourth pillar into the framework guiding sustainable development, which reflects a growing awareness of the significance of governments. This political pillar or governance dimension of sustainability emphasises the roles government decision-making and associated community engagement can play in shaping sustainable societies (Brundiers et al., 2021; Muff, Kapalka & Dyllick, 2017).

To assist the range of sustainability stakeholders in establishing and fulfilling their socially- and environmentally-responsible obligations (Muff et al., 2017), and to help improve the equilibrium between the pillars of sustainable development, the UN introduced 17 SDGs in 2015 (United Nations, 2015). A revision of the former Millennium Development Goals, which were more focused on the developing world, these are globally-focused sustainability objectives that relate to all human activities (see Fig. 1 below).

With 193 countries signing up to the corresponding 2030 Sustainable Development Agenda that included the 17 SDGs (United Nations, 2015), organisations around the globe were encouraged by governments to report how they are supporting these goals (Bull & McNeill, 2019). CSR has therefore subsequently evolved into corporate sustainability strategies that seek to demonstrate organisational commitment and contributions to global sustainability.

As with the pillars of sustainable development, the SDGs have been adopted by many educators to help shape sustainable management education (e.g. Kolb et al., 2017; Nwagwu, 2020). As a result, the important role of HEI in advancing the implementation of these SDGs has been increasingly acknowledged (Avelar, Silva-Oliveira & Pereira, 2019).

While each of the 17 SDGs are presented as separate initiatives, like the pillars of sustainable development, they are all interrelated. For example, quality education presented as SDG4 has been recognised as a crucial means for achieving the other 16 SDGs (Liu & Kitamura, 2019). Conversely, achieving positive outcomes across the other 16 SDGs will likely have an overall impact on SDG4.

Since the interrelated nature of the SDGs can cause challenges in terms of integrating them into sustainable management education curricula (Kolb et al., 2017), some researchers have developed SDG-based frameworks to assist educators. For example, Kolb et al. (2017) produced a conceptual framework that depicts the impact of business school HEI management education on SDGs. This sequential model shows how SDG4 has a direct impact on SDG8 (decent work and economic growth), SDG9 (industry, innovation and infrastructure), SDG12 (responsible consumption and production) and SDG17 (partnerships for the goals). These in turn can foster innovation in relation to SDG6 (clean water and sanitation), SDG7 (affordable and clean energy), SDG14 (life below water) and SDG15 (life on land), which can then lead to positive outcomes for SDG1 (no poverty), SDG2 (zero hunger), SDG3 (good health and well-being), SDG5 (gender equality), SDG10 (reduced inequalities), SDG11 (sustainable cities and communities), SDG13 (climate action) and SDG16 (peace, justice and strong institutions).

This study's literature review has uncovered that there are many sustainable management educators that use conceptual models, based on the pillars of sustainable development and/or the UN SDGs. In addition to the complexities of interrelated pillars and goals, it has also been highlighted by others that a potential issue with using such conceptual models is that rather than being empirically derived, they are based on individual subjective opinions and experiences, which vary from researcher to researcher (Moody, 2005). This research has therefore sought to develop a sustainability framework that is evidence based and empirically derived via statistical analysis of HEI student perceptions of sustainability.

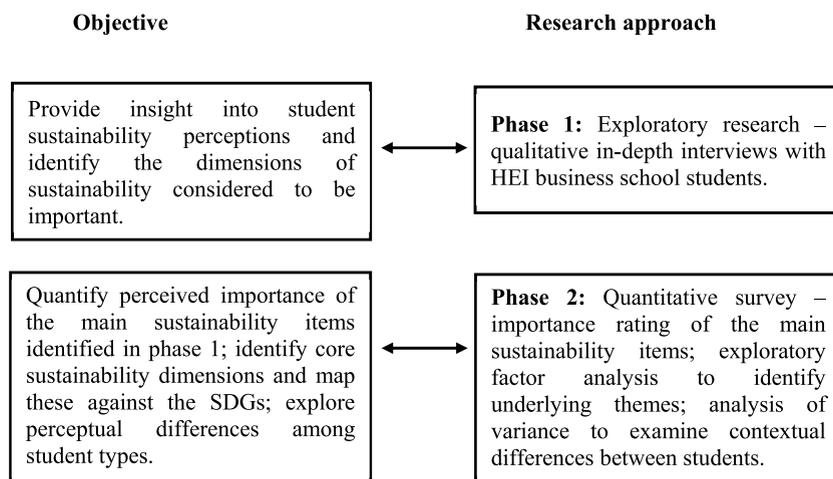| **Objective**	**Research approach**
Provide insight into student sustainability perceptions and identify the dimensions of sustainability considered to be important.	**Phase 1:** Exploratory research – qualitative in-depth interviews with HEI business school students.
Quantify perceived importance of the main sustainability items identified in phase 1; identify core sustainability dimensions and map these against the SDGs; explore perceptual differences among student types.	**Phase 2:** Quantitative survey – importance rating of the main sustainability items; exploratory factor analysis to identify underlying themes; analysis of variance to examine contextual differences between students.

Fig. 2. Logical schema of the research.

3. Methodology

3.1. Research design and context

In this study a sequential mixed-method approach was used (see Fig. 2), which combines the benefits of qualitative and quantitative data collection and analyses (e.g. Petkova & Lamm, 2021). An initial qualitative phase was used to produce detailed insights on student sustainability perceptions to inform items in a subsequent questionnaire. This is a common approach in sustainability and sustainable education studies, which compared to singular method approaches is considered to enhance research reliability via the development of more robust research instruments (e.g. Molina-Azorín & Font, 2016; Sasson, 2019). A subsequent quantitative phase was then used to capture the perceived importance of the identified sustainability items to facilitate statistical analyses and the identification of core underlying sustainability dimensions, as well as any differences between student types.

This research focused on the business school of one public HEI in Australia – Charles Darwin University (CDU). Such use of a single case study is a common research approach in sustainable management education studies (Nwagwu, 2020).

CDU was established in 2003 and is listed among the top 500–600 institutions globally, with almost 7000 full-time equivalent students (Times Higher Education, 2022). Like many HEI across the globe CDU is committed to sustainability, and in 2020 it became a University Signatory to the UN SDGs (Charles Darwin University, 2021). Corresponding initiatives at CDU include the introduction of a common sustainability course embedded in all undergraduate degree programmes from 2021, as well as specialist sustainability of-ferings such as a new MBA in Sustainable Enterprise delivered by the Asia Pacific College of Business and Law (APCBL) since 2022 (APCBL was renamed in 2018 – previously known as the CDU School of Business and Law).

