Sustainable Development in Higher Education: Conceptualization and Measurement

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Abstract:

The present study developed an assessment tool for measuring sustainability in higher education and used a mixed method approach generating items through thematic analysis followed by a quantitative method that build a scale using exploratory factor analysis, separately for three populations i.e. faculty, students and administration at institutions of higher learning. The participants were selected through purposive sampling technique and sampled 140 faculty members, 119 students and 182 administrators at two universities in Lahore. Age range of all participants was between 22 to 58 years. The final scale, called Higher Education Sustainability Assessment Tool (HESAT) reduced item pool to 8 factors dubbed as Teaching Quality (6 items; 36% variance), Development Opportunities (4 items;22% variance), Research Activities (3 items; 22% variance) in faculty form; Work Opportunities (3 items; 28% variance), Engagement (4 items; 27% variance), Skills Development (2 items; 23% variance) in student form; Strategic Communication (5 items; 42% variance) and Funding (3 items; 29% variance) in administrator form.

Keywords: higher education institution, sustainability, teaching, students, administration.

INTRODUCTION:

Sustainability means the capacity to endure, "to meet the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987), and is applicable in several areas such as environment, business, technology, and the social sciences. In 2005, the World Summit on *Social Development* identified three pillars (economic, social, and environmental) of sustainable development use several resources from nature to sustain complex human lifestyles, diversity and ecological balance. Raising educational standards and procuring jobs for sustainable economic growth were among the goals of sustainable development chalked out by United Nations (United Nations Organization, 2018). The focus of the present study, therefore, is to explore factors that bring sustainability conversations to higher education, addressing these goals. While development is a qualitative improvement of potentialities (Daly, 1990), sustainable development in higher education means activities that promote sound in ecological sense, promise social justice and economic viability for the present and future generations (Martin & Jucker, 2003).

Sustainable development was generally studied and conceptualized in an environmental context emphasizing the equity in distribution of natural resources within finite ecosystems (Ben-Eli, 2018; Stoddart, 2011), until more refined approaches spelled out economic and social domains (Hussain et al., 2014). In this regard, economic models seek to accumulate and use natural and financial capital sustainably; environmental models basically dwell on biodiversity and ecological integrity

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while social models seek to improve political, cultural, religious, health and educational systems, among others, to continually ensure human dignity and wellbeing (Robinson & Acemoglu, 2012), and for that matter, sustainable development. It can be argued that since higher education is directly linked with industry and economy, comprises of institutions where human think tanks originate, and prepares and sensitizes the individuals towards practical lives.

Higher education prepares human resource for organizations and industries, and trains existing students with skills, and information to effectively shoulder business market (Volchik et al., 2018). Higher education trains them so that they are cognizant of sustainability in the market they enter. Higher education, therefore, needs to review visions, core functions, policies, decisions, facilities, activities, courses and their curricula for sustainable development at the institutional level; and build an education that inculcates knowledge, skills, ethics, norms, and values in students that makes them planners of sustained development. To see the transformation of knowledge, skills and abilities and their persistence over time, it is essential to explore the factors that can influence the sustainable development in higher education.

Sustainability in higher education is needed because global space is shrinking and there is imminent danger that humanity may run out of its resources. Higher education can equip individuals to achieve their life goals in such a way that enhances human and non-human well-being and sustain it (Cortese, 1999), which has been a difficult task for policy makers at universities, for example, Uhl et al. (2000, 155) claim that: **"**Our universities are much too timid. They contain enormous brain power, but a dearth of vision, courage, and moral responsibility. By and large, they seem to be more concerned about "training" students to fit into a status quo world that is unraveling, rather than forthrightly addressing the causes of this "unraveling" and offering our young people a sense of hope and purpose. Our universities have great leverage, but they fail to use it in creative and exciting ways." Similarly, Anderberg et al. (2009) argue that higher education is more rhetorical in nature, and much limited in scope for global learning that is empirical and can achieve sustainable development.

Universities are laboratories where experiments can be done to generate hands on experience for sustainable development (Cortese, 2003). Beyond broadening discourses on sustainable development, it is important that universities become its model. Higher education can transform knowledge, skills and abilities in students; can invest critical and innovative thinking, impart transformative capacity to address the current social and developmental challenges and develop holistic approaches through cross disciplinary work (Max-Neef, 2005; van Dam-Mieras, 2006). All this can be made possible with the support of faculty and administration (Sterling, 2003; Wals & Corcoran, 2006) which needs to be open-minded, friendly with strong affirmative actions that would accomplish sustainability of campuses where sustainability should be perceptible in teaching, research, operations, and service (Shriberg, 2002).

