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INTEGRATION OF EDUCATION FOR SUSTAINABLE DEVELOPMENT INTO TERTIARY INSTITUTIONS: SYSTEMIC REVIEW OF MAJOR RESEARCH ENQUIRIES

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ABSTRACT

Education for Sustainable Development has been launched as one of the key answers to dealing with the sustainability of education at all levels. This study is conducted to find out the predominant model for integrating Education Sustainable Development in tertiary institutions. A total of 34 articles from 18 peer-reviewed journals were selected for the review in which different models of implementing education for sustainable development in the teaching and learning in tertiary institutions were presented and illustrated by four studies. The results indicated that "three pillars model of sustainability" was predominantly used in the integration of education for sustainable development. Moreover, "Sustainable Development Institute's theoretical model" and "Wheeler's model of education for sustainable development were also found effective when implemented in tertiary institutions. Consequently, the findings indicated that the human factor including resistance, communication, empowerment & involvement, and organisational culture could become barriers for the integration of SD in Higher Education.

Introduction

Countries with the deteriorating level of poverty were the main target of Millennium Development Goals (MDGs), to which rich countries were to add their solidarity and assistance through finances and technology. Later, it was obvious that no nation could resolve those issues of MDGs on its own due to disparities between and within nations, a worsening of poverty, hunger, ill-health and illiteracy and continuing deterioration of the ecosystem on which we depend for our well-being. The Sustainable Development (SD) goals will, necessarily, have a different feel about them. Sustainable development is eluding the entire planet. Thus, a global partnership for SD was established to pose goals and challenges for all countries—not what the rich should do for the poor, but what all countries together should do for the global wellbeing of this generation and those to come.

The concept of sustainable development (SD) seeks to combine environmental concerns with social and economic development [1]. The notion of SD maintained that environmental problems should be considered as related to economic and social issues. In today's society, SD is an overarching goal of balancing between the well-being and improved lives of people globally in space and time, while at the same time preserving natural resources and ecosystems.

Literally, SD refers to maintaining development over time. [2] defines SD as 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. [3] stressed that SD is understood to represent a

triplet approach to human wellbeing including economic development, environmental sustainability, and social inclusion. [4] opine that SD is a kind of development that provides real improvements in the quality of human life and at the same time conserves the vitality and diversity of the Earth. According to the SDI model, sustainable development is defined as the process of maintaining balance and reconciling the tensions within and among the six dimensions of sustainability [5]. These dimensions include (i) land and sovereignty; (ii) natural environment (which includes human beings); (iii) institutions; (iv) technology; (v) economics; and (vi) human perception, activity, and behaviour.

In many countries, the current level of basic education is too low, severely hindering national plans for a sustainable future. The impact of little and/or poor-quality education severely limits the options available to a nation for developing its short- and long- term sustainability plans. This recognition of the need for quality basic education sets Education for Sustainable Development (ESD).
UNESCO (1992) maintained that it is widely agreed that education is the most effective means that society possesses to confronting the challenges of the future. Education, to be certain, is not the whole answer to every problem. But education, in its broadest sense, must be a vital part of all efforts to imagine and create new relations among people and to foster greater respect for the needs of the environment. The relationship between education and SD is complex. Generally, research shows that basic education is key to a nation's ability to develop and achieve sustainability targets. Education can enhance the status of women, improve agricultural productivity, raise the standard of living, enhance environmental protection, and yield technology. Technology is the simplest means for eliminating poverty by providing high-income and middle-income economies to low-income economies. For SD of any nation, technology is needed to develop improved medicines, diagnostics, electrification, high-yield seeds, and internet which could reorganise human activity to combine improving living standards [3].

Education for Sustainable Development

Education for Sustainable Development (ESD) has been launched as one of the key answers to dealing with the sustainability of education at all levels [1]. In 1992 Rio de Janeiro conference, Agenda 21 is divided into forty chapters; each chapter focuses on an issue central to sustainability. Initial thoughts concerning ESD were captured in Chapter 36 of Agenda 21, "Promoting Education, Public Awareness and Training", is dedicated to the specific issue of education [6]. It identifies three major thrusts to begin the work of Education for Sustainable Development (ESD): improving basic education; reorienting existing education to address sustainable development, and developing public understanding, awareness, and training. It should also be noted that the role of education is not isolated to chapter 36 but is mentioned in all the other chapters of Agenda 21.

