Article

Exploring Postgraduate Students' Knowledge about Environmental Sustainable Development and How This Is Being Applied

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ABSTRACT

Sustainable development is universally acknowledged as meeting the needs of the current generation without impacting on the next generation. Sustainable development is often synonymous with creating an ideal sustainable management vision to help manage sustainability issues. Such vision usually involves creating environmental sustainability policies to aid the reduction of the depletion of natural resources, provision of energy and use with minimal impact on the environment, waste management, provision of water and waste water management, among others.

Students are often seen as agents of change and many will be the leaders of tomorrow, this fact informed this study. The study adopted a quantitative approach using survey questionnaires and collected data was analysed using descriptive statistics. We found students possessed appropriate knowledge needed about environmentally sustainable development, good understanding of environmental issues and practices for resolving these and were engaged and contributing to sustainable development.

KEYWORDS: sustainable development; environmental sustainability; postgraduate student; environmental protection; sustainability management

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INTRODUCTION

There has been a growing need and concern for sustainable development to ensure that we make today better for tomorrow [1]. It cannot be overemphasised if we say that there is a need to address the negative impacts of social, economic, and environmental issues the world is facing to realise a sustainable planet. In view of this global, regional, and national sustainable development policies have been conceptualised and put into practice to ensure human activities on the environment today are sustainable enough to make same environment better for next generation. However, this can only be effectively done through teaching people about sustainable activities and practices formally. Accordingly, Wals [2] argues

that educating people on sustainable practices can serve as one of the panaceas to the concurrent issues facing sustainability. According to [3] higher education institutions are in a better position to educate their students on the expected sustainable practices and skills needed to make them capable and competent of living a sustainable life.

Religion and culture could influence peoples' perceptions and attitudes towards environmental sustainability [4]. However, we are of the opinion that education could be used to play a key transformational role in cultivating a positive cultural change towards sustainable living. Because of the need to educate and realise sustainable development, the United Nations Educational, Scientific and Cultural Organisation [5] called for Education for Sustainable Development to enable people to obtain knowledge, skills, attitudes, and values towards a sustainable world. Barth et al., [6] suggested that higher institutions globally should include sustainability education in their curriculums. However, Uitto and Saloranta [7] argues that the multi-dimensional status of sustainability could constitute a problem regarding teaching and implementing them in the curriculum. However, Baniasadi et al., [8] suggested that only by engaging in education on environmental, social, and economic issues would help determine a better future of the world and its sustainable development.

This study, with 196 participants, examines knowledge acquired by postgraduate students and their understanding of environmental sustainable development, and the application of the same in addressing sustainability issues. This study also examine the environmental issues the participants are aware of and their contribution towards sustainability and environmental sustainable development.

LITERATURE REVIEW

The World Commission on Environment and Development (WCED) set up in 1983 [9], published its report titled "Our Common Future" [10]. The report is otherwise referred to as the "Brundtland Report" [10]. The report evaluated global environmental problems and found that the majority of problems were caused by massive poverty in the southern hemisphere and non-sustainable consumption and production patterns in the northern hemisphere. This situation called for a strategy to balance socio-economy and environmental development therefore, the concept of sustainable development was adopted. The report argues that sustainable development occurs when humankind makes development sustainable to meet the needs of the present without compromising the ability of future generations to meet their own needs [10]. Similarly, Salonen and Tast [11] describe sustainable development as a process of creating capacities and opportunities for people to make this generation better for generations coming behind.

In view of the importance of sustainable development and the need to make today better for tomorrow, the Sustainable Development Education

(SDE) Panel was inaugurated by the government in the United Kingdom (UK) [12]. To attain appropriate and universally acceptable meaning to SDE, the panel suggests that SDE should be engaging in learning activities needed to improve and maintain human quality of life today and for generations to come. It iproposes that individuals, groups, businesses, governments acquire knowledge on how to live and act sustainably, understanding how to participate, and help resolve environmental, social, and economic issues within and outside the immediate environment [12]. Acquiring appropriate and needed knowledge and putting same into practice will help create better world to live in the next century. However, the panel finally define SDE as 'Education for sustainable development' that enables people to develop the knowledge, values, and skills to participate in decisions about the way they do things individually and collectively, both locally and globally, that will improve the quality of life now without damaging the planet for the future [12].

This study suggests that SDE is about equipping individuals, communities, groups, businesses, and government to live and act sustainably; as well as giving them an understanding of the environmental, social, and economic issues involved. It is about preparing for the world we will live in the next century.

With the first global launch the United Nations declared 2005-2014 as the Decade of Education for Sustainable Development (DESD) [5]. It marked the beginning of harnessing and emphasising the importance of their initiatives to all concerned about education, the natural environment, and the well-being of future generations. The DESD was meant to marshal the educational resources to enhance and create a more sustainable future. To achieve the desired impact, sustainable agriculture and forestry, research and technology transfer, finance, sustainable production, and consumption would need to be included. The DESD report recognised education as one of the pathways to realising global sustainable development. However, this study argues that education alone cannot achieve the expected sustainable future but agrees that without education and learning in sustainable development it will be difficult to attain the global sustainable development goal.

In view of the importance and the need for attaining a sustainable environment, UNESCO [5] suggested that Education for Sustainable Development (ESD) should support people to acquire the knowledge, skills, attitudes, and values necessary to shape a better sustainable future; ESD should include issues of climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption; the teaching and learning relationship should be motivational enough to enable students to develop positive sustainable behaviours to engage in sustainable development. Similarly, the Council of the European Union [13] suggested that without ESD it would be difficult to achieve a sustainable environment. The Council suggested that ESD is not only needed at all levels of formal education and training but also non-formal

and informal learning. Similarly, the Sustainable Development Education Panel Report [12] did not emphasise that ESD should be facilitated through levels of formal education and training only. However, it describes ESD as the acquisition of learning needed to ensure and promote a sustainable environment to enhance the quality of life of this generation and generations to come [12]. Engaging in ESD, people will develop knowledge, values, and skills to enable them to make decisions individually and collectively on local and global issues concerning improving quality of life and sustainability without damaging the environment for the next generation.