Most CDU APCBL students undertake business, accounting and law degrees, while there is also a vocational education training (VET) cohort studying across a variety of other business-related subjects. APCBL accounting and business courses are comprised of approximately 50% international students, while the other programmes are predominantly domestic students.

This study was designed to inform CDU's overall sustainability education strategy and APCBL sustainable management education design for the new MBA in particular. This research was conducted in the second semester of 2020 during the COVID-19 pandemic and targeted the APCBL student cohort as outlined below in Table 1.

Ethical approval for this research project was granted by CDU's Human Research Ethics Committee (CDU-HREC, reference *H20024)*. Further detail on the mixed-method approach applied in this study, along with the corresponding results for each phase are discussed below.

3.2. Phase 1: Exploratory online qualitative research

Qualitative research has been recommended for generating deeper *student* insights *required* for HEI strategy and practice, because it typically probes the experience of these participants with open questions (Butcher & Rose-Adams, 2015; O'Shea, Stone, & Delahunty, 2015) and accommodates nuance of expression in documented evidence. Within this study, the primary objective of the qualitative phase was to identify core sustainability dimensions based on student sustainability perceptions, to include in a subsequent questionnaire.

The qualitative research phase used a convenience sample of APCBL business and accounting degree students, and involved an online depth interview protocol to accommodate COVID-19 social distance restrictions. In September 2020, two 90-min focus groups comprised of 8 and 11 participants respectively were conducted via the Blackboard Collaborate synchronous discussion function on CDU's learning management system (LMS), with recordings of the discussions transcribed immediately after each group. Such group discussions have been used in other investigations of student sustainability perceptions (e.g. Gramatakos & Lavau, 2019).

To provide further insights and ensure all key sustainability themes were identified in the qualitative phase, the focus groups were supplemented with 40 online in-depth computer-assisted self-interviews (Cooper & Schindler, 2006), as used in other student per-ceptions research (e.g. Greenland, Saleem, Misra, & Bhatia, 2021). These additional interviews involved an introduction to the qualitative study and link to Qualtrics via the LMS, where participants individually responded to the same questions that were used in the groups.

The qualitative schedule for both the group and individual in-depth interviews was comprised of open-ended questions used to capture student sustainability perceptions, including what they considered to be the most urgent sustainability issues. It began by asking students for their general views on what sustainability meant to them, before probing on what sustainability issues they were aware of and their knowledge of the UN SDGs. They were then further probed for dimensions and responsible behaviours in the context of the environment, society and the economy.

Table 1
Targeted APCBL student cohort.

APCBL qualification	Post-graduate	Under- graduate	Total
Accounting degree	252	253	505
Business degree	137	154	291
Law degree	–	606	606
VET (primarily business)	–	–	614
Total	**390**	**1013**	**2016**

The overall qualitative sample in this first phase was comprised of a total of 59 participants. According to Fugard and Potts' (2015) qualitative sample size tool, a sample of 50 participants is robust and has a 95% probability of capturing at least one instance of themes common to 6% of the population.

3.2.1. Qualitative analysis and findings

The qualitative data analysis used a combination of automated and manual analysis, as recommended by de Graaf and van der Vossen (2013). Leximancer automated content analysis software was first applied to identify the sustainability issues that students viewed as most urgent, and to explore corresponding interrelationships (e.g. Looser and Mohr, 2020). Leximancer has been deemed as effective for analysing larger volumes of qualitative data, including within exploratory research (Sotiriadou, Brouwers, & Le, 2014).

Fig. 3 below presents a Leximancer visual concept map with theme size at 60% and visible concepts at 100%. The map shows four interrelated themes – sustainability, social, environment and people – and depicts the linkage of numerous sustainability concepts including current and future needs of people, the environmental cost of anthropogenic activities, social and economic impacts, as well as environmental and corporate sustainability aspects.

This study's qualitative data were also analysed using manual thematic analysis. While Leximancer focuses on individual words, manual thematic analysis is an interpretive approach that provides more detailed insights (Braun & Clarke, 2014). This manual analysis involved reading through all the responses to identify main themes and subthemes, with code frames then developed and applied to facilitate the counting and comparison of theme prevalence (Namey, Guest, Thairu, & Johnson, 2007). Table 2 below provides a summary of the main sustainability themes and associated subthemes that were highlighted as issues at least three times by the participants.

The following verbatim quotations illustrate some of the most frequently mentioned subthemes within each of the above-listed main sustainability themes.

Environmental: *"**Pollution** – I think of the garbage that almost engulfs India and the smog that fills its atmosphere. It's all driving climate change."*
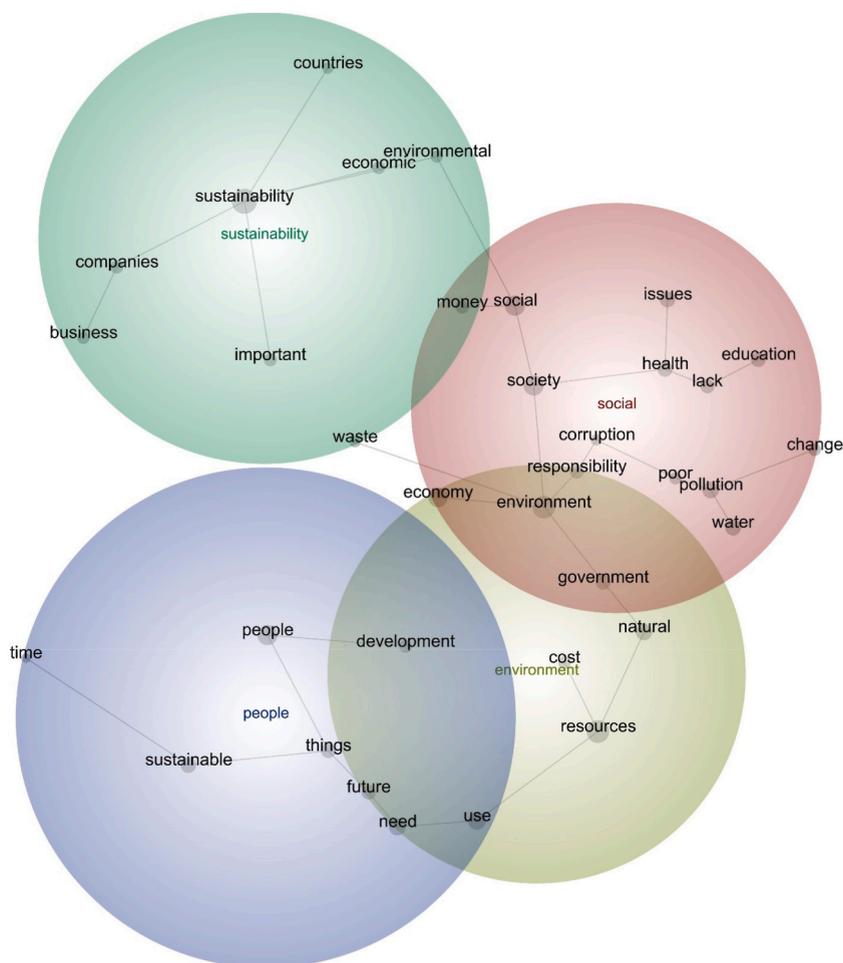