Since the birth of the idea of ESD, the concept has been under constant debate with respect to its objectives, terminology and implications. However, to thoroughly implement ESD in formal education, the UN formally announced the Decade of Education for Sustainable Development (DESD) for the years 2005- 2014 (UNESCO, 2005). Following the fact that United Nation's ESD framework ends in the year 2014, almost all educational institutions all over the world at all levels, including elementary and secondary schools, have endlessly worked to contribute to the sustenance of education to enabling up-coming generations of learners to become responsible individuals and promote sustainable development in our world [7].

Education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues [8]. To be successful, ESD, like all good education, must blend knowledge and skills [4]. ESD must provide practical skills that will enable people to continue learning after they leave school, secure sustainable livelihoods, and live sustainable lives. These skills include:

i. the ability to communicate effectively both orally and in writing;
ii. the ability to think about systems (both natural and social systems);
iii. the ability to think in time – to forecast, to think ahead, and to plan;
iv. the ability to think critically about value issues;
v. the ability to comprehend quantity, quality, and value;
vi. the capacity to move from awareness to knowledge to action;
vii. the ability to work cooperatively with other people;
viii. the capacity to use various processes – knowing, inquiring, acting, judging, imagining, connecting, valuing, questioning and choosing; and
ix. the capacity to develop an aesthetic response to the environment

Objectives of the Study

The study aims to describe and analyse research articles in the selected journals relating to the subject ESD in tertiary institutions, published from 2005 to 2019. This is done by answering three research questions:

i. How is ESD defined by the researchers?

ii. What are the major research inquiries and results of ESD?
iii. Which model is predominantly used for integrating ESD?

Methodology

This study is a systematic review of ESD in tertiary institutions that were published between 2005 and 2019. It considered only those studies which were conducted in higher institution of learning and was written in the English language. 13 databases were searched including Springer, science and education (ELSEVIER), ERIC, SCOPUS, Web of Science, Google Scholar, International Journal of Sustainability in Higher Education, Journal of Education for Sustainable Development, International Journal of Innovation and Sustainable Development, International Journal of Sustainability in Higher Education, International Journal of Educational Development, Environmental Education Research and Journal of Cleaner Production. The search criteria include the following keywords "education for sustainable development", "sustainable development", "sustainability", "education about sustainable development", "education of sustainable development" and "education in sustainable development".

Over 63,489 articles and above results of search engines were obtained, from which 18 journals were finally explored. Book chapters were first excluded, then articles solely relating to children in elementary and secondary schools. A total of 74 articles are included in this review. By using text analysis procedure, the full text of 74 articles was read to make sure that the questions raised in each article were being answered in the results of that study and to find out whether those articles covered sustainability issues in education. In the cases of unclear articles' title, their abstracts were read to ensure the inclusion SD among the main constructs of the studies. When all the title and abstract (in some cases) of the articles had been read, a quick search for the words 'sustainable', 'sustainability' and 'education' was made to ensure the alignment of the content of the article to its title and abstract. When the search for articles relating to sustainability issue, with emphasis on education, had been completed, detailed reading and analysis of each article were undertaken.

The content of each selected article was thoroughly reviewed in such a way to answer a series of different question including: How is ESD defined in the study? What is the purpose of the study? What methodology is used for the study? Does it propose any model for the integration of ESD? What are its results? What is the conclusion/recommendation made? The articles were sorted into different files depending on the answers to the questions.