According to United Nations Committees on Education Development [14], education for sustainable development should focus on ensuring the younger generation of today becoming responsible citizens of tomorrow capable of making a better environment in the future. Accordingly, de Haan [15] argues that in a democratic society, students are given opportunities to shape their country's sustainable future based on concept of sustainable development. Contrary to this, we are of the opinion that whether a country is democratic or totalitarian/despotic it will require the involvement of graduates in the development of sustainability policies and application of same to improve and make the environment safer. Graduates are in a better position to manage sustainable development having acquired the knowledge required to manage the environment to achieve better sustainable outcomes. Above all, we are of the opinion that students of today become the leaders of tomorrow irrespective of where they reside, either in the city or village or within a democratic or totalitarian society.

Economic activities, development, and modernisation have resulted in environmental degradation such as water pollution, air pollution and depletion of natural resources [16]. Reversing this trend will require positive environmental management through ESD to create a generation with the knowledge and skills required to enhance sustainable practices [17].

Studies had been carried out to examine the implications of students' knowledge about sustainability development [18,19]. According to Rahman et al., [19] acquisition of sustainability knowledge by students help them to create a positive sustainable behaviour willingness to have long-term impacts on sustainable development. Human ecology plays a role in people's thoughts about sustainability; social and cultural background influences their approaches to sustainability. Providing sustainable education to individuals, and or groups will help create a positive view in attitude and behaviour toward sustainability.

Orme and Dooris [18] argue that it is more appropriate for higher education institutions to integrate health-related work under the umbrella of sustainability. We argue that higher education institutions should integrate health-related educational activities into their sustainability development (curriculum) education. Adopting such will create a healthy higher educational institution approach to proposing a significant and

appropriate mechanism for enabling synergy between public health and sustainable development. Adopting health-related educational activities will help create a healthy and sustainable working, learning, and living environment for the institution as a community and wider society at large.

Examining how graduate economics students' sustainability knowledge reflected on their sustainability developments, practices, and personal lifestyles [20] found that because they were educated on sustainability they were seriously concerned about the sustainability of water and its wastage, the need to save energy but more concerned about appropriate waste disposal management. However, participants' lifestyles did not seriously reflect their concerns about sustainability, though they were keen to learn more about sustainability [20]. Kimanzi [20] recommended the need for higher education institutions to develop curriculum on educating students on the importance of sustainable practice and development. Contrary to this, [21] argues that to realise effective and needed change in sustainable practices and behaviour teachers need to change from their transmissive teaching models to transformative learning models. Similarly, [22] suggested the need for teachers to advance students with every facet of new knowledge needed to understand and appreciate sustainable development. Wals [2] stresses the importance of teachers engaging in transformational teaching to enhance transformational learning. This teaching-learning relationship should not only be knowledge acquisition but should also focus on engaging students in the act of sustainability practices. However, Dannenberg and Grapentin [23] concluded that while positive sustainable knowledge and behaviour toward sustainable practices may enhance sustainable development they emphasised that capacity for critical thinking, reflexivity, and transformation is paramount to enhancing sustainable environmental development.

While this study has discussed, evaluated, and critiqued knowledge of education for sustainable development, we concluded that irrespective of peoples' level of education, religious faith plays some role in peoples' attitudes towards sustainable practice especially ensuring a sustainable environment. According to Hope and Jones [4], religious beliefs and values influence peoples' perceptions and attitudes towards environmental sustainability. Hope and Jones [4] suggest that both Christians and Muslims have low perceptions of the urgency associated with environmental issues because they believe in the afterlife and divine intervention. Because of a lack of belief in the afterlife and divine intervention, secular participants were more concerned about environmental issues and the need for humans to be more responsible and active about environmental sustainable development [4].

Though existing research has greatly contributed to sustainable education and its implications on global sustainability [5,18,19,22,24]. These studies have neither highlighted nor discussed knowledge of postgraduate students' education for sustainable development and how

such knowledge is applied. To bridge the gap in the literature and to add to existing knowledge, this study explores the understanding of postgraduate students' knowledge about environmental sustainable development and how such knowledge is being applied. In view of the above discussion, the following research questions were formulated:

A. What are the current postgraduate students' understanding of environmental sustainability and how they apply these understandings?
B. What environmental issues are postgraduate students aware of?
C. How do postgraduate students contribute to practice sustainability and sustainable development?

Methodology

This study adopted quantitative research methods to represent quantifying data collected, utilisation, and analysis of the data. It used SPSS statistical analytical techniques to answer the study's research questions such as what, who, how [25]. We adopted quantitative research method to emphasises independent of the researchers from the research. The object being researched in this study is independent from the investigator. This is one of the guiding theories of quantitative research and was applied prior to research findings. Struwig [26] argues that quantitative data should be objective, precise, and reliable.

Research Design

Research design could be described as processes undertaken by the researcher to articulate what data will be required in the study, what methods will be used to collect the data required, and what analytical method will be used to analyse the data collected [27]. All these constitute a framework created by the researcher seeking answers to the research questions and to resolve the research problem [28]. Research design could also be referred to as a coordinated strategy used by the researcher to integrate major components of the research about answering the research questions and resolving research problem [27].

This study uses a descriptive research design because it helped to provide answers to the study's research questions of what is going on? And how it is going associating with the study's research problem. It also helped to obtain data concerning the current understanding of the study's phenomena, describing what exists and how it exists regarding variables in the study. It also presents us the opportunity to present the study's results in texts, drawings, tables, graphs, statistical notions [29]. However, Zikmund [30] argues that descriptive research is mostly used to describe the characteristics of a population or phenomenon.

Population and Sample

According to Banerjee and Chaudhury [31] research population constitutes a set of people with common or a set of defined characteristics, while a sample is referred to as a subgroup of the population. The population of this study is all postgraduate students in New Zealand however the target population is postgraduate students from three universities, three polytechnics and five colleges running postgraduate courses in Auckland.

The study adopted a convenience sample of postgraduate students from tertiary institutions. According to Saunders et al., [32], convenience sampling is a non-probability sampling method that collects data from a population that is convenient. However, sampling method was the best for this study to access and collect data easily, and for time and cost-saving. Using this provided the study with valuable information to answer the research question needed to resolve the research problem.

Participants were invited to take part in the study through email, a network of postgraduate students, and other lecturers' contacts. The same channels were used for the return of the completed survey. Participation was voluntary, the study adopted a 5 Likert scale as the survey instrument to collect data needed from the participants. Participants were asked 34 survey questions categorised into the following: knowledge on sustainability; knowledge on current environmental issues; sustainable practices. Descriptive statistics using frequencies means, and standard deviations were used to analyse data collected from 196 participants. However, ethics approval for data collection was issued by Otago Polytechnic dated 3 February 2020 with reference number: AIC40.