Fig. 3. Leximancer concept map of sustainability themes, issues and linkages.

Table 2
Sustainability issues most frequently mentioned by the students.

Sustainability issues – <u>main themes</u> and subthemes	Frequency of mention
Environmental	76
Pollution and climate change	26
Deforestation, desertification and food shortages	15
Water scarcity/pollution	13
Waste/plastic	11
Bushfires	6
Carbon emission	5
Economic	**67**
Economic growth/stagnation	28
Employment	15
Overconsumption of resources	6
Investment	6
Income (slow growth and low wages)	3
Corrupt corporations	3
COVID-19 and health	3
Insufficient production/manufacturing	3
Societal	**59**
Racism and discrimination	17
Education (including access and poor quality)	13
Poverty (including poor diet and ill-health)	12
Human rights	9
Security and personal safety	8
Responsible and ethical business practice	**55**
CSR	22
Environmental issues	12
Fraud/unethical practices	10
Employees (exploitation, safety, salary, etc.)	6
Discrimination/harassment	5
Governance and political	**46**
Power/corruption and weak governance	27
Political/legislative issues (including regulations)	9
Transparency (lack of)	4
Proper use of funds/lack of strategy	3
Immigration policy	3

Source: Manual thematic analysis of in-depth interviews (59 participants)

Economic: *"We are not trying hard enough to gear our **economy** away from the polluters … there are a great many laissez-faire businesspeople around who want little or no government regulation."*

Societal: *"Australia is rich in cultural diversity and its one of its greatest strengths as a nation. Despite this, many individuals experience **unfair treatment and racism** because of how they look and where they originate from."*

Responsible and ethical business practice: *"**Corporate social responsibility** is an area of growing debate and discussion worldwide, and increasingly in Australia. Companies have obligations that extend beyond shareholders. CSR requires companies to consider the interests of all stakeholders including investors, suppliers, consumers, employees and the community in going about their business."*

Governance and political: *"**Corruption** and black-market activity can also be key issues, which without government policy would undoubtedly increase."*

3.3. Phase 2: online quantitative survey

The second phase of this study involved a structured online survey administered using Qualtrics. The link to the Qualtrics survey was sent to APCBL students undertaking undergraduate, postgraduate and VET programmes (as listed above in Table 1) via CDU's LMS. Before data collection began, an informed consent statement was provided, which included details of the research purpose and respondent confidentiality assurance.

In addition to contextual questions relating to students' education history and demographics, the survey captured their perceived level of importance attached to the sustainability themes identified in the qualitative phase (see Table 3 below). After reviewing the qualitative findings, 34 sustainability dimensions were identified for inclusion in the questionnaire. Some of the more frequently mentioned subthemes such as 'pollution and climate change' were broken into separate questionnaire items – pollution, climate change and sea level rise. While more items could have been included, it was deemed as important to keep the questionnaire to an acceptable duration of less than 15 min. For example, the questionnaire item relating to racism and discrimination could have comprised separate items relating to race, gender and nepotism.

Survey respondents were asked to rate the perceived importance of each sustainability item using a 7-point importance scale, where 1 = not at all important and 7 = absolutely essential/critical. While both 5-point (Saqib et al., 2020) and 7-point scales (Santos, Caetano, Baron, & Curral, 2015; Silva, Moutinho, Coelho, & Marques, 2009) are commonly used for measuring importance, 7-point scales have been recognised as providing more accurate measures of respondent evaluations (Finstad, 2010). The survey data were

Table 3

Questionnaire questions and items reflecting the sustainability issues identified in the qualitative research phase.

SURVEY - SUSTAINABILITY QUESTIONS
A. Please indicate the level of importance you attach to each of the following global environmental sustainability dimensions by selecting an appropriate point on the scale below, where 1 = not at all important and 7 = absolutely essential (critical).
(Please note there is no right or wrong answers we just want to know your views)
1. Climate change/global warming
2. Air pollution
3. Deforestation and desertification
4. Water scarcity
5. Household waste (including plastic)
6. Industrial waste
7. Rising sea level
B. Now please indicate the level of importance you attach to each of the following global social sustainability dimensions
8. Poverty
9. Discrimination and inequality
10. Human rights
11. Safety and security
12. Healthcare (accessibility and quality)
13. Diet and lifestyle choices
14. Education (accessibility and quality)
15. Access to basic amenities and infrastructure (e.g. power, water, sanitation, road)
16. Hunger and not enough to eat
17. Disease and illness
18. Over consumption (people consuming too much)
C. Now please indicate the level of importance you attach to each of the following global economic sustainability dimensions
19. Economic growth
20. Unemployment
21. Corruption
22. Lack of investment and development funds
23. Inflation
D. Now please indicate the level of importance you attach to each of the following global business and commercial sustainability dimensions
24. Corporate <u>environmental</u> responsibility
25. Corporate <u>social</u> responsibility
26. Unethical financial practices (including corporate fraud and not paying taxes)
27. Employee exploitation (including child labour, health and safety issues)
28. Fair working conditions
29. Businesses influencing governments and regulations for their own gain
E. Now please indicate the level of importance you attach to each of the following global government and political sustainability dimensions
30. Political corruption
31. Abuse of power (lack of government accountability and responsibility)
32. Government and political transparency
33. Poor governance
34. Fair laws and justice for all

analysed using SPSS.