Table 1: List of journals with their respective number of articles selected

S/N	Name of the Journal	No. of Article(s)
1	Proceedings of the National Academy of Sciences of the United States of America	1
2	Chemistry Education Research and Practice	1
3	Environmental Education Research	6
4	International Journal of Sustainability in Higher Education	2
5	Sustainability (Switzerland)	2
6	Journal of Cleaner Production	7
7	Sustainability Science	2
8	International Journal or Cont. Engineering Education and Life-Long Learning	1
9	International Journal of Educational Development	1
10	Research in Science & Technological Education	1
11	Journal of Business Venturing	1
12	Journal of Social Sciences	1
13	Eurasia Journal of Mathematics, Science and Technology Education	1
14	International Journal of Consumer Studies	1
15	Journal of Education for Sustainable Development	1
1	International Journal of Innovation and Sustainable Development	1

6 1 7	Science and Technology	1
1 8	International Journal of Sustainability in Higher Education	3
	Total number of articles	**34**

Results

The results from this review were presented based on the research questions

How is ESD defined by the researchers?

Table 2: Definitions of ESD from various researchers

Sn	Author(s)	Definition of ESD	Journal
1	Hedefalk, Almqvist, & Östman (2015)	ESD is education about, in and for the environment	Environmental Education Research
2	Barth, Godemann, Rieckmann, & Stoltenberg (2007)	ESD is an education that aims at enabling people to not only acquire and generate knowledge but also to reflect on further effects and the complexity of behaviour and decisions in a future-oriented and global perspective of responsibility.	International Journal of Sustainability in Higher Education
3	Paul & Scott (2007)	ESD is an education that addresses learning skills, perspectives, and values that guide and motivate people to seek sustainable livelihoods, participate in a democratic society, and live sustainably.	Journal of Education for Sustainable Development
4	Pauw et al. (2015)	Education for Sustainable Development means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption.	Sustainability (Switzerland)

[9] see ESD as education about, in and for the environment. Education about the environment emphasises knowledge about how natural systems work, such as water cycles, ecological systems and how plants grow. Education in the environment emphasises direct experiences in nature. Education for the environment emphasises active participation in solving environmental problems or making socially just and sustainable choices.

[10] maintained that ESD is education that aims at enabling people to not only acquire and generate knowledge but also to reflect on further effects and the complexity of behaviour and decisions in a future-oriented and global perspective of responsibility. Tertiary institutions of learning must participate in the discussion about sustainable ways of living and working in its educational activities.

[6] ESD is an education that addresses learning skills, perspectives, and values that guide and motivate people to seek sustainable livelihoods, participate in a democratic society, and live sustainably. The central focus of ESD is to prepare the children in school to become responsible citizens in the future, such that they could be able to participate in a democratic society to help in shaping the future of the society sustainably [11]. They should learn to take responsibility for both themselves and future generations, based on the concept of sustainable development.

[12] maintained that Sustainable education implies four descriptors: sustaining, tenable, healthy and durable.

i. Sustaining – it helps sustain people, communities and ecosystems

ii. Tenable – it is ethically defensible, working with integrity, justice, respect and inclusiveness
iii. Healthy – it is itself a viable system, embodying and nurturing healthy relationships and emergence at different system levels
iv. Durable – it works well enough in practice to be able to keep doing it.

[1] stressed that based on UNESCO approach, ESD means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption. This definition is dealing with two essential features, content and pedagogy. It requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development. Consequently, ESD promotes competencies like critical thinking, imagining future scenarios and collaboratively making decisions.

What are the major research inquiries and results of ESD?

Interestingly, since the conference held at Rio de Janeiro, Brazil in 1992, during which the term ESD was first brought to the 'table of discussions', the concept has been under serious and constant debate with respect to its objectives, terminology and implications. Many studies were conducted with varying objectives and obtained different results as indicated by Table 2.

Table 3: List of articles selected for review of major research inquiries and results of ESD

