

Integrating ESG in a Managerial Accounting Class

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Among organizations and businesses, there has been a growing global attention on companies' approach to climate change and sustainable development. Concurrently, the United States, Securities and Exchange Commission (SEC) has announced the intent to require publicly traded companies to disclose information on climate-related risks (SEC, 2022), signaling a need for carbon emission reporting integrated with financial statements. Accounting practitioners and educators are thus concerned with accounting students' preparedness in developing skillsets that will meet the current demands for integrated reporting of climate-related and other sustainability or ESG mitigation measures (AAA, 2023). Despite this growing concern, few accounting cases address sustainability/ESG management. This case requires students to use data analysis to estimate the cost-benefit analysis across three variable costing budgets in a production cycle of a manufacturing plant while integrating the estimation of carbon emissions attributed to a number of products produced and sold. Students could synthesize relevant information on ESG issues related to production and make decisions on sustainable approaches to inventory production.

Keywords: climate risk, carbon emissions, ESG, variable costing

INTRODUCTION

Among organizations and businesses, there has been growing global attention on companies' climate risk and approach to sustainability or environmental, social, and governance (ESG) management strategies (in this study, I refer to climate risk and opportunities interchangeably with sustainability and ESG management). For example, the 2022 *Global Investor Statement to Governments on the Climate Crisis* (The Investor Agenda, 2022), expresses global investors' concerns about their investments (valued at USD \$42 trillion in assets)' exposure to climate risk (The Investor Agenda, 2022). In the United States, the Securities and Exchange Commission (SEC) published guidance on climate change-related disclosures in 2010, aimed at providing stakeholders the information needed to assess the effects of climate change on company performance and operations (SEC, 2010). In 2022, the SEC proposed rule changes requiring publicly traded companies to disclose information on climate-related risks (SEC, 2022). Similarly, in 2023, on a global scale, IFRS Foundation, through its International Sustainability Standards Board (ISSB) launched two sustainability disclosure standards, S1 (General Disclosures) and S2 (Climate-Related Disclosures), aimed at addressing investors' sustainability information needs and providing guidance to companies to enable them to provide decision-useful information on sustainability (SASB, 2023). In tandem with these announcements and actions, accounting practitioners and educators are signaling a growing emphasis on the accountant's role in sustainability reporting (AAA, 2023; Bakarich, 2022) as "the specific professional skills of accountants—including in governance, risk management and control, business analysis, and

decision support, which involves measuring, reporting, and providing assurance on financial and non-financial data—will become increasingly in demand” (IFAC, 2016, p 7). Furthermore, researchers assert that “at companies, the finance and sustainability function need to be able to explain investments in sustainability and their contribution to financial performance” (Eccles & Mirchandani, 2022, p 1). And empirical evidence provides insights that when a company’s in-house assurance engagements include non-financial information on sustainability measures alongside traditional financial information, firms benefit from higher financial statement audit quality (Lu et al., 2023).

However, despite this evidence on the rising importance of the accountant’s role in sustainability reporting, there are still challenges in meeting the demands for incorporating sustainability reporting in accounting education (Bakarich, 2022; AAA, 2023). In July of 2023, the AAA issued a proposal to establish a *Sustainability Accounting Section* for their members, which included purposes and objectives of the intended section under the sub-sections of research, research, teaching and education and practice/service (AAA 2023b). This proposal was based on the results of a survey taken earlier in 2023 by AAA members. In this survey 80 percent (375) out of 463 people indicated that they expected an increase in the future demand for and interest in business sustainability education. Additionally, roughly 70 percent (314) out of 451 respondents of the same survey answered “yes” to the need for new textbooks on business sustainability and sustainability reporting and assurance.