Approaches to measurement of sustainability are either accounts (raw data on a specific area as monetary converted into scores), narrative (texts, graphics and illustrative figures and tables) or indicator-based (specific indicators as students' sick leave alluding to wider areas as student health) (Bass & Dalal-Clayton, 2012). While accounts usually focus on a specific area, narratives in being detailed can lack consistency. The indicator based measures, though being the most effective, have focused on governance issues than research, education and outreach activities (Yarime &

Tanaka, 2012). Previous reviews of the sustainability development measures in education shows them to be more concerned with environmental issues than social and economic dimensions (Alghamdi et al., 2017). For example, the latest version of the Auditing Instrument for Sustainability in Higher Education (AISHE) developed in 2001 in the Netherlands by the Dutch Foundation for Sustainable Higher Education aimed at measuring sustainable education with 30 indicators across the five modules; identity, education, research, operations, and societal outreach; and it offers a five-stage description for each of these criterion (Roorda, 2020). Another instrument the Campus Sustainability Assessment Framework developing from Campus Sustainability Assessment Review Project in 2002 at the Western Michigan University (US) includes 43 best practice indicators across several dimensions. Similarly, the Campus Sustainability Assessment Framework (CSAF) by Lindsay Cole (Cole & Wright, 2003) has 169 indicators across 10 categories and offers opportunities to benchmark Higher Education Institutions against predefined scores. The Graphical Assessment of Sustainability in Universities (GASU) by Rodrigo Lozano (2006) by at Cardiff University (UK) and last updated in 2011 (Lozano, 2011) has 174 indicators aims to enable analysis and comparison of universities' sustainability efforts. However, despite being very useful these tools are evaluated as focused on management and have limited scope in dealing with other campus operations (Sayed, Kamal, & Asmuss, 2013). Other assessment tools that measure sustainability in education include Talloires Declaration, Halifex Declaration, the Kyoto Declaration and Copernicus University Charter (Calder and Clugston, 2003) and Guidelines for Establishment of a University (Higher Education Commision, 2007) that chalk out policies about sustainability. They provide guidelines that are general goals and do not provide tangible recommendations for universities to materialize them (Roorda, 2002). Work needs to be done in developing standards and translating them into target behaviors that pinpoint factors and core issues for sustainable development (Entwistle et al., 2000), and gathering qualitative data can identify these factors (Shriberg, 2002).

Higher education institutions require rapid, yet insightful ways to determine progress, status, path, and priorities. Since sustainability is a process not a destination, so the tools to determine sustainability should be ever changing and dynamic. The assessment tool should assess why, how and what organizations of higher education should do to meet these changes (Shriberg, 2004), and should make sense of stakeholders e.g., faculty, students and administrators. However, translating all the above into outcomes involves sound and complex methodologies (Stough et al., 2018). Leading work in this area relies on case studies, mixed methods and some theoretical underpinnings; with few empirical cross-sectional studies (Cortese, 1992; Creighton, 1998; Eagan & & Keniry, 1998; Eagan & Orr, 1992; Keniry, 1995; Smith, 1993). From the above discussion, the study draws its rationale as follows.

Rationale of the study

Sustainability and its measurement in higher education institutions in the above literature focuses on environmental protection and responsible use of resources; where these resources are advanced and decision-making procedures different than Pakistan. In addition, there is no quantitative tool to measure the sustainable development in higher education in terms of faculty, students and administration, separately. So, the objective of this study was to develop a quantitative assessment tool that would measure different dimensions of sustainable development in higher education in faculty, students and administration.

MATERIAL AND METHODS

Study 1

Objectives

The main objective of *study 1* was to use qualitative methodology to identify themes relevant to a sustainable development in higher education in faculty, students and administration.

Sample

Using a purposive sampling technique, a total of six participants were selected; three faculty members (PhDs) from various departments including one from the area of sustainable development, one student (PhD scholar, also serving as faculty), and two administrators (MPhil) one from Office of Registrar Academics and one from the Office of Controller Examination. All participants had more than 10 years of experience in higher education. The ages of these participants ranged from 37 to 52 years and this sample was equally divided for gender.

Measure

A semi-structured interview (English) with open ended questions was designed to gather information about the sustainable development in higher education, with the assumption that the sample was well versed in English and had diverse experience in the field of education, however bilingual responses were also collected, translated and used in analysis. This semi-structured interview started with general questions and then moved towards the relevant areas

Procedure

After taking informed consent from each participant, the interview was carried out at a pre-appointed meeting place (their office) and time. The participants were briefed about the study and rapport was established before conducting each interview, which lasted about 2-2.5 hours. During the interviews probe and prompts were given to the participants for further clarification on the topic. The discussion during the interviews was recorded and the verbatim output was transcribed to identify the constructs. The participants were assured that their responses would remain confidential and anonymous and they would have access to the published material of the study.

Qualitative Analysis

A thematic analysis technique was used in the study, which involved coding open ended conversation into categories so as to systemize and summarize the data into themes. Using a deductive approach in thematic analysis, these categories were drawn from prior theoretical framework of the research known as top-down approach, which requires prior familiarity with the literature on the topic in order to formulate these categories (Smith, 2003). First step was to generate code and initial themes, followed by subcategories from these codes. After defining and naming subcategories, main categories were established on the basis of relationship followed by merging relevant themes into superlative themes. Table 1 depicts a themes at various levels.