A total of 508 students attempted the survey, and after removing cases with a high number of missing values, a total of 383 useable responses remained. Case-wise or list-wise deletion is a common practice of data cleaning, to avoid data bias in cases where missing values exceed 50% of the study variables and the deletion of cases does not affect power of analysis (Cheng, Kao, & Lin, 2021). This aligns with other student perception studies that have relied on samples of around 300 when investigating sustainability contexts (Valente et al., 2021). Furthermore, the sample achieved in this study based on the overall population of 2016 targeted students, exceeded what is required for a 95% level of confidence with a 5% margin of error (Zikmund, 2007). Similar confidence levels have previously been reported in other sustainability studies (Nguyen, Nguyen, Nguyen, & Greenland, 2021).

3.3.1. Quantitative sample

Details of the survey respondent characteristics are presented in Table 4 below, which includes 66.58% under 34 years of age and 67.10% female, which is reflective of the APCBL student profile. The table also shows that most student respondents were enrolled in post-graduate programmes (45.69%), followed by under-graduate (36.55%) and VET (17.23%). In addition, 53.00% were domestic students, while most international students were from Asia Pacific emerging markets such as Nepal, India, China and Bangladesh.

3.3.2. Exploratory factor analysis

Exploratory factor analysis (EFA) is a data reduction technique that is used to empirically derive underlying core themes (factors) within larger numbers of corresponding elements (questionnaire items) via a rotated solution (Hair, 2010; Wismeijer, 2012). In this study, EFA was used to identify the core underlying sustainability themes within the 34 survey sustainability items rated along the 7-point importance scale. In this manner, rather than using pre-existing sustainability frameworks to group sustainability dimensions, EFA empirically uncovered the underlying structure of the sustainability items and identified the core underlying sustainability themes within the data.

Table 4
Demographic distribution of student respondents (n = 383).

Variable	Category	Distribution (valid)		Missing values	
		Frequency	Percentage	Frequency	Percentage
Age	Under 18	4	1.04	1	0.26
	>18-24	81	21.15		
	>24-34	170	44.39		
	>34-44	68	17.75		
	>44-54	32	8.36		
	Above 54	27	7.05		
Student type	Domestic	203	53.00	1	0.26
	International	179	46.74		
Gender	Male	124	32.38	2	0.52
	Female	257	67.10		
Country of origin	Australia	203	53.00	0	0
	India	34	8.88		
	Bangladesh	20	5.22		
	China	25	6.53		
	Nepal	38	9.92		
	Pakistan	8	2.09		
	Indonesia	3	0.78		
	Malaysia	1	0.26		
	Other	51	13.32		
Course	VET	66	17.23	2	0.52
	Under-graduate	140	36.55		
	Post-graduate	175	45.69		
Total years in HE	<1 year	77	20.10	2	0.52
	1–2 years	143	37.34		
	3–4 years	63	16.45		
	>4 years	98	25.59		
Study area	Business	118	30.81	0	0
	Accounting and finance	157	40.99		
	Law	72	18.80		
	Other	36	9.40		

This study's EFA was conducted via principal component analysis with a Varimax rotation method (Yong & Pearce, 2013). The Kaiser-Meyer-Olkin (KMO) measure (KMO = 0.948) indicated the sampling adequacy of 383 responses for EFA, with sufficient inter-item correlation from significant Bartlett's test of sphericity ($p < 0.001$) to proceed for further analysis of factor structure (Kaiser, 1974; Yong & Pearce, 2013). This assessment of factors and corresponding iterative refinement process were based on factor and cross-loading criteria, as recommended in the literature (Field, 2017; Nunnally, 1994). That is, the items with factor loading lower than 0.5 and a cross-loading between different factors lower than 0.2 were sequentially removed from the analysis. Three of the 34 sustainability items included in the questionnaire did not load onto any factors based on a loading of at least 0.5 (13. Diet and lifestyle choices; 17. Disease and illness and 18. Over consumption - people consuming too much). This suggests these items were either redundant or not prominent in student sustainability perceptions.

The EFA generated a five-factor model, comprised of 31 items and a total explained variance of 68.75%, which was greater than the acceptable level of total explained variance in social sciences (Hair, 2010). These five factors were named based on the items making up each, in line with extant sustainability literature. The factors, item structure and nomenclature are summarised in Table 5 below.

3.3.3. Hierarchical components model and dimensionality assessment

After EFA, a hierarchical component model (HCM) was established based on the partial least square structural equation modelling (PLS-SEM) approach, via the SmartPLS v.3.3.3 programme. PLS-SEM has become an increasingly common approach within business research (Ahn & Kwon, 2020; Inyang & Jaramillo, 2020; Schirmer, Ringle, Gudergan, & Feistel, 2018). It enables estimation of complex models (including those with several constructs and indicators), which is accommodating for distributional violations, and provides a high degree of statistical assuredness (Hair, Risher, Sarstedt & Ringle, 2019).

The primary purpose of the specification and estimation of HCM in this study was to confirm the importance of each sustainability dimension/factor explored during EFA, and to also assess for reliability and validity.

3.3.4. Reliability and validity assessment

Reliability of constructs refers to the capacity of an instrument to repeatedly measure the intended concept or phenomenon and yield identical results (Nunnally, 1994), while validity relates to an instrument's ability to measure what it is meant to (Clark & Watson, 1995). The results reported in both Tables 5 and 6 (above and below) confirmed that five sustainability factors were reliable and robust (α: 0.863–0.836; CR: 0.907–0.948) (Nunnally, 1994). In addition, the convergent validity and discriminant validity measures confirmed that the constructs were valid in the context of the sustainability dimensions (AVEs: 0.588–0.888; $HTMT_{0.85}$: 0.443–0.721) (Churchill, 1979; Hamid, Sami, & Sidek, 2017; Henseler, Ringle & Sarstedt, 2015).

Table 5
Factor measurement model properties.