SN	Author	Title	Objectives	Results
1	Verhulst & Lambrechts (2014)	Fostering the incorporation of sustainable development in higher education. Lessons learned from a change management perspective	studies higher education from the perspective of organisational change management, focusing on analysing the human factors in resistance, communication, empowerment and involvement, and organisational culture	results indicate that the conceptual model helps to get a profound understanding of human-related barriers for integrating sustainable development in higher education, as well as to understand the underlying reasons for these barriers and linkages between them in different stages of the integration process
2	Dockry, Hall, Lopik, & Caldwell, (2016)	Sustainable development education, practice, and research: an indigenous model of sustainable development at the College of Menominee Nation, Keshena, WI, USA	provides a detailed description of the SDI model and its development and concludes with short examples illustrating how the model has been used for course design and delivery in higher education, interdisciplinary community planning, and participatory research.	students learn that sustainability entails complex interactions among topics such as climate change, biodiversity, social justice, technology, food security, population control, land rights, organizational development, cultural preservation, poverty alleviation, economic development, resource management, and spirituality
3	Pauw, Gericke, Olsson, & Berglund, 2015)	The Effectiveness of Education for Sustainable Development	to investigate the effectiveness of ESD, in the context of formal education, in terms of promoting the sustainability consciousness of adolescents.	The results from our structural equation model thus show that when teachers integrate the environmental, social, and economic dimensions of sustainability issues, as well as focus on their past, present and future, and on their local, regional and global nature, students gain a better understanding (i.e., and increased knowingness) of the complexity of SD.
4	(Manteaw, 2012)	Education for sustainable development in Africa: The search for pedagogical logic	to facilitate understanding of how language use informs social practices and ideology formation, and in this context how it shapes understandings of the role of education in sustainable development	Results indicated that conscious and serious efforts are needed to transform learning processes to make sustainable development possible and meaningful to people.

5	Lambrechts, Mulà, Ceulemans, Molderez, & Gaeremynck, (2013)	The integration of competences for sustainable development in higher education: an empirical analysis of bachelor programs in management	to find out how and to what extent integration of competences for SD in higher education programs are already present	Results of the analysis show that competences for SD related to responsibility and emotional intelligence are widely integrated, while competences for SD dealing with system orientation, future orientation, personal commitment, and action-taking are virtually absent. The analysis also shows that many competencies for SD could be discovered within the selected study programs, though in an implicit and fragmented way, thus not covering all necessary fields of knowledge, skills, and attitudes.
6	Burmeister, Rauch, & Eilks (2012)	Education for Sustainable Development (ESD) and chemistry education	To reflects upon the meaning of the UN's challenge and on what ESD pedagogy will mean for chemistry education.	it provides an overview of different models suggesting how such integration of sustainability issues can be compatible with chemistry education.
7	Hedefalk, Almqvist, & Östman, (2015)	Education for sustainable development in early childhood education: a review of the research literature	to describe and analyse research articles relating to the subject of education for sustainable development (ESD) for early childhood education (ECE), published during the years 1996–2013.	This study shows that ESD is a growing topic of interest in the field of ECE research.
8	Cebrián, Grace, & Humphris (2015)	Academic staff engagement in education for sustainable development	to explore: (i) the factors influencing academic staff engagement in Education for Sustainable Development; and (ii) the views and vision of academic staff concerning Education for Sustainable Development at the University of Southampton.	This study provides evidence on different views and visions of academics concerning Education for Sustainable Development and several contradictions between its principles and the role of Higher Education

9	Dewhurst & Pendergast, (2011)	Teacher perceptions of the contribution of Home Economics to sustainable development education: A cross-cultural view	to better understand the similarities and differences of the home economics curriculum in these contexts, as it contributes to sustainable development education.	data reveals that the teachers in the study considered sustainable development to be an important issue and the formal home economics curricula made significant contributions to the education of this topic.
10	Eilks, (2015)	Science education and education for sustainable development - justifications, models, practices and perspectives	to give insights into roughly 15 years of ESD research in connection with societally oriented science education performed at the Institute of Science Education (IDN) at the University of Bremen	show that thoroughly combining the ESD framework with science teaching that follows a socio-scientific issues-based approach to education has great potential for helping students develop many general educational skills. It also opens a path to a more balanced view of science in its societal and professional context.
11	Barth & Timm (2011)	Higher Education for Sustainable Development: Students' Perspectives on an Innovative Approach to Educational Change	to examined undergraduate students' view on the Higher Education Sustainable Development approach and to shed light on their acceptance and perceptions of such a Higher Education Sustainable Development learning setting	showed a sophisticated understanding of the concept of sustainability and agreed with the values associated. Comparing the results of three different student groups with variation in the degree of sustainability-related studies, a group of students studying sustainability in their minor as a second subject beside disciplinary oriented studies showed a significantly higher acceptance rate than their study peers.
12	Barth & Rieckmann (2012)	Academic staff development as a catalyst for curriculum change towards education for sustainable development: an output perspective	To describes the case of an academic staff development programme which was implemented at the Universidad Técnica del Norte (Ecuador) and analyses the extent to which such a programme has positive effects on transformative changes towards a sustainable university.	The results of this case study thus highlight the potential benefits of ESD academic staff development programmes in terms of their relevance for initiating individual learning processes as well as for facilitating social learning and, in this respect, confirm the idea that the competence development of academic staff is an essential prerequisite for a sustainability paradigm shift in higher education.