Table 1: Expert Verbatim Reports, Subordinate and superlative categories of Conceptualization of Sustainability in Higher Education

Expert Opinion	Subordinate Themes	Superlative Themes
Sustainability is a process in which we make policies long lasting for the future generation	Policies, Long lasting, Future Generation	
If we design a sustainable system, we must strictly follow the rules & regulations of that system so that the sustainability can be maintained for the benefits of humanity.	Following rules and regulation, policies.	Policy making and strategic planning SOPs
I think the process would be important. What steps & policies are being implemented?	Process- steps & policies	
Policies and changes that have been introduced are followed consistently.	Absorb change in policies.	
Sustainability is that when you plan something by focusing on future. Market survey is very important for departmental coordinators before launching any course. Need to think about overall benefits instead of individual benefits. Programs and course outline should be designed according to market demand (e.g., computer department students doing internship in organizations established more than 3 years ago. Clinical Psychology students doing case studies according to market demand).	Futuristic planning – Market driven planning, Effective degree program, relevant course outlines and curriculum.	Focus, Involvement in decision making
Any intervention & strategy which implemented for long term results. You need to build structures, processes in the organization to consolidate change interventions in the organization.	Interventions, strategy, structures, processes and change.	
Introduce degrees and programs according to the changing needs of the organization/ students. Strengthening and consolidation of existing programs.	Curriculum – planning-market demand-improvement in current curriculum	
Create such standards of education, faculty & research which can be turned / termed as benchmark. Also the result in the institute repute be covered by competitors.	Set standards	Curriculum
The courses & their syllabus shows continual development / improvement. Leading to better exposure for them.	Curriculum development	
Sustainability meant to teachers that they should be equipped with knowledge from its root to advance level and know how to transfer it. If they are using all available resources and advance technology, then it means there is sustainability. Teacher must have updated knowledge regarding his / her subject. Need to explore all the resources to get knowledge and learn methods and techniques to transfer the knowledge to students.	Personal development-updated knowledge-transformation of knowledge-teaching methodology	

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Teachers should advise the students that how can we reduce the air pollution, water pollution, climate changes. Teachers should assign different assignment to the students so they can understand the sustainability very easily. Continuous training and faculty development. Actively engage in research activities.	Teaching method- transformation of knowledge-	Training and development
For me sustainability links to development, especially if its continuous.	Continuous development	
Staff is usually too much confined, there is always a chance of development. There should be a development, improvement in the daily working of staff & administration is what sustainability meant for them. They should also explore & use the new methods and techniques to accomplish their official task.	Staff should not be confined- development of staff-exploration- innovations in methods and techniques of doing work	
Staff / Administration play key role in sustainability. Giving respect to professors, do not pressurize and making suitable policies for students and teachers so everyone will work in a good way and things will develop is sustainability for staff / administration.	Development of staff- helping and providing support-understanding the importance-	
Keeping themselves abreast of the latest development that can enhance productivity. Training & Development.	Training & development to enhance productivity	
If students do practices and transform the knowledge into practical things is call sustainability for students. Stakeholders like Parents, students and teachers have very close dependent relationship.	Transform knowledge into practical life-	Employability.
Getting themselves ready for higher degrees and future roles.	Employability- development-	
Faculty development. Making the gap between academia & industry reduced. Get the practical people from field on board to review the scheme of studies to make the courses and programs competitive.	Development- linkages of academia and industry- involvement of practical people.	
There should be a defined line and increase in growth level above from that line is sustainability. The defined goals should be sustainable.	Goals – benchmark line	Future forecasting Goal setting
An organization should make such rules & regulations which can be implemented onto the next level of students such as design and introduce such courses which can be helpful to sustain the environment for future generation.	Rules, regulations, helpful curriculum, sustain environment for future generation.	
Vision depends on Sets Standards, achievements, outcome, performance. The set visions should be sustainable.	Set standards, achievements, outcomes and performance.	Vision/ Mission/Goals
Sustainability vision of an organization should be focusing on the market demand and aligned to the	Market driven – future goals	

	future goals.		
	Vision for expansion and catering to future changing needs of the organization. Building systems that have the capacity to innovate and implement such innovations.	Future changing / forecasting – innovation	
	Students should get awareness that how to compete with new challenges of changing environment and try to solve these current problems to sustain the environment for future generation.	Awareness-challenges-current problems-future generation	Awareness
	Sustainability meant to students that they get what he/she has been admitted to university. Achieve the goals for which he / she has been admitted. He / she must qualify all the steps which are being set to get particular degree. Character building, personality grooming should be reflected while interacting with others not only for degree but for other factors as well.	Objective-goals-character building-personality grooming-	Problem Solving Skills
	Students should get awareness that how to compete with new challenges of changing environment and try to solve these current problems to sustain the environment for future generation.	Awareness-challenges-current problems-future generation	
0	Durability. Something will sustain or continue to be overtime.	Long lasting	Reliability/ consistency
	Using resources in longer way.	Long lasting	
	How to maintain their organization to be of a standard which would make them durable. Better yet let them known to be of high quality.	Durability – high quality	
	Organizations should focus on quality & quantity along with productivity	Quality – quantity – productivity	
1	The institute should design such courses which should be helpful for the next generation such as sustainable agricultural method should be adopted so that food security can be implemented for the next generation	Curriculum designing – futuristic demand	Futurism
	The sustainability vision of an institute can be to produce that kind of students which will be helpful for society academically and professionally. It can be achieved by providing platforms through sports, extracurricular activities for the development of students at affordable price with research enhancement. Example of GCU that they equip their students academically plus ethically and professional as more than 50 societies are working as a platform and develop many sportsmen, socially responsible bureaucrats, musician, journalist, actors, politicians and soldiers.	Market driven – futuristic product – academically and professionally strong students.	
2	Need to define and aligned the goals of current & future need and make policies to accomplish those	Alignment of current & future need- efficiently	Alignments