The purpose of any education is to prepare students to enter practice roles, and this is no different for students in accounting programs. Managerial accounting is that part of accounting that prepares students with the skill set to estimate what it costs companies to run their operations and provides decision support for the company’s strategies. In practice today, there are still concerns that organizations still struggle with implementing sustainability into their corporate and operational strategies (Beusch et al., 2022; Battaglia et al., 2016; Engert et al., 2016; Lueg & Radlach 2016). IFAC’s recommendation on the role that accountants are likely to play in sustainability management provides clues to how accounting can rise to the demands of providing decision support on ESG integration (IFAC, 2016). Management accounting, including cost accounting, has decision-making and control as parts of its main functions (Zimmerman, 2017). Furthermore, empirical research has demonstrated the use of costing information systems as informative for decision-making (Daowadueng et al., 2023; Qiu et al., 2023; Balakrishnan et al., 2012; Engert et al., 2016; Battaglia et al., 2016; Lueg & Radlach, 2016).

Using variable costing as a managerial accounting tool, this study provides a cost accounting approach on how students in an accounting program can analyze inventory production and its implications on a manufacturing company’s carbon emissions management strategy. The case scenario used in this application drew from the ISSB’s summaries intended for guiding general requirements for the disclosure of sustainability-related financial reporting. Specifically, in practice, entities should disclose information on strategies that entities use to manage sustainability-related risks and opportunities (IFRS S1, 2023). Additionally, the *connected information* section of IFRS S1 provides practice guidance.

For the choice of methodology, I noted that IFRS S2 recommends the use of climate-risk scenario analysis as one of the means through which entities might be able to assess their exposure to climate risk and a mechanism to determine opportunities that might arise in strategizing the mitigation of those risks (IFRS S2, 2023). Cases are a well-established scenario analysis methodology. The case approach applied in this study depicts a manufacturing company contemplating its inventory sustainability risk and opportunities related to the manufacturing strategy of a specific product offering over a fiscal year. Accounting methods using variable costing and absorption costing are analyzed for inventory planning and sustainability implications. Students demonstrated learning efficacy by correctly applying costing methods and data analysis to make production recommendations. Satisfaction surveys showed that students perceived learning gains in integrating sustainability/ESG considerations in internal accounting for inventory production.