Factor	Items	Indicator level loading	Higher order loading (HOC » LOC)	Percentage variance	AVEs	CR	α
1. Environmental sustainability	1. Climate change/global warming	0.832	0.829	18.677	0.724	0.948	0.936
	2. Air pollution	0.829					
	3. Deforestation and desertification	0.821					
	4. Rising sea levels	0.759					
	5. Water scarcity	0.752					
	6. Industrial waste	0.733					
	7. Household waste	0.672					
2. Political sustainability	8. Abuse of power	0.848	0.831	17.718	0.663	0.940	0.927
	9. Poor governance	0.836					
	10. Political corruption	0.832					
	11. Corruption	0.721					
	12. Employee exploitation	0.688					
	13. Government and political transparency	0.644					
	14. Business influencing governments	0.641					
	15. Unethical financial practices	0.635					
3. Social sustainability	16. Human rights	0.751	0.900	17.257	0.588	0.934	0.922
	17. Safety and security	0.749					
	18. Healthcare accessibility and quality	0.741					
	19. Access to basic amenities	0.714					
	20. Education accessibility and quality	0.651					
	21. Fair work conditions	0.607					
	22. Hunger and not enough to eat	0.606					
	23. Discrimination/inequality	0.532					
	24. Fair laws and justice for all	0.522					
	25. Poverty	0.506					
4. Economic sustainability	26. Economic growth	0.789	0.709	9.099	0.708	0.907	0.863
	27. Inflation	0.787					
	28. Lack of investment and development funds	0.690					
	29. Unemployment	0.688					
5. Corporate sustainability	30. Corporate environmental responsibility	0.671	0.714	6.003	0.888	0.940	0.873
	31. CSR	0.616					
KMO value				0.948			
Bartlett's test				0.000			
Total percentage variance explained				68.754			
Range of communalities				0.568–0.823			

Notes: Principal component analysis conducted with Varimax rotation; AVE = average variance explained; CR = composite reliabilities.

Table 6
Discriminant validity of sustainability factors using HTMT0.85

Sustainability factors	A. Environmental	B. Political	C. Social	D. Economic	E. Corporate
A. Environmental	**0.850**				
B. Political	0.581	**0.814**			
C. Social	0.721	0.670	**0.766**		
D. Economic	0.484	0.654	0.645	**0.841**	
E. Corporate	0.652	0.573	0.697	0.443	**0.942**

Notes: Diagonal elements indicate the square root of AVE; all other elements are HTMT correlations.

3.3.5. Dimensionality assessment and modelling

After the exploration of the factor structure, another important objective of this research stage was to explore and develop a typology of HEI student-centred sustainability. Based on the confirmatory tetrad analysis (CTA) developed in SmartPLS, it was deemed appropriate to specify a reflective-reflective higher order model of student sustainability perceptions (Gudergan, Ringle, Wende & Will, 2008) comprised of five distinct but intercorrelated sustainability dimensions (see Fig. 4 below).

The HCM of sustainability in Fig. 4 presents the estimated higher-order model of student sustainability perceptions. The sustainability dimensions are presented in order of the highest significance as perceived by the students involved in this research and statistically established via the PLS algorithm. It is worth noting that, unlike EFA, the PLS algorithm in HCM analysis identifies the
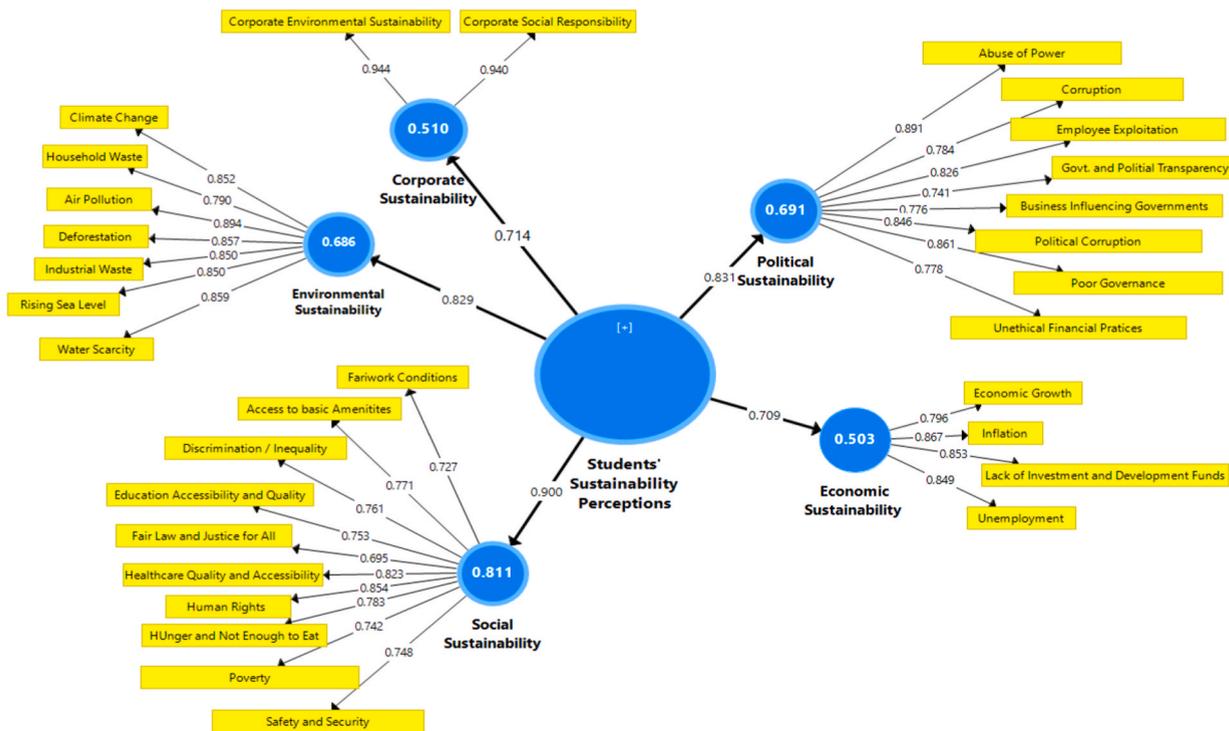
Fig. 4. Sustainability HCM based on student perceptions.

importance of higher-order dimensions of a construct based on factor loading and informs which dimensions provide a better explanation of the construct. That is, instead of the contribution to the proportion of variance explained, the dimensions are ranked according to the higher-order factor loading. The estimated model revealed that the student respondents perceived issues related to social sustainability as most important (λ social sustainability = 0.900), followed by political sustainability (λ political sustainability = 0.831), environmental sustainability (λ environmental sustainability = 0.829), corporate sustainability (λ corporate sustainability = 0.714), and economic sustainability (λ economic sustainability = 0.709). The HCM therefore reconfirms and further validates the dimensions and sustainability constructs identified in the EFA.

3.4. Contextual investigation

In this study, analysis of variance (ANOVA) was used to explore any potential differences in sustainability perceptions based on various student respondent demographics and study characteristics. Table 7 highlights those corresponding results where significant differences emerged.

In relation to age, compared to younger students, those aged 55+ attached significantly higher importance to political sustainability (x = 6.66, p < 0.01). In contrast, those aged 25–34 attached significantly higher importance to economic sustainability compared to other age groups (x = 5.85, p < 0.01).