	goals. Need to utilize resources efficiently so the mutual benefits can be achieved. Specialized and expert people required of all fields.	utilization of resources – specialized and expert people	Integration
	How structure am I, which will be long term beneficiary.	Focused-aligned	
3	Typically, education institute should focus on teaching & research quality which is in productivity of its students.	Teaching & research quality-	Experimentation and research
	Experiments, practical implications and see the results / outputs. e.g. for medical student's house job makes the real difference of his learning. **1.1.1**	Experiments results-output-	
	Can be done by analyzing the outcomes achieved. Assess the effectiveness of sustainability program. **1.1.2**	Output	
	Vision should be clearly defined, academic audit should be after every 2 years or 3 years, demand of programmes, thorough evaluation of academic programs before introducing in a market. Necessary requirements regarding teaching & research need to be fulfilled. To provide friendly environment, to provide financial incentives. **1.1.3**	Vision- Audit-market survey-resources required-facilities and motivation	
4	As an institute we can analyze it by looking the absorption of our graduates in the market, level of appointments, number of research papers published, research work, scholars produced, how many patents achieved, graduates qualified for higher education, participation of students at national and international level	job-publications-scholars-Higher education- participation at national and international level	Productivity at various levels
5	We should implement the policies How can we sustain our environmental changes such as climate change, water pollution, air pollution, solid waste management etc.	Implementation Sustaining change-	Environmental sustainability
6	Honest and dedicated people required for sustainability. Competent people required to be on decision making. **1.1.4**	Honesty-dedication competitive resources	Leadership
	Administrative strengthening and Capacity building. revision of policy on regular basis.	Administrative strengthening Self-reflection	

Study 2

Objective

The objective of study 2 was to develop a measure of sustainable development in higher education based on the items generated from above pool of themes.

Phase 1: Item Generation

The objective of the *Study 2* was generation of items for the measure of sustainability in higher education based on factors identified as relevant to local institutional culture. After detailed and comprehensive discussion some of the items were rephrased, modified, discarded and merged. An initial pool of 110 items was generated. The items were generated keeping in mind three different populations of stakeholders in a university i.e., teachers, students and administrative staff. For instance, the capacity building and personal and professional development relates to all stakeholders and items reflected the concern of each of these groups.

Phase 2: Ratings

Four higher education experts, two from Pakistan and two from outside Pakistan rated 110 items (sent through email). All judges were briefed about the study, and were asked to rate each item on a 6-point scale (0-5), where 0 represented, no relation of item with sustainable development and 5 represented the highest relationship of item with the sustainable development. Most responses had ratings of 4 and 5, with 8 items rated at 2 and 3; these items were discarded. From this pool of 102 items, 28 items pertained to faculty, 24 items to students and 50 items to administration were separated.

Phase 3: Pilot Study

Sample and Measure

A pilot study was conducted on 18 males and 12 females (N = 30) that ranged in age from 22 to 58 years. The sample was selected from three different domains of faculty (n = 10, 6 men and 4 women), administration (n = 10, 7 men and 3 women) and students (n = 10, 5 men and 3 women) from two public universities. *The retained pool of items (102) was administered to the participants.*

Procedure and Results

Each item approved by the judges was administered to participants who showed willingness to participate in the study with informed consent. All the respondents were given detailed instructions before rating the pool, and were asked to identify a statement if they felt it was difficult to understand or comprehend. Since no items were difficult to understand all items were retained for analysis in the final phase of Study 2.

Phase 4: Principal Component Analysis

Principal Component Analysis (PCA) was carried out in the Phase 4 of the study, to reduce the dimensionality of a large number of variables (items) to a fewer number of factors and to structure the relationship of variables.

Sample

Three different populations were identified and three convenient samples were extracted from them, where a sample of 56 male and 84 female faculty members (N=140) was extracted from two universities. The age range of participants was from 20 to 50 years, where 103 respondents held MPhil degrees and 37 PhDs. Student sample consisted of 34 male and 85 female students (N = 119) from the same two universities, with an age range from 20 to 25 years, where 91 respondents were bachelors, seven masters, and 21 MPhil students. The 22 respondents were employed and 97 were unemployed. Convenient sample of administrators included 108 males and 74 females (N = 182)

and they ranged in age from 20 to 45 years, where 28 respondents had bachelors, 104 masters and 50 MPhil degrees.

Measure

The student, faculty and administration relevant items were administered separately on each of these groups and each item was rated on a 5-point Likert type scale with 1 meaning strongly disagree to 5 meaning strongly agree.

Procedure

Participants were approached at two universities and permission was taken from relevant authorities before submission of the printed pool of items and data collection. Informed consent was taken from each participant for a sub-part of the item pool to which the participant belonged. All participants were briefed about the nature and purpose of the study, and confidentiality and anonymity of participant data was assured. Each participant was then handed the pool of items along with a sheet where they could provide their demographic information. Participants returned their responses in one to two days, which were physically collected from them.

Results

Assumptions of Kaiser-Meyer-Olkin (KMO, ~.6 or higher) and Bartlett Test of Sphericity (p<.05) were met for all three groups (Kaiser, 1974). Specifically, KMO value for faculty (.78), students (.55) and administration (.72) were above or close to the threshold value of KMO. Bartlett Test of Sphericity for faculty $\chi^2(78, n = 140) = 2395.54$, $p< .001$, students χ^2 (36, N=120) = 780.86, $p< .001$, and administrator$\chi^2(28, n = 182) = 1011.13$, $p< .001$, were all highly significant, satisfying assumptions for both tests; confirming suitability of data for factor analysis. In short, all data distributions were normal with skewness within the adequate range of ±1 (Field, 2005) with no outliers.

