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An explorative socio-psychological model for determining sustainable behavior: Pilot study in German and Mexican Universities

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ABSTRACT

This paper presents a proposal for a socio-psychological model which examines behavior for sustainability of individuals in higher education institutions (HEIs). The model aims to offer an alternative to the theory of social dilemmas, which is often proposed to explain unsustainable behavior. This model focuses on values and moral norms grounded within individuals, rather than on rational choice and self-interest. Key variables are universal values, awareness of consequences, ascription of responsibility, and personal intelligences. Results of this exploratory study show that not all of these key variables can be proven to be significant. However, ascription of responsibility, universal values, and personal intelligences seem to be the main factors which explain behavior for sustainability. This model is promising because it shows, in an explanatory manner, an increase in behavioral variance.

1. Introduction

UNESCO has promoted the Decade of Education for Sustainable Development (DESD). The DESD, initiated in January 2005, emphasizes the importance of quality basic education. Furthermore, the DESD stresses that education must provide specific skills such as learning to know, learning to live together, learning to do, and learning to be [1,2] in order to fulfill the sustainability requirements of the Ubuntu Declaration [3]. According to the DESD, educational curricula [2,4] from nursery school through university must be thoroughly revised toward sustainability.

UNESCO [5] establishes the far-reaching DESD initiative, reflecting the social, economic, and environmental challenges facing humanity and the planet. This initiative intends to prepare people in all professions and under all social conditions to cope with and find solutions to problems which threaten the sustainability of our planet. Environmental issues such as water and waste affect every nation, as do other social issues such as employment, human rights, gender equity, peace, and human security. All countries must also address economic issues such as poverty reduction and corporate responsibility and accountability. Major concerns that have demanded global attention such as HIV/AIDS, migration, climate change, and urban sprawl nowadays involve several spheres of sustainability: environment, society, and economy. The initiative is complex because its goals integrate values related to dignity, human rights, equity, care for the environment, and sustainable development, along with human diversity, inclusiveness, and participation. In the economic realm, the initiative includes sufficiency for all, and equity of economic opportunities. The DESD is a transformational undertaking because it implies that Education for Sustainable Development (ESD) focuses on underlying principles and values conveyed through education. As such, ESD is concerned with the content and purpose of education, and, more broadly, with all types of learning. ESD challenges all forms of education. Thus, ESD also addresses pedagogical processes, validation of knowledge, and the functioning of educational institutions.

Table 1 shows ESD principles and characteristics. ESD is based on a holistic vision and is an interdisciplinary, values driven, and critical thinking approach, focused on problem solving, and based on multiple methods: pedagogical, ludic, artistic, and participatory in local decision-making. Education for sustainability must enable students to understand the complexity of global environmental, social, and cultural settings. ESD proposes sustainable alternatives to current practices. Students must understand that in order to attend to the current situation, they must develop a critical, responsible, and participatory attitude based on sustainability

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Table 1
Principles of education for sustainability (adapted from UNESCO guidelines) [5,6].

Principle	Characteristics
Interdisciplinary and based on systems thinking	Learning for sustainable development embedded in the whole curriculum, research, outreach and management campus programs, not as a separate subject
Values-driven	Sharing the values and principles underpinning sustainable development
Critical thinking and problem solving	Leading to confidence in addressing the dilemmas and challenges of sustainable development
Multi-methods	Art, debate, drama, playful experiences, different pedagogies, etc. which model the learning processes
Participatory decision-making	Learners participate in decisions on how they are to learn
Locally relevant, effective and contextual	Addressing local as well as global issues, and using the languages which learners most commonly use

which is multi-causal, and the analysis and solutions are transdisciplinary.

This paper aims to address personal factors which influence behavior toward sustainability of decision-makers within Higher Education Institutions (HEIs) in developed and developing countries, as well as to present the spheres or areas where these individuals work, and in which higher education for sustainability is fostered. First, this model focuses on values and moral norms rather than on rational choice and self-interest. This study is intended to provide a valid model useful worldwide, as it incorporates variables grounded within individuals. Compared to previous models, this model represents an advance in explaining behavioral variance. Secondly, this research draws on social psychology which is the scientific study of the reciprocal influence of the individual and his or her social context through the behavioral expression of his or her thoughts and feelings. Therefore, the model presented here addresses a range of contexts from intra-personal processes and inter-personal relations, to inter-group behavior and societal analyses.

2. Proposal, testing, and validation of a socio-psychological model

2.1. Sustainable behavior

The idea for this study of sustainable behavior arises from two viewpoints: environmental psychology, and sustainability as an evolving concept. On the one hand, environmental psychology explores the interaction between people and their physical setting [7], or in other terms, the relationship between people (human well-being) and the broader environment (socio-physical context) [8]. The concept of sustainability has its roots in the "green" movement of the United States and Europe since the late 1960s. During this period, western society has become more conscious about living in harmony with nature, the limits to natural resources, and worsening environmental problems [9].