In the context of gender, there were some significant differences in relation to perceptions of environmental, social and corporate sustainability. For example, female student respondents provided significantly higher importance ratings than males across the three sustainability dimensions ($x_{env.sust.}$ = 6.33, p < 0.01; $x_{soc.sust.}$ = 6.35, p < 0.01; $x_{cor.resp.}$ = 6.13, p < 0.01).

In the context of study characteristics, the only sustainability dimension where international student perceptions notably differed from domestic students was economic sustainability, where international students deemed this as more important (x = 5.99, p < 0.01). Furthermore, post-graduate students rated economic sustainability as more important than VET and under-graduate students (x = 5.93, p < 0.01). In the context of the three main disciplines of business, law and accounting, there were no significant differences in sustainability perceptions, so these data were not included in Table 7.

Table 7
Differences between sustainability perceptions and student context.

Demographic variables	Categories	n =	Sustainability dimensions				
			Environmental	Social	Political	Economic	Corporate
Age	Under 18	4	5.39	5.27	5.43	4.25	5.12
	18–24	81	6.19	6.21	5.80	5.63	6.00
	25–34	170	6.14	6.22	5.89	5.85	5.95
	35–44	68	6.43	6.33	6.21	5.76	6.16
	45–55	32	6.08	6.28	6.30	5.42	6.03
	55+	27	6.43	6.33	6.66	5.12	6.46
$f_{(5,376)}$			1.63	1.24	4.17	3.87	1.66
Sig.			0.150	0.285	0.001	0.002	0.143
Gender	Male	124	5.94	6.01	5.93	5.69	5.83
	Female	257	6.33	6.35	6.05	5.68	6.13
$f_{(1,379)}$			11.76	13.07	1.02	0.007	5.77
Sig.			0.001	0.000	0.311	0.933	0.017
Student type	Domestic	203	6.14	6.17	6.10	5.41	5.95
	International	179	6.28	6.32	5.91	5.99	6.13
$f_{(1,380)}$			1.70	2.72	2.93	25.74	2.66
Sig.			0.193	0.100	0.088	0.000	0.103
Course	VET	66	6.28	6.31	6.28	5.72	6.00
	Under-graduate	140	6.13	6.18	5.90	5.35	6.01
	Post-graduate	175	6.26	6.25	6.01	5.93	6.06
$f_{(2,378)}$			0.74	0.53	2.78	10.07	0.13
Sig.			0.474	0.584	0.063	0.000	0.877

Notes: VET = vocational education and training; n = number of respondents.

4. Discussion

This section discusses this study's findings and their implications for sustainable management education by relating them to associated literature, including previous models of sustainability and the UN SDGs.

4.1. Five pillars of sustainability

Both three- and four-pillar models of sustainable development, and the 17 UN SDGs, have commonly been used to guide sustainable management education (Brundiers et al., 2021; Muff et al., 2017; Savelyeva & Douglas, 2017). Although it has been argued that these prior models and frameworks are often conceptual in nature (Burford et al., 2013; Muff, 2017). This means they are mostly based on subjective opinions and experiences that vary from researcher to researcher, rather than derived from empirical analysis (Moody, 2005).

Prior to analysing the importance ratings of the 34 sustainability dimensions identified in this study's qualitative phase, it was anticipated that a considerable number of factors would emerge that were more aligned with 17 SDGs rather than the three- and four-pillar models of sustainable development. Yet the subsequent EFA of student sustainability perceptions produced a robust five-factor model with the following distinct, statistically derived pillars of sustainability: social, environmental, economic, political and corporate.

As shown in both Table 5 in the EFA and in Fig. 4 for the CTA, these five factors all had substantial factor loadings above 0.7 (Hair et al., 2019) and were statistically significant. These same five themes also emerged in the earlier thematic analysis within the qualitative phase (see Table 2). The five core sustainability dimensions clearly relate to the traditional three- and four-pillar models of sustainable development (e.g. Brundiers et al., 2021; Muff et al., 2017; Savelyeva & Douglas, 2017), but with a new fifth pillar of corporate sustainability that is distinct to this study. This new corporate sustainability pillar has been determined as logical, as business activity is responsible for many negative environmental impacts, such as industrial pollution and unsustainable consumption, and supports the argument that more sustainable business and production practices are a fundamental prerequisite for future sustainability (e.g. Greenland, 2019; Hunter et al., 2017).

Sustainable management educators could therefore adopt these five empirically derived pillars as a more appropriate framework for guiding education strategy and course design. Examination of each of the items comprising each factor and their associated importance also provide further insights for understanding these key sustainability dimensions from the student perspective. Each of the five sustainability dimensions is discussed below, in order of relative importance as indicated by the higher-order factor loading.

4.1.1. Social sustainability

Social sustainability usually refers to a process that creates sustainable places and communities that promote the wellbeing of individuals, including health and comfort considerations, safety and security issues, pleasant interactions between individuals, and the support of social values and cultural lifestyles (Fatourehchi & Zarghami, 2020). In alignment with the observations of other social sustainability assessments (Fatourehchi & Zarghami, 2020; Walker et al., 2021), this factor emerged in this study's EFA as the most important factor, with a higher-order loading of 0.900 and was comprised of 10 items. The most important item was human rights with a score of 0.751, which encapsulates aspects of all the other attributes making up this factor. In order of importance, the other items

were safety and security, healthcare accessibility and quality, access to basic amenities, education accessibility and quality, fair work conditions, and hunger and not enough to eat – all with loading scores above 0.6.

While those items with lower loading scores could be considered as less important, this may also highlight gaps in student sustainability knowledge, which could be addressed in sustainability curricula design. For example, poverty is comparatively the least important item in the social sustainability factor with a score of 0.506; 0.5 is commonly deemed the cut-off point for exclusion from factor interpretations (Hair, Sarstedt, Ringle & Mena, 2012). This finding may reflect the fact that HEI students often come from more affluent backgrounds, meaning that studies conducted among less affluent respondents could produce a different outcome. Likewise, the other items that scored below 0.6 for the societal sustainability factor – discrimination/inequality, and fair laws and justice for all – may also represent knowledge gaps and might also prove to be more significant concerns among more disadvantaged groups.