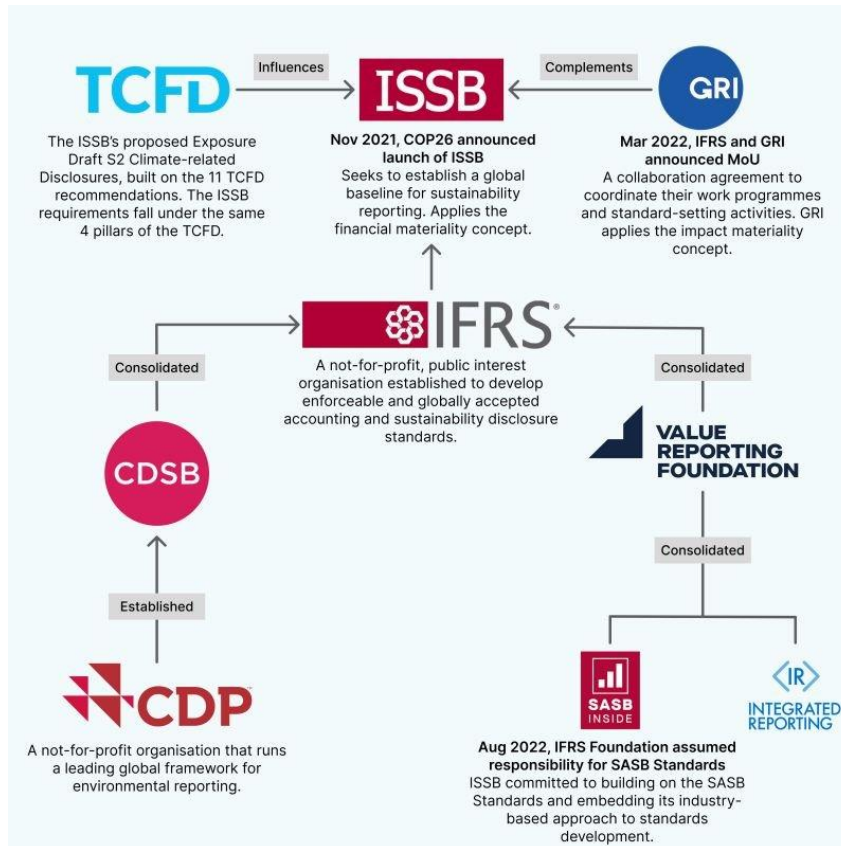
LITERATURE REVIEW

ESG Reporting Standards for Accounting & Finance

Over the last decade, multiple standards have been used for ESG reporting and related to integrated entity financial statements. Many companies have used voluntary standards such as GRI (Global Reporting Initiative) frameworks and the Sustainability Accounting Standards Board (SASB) frameworks. GRI standards cut across many sectors affecting an entity including the economy, environment, and governance of people. According to KPMG’s Survey of Responsibility Reporting 2022, covering 250 largest global companies by revenue (G250), 78% of those companies had used GRI standards by 2022 (KPMG, 2022). The GRI strives to guide an integrated approach to reporting financial and sustainability information. With the recent progress on SASB frameworks and other international reporting standards, the GRI also helps entities consolidate their information with other relevant frameworks.

Recently, many of the frameworks being developed over the last few years have consolidated into S1 and S2 standards led by the ISSB and IFRS. The consolidated frameworks include the SASB and the Taskforce on Climate-related Financial Disclosures (TCFD) frameworks. The TCFD was formed in 2015 in response to the myriad climate risk impacts felt by multinational businesses globally. It aimed to provide companies with a framework to report on their climate risk to provide investors with informative reporting that would protect capital markets. The various frameworks formerly in use in accounting and finance and their consolidation flow are outlined in Figure 1 below.

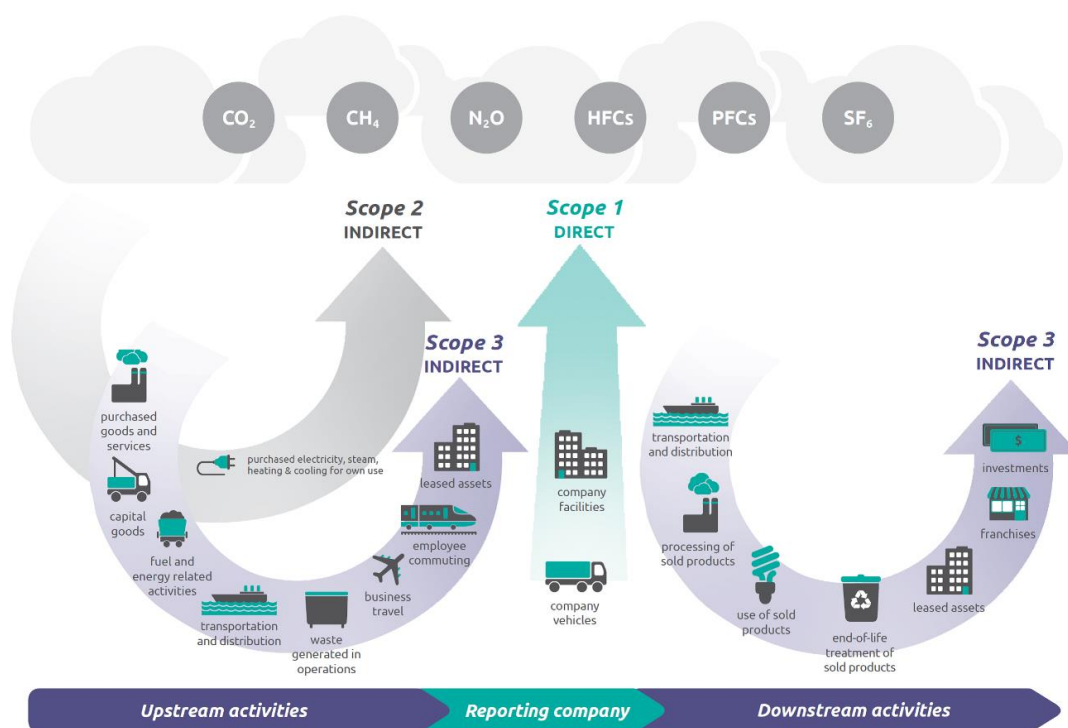
**FIGURE 1
CONSOLIDATION FLOW OF ACCOUNTING & FINANCE FRAMEWORKS FOR
ESG REPORTING**