Theoratical and Conceptual Framework

This section provides a platform for discussing and explaining the related theories to the study and to further establish the need for the research study. According to Swanson and Chermack [33], theory is built on adopted established principles relative to the natural world. Theories could originate from consistent testing and observations carried out with established facts, predictions, and assumptions with societal acceptance. However, and in most cases, theories consist of concepts and principles. Writing academic research, researchers are expected to establish their conceptual framework explaining how the research study was investigated. Although the conceptual framework is used to identify and illustrate the interaction between the dependent and independent variable in a research study as shown in Figure 1 below, it is expected to be linked to a theory because concept is part of theory build-up [34]. Theory could be used to understand behaviours, events, or situations because it defines concepts, proposes how events or situations could be predicted or explained and establishes a relationship between and among variables [35].

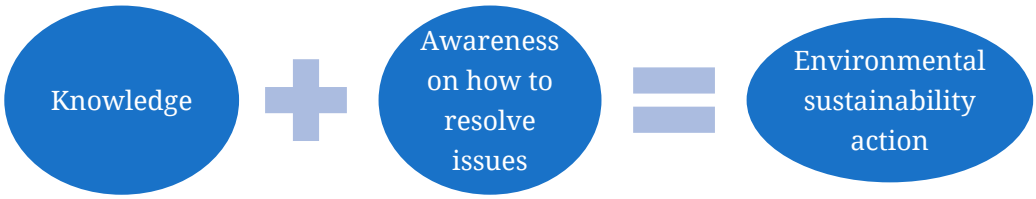

Figure 1. Behavioural change model, adopted and modified from Hungerford and Volk [36].

To properly explore the understanding of postgraduate students' knowledge about environmental sustainable development and how this is being applied, this study applied the following theories and models: primitive model [37], behavioural model (Hines et al., [38]), planned behaviour theory (Ajzen and Fishbein [39]).

Primitive models: This model emphasises the need to educate society on associated environmental and ecological issues as a panacea to changing human behaviour toward sustainable environmental practice [37]. This model related to this study because all participants were postgraduate students, and they were thought to possess basic knowledge of sustainable environmental responsibilities.Therefore, we are of the opinion that acquiring the needed environmental sustainable development will improve their approach toward environmentally responsible behaviour.

Behavioural change model: This model has linkages to the primitive model with the understanding that if people in societies are better educated on the environmental problems and the processes of resolving them, people will be environmentally responsible [39]. Therefore, we are of the opinion that acquisition of environmental sustainability knowledge by postgraduate students would have a linkage to their attitudinal behaviour towards environmental sustainability practices.

Planned behaviour theory (PBT): According to Ajzen [39] PBT is determined by people's intent to act and unbiased situational factors as determinants to their sustainable environmental behaviour. PBT is associated with the **Theory of Reasoned Action** which assumes that human acts are based on belief, consequences, and expectations [40]. This theory is applied to the study to establish the connection between the postgraduate student's knowledge of environmental management acquired leading to an attitudinal and behavioural change to environmental sustainability management practices.

Figure 2 below represents the relationship between postgraduate students' knowledge of environmental sustainability, environmental issues postgraduate students are aware of, their participation in environmental sustainability practices. Positive involvement and practice by postgraduate students the three components of this conceptual framework is expected to result to sustainable environment.

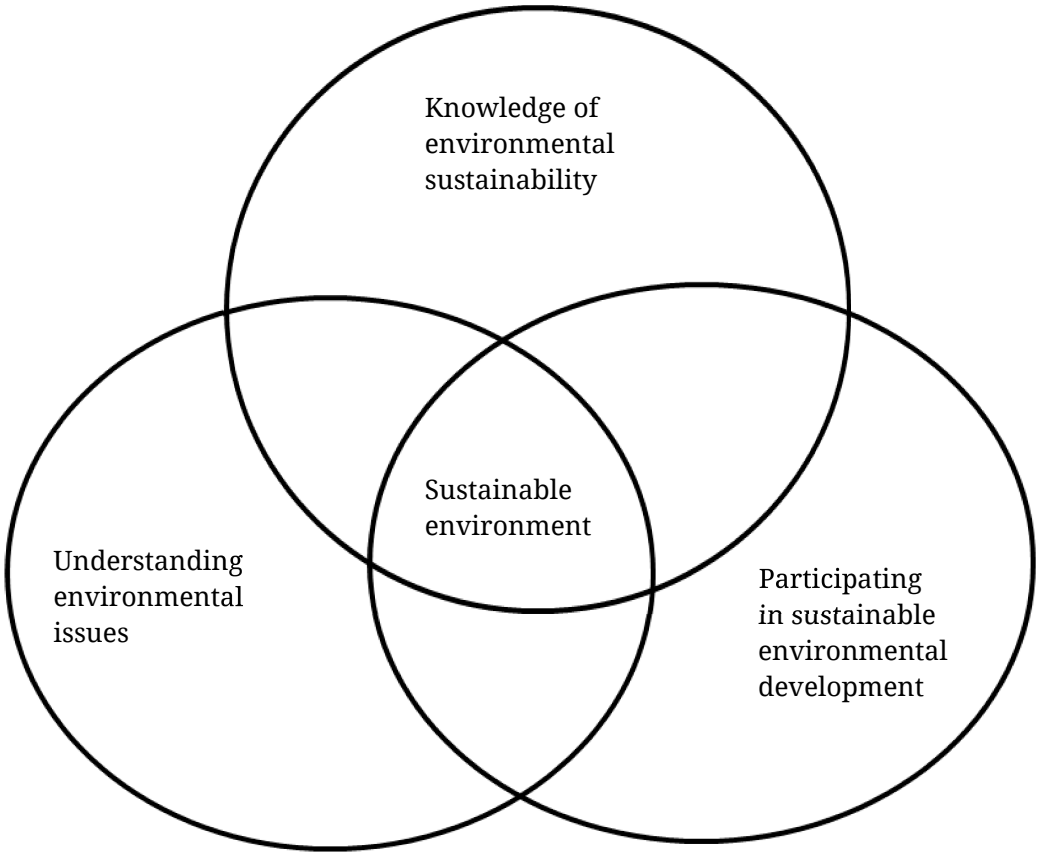

Figure 2. Conceptual framework on environmental sustainability development.