13	Barth, Godemann, Rieckmann, & Stoltenberg (2007)	Developing key competencies for sustainable development in higher education	to consider, the possibilities both of formal and informal learning and their relationship to competence development within higher education	The development of key competencies is based both on cognitive and non-cognitive dispositions and asks for multiple contexts.

In a study titled "the effectiveness of education for sustainable development" conducted by [1] to investigate the effectiveness of ESD, in the context of formal education, in terms of promoting the sustainability consciousness of adolescents. The researchers used students in grades 6, 9, and 12 from 51 schools across Sweden. Overall, the sample included 2413 students from 51 schools across Sweden, with a mix of big and small schools as well as schools in urban and rural areas. The respondents marked their answers on a five-point Likert scale: (1) never, (2) seldom, (3) sometimes, (4) often, and (5) very often. A "don't know" option was available. The results from our structural equation model thus show that when teachers integrate the environmental, social, and economic dimensions of sustainability issues, as well as focus on their past, present and future, and on their local, regional and global nature, students gain a better understanding (i.e., and increased knowingness) of the complexity of SD.

[13] conducted a study to facilitate understanding of how language use informs social practices and ideology formation, and in this context how it shapes understandings of the role of education in sustainable development. Results indicated that conscious and serious efforts are needed to transform learning processes to make sustainable development possible and meaningful to people. The meanings and goals of ESD should be clarified, so that appropriate educational philosophies and pedagogies could then be put in place to pursue set goals in Africa.

The results of a study titled "The integration of competences for sustainable development in higher education: an empirical analysis of bachelor programs in management" conducted by [14] to find out how and to what extent integration of competences for SD in higher education programs are already present, indicates that competences for SD related to responsibility and emotional intelligence are widely integrated, while competences for SD dealing with system orientation, future orientation, personal commitment, and action-taking are virtually absent. The analysis also shows that many competencies for SD could be discovered within the selected study programs, though in an implicit and fragmented way, thus not covering all necessary fields of knowledge, skills, and attitudes.

Similarly, [15] conducted a study to consider, the possibilities both of formal and informal learning and their relationship to competence development within higher education. An explorative, qualitative study based on focus groups was designed using different groups from formal and informal learning settings. The results indicate that the development of key competencies is based both on cognitive and non-cognitive dispositions and asks for multiple contexts.

[9] conducted a systematic review on Education for sustainable development in early childhood education to describe and analyse research articles relating to the subject of education for sustainable development (ESD) for early childhood education (ECE), published during the years 1996–2013. The result of the study shows that ESD is a growing topic of interest in the field of ECE research. The major research areas identified in this review are teachers' understandings of ESD and implementations of ESD.

Another study conducted by [16] to explore: (i) the factors influencing academic staff engagement in Education for Sustainable Development; and (ii) the views and vision of academic staff concerning Education for Sustainable Development at the University of Southampton, provides evidence on different views and visions of academics concerning ESD and several contradictions between its principles and the role of Higher Education. The study employs exploratory action research study and consisted of two differentiated research stages. In Stage I, 14 academic staff members from different disciplines were interviewed as a reconnaissance phase of a typical action research cycle. In Stage II, a facilitator role for curriculum development was adopted by one of the authors as part of her doctoral studies. It suggests that although academics might have a personal interest and motivation to engage in ESD, factors such as the lack of time and financial resources, lack of deep understanding of sustainability, current curriculum structures and ways of delivery, academic pressures, external factors, lack of organisational support and existing organisational conditions block their engagement in ESD.