All this has caused a change in worldviews regarding *Human Exception*, by which the human being is conceived as a special organism – an exception among animal species. Animals basically depend on their instincts in order to survive. Humans, on the contrary, have markedly different learning mechanisms, deliberate action, and the capacity to dominate other organisms. This world vision has shifted toward a *New Environmental Paradigm* [10], which holds that humans are part of the natural world and subject to rules of nature, and are part of the interdependence of species. Earlier *behavioral* theoretical approaches such as Skinner's contingency model stated that conditions which exist when a response is followed by a reinforcement action enable a range of environment–behavior relationships to satisfy a contingency. The newer *cognoscitivism* model aims to study the information determinants of thought processes and related events. That is, behavior is influenced by the information an organism stores in the brain and the brain's information-processing systems [11]. Finally, this new paradigm moves from *disciplinary* work toward *interdisciplinary* work, that which transcends disciplines.

Several authors [12,13] consider behavior to be the interaction between organisms and objects. Specifically, pro-environmental behavior is defined as actions contributing to environmental conservation, or human activity intended to protect natural resources, or at least reduce environmental deterioration. These definitions include a deliberate component, or intentionality. In conclusion, sustainable behavior has three main characteristics: (1) it is an outcome or result; (2) it is effective, and (3) it is complex. According to the aforementioned, and adapted from the definition by Corral-Verdugo and Pinheiro, this paper considers sustainable behavior to be "a set of effective, deliberate, and anticipated actions aimed at accepting responsibility for conservation and preservation of physical and cultural resources. These resources include integrity of animal and plant species, as well as individual and social well-being, and safety of present and future human generations". This extended definition provides a point of reference for determining sustainable human behavior in this study.

2.2. Cognitive theory and the information-processing approach

Virtually all conceptual schemes which have been used to model behavior have been applied to explain sustainable behavior. The most relevant is cognitive theory, which characterizes people as dynamic information-processing systems whose internal and mental operations (beliefs, attitudes, or perceptions) might be described in computational terms [14].

The mind–body problem, and its modern subjective expression called "conscience", is a topic which has been vehemently debated by philosophers for millennia, and more recently by psychologists and biologists. The question of whether conscience plays a role in the production of behavior, or whether it is a powerless observer of the world, and body's response to behavior, seems to present two competing approaches based on the information processing: the symbolic system hypothesis and the connectionist assumption [15].

The symbolic system hypothesis establishes that the mind is like a computer program. At the core of the program is a manipulation of symbols representing the world through a set of formal rules, analysis of stimuli, and selection of responses. In its simplest form, information arises from the senses, is transformed into an internal representation, and the subject produces an answer [14]. Meanwhile, the connectionist assumption makes no distinction between types of memory. Instead, this approach states that the architecture of cognition consists of multiple simple processing units, very similar to neurons in the interconnected network of the brain. Each unit is identical to all other units, and learning, memory, and thinking are all changing patterns of activity in the network as a whole [15]. At present, there is an emerging hypothesis which could reunite the two approaches of cognition; the human mind is a hybrid of both. It is possible that the human mind in its rational aspects is a serial performance processor, especially when thoughts are transformed into awareness. For example, when we think or

write, an idea and a thought appear simultaneously. Meanwhile, more automatic and unconscious aspects of the human mind would be of a connectionist nature [15].

In summary, cognitive theory and the computational framework remain the only scientifically acceptable bases for conceptualizing performance, although these two theories have attracted a variety of criticisms regarding the brain, mental states (beliefs, feelings), the formation of generalizations and interferences, and the understanding of complex patterns and emotions. However, none of these limitations should be considered to be fundamental difficulties for the computer metaphor which has proven to be extremely useful in explaining many areas such as personality, emotional disorders, and human behavior [14].

2.3. Social psychology models

Contemporary scholars have built complex models of relationships among several key behavioral determinants such as experience, knowledge, beliefs[1], attitudes[2], and values[3]. Despite the diversity of specific applications of attitude-related theories, they may be separated into two socio-psychological models which take into account factors which promote or limit an individual's behavior [16].

The two general models are (a) Theory of Planned Behavior [17] and (b) Norm-Activation Theory (NAT) [18]. While the first has its basis in deliberation based on rational choice and self-interest, the second is grounded in values and moral norms. Recently formulated, the value–belief–norm framework [19] is a generalization of the NAT.

2.4. Proposed model

Prediction of sustainable behavior is not simple. It appears to involve a number of variables, none of which is likely to operate without interacting with others. Therefore, the development of a model is a difficult task. The appropriate question concerning sustainable behavior is what factors are important and why? In order to prepare the proposed model, a number of conceptual frameworks were researched which provide important considerations in identifying psychological, situational, and contextual factors explaining behavior.