4.1.2. Political sustainability

While political sustainability is generally overlooked in the traditional three-pillar sustainable development model, it is included in the four-pillar model (Brundiers et al., 2021) and has become increasingly relevant in contemporary times where declining democracies and the need for new forms of governance have been reported (Huang, 2021; Lührmann & Rooney, 2021). Based on the Brundtland Report, "an action is politically sustainable if it allows for the fulfilment of current political goals and resource needs without compromising future goals and needs" (Broniatowski & Weigel, 2006, p. 2).

In this study's EFA, political sustainability emerged as the second most important factor with a loading of 0.831 and consisted of eight items. Abuse of power at 0.848 was the most important item, which reflects the overall essence of this factor. In order of importance, the other items related to poor governance, political corruption, corruption in general, employee exploitation, government and political transparency, and unethical business and financial practices.

4.1.3. Environmental sustainability

Sustainability models frequently evaluate environmental responsibility based on interaction with the natural ecosystem to maintain natural resources and avoid jeopardising their availability for future generations (Ali, Younus, Khan & Pervez, 2020), and include emission of pollutants, resources consumption, waste minimisation and recycling, and green product manufacturing (Ben Ruben, Nithin Balaji, Pranav, & Jayasuryaa, 2020). In this study, environmental sustainability emerged as the third most important factor with a loading of 0.829 and was comprised of seven items. Climate change/global warning was the most important item, closely followed by air pollution and deforestation and desertification – all these items had loadings above 0.82. None of the remaining items – rising sea levels, water scarcity, industrial waste and household waste – had a loading below 0.672.

4.1.4. Corporate sustainability

Extending beyond the notion of CSR, corporate sustainability has been defined as "the leadership and management approach that a corporation adopts so that it can profitably grow and at the same time deliver social, environmental and economic outputs" (Kantabutra & Ketprapakorn, 2020, p. 3). As such, this dimension provides broader scope in the context of corporate profiling than the implied reporting function of CSR. In support of other studies that have highlighted the relevance of corporate sustainability (Aksoy, Yilmaz, Tatoglu, & Basar, 2020; Jia & Li, 2020), this study's EFA identified it as the fourth most important factor with a higher-order loading of 0.714. This factor was comprised of two items – corporate environmental sustainability and CSR – that both had loadings above 0.610.

4.1.5. Economic sustainability

The economic sustainability concept is closely interrelated with social and environmental sustainability. At the macro level, economic sustainability refers to practices intended to ensure long-term economic growth without compromising the social and environmental aspects of a community (Arya, Srivastava, & Jaiswal, 2019). In this study, economic sustainability emerged as the fifth most important factor with a higher-order loading of 0.709, and was comprised of four items. The most important item was economic growth with a loading of 0.789, followed by inflation, unemployment, and lack of investments and development funds.

4.1.6. Contextual differences

Further analysis of this study's student sustainability perceptions by their contextual characteristics revealed no significant differences based on the different disciplines of business, accounting and law. However, the importance students attached to the five sustainability dimensions varied somewhat according to gender, and to a lesser extent by age, for domestic versus international students, as well as VET versus degree students. These findings support other studies that have also recognised differences in student sustainability perceptions based on contextual factors, such as education location (e.g. Boarin et al., 2020; Emanuel & Adams, 2011) and emerging versus developed home countries (e.g. Saqib et al., 2020). It is important for sustainable management academics to be aware that different types of students have different perceptions of sustainability, so that corresponding education can accommodate such variances.

4.2. SDG mapping against the five sustainability pillars

Sustainability pillars and the UN SDGs have both been used to guide sustainable management education. Fig. 5 below presents this study's mapping of those SDGs deemed as most strongly related to each item making up the five sustainability factors or pillars. These are presented in the sequence of the EFA higher-order factor scores, with the items for each sustainability factor presented in order of their loadings, as shown in Table 5.
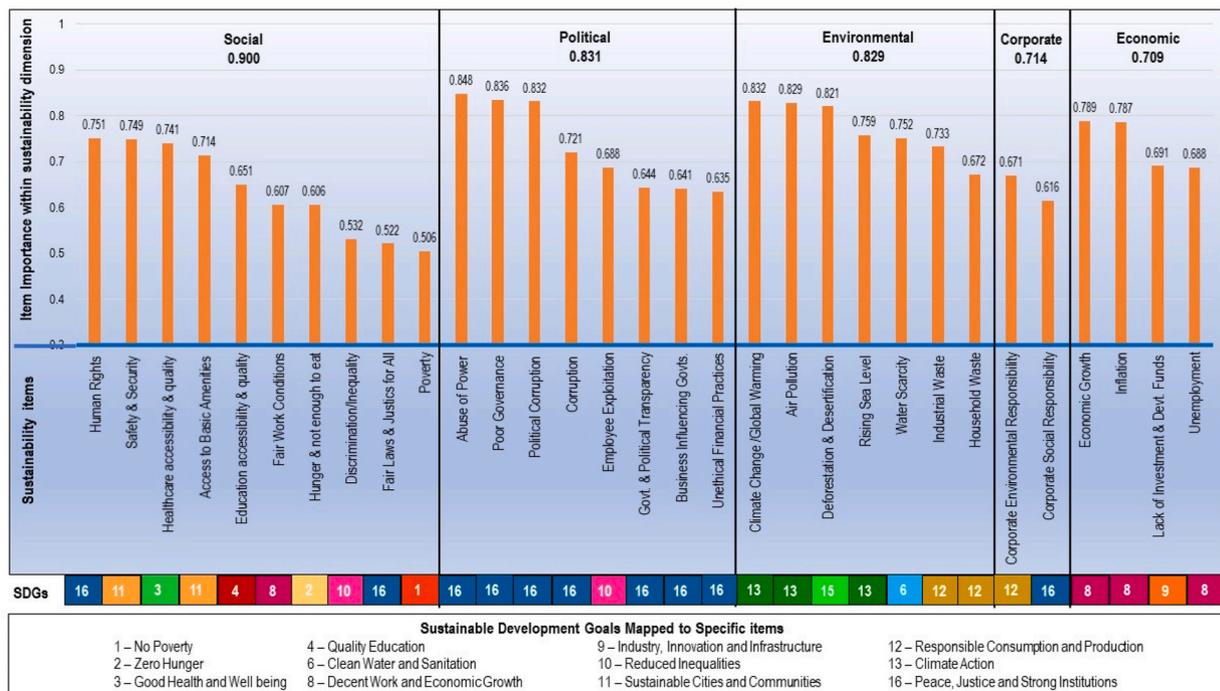
Fig. 5. SDGs mapped against sustainability items (from five sustainability factors).