Source: ESG Professional’s Network (2023). An infographic on ESG reporting landscape, Available at: <https://www.esgprofessionalsnetwork.com/an-infographic-of-the-esg-reporting-landscape/>

The ISSB has focused on the proposed rules by the SEC to require publicly traded companies to report on their carbon emissions. The expected carbon emissions reporting should include Scope 1 and 2 emissions and to some extent, Scope 3 (see figure 2). For accounting and finance firms to provide integrating reporting consulting services capturing both financial and non-information (carbon emissions) in a standardized manner, IFRS developed guidance that is expected to become the standard-setting guidance framework for accountants going forward (Eccles & Mirchandani, 2022). These standards are embodied in S1 and S2. The requirements in S1 on connected information are intended to provide users of general-purpose financial reports with a better understanding of the connections between various disclosures in an entity’s general-purpose financial reports... Entities must also explain the relationships and trade-offs that arise between various sustainability-related risks and opportunities (IFRS S1, 2023, p 29).

FIGURE 2
THE SEC PROPOSES CARBON EMISSIONS (SCOPE 1-3 ILLUSTRATED HEREIN)
REPORTING BY PUBLICLY TRADED COMPANIES



Source: The United States Environmental Protection Agency. Available at:
<https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance>

Such guidance in practice would imply that reporting on entities’ internal sustainability strategies should be integrated with financial outcomes such as revenue and profit or loss. This is compatible with other conceptual frameworks surrounding sustainability in business contexts such as work by Esty and Winston (2009) who build a business case for sustainability by analyzing the intersection between revenues, intangibles, costs, and risk. Also, Winton et al. (2017) analyze companies increasingly incorporating the measurement and tracking of costs related to energy usage as value-creation strategies. And as Siegrist et al. (2020) outline reductions in risk and increases in sales as among the features which a firm embracing a long-term approach to a sustainable business model would adopt, in Huang (2021)’s study, a positive empirical connection was made between ESG performance and corporate financial performance. These practices provide internal and external reporting opportunities as accounting systems play an integral role in business strategy and risk tracking (West and Brereton 2013).

CASE STUDY APPLICATION

The case was designed to integrate sustainability/ESG strategies into managerial accounting methods. The case was applied in a managerial accounting class and upper-division undergraduate managerial accounting classes. The subject matter covered a manufacturing company's production cycle and the use of variable accounting methods for its measurements and estimations of inventory. Absorption costing methods were explored as well. The application of data analysis enabled the measurement and estimations of energy and carbon emissions associated with each unit of inventory produced. Students were provided with sustainability and ESG resources, classroom teaching, and discussions.

Requirements

Students considered a case scenario of a manufacturing plant intending to include de-carbonization strategies in its operations. Data on how much inventory could be produced within a yearly period was included in the considerations. Inventoriable costs were provided, including direct materials, direct manufacturing labor, and manufacturing overheads. Price of product sales and fixed costs were also included. Using variable costing methods to estimate income statement budgets, students arrived at variable and fixed costs for the period according to how many units of inventory were budgeted. Using data analysis applications, students were asked to compare their budgets against budgets using the absorption costing approach. Energy usage and carbon emission data attributed to each unit produced were analyzed as part of the requirements. Students then answered the following questions:

1. What are the differences in operating income while using a variable costing approach as opposed to an absorption costing approach for each of the inventory levels provided?
2. Upon conducting a data analysis of inventory production levels, what internal accounting approach is most likely to amount to the lower level of energy usage?
3. What are the implications of the internal accounting approach when integrating a sustainability/ESG focus in the planning of inventory production?