The first theoretical framework is the meta-analysis from Hines, Hungerford, and Tomera [20] which addresses responsible environmental behavior. This study remains a benchmark for conclusions on behavioral variables. The model identifies four factors which explain elements of willingness to perform an individual process: (1) recognition of the problem as a prerequisite for action, (2) knowledge of the courses of action which are available and most effective in a given situation, (3) the ability to implement strategies of action items, combined with (4) appropriate knowledge. These factors allow individuals to take action. One remaining category exists which can interrupt this pathway to action: (5) situational factors. Situational factors such as economic constraints, social pressures, and opportunities to choose different actions may enter into the picture and serve either to counteract or to strengthen the variables in the model.

The second model, the value–belief–norm [19] framework states that according to values, behavior may be predicted. This model offers an array of five causal factors which determine actions toward social movements. This model is based on Schwartz's [21] 10 core values (power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, conformity, and security) which are recognized across cultures. They have practical, psychological and social consequences which may create inherent conflicts or compatibility among people's motivational goals. Also, the model is based on the norm-activation process [19].

Thirdly, the theory of multiple intelligences [22] (TMI) establishes seven skills (linguistic, logical–mathematical, musical, spatial, bodily kinesthetic, and inter-personal and intra-personal intelligence) which human beings perform in any culture in which they live and grow up. TMI is developed under a distributed vision, that is, inherent to individuals and artifacts that surround them. There are several criticisms of Howard Gardner's conceptualization of multiple intelligences. This theory holds (1) that multiple intelligences act on a value system whereby students with a diversity of abilities can learn and succeed; (2) that learning is exciting, and that hard work by teachers is necessary; (3) that the exchange of constructive suggestions and formal and informal ideas embedded in the curriculum and the evaluation of educational activities are valid for the students, as well as for the broader culture, (4) that the arts may be employed in order to develop people's abilities and comprehension within and across disciplines, and (5) that multiple intelligences are means to fostering high quality student work. These features are highly pursued in education for sustainability.

The fourth and final theory consists of five psychological dimensions proposed by Corral-Verdugo and Pinheiro [7] to achieve sustainable actions: effectiveness, deliberation, anticipation, solidarity, and austerity. The requirements for sustainability include either challenges imposed by the environment (lack of resources, climatic adversity, environmental and social opportunities), or regulatory requirements of social groups (conventions, rules and laws for environmental protection, rules of solidarity, public policies). In addition, individual dispositions (attitudes, beliefs, perceptions, and values) generate conditions in individuals which lead them to act responsibly toward themselves, the environment, and their fellow humans.

Fig. 1 depicts the model proposed to explain sustainable behavior. Situational factors (demographics, in this study) which either counteract or strengthen actions in the model are taken into account. Two key elements of personal skills – inter- and intra-personal intelligences – which are concerned with the capacity to understand the intentions, motivations, and desires of other people and oneself, are considered. These two personal skills were sifted through the five psychological dimensions to predict sustainability actions of HE subjects. Two personality traits (ascription of responsibility and awareness of consequences) inform us as to people's desire to take action on environmental issues. In order to discern a personally or socially preferable way of life, the four core values based on inherent conflicts or compatibility among people's motivational goals are taken into account. The authors of this study believe that both the psychological and the demographic variables elucidate people's sustainable behavior. That is, human sustainable behavior is based on core elements of personality which determine an action in favor of the common good, as well as causal factors joined to both the idea of sustainable actions and to social and individual responsibility in any culture.

[1] A belief [43] is a simple proposition, conscious or not, which may be inferred from what a person says or does, and which may be preceded by the words "I believe that." Any belief consists of three parts: cognitive (knowledge); affective (feeling) and conative (action). The three main categories of belief are descriptive or existential (I believe that the sun rises in the east); evaluative (I believe that trees are beautiful) and prescriptive or exhortative (I believe that trees must be respected). Beliefs are formed during childhood. The set of beliefs that an individual has regarding the surrounding socio-physical reality is called a belief system.

[2] An attitude [44] is a smaller set of related beliefs. It is also a comprehensive, relatively enduring belief regarding an object or situation which predisposes the person to respond in a certain way to that object or situation.

[3] Values [44] are forged from sets of interrelated attitudes. Values are enduring beliefs about a certain behavior or ideal way of life which is personally or socially preferable to an alternative behavior or way of life.