Participants

The total number of participants was 196. They ranged in ages from 20–29; 30–39; 40–49; 50 and above. 70 participants aged between 20–29 years representing 35.7% of the total participants; 116 participants were aged between 30–39 years with 59.2% of the total respondents, ten participants were in the age bracket of 40–49 years representing 5.1% of the total respondents. There were no participants from the 50 years or above age group. Figure 3, illustrated the demographic analysis indicated that 99 were female representing 50.5% of the total participants and 97 were male representing 49.5% of the total population.

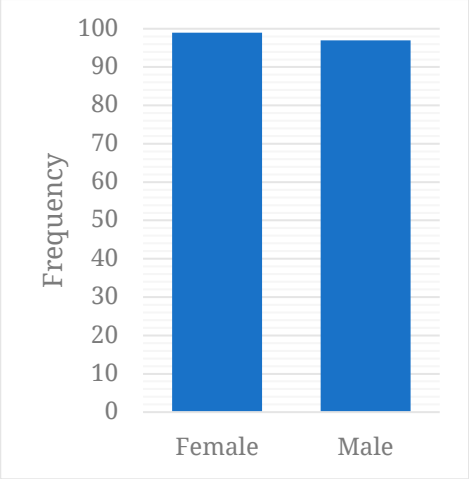

Figure 3. Sample of gender distribution of postgraduate student participants.

Analysis and Findings on Postgraduate Students' Knowledge about Environmental Sustainable Development and How This Is Applied

This study adopted descriptive statistics to analyse data collected through a 5 Likert scale of Strongly disagree = 1, Disagree = 2, Neutral = 3, Very Agree = 4, Strongly Agree = 5 and Never = 1, Seldom = 2, Sometimes = 3, Often = 4, Always = 5. Mean and Standard Deviation (SD) were used to analyse the data collected. To determine the significance of the mean outcome we created an upper and lower limit for the 5 Likert scale: from 1 to 1.8 (lower limit to upper limit) = Strongly Disagree, 1.81 to 2.6 = Disagree, from 2.61 to 3.40 = Neutral, from 3.41 to 4.20 = Agree, from 4.21 to 5 = Strongly Agree.

To determine the consistency and reliability of the study's constructs and test if the research design accurately measures the research variable of interest, we conducted Cronbach's Alpha test. According to Nunnally [41], Cronbach's Alpha could be used to assess the unidimensionality of a set of scale questions. It could also be used to determine the extent to which research variable scales are positively related as well as adjusting the average correlation between variables. Accordingly, Cronbach should be greater than $0.7 \geq 0.70$ but if questions should be less than ten Cronbach should be greater than $0.5 \geq 0.5$. However, based on ten items as presented in this study 0.7–0.79 is acceptable, 0.8–0.89 is good, 0.9 and above is excellent (excellent internal consistency or reliability). Table 1 below represents the outcome of Cronbach's Alpha test conducted on 34 items (three sections of the research survey), showing the results from Cronbach's Alpha and Cronbach's Alpha Based on standardized items were 0.892 and 0.893 indicating they are consistent and reliable.

Table 1. Reliability Statistics on 34 items.

Cronbach's Alpha	Cronbach's Alpha based on standardized items	Number of items
0.892	0.893	34

Table 2 below represents the order of rank on the knowledge of postgraduate students' sustainable environment development (*N* = 196). Seven items recorded a higher mean of between 3.67 to 4.19 with an SD of between 0.734 to 0.921. Three items recorded the highest mean of between 4.21 to 4.33 and SD of between 0.714 to 0.753 on sustainable management knowledge acquired by participants. The interpretation of this is that participants Mostly Agree and Strongly Agree with the ten-item survey. Given the above analysis, this study suggests that with the acquisition of appropriate knowledge on environmental sustainability and the process by people, society will attain a sustainable environment. This is supported by the primitive model [37], which emphasises educating society on environmental and ecological issues will make people engage in sustainable environmental practice.

Table 2. Questions relation to "environmental sustainability knowledge".

QN	Knowledge needed about environmental sustainability development	Mean	SD
Q1	Appropriate knowledge on sustainability	3.67	0.756
Q2	Good understanding of three dimensions of sustainability	3.59	0.921
Q3	Economic development requires a good sustainable framework structure	4.05	0.736
Q4	Economic development is necessary for sustainable development	4.03	0.790
Q5	Social development is necessary for sustainable development	4.19	0.734
Q6	Environmental protection is necessary for sustainable development	4.32	0.733
Q7	Knowledge of sustainability can help promote sustainable development	4.33	0.714
Q8	Education on sustainability will prevent environmental degradation	4.13	0.780
Q9	Education on sustainability will promote sustainable energy use	4.21	0.753
Q10	Education on sustainability will promote sustainable water use	4.14	0.755

SD = Standard Deviation; QN = Question Number.

Table 3 below represents the outcome of Cronbach's Alpha reliability statistical test conducted on ten items on environmental sustainability knowledge. The result from Cronbach's Alpha is 0.830 while and Cronbach's Alpha Based on standardized items 0.834 indicating the items are consistent, reliable and research variables scales are positively related.

Table 3. Reliability Statistics on ten items.

Cronbach's Alpha	Cronbach's Alpha Based on standardized items	Number of items
0.830	0.834	10

Percentage Distributions of Participants' Responses to Survey Questions on "Knowledge of Environmental Sustainable Development"

Figure 4 presents the percentage distribution analysis of participants' responses to the survey questions on knowledge of environmental

sustainability development (*N* = 196). The objective here was to determine what level and type of environmental sustainability knowledge do participants need to possess to help them navigate and participate in the process of attaining a sustainable environment. Figure 4 also indicates that one percent of all the participants Strongly Disagree that appropriate knowledge on sustainability is required to attain environmental sustainability development, while 51% and 10.7 % of participants Agree and Strongly Agree that acquiring appropriate knowledge on sustainability is the most important prerequisite to realising environmental sustaibability development. However, Strongly Disagree, Disagree and Neutral scales shared the remaining percentage. The percentage response on sustainability education will promote sustainable water use show that 47.4% and 34.2% of participants Agreed and Strongly Agreed. This indicated that sustainability education is very important towards realising sustainable water use leading to environmental sustainability development. The remaining percentage was shared between participants who Strongly Disagree, Disagree, and were Neutral. From the Figure 4, the percentage responses to the survey item on "social development are necessary for sustainable development'' suggest 51.8% and 35.4% of the participants Agree and Strongly Agree that social development is a necessity for sustainable development. However, 3.1% and 9.7% of the participants disagree or remain Neutral.