A survey was used to collect data from home economics teachers in Australia, Canada, Malta and Scotland to better understand the similarities and differences of home economics curriculum in these contexts, as it contributes to sustainable development education. The results of this study titled "Teacher perceptions of the contribution of Home Economics to sustainable development education: A cross-cultural view" conducted by [17] indicates that the teachers in the study considered SD to be an important issue and the formal home economics curricula made significant contributions to the education of this topic. Further study is recommended to investigate how the field specifically contributes to the development of future global citizens, through the vehicle of sustainable development education knowledge and practices.

Table 2 indicated a study conducted by [18] to examined undergraduate students' view on the Higher Education Sustainable Development approach and to shed light on their acceptance and perceptions of such a Higher Education Sustainable Development learning setting uses a survey to analyze the impact of such a curriculum design on undergraduate students of the 2nd and 4th semester. The results showed a sophisticated understanding of the concept of sustainability and agreed with the values associated. Comparing the results of three different student groups with variation in the degree of sustainability-related studies, a group of students studying sustainability in their minor as a second subject beside disciplinary oriented studies showed a significantly higher acceptance rate than their study peers. However, it suggests that the Leuphana University holistic HESD education approach may not only be attractive to inherent sustainability affiliated prospective students but particularly also to open, tolerant and cosmopolitan young people that are interested to attend interdisciplinary sustainability studies besides their major study subject.

Finally, a study titled "Academic staff development as a catalyst for curriculum change towards education for sustainable development: an output perspective" was conducted by [19] to describes the case of an academic staff development programme which was implemented at the Universidad Técnica del Norte (Ecuador) and analyses the extent to which such a programme has positive effects on transformative changes towards a sustainable university. An experimental method was adopted for the study. The results of this case study thus highlight the potential benefits of ESD academic staff development programmes in terms of their relevance for initiating individual learning processes as well as for facilitating social learning and, in this respect, confirm the idea that the competence development of academic staff is an essential prerequisite for a sustainability paradigm shift in higher education. The researchers expressed that social learning is seen as a necessary prerequisite for sustainability learning.

Which model is predominantly used for integration ESD?

Table 4: List of studies representing predominant models for integrating ESD

SN	Author	Objectives	Model(s)
1	Burmeister, Rauch, & Eilks (2012)	To reflects upon the meaning of the UN's challenge and on what ESD pedagogy will mean for chemistry education.	three pillars model of sustainability
2	Dockry, Hall, Lopik, & Caldwell, (2016)	To provide a detailed description of the SDI model and its development and concludes with short examples illustrating how the model has been used for course design and delivery in higher education, interdisciplinary community planning, and participatory research.	Sustainable Development Institute's (SDI) theoretical model
3	Eilks, (2015)	To give insights into roughly 15 years of ESD research in connection with societally oriented science education performed at the Institute of Science Education (IDN) at the University of Bremen	three pillars model of sustainability & Wheeler's model of ESD
4	Verhulst & Lambrechts (2014)	To study higher education from the perspective of organizational change management, focusing on analyzing the human factors in resistance, communication, empowerment and involvement, and organizational culture	Barriers to the integration of SD in Higher Education (HE)

[11], conducted a study to reflects upon the meaning of the UN's challenge and on what ESD pedagogy will mean for chemistry education. In this titled "Education for Sustainable Development (ESD) and chemistry education". they critically consider various models including "three pillars model of sustainability" to come with four compatible models in terms of "learning about SD", "learning for SD" and "directly contributing to SD". The study provides an overview of different models suggesting how such integration of sustainability issues can be compatible with chemistry education. These models are (i) Adopting green chemistry principles to the practice of science education lab work; (ii) Adding sustainability strategies as content in chemistry education; (iii) Using controversial sustainability issues for socio-scientific issues which drive chemistry education; and (iv) Chemistry education as a part of ESD-driven school development. The study provides different strategies for implementing learning about and for sustainable development into the teaching and learning of chemistry with the spectrum of possible action terminates with the advanced Model 4, which includes more comprehensive ESD-driven projects enhancing school development. It concluded that Chemistry teacher education should more thoroughly mirror the importance of the subject, including the use of chemistry education as a tool allowing students to actively learn how to shape their society in a positive, sustainable fashion.