Faculty Form

To screen each item a criterion (r≥ .30) for corrected item-total correlation was used, which resulted in screening 13 items that met this criterion. Each of these items positively correlated (r =.56-.86) with the sum of total of the items, and were significant (p<.01). Thus, all items may be considered valid and reliable indicators of the scale. At this point in the analysis 28 items were placed into a Faculty Form and the complete scale was named as Higher Education Sustainability Assessment Tool (HESAT). To factor analyze, aPCA with orthogonal rotation (Varimax) was used, which yielded three-factor solution with Eigenvalues greater than 1.0. These factors were theoretically relevant and had the significant amount of variance (82%); see Table 2 for other psychometric properties.

Table 2: Factor Loading measured through Exploratory Factor Analysis of Faculty Form of Higher Education Sustainability Assessment Tool (HESAT) and its Psychometric Properties

	Factor		
Item	**Teaching Quality**	**Development Opportunities**	**Research Activities**
Teaching approach in our university contributes to build up a respect for the opinion for others.	.89		

Over the years, my work at this institution has improved my critical thinking skills.	.86			
The teaching approaches in my institution play a part in developing a sense of responsibility towards environment.	.84			
The university offers such courses that are based on market demand.	.78			
Whatever I teach, I try to link it with real life contexts in our society.	.75			
Teaching methodologies endorsed by this institution inspire problem solving skills.	.70			
The university provides significant professional development opportunities.		.89		
The university provides significant opportunities to enhance teaching skills		.77		
The institution provides chances of cross cultural exposure		.65		
Our institution creates think tanks where we can discuss and contribute to public policy making.		.59		
The university has established interdisciplinary structures for research.				.89
In my university, sustainability issues and challenges are part of research.				.88
My university's research programs are aligned with global issues.				.64
Eigen	8.03	1.46	1.13	
% Variance	61.74	11.22	8.65	
K	6	4	3	
M(*SD*)	38.10(10.48)	22.54(6.81)	18.69(5.74)	
A	.95	.85	.91	

Note. Factor loadings > .55 is in bold. Solution was obtained by orthogonal rotation with Varimax method, *k* = number of items, *α* = Cronbach alpha

Student Form

Data from 120 student participants were factor analyzed for students resulting in retaining nine items (total items 24) that positively correlated (r = .30-.77) with the sum of the total items and were significant (p<.01). Thus, all items may be considered valid and reliable indicators of the scale. A PCA using orthogonal rotation (Varimax) yielded three-factor solution with Eigenvalues greater than 1.0, which were theoretically relevant with significant variance (78%), see Table 3 for other psychometric properties.

Table 3: Factor Loading measured through Exploratory Factor Analysis of Student Form of Higher Education Sustainability Assessment Tool (HESAT) and its Psychometric Properties

	Factor		
Item	**Work Opportunities**	**Engagement**	**Skills Development**
I am confident that the education I have received	.89		

would find me a placement in job market				
The university organizes job fairs for final batches very frequently.	.86			
My university encourages students to choose a career path of their own interest	.72			
Students voluntary participated in the sports, clubs, societies and co-curriculum forums		.80		
Our classroom discussions involve societal problems and what can do about them		.78		
It is good to see my fellow students from diverse cultural backgrounds.		.74		
Student are directly involved in initiatives to organize knowledge based activities across the university.		.72		
The training I have received from this institution has contributed to my problem solving skills in real life.				.90
The training at this institution has made me sensitive towards preserving environment.				.89
Eigen	4.03	1.96	1.05	
% Variance	44.83	21.72	11.69	
K	3	4	2	
M(*SD*)	12.90(5.65)	17.34(6.34)	9.82(3.73)	
A	.82	.79	.95	

Note. Factor loadings > .60 is in bold. Solution was obtained by orthogonal rotation with Varimax method, *k* = number of items, α = Cronbach alpha

Administrator Form

Analysis of data from 182 administrative staff members retained eight items that positively correlated (r = .42-.69) with the sum of total of the items and were significant (p<.01) and were considered valid and reliable indicators for the form. A PCA with orthogonal rotation (Varimax) was used, which yielded two-factor solution with Eigenvalues greater than 1.0. These factors were theoretically relevant and had the significant amount of variance (71%); see Table 4 for other psychometric properties.