As the results in Fig. 5 show, 12 of the 17 SDGs were mapped against the items that make up each of the five sustainability factors. The exceptions were SDG7 affordable and clean energy, SDG14 life below water, SDG15 life on land, and SDG17 partnerships for the goals. These might be considered gaps in students' SDG-related knowledge, which APCBL's sustainable management education programme could seek to address with a redeveloped curriculum. SDG5 gender equality is also missing from the mapping in Fig. 5, because SDG10 reduced inequalities was deemed to be the closest match with the 'discrimination/inequality' item. While gender inequality was mentioned in the qualitative phase, a decision not to break out 'discrimination/inequality' into several dimensions was made in this study, to keep the questionnaire at a manageable length.

Furthermore, some of the SDGs only appeared once in the mapping, while others such as SDG12 responsible consumption and production, and SDG16 peace, justice and strong institutions appeared numerous times. This suggests that some of this study's sustainability items, particularly those relating to political and corporate sustainability, which were considered significant by the students, may not be adequately reflected in the 17 SDGs. Although the more detailed SDG descriptions provided within associated UN SDG documentation do elaborate on some of these aspects (e.g. United Nations, 2015).

The interconnected nature of the sustainability pillars and SDGs has been recognised as a challenge for sustainable management educators with respect to integrating them into their sustainability curricula (Kolb et al., 2017). Such complexity became evident in this research when mapping SDGs against the sustainability items. For some sustainability items it was difficult to identify which SDG was most closely related to it. For example, the sustainability item fair work conditions could also be associated equally with SDG16 peace, justice and strong institutions, instead of SDG12 responsible production and consumption as indicated in Fig. 5. Likewise and as already mentioned, SDG5 gender equality and SDG10 reduced inequalities were both identified as equally relevant to the sustainability item discrimination/inequality.

5. Conclusion

Effective sustainable management education is essential for imparting the knowledge, attitudes and skills that will foster organisations and societies capable of addressing the world's sustainability challenges. This study has helped to close some gaps in the sustainable management education literature via a sequential mixed-methods research approach that generated deeper understanding of student perceptions of sustainability.

This study's main contribution is via its perception based, empirically derived five-pillar model of sustainability, comprising 31 sustainability items. The five sustainability pillars were derived using EFA applied to the importance ratings of students' key sustainability concerns, which were identified in the study's initial qualitative phase.

Prior sustainability models and frameworks have often been conceptual in nature, which means that rather than being derived empirically, they are based on subjective researcher opinions and experiences. This study's empirical approach confirms the validity of the pillars common to traditional three- and four-pillar conceptual models of sustainability (economic, environmental, social and

political). This research also identified a new and distinct fifth pillar – corporate sustainability – which is logical given the negative sustainability impacts of much organisational activity.

Among the five pillars identified, social sustainability emerged as the most important with human rights, safety and security, healthcare accessibility and quality, and access to basic amenities identified as the key items. Political sustainability was the second most important pillar, with abuse of power, poor governance and political corruption the top three items. Environmental concerns, which are frequently at the forefront when people consider sustainability, emerged as the third most important pillar. This was followed by the corporate and economic sustainability pillars. The greater importance attached to the social and political pillars may stem from a contemporary global perspective that has evolved during COVID-19, when health concerns including government handling of the crisis have filled newspaper headlines around the globe.

Analysis of the ratings of the sustainability constructs and items provided evidence that perceived importance varies across different student types such as by gender, age, programme level and country of origin, including developed versus emerging markets. The mapping of the five sustainability pillars against SDGs also confirmed the complex interrelated nature of the development goals and the challenge this presents in terms of categorisation.

In conclusion, this study can help sustainable management educators develop deeper understanding of sustainability via its detailed investigation of students' perceptions. The empirically derived perception based, five-pillar model of sustainability provides a new approach for structuring sustainability education and appreciating the components making up the five pillars. The findings also help to appreciate students' contextual differences and their varying knowledge and perceptions of sustainability, which can then be reflected in sustainable management education design.

This study was conducted in the semester prior to the rollout of a new sustainability unit common to all CDU degrees, and the year before the launch of an MBA in Sustainable Enterprise. The findings are being used to inform the design of these courses. This research provides benchmark data of CDU student sustainability perceptions against which the impact of subsequent sustainable management education can be evaluated to inform further improvement.

5.1. Limitations and future research

This research focused on students within business, accounting and law programmes at one Australian university. Thus, while its insights should be helpful to other HEI interested in sustainable management education, as well as businesses considering their sustainability impacts, the generalisability of the study's findings may be limited.

Future research might duplicate this study's approach, to investigate the impact of wider contextual factors on sustainability perceptions. For example, it would be interesting to observe whether the same five sustainability pillars and their levels of importance are replicated in different regions, such as the Middle East and Africa. Likewise, it will be beneficial to examine student perceptions across more diverse disciplines, including the arts and sciences. Furthermore, future investigation could focus on the perceptions of other key sustainability stakeholders, such as business practitioners. Such investigations of practitioner perceptions could be prioritised in the sectors recognised as having the most detrimental sustainability impacts, such as agriculture, mining and oil and gas production, as well as manufacturing. This study's sample also had a small number of VET students. However, the fact significant differences emerged between the perception ratings of VET and degree students suggests that research using a larger VET sample offers another worthwhile avenue of further investigation.

The mapping of SDGs against the five-pillar model confirmed the challenge of linking sustainability pillars and SDGs, and that such interpretation is subjective. While this research focused on student perceptions of sustainability, future studies could investigate perceptions specifically in relation to SDGs to enhance understanding of the complex interrelationships between the goals and to address the challenge of categorising SDGs. By adapting this study's approach to investigate perceptions of SDGs, empirically derived SDG models can be developed to further inform sustainable management education and corresponding business practice.

Lastly, this study was conducted during the COVID-19 pandemic, which may explain why the social pillar of sustainability was perceived as most important. It is imperative to continue monitoring sustainability perceptions, as these are dynamic in nature. Since this study's data collection, increased global political tensions have become apparent, such as the negative economic impacts of Brexit on the UK and Europe as well as the Russia–Ukraine crisis. Future studies might therefore find that the political pillar has become more important.

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Author statement

Steven Greenland: Conceptualization, research and methodology design, writing original draft and revision. **Muhammad Saleem**: Data management, application of statistical techniques to analyse study data and associated write up. **Roopali Misra**: Management and coordination of research data collection, qualitative analysis including SDG mapping. **Jon Mason**: Writing input to initial draft, including critical review and editing.

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