[5] conducted a study to provides a detailed description of the Nation Sustainable Development Institute's (SDI) theoretical model and its development and concludes with short examples illustrating how the model has been used for course design and delivery in higher education, interdisciplinary community planning, and participatory research. The result of the study indicates that students learn that sustainability entails complex interactions among topics such as climate change, biodiversity, social justice, technology, food security, population control, land rights, organizational development, cultural preservation, poverty alleviation, economic development, resource management, and spirituality. When students begin to look at the six dimensions of the SDI model, they begin to understand that sustainability involves all aspects of life and their coursework.

[7] conducted a study to gives insights into roughly 15 years of ESD research in connection with societally oriented science educa-

tion performed at the Institute of Science Education (IDN) at the University of Bremen. Different models of implementing ESD in the teaching of science and technology are presented and illustrated by various case studies, which were developed by the University of Bremen chemistry education group including "three pillars model of sustainability" & "Wheeler's model of ESD". Moreover, the study develops four-stage models for integrating ESD into science education practices.

To enable learners, have the opportunity to develop their capabilities decision-making and help science education to achieve a broad range of goals, [11] suggested four different basic models for integrating science education and ESD including, (i) adopting principles from sustainable practices in science and technology for hands-on science education laboratory work (ii) adding sustainable science as content in the science and technology curriculum (iii) using controversial sustainability questions for the socio-scientific issues-driven science education (iv) science education as a part of ESD-driven school development. Since all of the four models can effectively serve as tool for-or-about sustainable development, [20] stressed that "Science Education as a Part of ESD-Driven School Development" is promising in respect to education for sustainable development. This could be associated with the reason that the model is effectively potential for; learning about sustainable development; learning for sustainable development, and directly contributing to sustainable development. The results show that thoroughly combining the ESD framework with science teaching that follows a socio-scientific issues-based approach to education has great potential for helping students develop many general educational skills. It also opens a path to a more balanced view of science in its societal and professional context.

[21] conducted a study to investigate ESD in higher education from the perspective of organisational change management, focusing on analysing the human factors in resistance, communication, empowerment and involvement, and organisational culture. In the study, the researchers used a conceptual model that links the SD integration process to human factors. The results indicate two types of resistance emerged: resistance related to financial and structural support; and resistance related to empowerment and personal support. It also showed that the bottom-up approach successfully connected with a top-down approach, but that there still is a risk for de-motivation and sustainability fatigue after initiatives (and funding) ends. Other indications include good communication and empowerment - and their mutual connections – form a critical element to successfully integrate SD in higher education. For the higher institution of learning, the analysis offers more profound insights on how human factors can influence the integration process. The case provides valuable insights for supporting future integration processes within the studied and other higher education institutions. Hence the study concluded that the conceptual model provided helps to get a profound understanding of human-related barriers for integrating SD in higher education, as well as to understand the underlying reasons for these barriers and linkages between them in different stages of the integration process represented in Table 4. The model offers supports and good guidance to structure the integration process of SD in the higher education institution.

Table 5: Barriers for the integration of SD in HE related to human factors in organizational change management discourse

Barriers for the integration of SD in HE			**HUMAN FACTORS**			
			Organizational Culture	**Resistance against change**	**Empowerment and Involvement**	**Internal Communication on changes**
Related to lack of awareness	i.	Lack of interest and involvement			√	
	ii.	Lack of support		√		
	iii.	Lack of professionalization			√	
	iv.	Lack of policymaking	√			
	v.	Lack of standard definitions Sustainable Development in Higher Education				√
	vi.	Lack of recognition		√	√	
	vii.	Sustainable Development is seen as a threat to academic freedom		√		
	viii.	Sustainable Development is not seen as relevant		√		
Related to the structure of higher education	i.	Conservative disciplinary structure of Higher Educational Institutions	√			
	ii.	Inefficient communication				√
	iii.	Resistance to change		√		
	iv.	Focus on short-term profit	√			

	v.	Lack of interdisciplinary research	√			
	vi.	Overcrowded curriculum	√	√		
	vii.	Focus on content-based learning	√	√		
Related to the lack of resources	i.	Lack of money		√		
	ii.	High work pressure and lack of time	√			
	iii.	Lack of access to information		√		√
	iv.	Lack of consistent legislation	√			
	v.	Lack of performance indicators	√			
	vi.	Technical problems	√			
	vii.	Lack of physical place	√			