Table 4: Factor Loading measured through Exploratory Factor Analysis of Administrator Form of Higher Education Sustainability Assessment Tool (HESAT) and its Psychometric Properties

	Factor	
Item	**Strategic Communication**	**Funding**
The university has communication strategies to secure and maintain mutual support between students and faculty.	.90	
The best way to guide is through notification.	.84	
The best way to share any information with students and faculty is through social media.	.74	
The university has strong public support in encouragement.	.73	
Leadership of the university efficiently utilizing its staff and other resources.	.72	

The leaders of academia are contributing in funding our university.		.88
Our university is getting support from the business community.		.82
University provides us sufficient funds for various activities of university.		.73
Eigen	4.29	1.40
% Variance	53.62	17.49
K	5	3
M(*SD*)	33.69 (5.67)	16.78 (5.69)
A	.88	.78

note. factor loadings > .60 is in bold. solution was obtained by orthogonal rotation with varimax method, *k* = number of items, *α* = cronbach alpha

DISCUSSION

The current study was carried out to conceptualize and measure sustainability in higher educational institutions of Pakistan using mixed methods that used thematic analysis to highlight if issues of sustainability were different in Pakistan than other countries. A review of the literature suggested, much of these issues were aligned with the rest of the world highlighted by global agencies like the UN etc. A second endeavor in this study was to use qualitative data and transform it into a quantitative scale that could assess sustainability. This resulted in an instrument named Higher Education Sustainable Assessment Tool (HESAT) with eight subscales and three forms suitable for populations that represented faculty, students and administrators. The subscales for Teaching Quality, Development Opportunities and Research Activities are aligned with sustainable development that facilitated the competencies for the development of faculty (Barth & Rieckmann, 2012; De Haan, 2010; Wiek et al., 2011; Wiek & Lang, 2016). New teaching approaches, learning culture and approaches are needed for the sustainable development in higher education (Soriano et al., 2012). The examples of these approaches are research-based learning, service learning, inter and trans-disciplinary project work, problem based learning and collaborative teaching (Lehmann et al., 2008). The latest pedagogies will improve the teaching quality and research activities by focusing on interdisciplinary approaches and active participatory as well as experimental learning (Christie et al., 2015). The student's involvement in the development of curricula is another part where faculty might benefit from support and training. The adaptable and flexible learning environments provide the best possibility for the collaborative and participatory approaches that are helpful for the sustainable development in higher education. However, there is much capacity for better use of currently available resources by universities, particularly faculty and even minor changes to pedagogies and curriculum can make a significant difference to students' learning. Replication of good practices in learning and teaching quality is also a significant part of developing a positive learning environment for students. The faculty will get advantage from awareness about the activities, initiatives and policies of university that have an influence on sustainable development in higher education. It will be beneficial if the teaching quality, development opportunities and research activities align with other university strategies. This permits consistency and uniformity; higher education universities that have essentially an integrative approach have entrenched the sustainable development more successfully than those that have not. The examples of these approaches are research based learning, service learning, inter and trans-

disciplinary project work, problem based learning and collaborative teaching (Lehmann et al., 2008). Higher Education is like a nursery of human potential for future which plays an important role in the development of organizations of societies. The students become part of industries and organizations once they complete their studies. At universities they learn new skills, knowledge and develop their abilities so they can become a part of a professional and a challenging world which is continuously developing.

It is suggested that the skills development of students, work opportunities and engagement play an integral part in the sustainable development in higher education. The study shows that the skills development is overwhelmingly expected to be important for employment (Delbecq et al., 1975). By concentrating on creating positive change among students, higher education universities need to focus on student's skills development, work opportunities and engagement. The collaboration with industries and other higher educational universities will create work opportunities for students and well organized, well-resourced projects can be initiated. This opportunity for deep skills and knowledge development is appreciated by students to use their creativity and work on real time scenarios (Dobson & Tomkinson, 2012). New vision of education that seeks to empower the students by engaging them in decision making related to curriculum design and their related policies. The values, attitudes, behaviors and skills acquired in early stages of higher education may have long-lasting impact in later life. The universities encouraged students to make sustainable choices for their future and provide them the opportunities for their growth of professional and personal life (Clugston et al., 2002).

Through engagement, universities have the potential to go beyond and engage the students in sustainable development. In this study the role of universities is more important by the fact that students they teach are the decision-makers of future. They are the future developers and managers of industries and organizations.

The strategic communication and funding will also contribute in the sustainable development in higher education. The administration is responsible for the policies, transforming learning, integration of sustainable development principles in daily activities, building capacities in staff and faculty, empowering and accelerating the implementations of solutions for the sustainable development. Strategic communication and funding turned out to be the most important factors in the current study that influence the sustainable development in higher education. In order to make sure the strategic communication is aligned with the operations of higher education universities, administration need to implement the sustainable practices (Cortese, 2003). To permit students to fully conceptualize the importance of sustainable development the administration need to transform many aspects of higher education. It can be through top-down/bottom-up approach (Barth, 2013; James & Card, 2012).. There are several ways to incorporate sustainable practices in higher education institutions, but researchers continue to debate over the most effective method of implementation. The effective method should be based on the contextual existence of the higher education and should translate its purpose of existence. To incorporate sustainable development in higher education requires a total transformation of university practices with the strategic communication and proper funding (James & Card, 2012; Moore, 2005; Shriberg, 2002). The conditions and critical dimensions required to create sustainable development practices in higher education includes restructuring the mission, curriculum and research while building support from

leadership (Clugston & Calder, 1999). The small but systematic change can successfully create sustainable development in higher education from formal to informal leadership and it can create successful implementation of sustainable development in higher education through ongoing communication, systems of support and leadership (Barth, 2013).

The present study is the first study to develop the relationship between faculty, students and administration and their factors that influence the sustainable development in higher education in the context of Pakistan to fill an important gap in literature.