Table 4 represents percentage distribution of participants' responses to 10 survey questions on postgraduate students' environmental sustainability knowledge. Responses to the 10 questions as presented in Table 2 are shown in Table 4 below in numerical format. Questions 1 to 5 recorded between 51% to 59% Agree responses and between 10.2% to 35.4% on Strongly Agree from 196 participants. Similarly, participants responses to questions 6 to 10 recorded the followings: 43.9% to 49.5% represented Agree response while Strongly Agree recorded between 33.7% to 45.4%. However, the remaining percentage were shared between participants' responses of Strongly Disagree, Disagree and Neutral. This analysis indicates that postgraduate student had equipped themselves with adequate knowledge on environmental sustainability development. However, a good number of them seems to be careless on the acquisition of appropriate environmental sustainability development knowledge.

Table 4. Percentage of participants' responses to survey questions on "knowledge of environmental sustainability development".

QN	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Q1	1.0	3.6	33.7	51.0	10.7
Q2	3.1	10.7	20.9	55.1	10.2
Q3	1.0	1.0	15.3	57.1	25.5
Q4	1.5	3.1	11.2	59.2	25.0
Q5	0.0	3.1	9.7	51.8	35.4
Q6	0.0	2.6	8.2	43.9	45.4
Q7	0.0	2.0	8.2	44.4	45.4
Q8	0.5	2.6	13.8	49.5	33.7
Q9	0.0	3.1	10.7	48.5	37.8
Q10	0.0	2.0	16.3	47.4	34.2

QN = Question number based on Table 2.

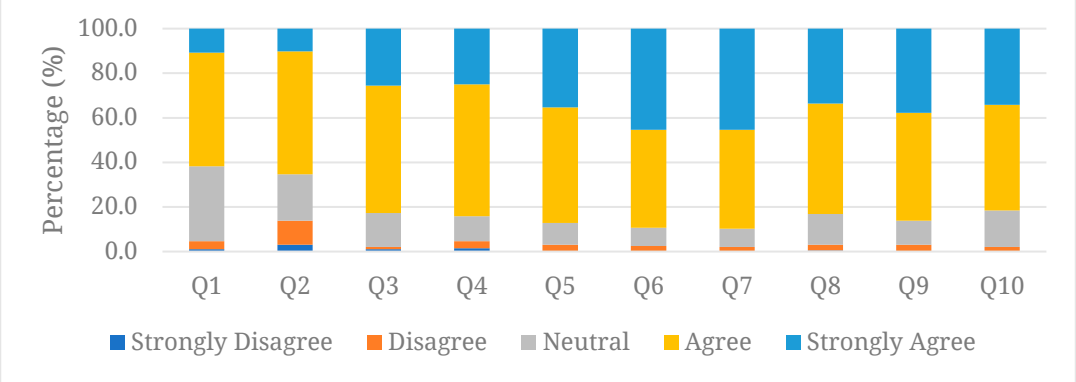

Figure 4. Percentage distributions of participants' responses to survey questions on "knowledge of environmental sustainability development".

Table 5 below represents data collected on ten survey questions to find out the participants' understanding of environmental issues and how to resolve them (N = 196). Four questions recorded the highest mean of 4.5 and above, three out of the four recorded a SD of 0.7 and above. However, the need to minimize air pollution had a mean of 4.63 and a questionable SD of 0.615. Three questions also recorded a higher mean of 4.29, 4.32, and 4.28 with the respective 0.727, 0.767, and 0.786 SD. The last three questions had an acceptablly high means of 3.99, 3.68, and 3.46 with the respective 0.823, 0.919, and 0.975 SD. Therefore, from the analysis we suggest that most participants did Agree and Strongly Agreed that understanding environmental issues and the process of resolving them will help promote a sustainable environment and environmental sustainability development. The result of this analysis supports the behavioural model of Hungerford and Volk [36] which argues that when the public is well educated on common environmental issues and how to resolve the issues,

people will be environmentally responsible through attitudinal behavioural change leading to a sustainable environment.

Table 5. Questions relating to understanding "environmental issues and process to resolving them".

QN	Understanding how to check environmental issues and the process for resolving them	Mean	SD
Q1	A huge population puts much pressure on earth resources	4.29	0.786
Q2	There is a need to minimise water pollution	4.55	0.704
Q3	There is a need to minimise air pollution	4.63	0.615
Q4	There is a problem of global warming and climate change	4.47	0.726
Q5	There is a need to report unsustainable activities and practices in the community	4.32	0.767
Q6	Sustainability education can help promote a sustainable environment	4.28	0.727
Q7	Uncontrolled human activities destroy nature	4.50	0.691
Q8	Industrial growth is one of the sources of destroying nature	3.99	0.823
Q9	The economic growth of a country enables it to protect the environment	3.68	0.919
Q10	The economic growth of a country helps to reduce environmental degradation	3.46	0.975

QN = Question Number.

Table 6 below represents the outcome of Cronbach's Alpha reliability statistical test on the ten questions on environmental issues and the process of resolving these. The result from the Cronbach's Alpha is 0.732 and 0.755 from Cronbach's Alpha Based on standardized questions. These outcomes suggest that the questions are consistent, reliable and study variables are certainly correlated.

Table 6. Reliability Statistics on ten items.

Cronbach's Alpha	Cronbach's Alpha Based on standardized items	Number of items
0.732	0.755	10

Percentage Distributions of Participants' Responses to Survey Question "Environmental Issues and Process of Resolving Them"

To determine the participants' reaction to survey questions administered on their understanding of environmental issues and how they resolve these, a percentage analysis of participants' responses was conducted.

Figure 5 indicates that all questions realised high percentages relative to Agree and Strongly Agree. However, participants' responses to the survey question "there is a need to minimise air pollution" realised 26% and 68.9% Agreeing and Strongly Agreeing while the remaining percentage was shared between Disagreeing and Neutral. This is an indication that more than 90% of the participant responses believe that to realise sustainable environments air pollution must be minimised.