Numerous researchers studied factors that influence a change process. These factors can either support or hamper the integration process. Success factors and obstacles are strongly related to each other: one factor can support a change process or approach in a certain situation, whilst this same factor can hamper another change process or approach in different circumstances [21]. Base on the fact that many frameworks and models for integrating sustainable development in higher education proposed by scholars [18]&[22] have been criticised by [23] for failing to take into account the processes by which change takes place, [21] develop a conceptual model, which links human factors (resistance, communication, empowerment and involvement, and organizational culture) and barriers to the sustainable development integration process in higher education represented in Table 1. The model structures and supports the analysis of this integration process in a higher education institution.

Discussion

The most common model of SD today remains the three-pillar model described above, which encompasses ecological, economic and social sustainability [7]. To enable learners, have the opportunity to develop their capabilities decision-making and help science education to achieve a broad range of goals, [11] suggested four different basic models for integrating science education and ESD including, (i) adopting principles from sustainable practices in science and technology for hands-on science education laboratory work (ii) adding sustainable science as content in the science and technology curriculum (iii) using controversial sustainability questions for the socio-scientific issues-driven science education (iv) science education as a part of ESD-driven school development. Since all of the four models can effectively serve as tool for-or-about sustainable development, [20] stressed that "Science Education as a Part of ESD-Driven School Development" is promising in respect to education for sustainable development. This could be associated with the reason that the model is effectively potential for; learning about sustainable development; learning for sustainable development, and directly contributing to sustainable development. The results show that thoroughly combining the ESD framework with science teaching that follows a socio-scientific issues-based approach to education has great potential for helping students develop many general educational skills. It also opens a path to a more balanced view of science in its societal and professional context.

Academic staff development programmes enable teachers to cope with these challenges, to improve their teaching and learning practice and to boost motivation and confidence in their teaching abilities [19]. Studies show that teachers would be open to ESD education, provided that feasible training and corresponding teaching materials are made available to them. [19], stressed that sustainable development is not just another topic to be considered in the curriculum, but challenges traditional discipline-oriented and teacher-centred teaching and asks for participatory and competence-oriented approaches in higher education.

[13], argue that the majority of organizations, including governmental-and-nongovernmental, schools, civil society, businesses and individuals are yet to know and understand the role of education in the quest for sustainable development. Sustainable development is muted in most educational policies and practices in Africa. However, the concept remains alien in most communities as it is not appropriately communicated. Any serious efforts towards sustainable development must begin with local people knowing, understanding, and participating in the creation of sustainable development goals [24].

Conclusion

This study reviewed about four different definitions of Education for Sustainable Development and each one of them is rich to deliver essential meaning for understanding the concept. These definitions come from different authors in a varying educational journal. The Education for Sustainable Development shows great potential for bettering the level of general educational skills among students in the sense of participatory learning.

Similarly, the study reveals that most authors inquire for the effective means for the integration of ESD into the educational system. They explore the relevant strategies for executing ESD in a formal educational setting. Lastly, models are used to depict step-by-step procedure for executing planned educational activities. The three pillars model of sustainability was found to be the most predomi-

nantly used model for providing clear information on factors associated with ESD.

Recommendation

The study suggested that teacher education programs need to produce professionals who not only teach sustainability themes but also can "pull together" the various disciplinary strands that will give their students a holistic understanding of a sustainable future and the role of individuals, communities, and nations in a sustainable world. Teacher educators write not only pre-service teacher-education curriculum but also contribute to committees that create teacher-education standards and officially mandated curriculum for primary and secondary education.

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