CONCLUSION

On the basis of the obtained findings, we may conclude that the identified factors that influence the sustainable development in higher education Faculty (Teaching Quality, Development Opportunities and Research Activities), Students (Work Opportunities, Engagement and Skills Development) and Administration (Strategic Communication and Funding) have positive impact on sustainable development in higher education. HESAT measures eight factors through three forms depicting three different kinds of people in higher education

The sample was taken only from public universities so the findings cannot be generalized. The data should be collected from different universities and from various cities with combination of public and private sector to get diverse data for the validation of the scale as the result findings could be generalized. Gender differences should also be observed to find out the factors contributing to sustainable development in higher education among male and females. As the questionnaires were lengthy, mental fatigue limits the accuracy of information. Confirmatory factor analysis should also be used for the validation of the scale.

This research work builds up a framework which helps the higher education universities to strengthen the factors that influences the sustainable development. The study focused on the human resource and their knowledge, skills, behaviors, attitudes and involvement in the sustainable development in higher education. The development of HESAT (Higher Education Sustainability Assessment Tool) for the higher education was a contribution of psychological assessment. The importance of the study lies in putting forward a model enlightening many significant paths that can help in sustainable development in higher education.

References:

Alghamdi, N., den Heijer, A., & de Jonge, H. (2017). Assessment tools' indicators for sustainability in universities: An analytical overview. *International Journal of Sustainability in Higher Education*, *18*(1), 84-115.

Anderberg, E., Nordén, B., & Hansson, B. (2009). Global learning for sustainable development in higher education: Recent trends and a critique. *International Journal of Sustainability in Higher Education, 10*(4), 368-78.

Barth, M. (2013). Many roads lead to sustainability: A process-oriented analysis of change in higher education. *International Journal of Sustainability in Higher Education, 14*(2), 160-75. DOI: http://dx.doi.org/10.1108/14676371311312879

Barth, M., & Rieckmann, M. (2012). Academic staff development as a catalyst for curriculum change towards education for sustainable development: An output perspective. *Journal of Cleaner Production*, *26*(1), 28–36.

Bass, S., & Dalal-Clayton, B. (2012). *Sustainable development strategies: A resource book*. Routledge.

Ben-Eli, M. U. (2018). Sustainability: Definition and five core principles, a systems perspective. *Sustainability Science*, *13*(5), 1337–43.

Brundtland, G. H. (1987). Our common future: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.. *World Commission on Environment and Development [WCED]*. Oxford: Oxford University Press.

Calder, W., Clugston, R.M. (2003, Mar.-May). International efforts to promote higher education for sustainable development. *Planning for Higher Education*, *31*, 34-48.

Christie, B. A., Miller, K. K., Cooke, R., & White, J. G. (2015). Environmental sustainability in higher education: What do academics think? *Environmental Education Research*, *21*(5), 655–86.

Clugston, R. M., & Calder, W. (1999). Critical dimensions of sustainability in higher education. *Sustainability and University Life*, *5*(1), 31–46.

Clugston, R. M., Calder, W., & Corcoran, P. B. (2002). *Teaching sustainability with the Earth Charter*. University of Nairobi.

Cole, L., & Wright, T. (2003). *Assessing sustainability on Canadian University campuses: Development of a campus sustainability assessment framework* (Unpublished Master's Thesis, Royal Roads University, Victoria, BC).

Cortese, A. (1999). *Education for Sustainability: The need for a new human perspective* (Opinion Paper). Boston, MA: Second Nature.

Cortese, A. D. (1992). Education for an environmentally sustainable future. *Environmental Science & Technology*, *26*(6), 1108–14.

Cortese, A. D. (2003). The critical role of higher education in creating a sustainable future. *Planning for Higher Education*, *31*(3), 15–22.

Creighton, S. (1998). *Greening the ivory tower: Improving the environmental track record of universities, colleges, and other institutions*. MIT Press.

Daly, H. E. (1990). Sustainable development: From concept and theory to operational principles. *Population and Development Review*, *16*, 25–43.

De Haan, G. (2010). The development of ESD-related competencies in supportive institutional frameworks. *International Review of Education*, *56*(2–3), 315–28.

Delbecq, A. L., Van de Ven, A. H., & Gustafson, D. H. (1975). *Group techniques for program planning: A guide to nominal group and Delphi processes*. Scott Foresman.

Dobson, H. E., & Tomkinson, C. B. (2012). Creating sustainable development change agents through problem-based learning: Designing appropriate student PBL projects. *International Journal of Sustainability in Higher Education*, *13*(3), 263–78.

Eagan, D. J., & Keniry, J. (1998). *Green investment, green return: How practical conservation projects save millions on America's campuses.* ERIC.

Eagan, D. J., & Orr, D. W. (1992). *Campus and environmental responsibility*. Jossey-Bass.

Entwistle, N., Skinner, D., Entwistle, D., & Orr, S. (2000). Conceptions and beliefs about "good teaching:" An integration of contrasting research areas. *Higher Education Research & Development*, *19*(1), 5–26.

Higher Education Commission. (2007). *Guidelines for the establishment of a new university or an institution of higher education,* 5th Ed. Author.

Hussain, F., Chaudhry, M. N., & Batool, S. A. (2014). Assessment of key parameters in municipal solid waste management: A prerequisite for sustainability. *International Journal of Sustainable Development & World Ecology*, *21*(6), 519–25.

James, M., & Card, K. (2012). Factors contributing to institutions achieving environmental sustainability. *International Journal of Sustainability in Higher Education, vol & issue no, pages*.