Question 6 asked the participants if sustainability education can help promote sustainable environment. The response percentages were 0.0% Strongly Disagree; 1.5% Disagree; 11.7% Neutral; 44.4% Agree; 42.3% Strongly Agree. Question 7 asked the participants if uncontrolled human activities destroy nature. Table represents the participants' response percentages 0.0% Strongly Disagree; 1.5% Disagree; 6.6% Neutral; 32.1% Agree; 59.7% Strongly Agree. Question 10 asked participants if the economic growth of a country helps to reduce environmental degradation. The responses percentages were 2.1% Strongly Disagree; 13.8% Disagree; 34.9% Neutral; 34.4% agree; 14.9% Strongly Agree.

Table 7 represents analysis of participants' responses to 10 survey questions on postgraduate students' understanding of environmental issues and the process of resolving them. 10 survey questions as presented in Table 5 were presented to participants to elicit responses from them. Responses from participants are shown in Table 7 below in numerical format. Questions 1 to 10 recorded between 28.1% to 49.5% Agree responses and between 14.9% to 68.9% on Strongly Agree. However, Strongly Disagree, Disagree and Neutral shared the remaining percentage. Findings from this analysis indicates that postgraduate student had acquired adequate knowledge on environmental issues as well as the processes to resolving them. equipped themselves with adequate knowledge on environmental sustainability development. However, finding also indicate that some participants chose to be neutral towards acquisition of knowledge of environmental issues and how to resolve them.

Table 7. Percentage distribution of participants' responses to the survey questions on "environmental issues and process of resolving them".

QN	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Q1	0.0	3.1	11.2	39.3	46.4
Q2	0.5	1.0	6.1	28.1	64.3
Q3	0.0	1.0	4.1	26.0	68.9
Q4	0.0	1.5	9.2	29.6	59.7
Q5	0.5	2.6	7.7	42.9	46.4
Q6	0.0	1.5	11.7	44.4	42.3
Q7	0.0	1.5	6.6	32.1	59.7
Q8	0.0	5.6	17.3	49.5	27.6
Q9	1.5	8.7	28.1	43.9	17.9
Q10	2.1	13.8	34.9	34.4	14.9

QN = Question Number based on Table 5.

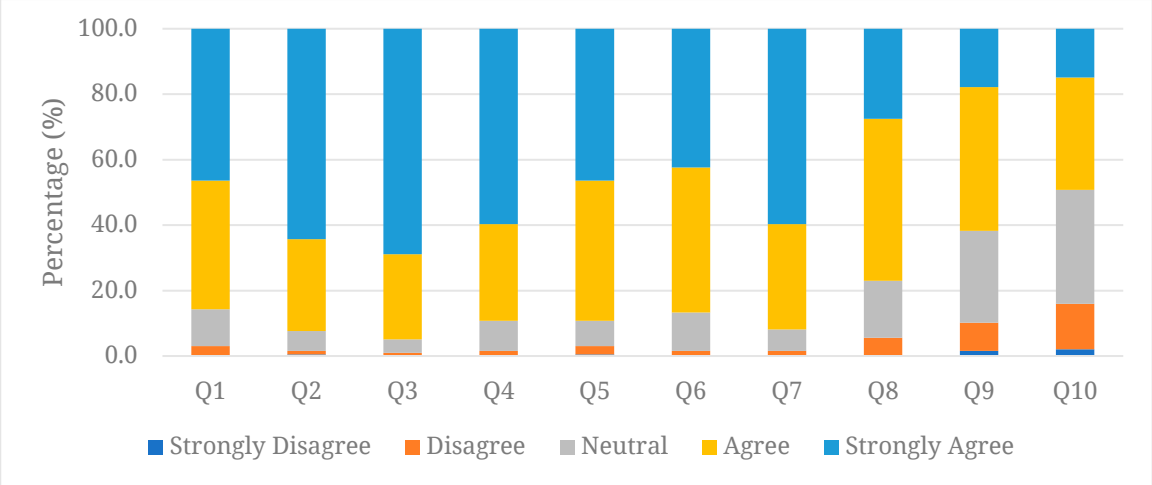

Figure 5. Percentage distributions of participants' responses to environmental issues and processes of resolving these.

Table 8 below represents the outcome of Cronbach's Alpha reliability statistical test on the 14 questions on how to contribute to sustainable development. The result from Cronbach's Alpha is 0.901 and0.902 from Cronbach's Alpha Based on standardized questions. These outcomes suggest that the questions are consistent and reliable and study variables are excellently correlated.

Table 8. Reliability Statistics on 14 items.

Cronbach's Alpha	Cronbach's Alpha Based on standardized items	Number of items
0.901	0.902	14

Table 9 below represents an analysis of the data collected from the 14 questions on how to contribute to sustainable development (N = 196). According to participants' responses, the two highest to contribute to sustainable development were related to minimising food waste (M = 4.23, SD = 0.898); minimising water waste (M = 4.14, SD = 0.923). Eleven questions recorded means of ≥3 with SD between 0.898–1.123. The least sustainable development contribution was participating in co-curricular activities related to environmental protection and sustainability (M = 2.84, SD = 1.098). The suggested reason for the lower mean here could be adduced that intentional acts of participants not to take part in the co-curricular activities on environmental protection and sustainability due to other academic pressure. It could be concluded from the analysis that most participants Agree and Strongly Agree to contribute to sustainable environmental development based on their intent to act to ensure the realisation on sustainable environment. Intent not to act and or not to take part could be the reason why some participant's responses cumulated to a mean of 2.84. However, from Table 9 the majority of participants believed that contributing to sustainable environmental development is one of the

panaceas to attaining a sustainable environment. Analytical findings in this section are synonymous with PBT [39] which argues that people's engagement in positive sustainable environmental behaviour despite their knowledge is determined by their intention to act; an unbiased situational factor. As presented in the analysis some participants, despite their knowledge, responses indicated they would not take part in co-curricular activities related to environmental protection and sustainability. This is supported by the Theory of Reasoned Action [40] which suggested that human acts are based on belief, consequences, and expectation. It is suggested that some participants in this study responded that they would choose not to participate in co-curricular activities related to environmental protection and sustainability because they lack faith it will make them contribute more to sustainable development. It could also be because of the consequential effect of losing academic activities [40].