In-Class Sessions

Since implementing the costing methods involved in-depth use of excel, I integrated excel schedule proofing periods in class to enable students to proof their schedules. This was done in 30-minute sessions in one class session a week after the project was assigned. The class was organized such that students could provide feedback to their peers while allowing them to resolve any issues with their schedules while I was present to offer support. Students were also able to test out data visualization methods and receive peer and instructor feedback. The students then implemented revisions of excel projects once the proofing sessions were completed.

In-class discussions were also conducted on students' understanding of sustainability and ESG and the growing focus on accounting and finance firms. Case studies of the Big Four accounting firms, Deloitte, Ernst & Young (EY), KPMG, and PwC and their firms' approach to sustainability were also discussed. The class viewed their client videos, testimonials, and website stories. This exercise was aimed at helping students make the connection between sustainability/ESG and its place in accounting. Discussions following such views revealed that students were excited about the accounting profession's involvement in sustainability practices. Other resources such as the GRI standards and Textbook chapters on ESG were also discussed. Students then continued to work on their analysis. Over three weeks, instructor support was provided in class, and through office hours, students completed and submitted the project.

APPLICATION EFFICACY

Classroom application studies in accounting have often used surveys to assess teaching efficacy (Apostolou et.al., 2013; Blazovich et. Al. 2014; Grim, 2015; Matherly & Burney, 2013) thus to track the usefulness of this study's case application, a survey instrument was used. A pre-case survey was applied before introducing the case, and a post-case survey was applied after the case was submitted, but before

grades were posted. Students were asked to rate their perceived knowledge and skillset on several considerations pertaining to the case subject matter and application tools. The rating was a 5-point likert scale, anchored on strongly agree and strongly disagree. Overall, students perceived that the case developed their skills on data analysis and visualization applications useful for making strategic decisions on sustainability in managerial accounting. Table 1 below details the findings of the survey results.

**TABLE 1
PRE-POST TEST SURVEY RESULTS**

	Response	Percentage
Student Demographics		
MBA students	23	22.77%
Undergraduate Upper-division Accounting Students	78	77.23%
Total	101	100.00%
	Means	p-value
Q1. Rate your level of knowledge of sustainability risk related to carbon emissions in inventory production.		
Student response mean on pretest	1.818	
Student response mean on post-test	2.444	
P(T<=t) two-tail		(0.020) *
Q2. Rate your level of knowledge of how internal accounting approaches to inventory production relate to sustainability risk and management.		
Student response mean on pretest	1.954	
Student response mean on post-test	2.722	
P(T<=t) two-tail		(0.010) **
Q3. Rate your level of knowledge in applying data analysis for decision making on choice of internal accounting approach that would enhance carbon emissions reductions in inventory production.		
Student response mean on pretest	1.863	
Student response mean on post-test	2.5	
P(T<=t) two-tail		(0.020) *
Q4. Rate your level of knowledge on estimating carbon emissions related to absorption costing when chosen as the internal accounting approach to inventory production.		
Student response mean on pretest	1.772	
Student response mean on post-test	2.611	
P(T<=t) two-tail		(0.000) ***

Q5. Rate your level of knowledge on estimating carbon emissions related to variable costing when chosen as the internal accounting approach to inventory production.

Student response mean on pretest	1.727
Student response mean on post-test	2.7
P(T<=t) two-tail	(0.000) ***

Q6. Rate your level of knowledge on estimating energy and carbon emissions wasted or saved related to choice of internal accounting approach for inventory production.

Student response mean on pretest	1.772
Student response mean on post-test	2.8
P(T<=t) two-tail	(0.000) ***

Q7. Rate how comfortable you feel using data analysis tools to analyze cost/benefit tradeoffs in sustainability targeted inventory production.

Student response mean on pretest	1.822
Student response mean on post-test	2.5
P(T<=t) two-tail	(0.020) **

Q8. Rate how comfortable you feel using data analysis tools to determine an internal accounting approach to recommending a more sustainability focused inventory production strategy.