Keniry, J. (1995). *Ecodemia: Campus environmental stewardship at the turn of the 21st century: lessons in smart management from administrators, staff, and students*. Natl Wildlife Federation.

Lehmann, U., Dieleman, M., & Martineau, T. (2008). Staffing remote rural areas in middle-and low-income countries: A literature review of attraction and retention. *BMC Health Services Research*, *8*(1), 1-10.

Lozano, R. (2006). A tool for a Graphical Assessment of Sustainability in Universities (GASU). *Journal of Cleaner Production*, *14*(9–11), 963–72.

Lozano, R. (2011). The state of sustainability reporting in universities. *International Journal of Sustainability in Higher Education*. *12*(1), 67-78.

Martin, S., and Jucker, R. (2003). Educating earth-literate leaders. Paper presented at International Conference on Education for a Sustainable Future, Shaping the Practical Role of Higher Education for a Sustainable Development organized by International Association of Universities and Charles University in Prague, Charles University, Karolinum, Prague, Czech Republic, on 10 – 11 September, 2003.

Max-Neef, M. A. (2005). Foundations of transdisciplinarity. *Ecological Economics*, *53*(1), 5–16.

Moore, J. (2005). Is higher education ready for transformative learning? A question explored in the study of sustainability. *Journal of Transformative Education*, *3*(1), 76–91.

Robinson, J. A., & Acemoglu, D. (2012). *Why nations fail: The origins of power, prosperity and poverty*. Profile London.

Roorda, M. B. S. (2020). *Developing defensible criteria for public sector evaluations* (PhD Thesis, The University of Melbourne, Australia).

Roorda, N. (2002). Assessment and policy development of sustainability in higher education with AISHE. In W. L. Filho (Ed.). *Teaching sustainability at universities: Towards Curriculum Greening, Environmental Education, Communication and Sustainability.* (459-486). Peter Lang, Frankfurt.

Sayed, A., Kamal, M., & Asmuss, M. (2013). Benchmarking tools for assessing and tracking sustainability in higher educational institutions: Identifying an effective tool for the University of Saskatchewan. *International Journal of Sustainability in Higher Education*, *14*(4), pp. 449-65.

Shriberg, M. (2002). Institutional assessment tools for sustainability in higher education: Strengths, weaknesses, and implications for practice and theory. *Higher Education Policy*, *15*(2), 153–67.

Shriberg, M. (2004). Assessing sustainability: Criteria, tools, and implications. In P. B. Corcoran, & A. E. J. Wals (Eds.). *Higher education and the challenge of sustainability*: Problematics, promise and practice. (71–86). Springer.

Smith, A. A. (1993). *Campus ecology: A guide to assessing environmental quality and creating strategies for change*. Living Planet.

Smith, J. A. (2003). *Qualitative psychology: A practical guide to research methods.* Sage.

Soriano, D. R., Vila, L. E., Perez, P. J., & Morillas, F. G. (2012). Higher education and the development of competencies for innovation in the workplace. *Management Decision*. *50*(9), 1634-48.

Sterling, S. R. (2003). *Whole systems thinking as a basis for paradigm change in education: Explorations in the context of sustainability* (Doctoral dissertation, University of Bath).

Stoddart, M. C. (2011). "If we wanted to be environmentally sustainable, we'd take the bus:" Skiing, mobility and the irony of climate change. *Human Ecology Review*, *18*(1), 19-29.

Stough, T., Ceulemans, K., Lambrechts, W., & Cappuyns, V. (2018). Assessing sustainability in higher education curricula: A critical reflection on validity issues. *Journal of Cleaner Production*, *172*, 4456–66.

Uhl, C., Anderson, A., & Fitzgerald, G. (2000). Higher education: Good for the planet? *Bulletin of the Ecological Society of America*, *81*(2), 152-56.

United Nations Organization. (2018). Higher education and research for sustainable development (HESD). Retrived from https://sustainabledevelopment.un.org/partnership/?p=11748 (accessed on 27 August 2018).

van Dam-Mieras, R. (2006). Learning for sustainable development: Is it possible within the established higher education structures. In J. Holmberg, & B. E. Samuelsson (Eds.), *Drivers and barriers for implementing sustainable development in higher education: Education for sustainable development in action*.(13–18). UNESCO.

Volchik, V., Oganesyan, A., & Olejarz, T. (2018). Higher education as a factor of socio-economic performance and development. *Journal of International Studies*, *11*(4), 326-40. doi:10.14254/2071-8330.2018/11-4/23

Wals, A. E., & Corcoran, P. B. (2006). Sustainability as an outcome of transformative learning. In J. Holmberg, & B. E. Samuelsson (Eds.), *Drivers and barriers for implementing sustainable development in higher education: Education for sustainable development in action*. (103-110). UNESCO.

Wiek, A., & Lang, D. J. (2016). Transformational sustainability research methodology. In H. Heinrichs, P. Martens, G. Michelsen, & a. Wiek (Eds.), Sustainability science: An introduction. (pp. 31–41). Springer.

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, *6*(2), 203–18.

Yarime, M., & Tanaka, Y. (2012). The issues and methodologies in sustainability assessment tools for higher education institutions: A review of recent trends and future challenges. *Journal of Education for Sustainable Development*, *6*(1), 63–77.