Table 9. Questions contributing to sustainable development.

QN	How to contribute to sustainable development	Mean	SD
Q1	I use public transport	3.86	0.985
Q2	I watch and control my bills to conserve my energy	3.84	1.078
Q3	I purchase green or eco-friendly goods	3.35	0.973
Q4	I recycle materials as far as possible	3.63	1.012
Q5	I buy products made of recycled materials	3.19	0.902
Q6	I minimise food waste	4.23	0.898
Q7	I minimise water waste	4.14	0.923
Q8	I support non governemental organisations dedicated to sustainability	3.22	1.123
Q9	I use disposable products	3.24	0.960
Q10	I use biodegradable products	3.30	0.958
Q11	I support sustainable practices and/or attend sustainability-related activities organised by the institute and/or community	3.09	1.061
Q12	I talk with other students, friends, and family about the need to be environmentally conscious	3.25	1.064
Q13	I talk with other students, friends, and family about the global environmental situation and methods of protecting the planet earth	3.20	1.046
Q14	I participate in co-curricular activities related to environmental protection and sustainability	2.84	1.098

QN = Question Number.

Percentage Distributions of Participants' Responses to Survey Question "How to Contribute to Sustainable Development"

This section represents a percentage analysis of participants' responses to the survey questions on how they could contribute to environmentally sustainable development. The objective at this point was to understand which of the 14 questions were well responded to in proportions.

Figure 6 below represents the percentage analysis of participants' responses on their perception of using public transport as a way of contributing to a sustainable environment. Percentage distribution of participations responses were 2.6% Never; 5.6% Rarely; 24.0% Sometimes; 38.8% Often; 29.1% Always. Question 7 asked participants if they minimise water waste as one of the prerequisites to enhancing environmental sustainability showed 1.5% Never; 3.1% Rarely; 17.9% Sometimes; 34.7% Often; 42.9% Always.

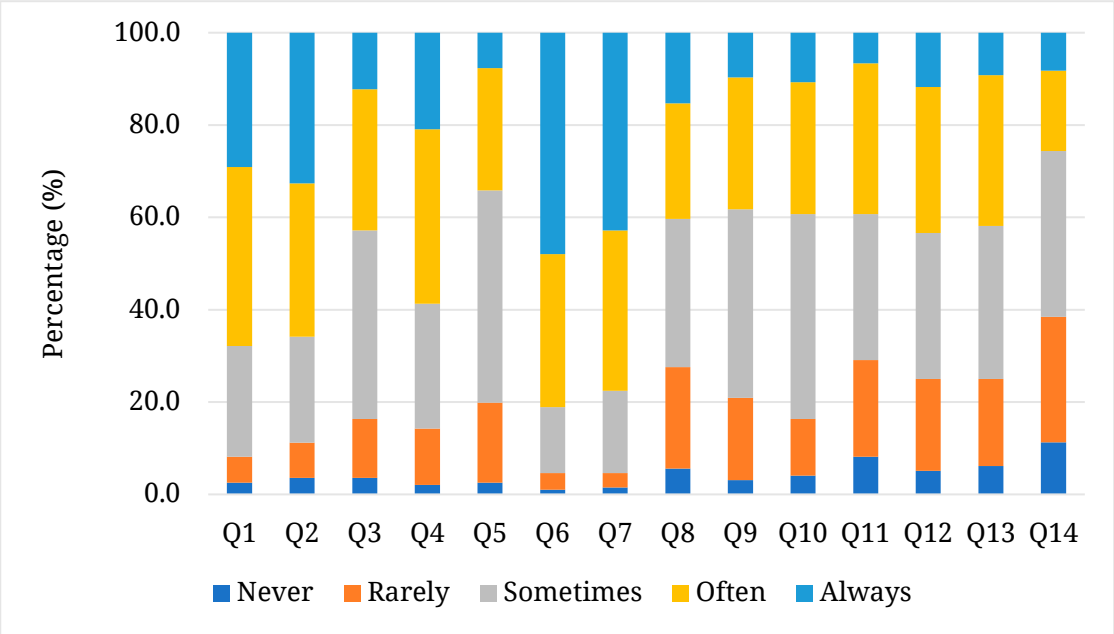

Figure 6. Percentage distributions of participants' responses to contributing to sustainable development.

Question 9 asked participants if they use disposable products to enhance a sustainable environment. Percentage distribution of participants responses were 3.1% Never; 17.9% Rarely; 40.8% Sometimes; 28.6% Often; 9.7% Always. Question 14 asked participants if they participate in co-curricular activities to contribute to sustainable development. Participants' responses were 11.3% Never; 27.2% Rarely; 35.9% Sometimes; 17.4% Often; 8.2% Always. This indicates that participants do not take part in co-curricular activities related to environmental protection and sustainability. Suggested reasons for not participating are discussed in the analysis of Table 10.

Table 10. Percentage table of participants' responses to contributing to sustainable development.

QN	Never	Rarely	Sometimes	Often	Always
Q1	2.6	5.6	24.0	38.8	29.1
Q2	3.6	7.7	23.0	33.2	32.7
Q3	3.6	12.8	40.8	30.6	12.2
Q4	2.0	12.2	27.0	37.8	20.9
Q5	2.6	17.3	45.9	26.5	7.7
Q6	1.0	3.6	14.3	33.2	48.0
Q7	1.5	3.1	17.9	34.7	42.9
Q8	5.6	21.9	32.1	25.0	15.3
Q9	3.1	17.9	40.8	28.6	9.7
Q10	4.1	12.2	44.4	28.6	10.7
Q11	8.2	20.9	31.6	32.7	6.6
Q12	5.1	19.9	31.6	31.6	11.7
Q13	6.1	18.9	33.2	32.7	9.2
Q14	11.3	27.2	35.9	17.4	8.2

QN = Question number based on Table 9.

DISCUSSION

The study focused on the understanding of postgraduate students' knowledge about environmental sustainable development and how this is applied. The study has one survey containing 34 questions. Three sets of questions were used each focusing on a specific sustainability theme: centred on examining sustainability management knowledge acquired by postgraduate students; understanding environmental issues and processes to resolving them; contributing to sustainable development. Research questions were into three sections accordingly, Section 1 has ten questions, Section 2 has ten questions and Section 3 has 14 questions.