Student response mean on pretest	1.822
Student response mean on post-test	2.5
P(T<=t) two-tail	(0.020) **

Responses were provided on a five-point scale anchored at strongly disagree (1) and strongly agree (5)

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

Student Satisfaction Results

Students' ratings on their level of satisfaction with various knowledge and skills were also assessed on how well they felt that the case had fostered growth. Student responses were also assessed and investigated to determine if certain student groups may have felt higher learning gains than others. The results indicated that among the student-groups high high-performing students evidenced by higher GPA's were more likely to feel higher knowledge gains and skill development than students with lower GPA's. Similarly, students with more work experience expressed more satisfaction in skill development than those with less work experience. Table 2 below details the findings of the student satisfaction survey results.

TABLE 2
TEST OF STUDENT SATISFACTION

R1. The case encouraged me to apply knowledge of sustainability risk related to carbon emissions in inventory production.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	23	50	1.036
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	39	34	(0.017) **
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	7	46	0.475
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	0.187

R2. The case enabled me to gain knowledge on internal accounting approaches to inventory production related to sustainability/ESG.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	23	50	1.011
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	39	34	0.461
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.012) **
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.245

R3. The case enabled me to gain knowledge on applying data analysis to decision making on choice of internal accounting approach that would enhance carbon emissions reductions in inventory production.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	23	50	(0.001) ***
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	39	34	0.461
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.022) **
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.122

R4. The case enabled me to gain knowledge on estimating carbon emissions related to absorption costing when chosen as the internal accounting approach to inventory production

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	17	54	1.201
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	37	34	0.271
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.061) *
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.245

R5. The case enabled me to gain knowledge on estimating carbon emissions related to variable costing when chosen as the internal accounting approach to inventory production.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	17	54	1.312
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	37	34	(0.061) *
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.071) *
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.123

R6. The case encouraged me to gain knowledge on estimating energy and carbon emissions wasted or saved related to the choice of internal accounting approach for inventory production.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	17	54	1.124
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	37	34	(0.001) ***
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.000) ***
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.245

R7. The case encouraged me to feel more comfortable using data analysis tools to analyze cost/benefit tradeoffs in sustainability targeted inventory production.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	17	54	1.201
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	37	34	(0.001) ***
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	(0.000) ***
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	42	32	1.621

R8. The case encouraged me to feel more comfortable using data analysis tools to determine an internal accounting approach to recommending a more sustainability focused inventory production strategy.

Classification	MBA	Accounting Undergraduates	<i>p</i> -value
	17	54	(0.040) **
GPA (Avg. = 3.4161)	Above Average	Below Average	<i>p</i> -value
	37	34	(0.021) **
Work Experience (Avg. = 63.205 months)	Above Average	Below Average	<i>p</i> -value
	30	43	1.212
Gender (No response for non-binary designation)	Female	Male	<i>p</i> -value
	32	33	1.311

Responses were provided on a five-point scale anchored at strongly disagree (1) and strongly agree (5)

*Significant at the 10% level

**Significant at the 5% level

***Significant at the 1% level

CONCLUSION

The urgency of integrating sustainability management in accounting curricula is evident as regulatory bodies are gearing towards requiring ESG reporting among business entities. Accounting education must update its curricula to live up to the moment as “[T]here’s no time to waste in getting topics, tools, and strategies in place in today’s accounting curriculum to tackle pressing ESG issues.” (Brands & Holtzblatt, p.1). Furthermore “incorporating ESG into existing curricula demonstrates that sustainability is integral to business and not a supplemental practice and thus needs to be strongly embedded” (Simmons et al. 2023, p. 5) into accounting curricula. This study is thus a timely contribution to the growing development of ESG-integrated learning in accounting education.

It is also important to note that this study is not without limitations. The scope of our study covered managerial accounting topics and focused on upper-division undergraduate accounting students and MBA students taking an accounting class. The study could improve its variability by applying similar cases to introductory courses in accounting. Additionally, other forms of efficacy could improve the findings. For instance, there is room to use open-ended questions to obtain a wider range of student views. Overall, applying this case was a valuable endeavor as it is one step in the right direction as the calls for more integration of ESG content in accounting education become the prevailing need.

ENDNOTE

- ¹ IRB approval was obtained prior to embarking on this study. The study was classified under Exempt Status.

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