Results from ten questions in Section 1 of the survey (environmental sustainability knowledge) showed the sum of responses on Agree and Strongly Agree in the order of the survey questions: 61.7%, 62.3%, 82.6%; 84.2%, 87.2%, 89.3%, 89.8%, 83.2%, 86.3%, 81.6%. Participants' response rate to Neutral ranged between 33.7% to 8.2%. However, lower level of participants' responses to the ten questions was pronounced strongly disagree and disagree. The highest cumulative percentage of both Strongly Disagree and Disagree among the ten questions was 13.8% while 2% represented the lowest. This suggests that the sustainability knowledge acquired by postgraduate students promoted their understanding of environmental sustainable development. This result is consistent with Azapagic et al., [24] finding that significant gaps in sustainability knowledge result in an unsatisfactory level of understanding of environmental sustainability development. Kimanzi [20] argues that when people are educated on sustainability, they will be seriously concerned about environmental sustainability development. Finding from the study also indicated that sustainable environment knowledge

acquired by postgraduate student positively contributed to their contribution to sustainable development. Similarly, Akintunde [37] found educated society in environmental and ecological issues engages in sustainable environmental practice. Also, Rahman et al., [19] suggested that sustainability knowledge acquired by students creates a positive willingness to engage in environmental sustainable development.

Findings from ten questions in Section 2 (understanding environmental issues and process to resolving them) showed the sum of responses on Agree and Strongly Agree in the order of the survey questions: 85%, 92.4%, 94.9, 89.3%, 89.3%, 86.7%, 91.8%, 77.1%, 61.8%, 49.3%. The highest percentage of participants responses to Neutral were 34.9% (question ten); 28.1% (question nine); 17.3% (question seven). Participants responded poorly to Strongly Disagree and Disagree in questions two, nine and ten recording 2.1%, 1,5%, and 0.5%, respectively. The other seven questions in the section recorded 0%. In view of this analysis, it is argued that understanding environmental issues and the processes of resolving them is a necessity to attaining a sustainable environment. According to Mahat et al., [17] except people understand environmental issues such as water pollution, air pollution, depletion of natural resources and possess the knowledge and skills as to how to manage them sustainable environment will never be attained. Similarly, Hungerford and Volk [36] suggest that educating on environmental issues and the processes of resolving these creates sustainable environmentally conscious people. This could lead to a change in people's attitudes and behaviour towards embracing environmental sustainable development.

Results from the fourteen questions Section 3 (contributing to sustainable development) showed the sum of responses contributing to sustainable development (Never, Rarely, Sometimes, Often, Always) revealed the highest percentage to "Often and Always" in regards to using public transport 67.9%; controlling energy bills 65.9%; recycling used materials 58.7%; minimising food waste 81.2%; and minimising water waste 77.6%. The sum of the remaining nine questions on participants' responses to Often and Always questions were below 50%. Participants' responses of Sometimes to questions had the lowest percentage of 14.3% with the highest of 45.9%. However, participants' responses of Never and Rarely recorded the lowest percentage on average. From this analysis, this section of the study recorded a very high percentage of responses to participants Sometimes, Often, and Always engaged in sustainable practices to attain environmentally sustainable development. The highest percentage recorded on Often and Always could be based on participants' intention to engage in sustainable practice as the situation permits [42]. However, participants' belief, consequences and expectations could determine why participants Sometimes participate to contribute to sustainable development, Never and or Rarely participate or contribute to sustainable development.

CONCLUSION

This study has contributed to literature from the perspective of environmental sustainable development, in particular this study contributes to literature relative to postgraduate students' knowledge of sustainability practices and their application in their daily activities. The study focused on the acquisition of knowledge needed regarding environmental sustainable development; understanding environmental issues and processes to resolving these; contributing to sustainable development. Research results indicated that in Section 1 of the questionnaire survey, the summative percentage of participants' responses (Agree and Strongly Agree) to the ten questions (knowledge of environmental sustainable development) recorded a minimum percentage of 61.7% and 90%, respectively. This result is reflective of Kalsoom and Khanam's [43] finding that educating people on sustainability helps improve people's sustainability management and practices. Similarly, the questions in Section 2 of the survey on "understanding environmental issues and processes to resolving them" participants responses for Agree and Strongly Agree for seven of the ten questions were nearly all above 80% with three questions recording 49.3%, 61.8% and 77.1%. Fourteen questions were presented in Section 3 on contributing to sustainable development. Participants were required to respond using Never, Rarely, Sometimes, Often, and Always and results indicated that participants participated in sustainability practices Sometimes, Often, and Always recorded average of 30% response from each questions compared to participants responses to Never and Rarely participate in sustainability practices with average of 5% and 12% respectively.

This study presented 34 questions in the form of a survey to 196 participants in the area of Auckland, New Zealand to assist in exploring the understanding of postgraduate students' knowledge about environmental sustainable development and how this is being applied?

The participants' responses have helped the research achieved its overall objectives: determine postgraduate students' understanding of environmental sustainability and how they apply the knowledge; environmental issues postgraduate students aware of; postgraduate students contributions to sustainability practice and sustainable development. The research survey tool used in this study could be adopted by other researchers interested in further examining environmental sustainable development and how this is being applied?

Limitaions

Two major limitations of this study is that the survey was only administered to postgraduate students within the Auckland region of New Zealand, limiting the research population. In view of these limitations, future research might include postgraduate students from across the

wider New Zealand tertiary education sector and also covering other segments of the society. This could make such research findings more generalised.

Recommnedations

In view of one of the limitations on this study. We recommend that another similar study be conducted where participants will be recruited from all regions of New Zealand so the such study will have more generalisation and widely acceptable from at least from New Zealand perspective. We also recommend that another study be carried out that will focus on further development of sustainable management practices for students to acquire however mix method methodology should be adopted.

AUTHOR CONTRIBUTIONS

Olufemi Omisakin—Conceptualised the research topic title, complete ethic form, develop and write the literature review. Develop and complete the research methododolgy section. Involved in the designing and distribution of the research survey question, data collection, data analysis and findings of the study.

Indrapriya Kularatne—Gaining ethics approval from Otago Polytechnic Auckland International Campus Ethics Committee, developing data collection surveys/methodologies, analysing data, designing and developing graphical illustrations, writing, improving and reviewing some paragraphs of the manuscript.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest have occurred in this research.

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