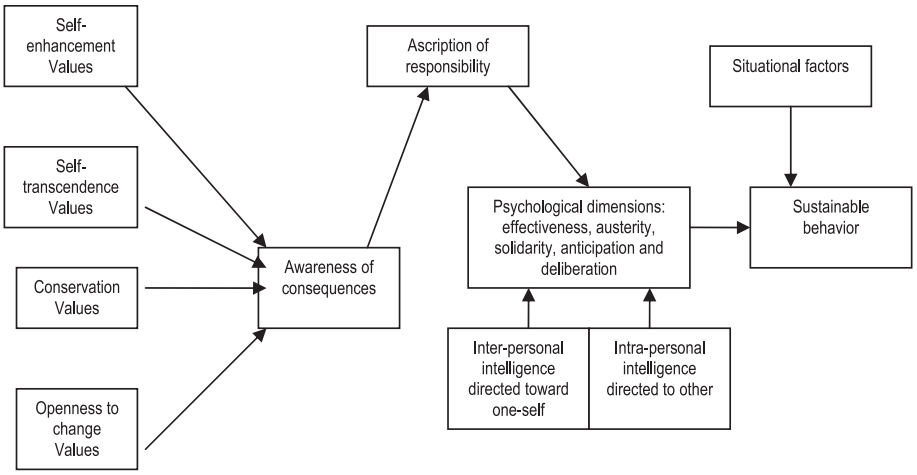

Fig. 1. Proposed model with factors which explain behavior for sustainability.

2.5. Implementation and validation of the model

Once the conceptual model is constructed, the construct of behavior for sustainability must be operationalized. This is done by taking into account the five latent variables mentioned above: (1) universal values, (2) awareness of consequences, (3) ascription of responsibility, (4) inter- and intra-personal intelligences associated with psychological dimensions, and (5) demographical factors.

The construct of behavior for sustainability and the factors mentioned, except for demographics, are entities which are impossible to directly observe and measure. In order to resolve this limitation, social psychologists and other social scientists have theorized and proposed latent variables (hypothetical terms). Latent variables are mental constructs which represent complex relationships; when subjects response from a questionnaire containing a variety of indictors, these latent variables may be measured as real entities [23].

A questionnaire [19] was prepared which consisted of 67 items in five sections according to the latent variable model. The first section of *universal values* includes 21 items of Schwartz's [24] 10 value categories. At least one item was included from each value type. Fifteen of the items supported principles underlying the ESD and six items were contrary to ESD. The order of these variables was randomized to prevent participants from anticipated response. The variables for moral norm activation from the second and third sections of the questionnaire were measured through nine items regarding *awareness of consequences* (AC) and nine regarding *ascription of responsibility* (AR). Those questions related to AC included importance to oneself, country, and other species on three actual environmental problems (climate change, loss of forests, and chemicals). In the AR section, three items concerned personal obligations, three concerned government obligations, and three concerned business obligations. The fourth section on *intra-personal and inter-personal intelligences* contained 20 items [25], sifted through five psychological dimensions of sustainability. The order of these variables was randomized to prevent participants from anticipated response. The final section contained eight questions related to demographics such as age, gender, religious denomination, general income level, and educational training. Fifty-nine items were polytomous in four different Likert scale items and 8 demographics were dichotomous [26]. The questionnaire is included in Appendix 1.

The questionnaire was applied to individuals from two universities in countries with vastly different cultures and economies. The first is the *Universidad Autonoma Metropolitana, Azcapotzalco* (UAMA), which is located north of Mexico City, and is one of four campuses of the UAM, a public university. In 2006, the UAM issued a general framework, the so-called *Plan Institucional hacia la Sustentabilidad*. This plan was part of a broader program developed by a three-part initiative of the Mexican Environmental Ministry, the National Association of Universities and Higher Education Institutions, and the Center of University Studies. This initiative was published in 2000 and encourages a strategy to lead HEI toward improved environmental performance in light of the Decade of Education for Sustainable Development [27]. The other university is the *Leuphana Universität Lüneburg, Institut für Umweltkommunication* (LULIfUK), a public university 30 km from Hamburg in the Federal Republic of Germany, honored with the UNESCO Chair in Higher Education for Sustainable Development [28]. The central aim of the UNESCO Chair is to investigate how academic teaching and learning can be reoriented toward sustainable development.

Two samples were obtained and their characteristics are shown in Table 2. The UAMA questionnaire was applied directly to participants who are key individuals; that is, they are or have been members of one of the three campus councils or have coordinated activities providing support and service for the entire campus community. At LULIfUK, the questionnaire was applied through the Internet via participants' e-mails. Each participant's decision-making activities are unknown.

In order to validate the proposed model, two analytical methods were applied in the following order: principal component analysis [29] (for all data of both HEIs), and the Rasch model [30] based on Item Response Theory [31] (only for personal intelligence data related to sustainable dimensions and participants).

Table 2
Sample characteristics in Mexican and German universities.

Samples	UAMA (Mexican HEI)	LULIfUK (German HEI)
Participants	82	40
Answer rate	65.6% (total 125)	8% (total 500)
Students	15 (19.0%)	30 (75.0%)
Faculty members	40 (49.0%)	7 (17.5%)
Administrators	27 (32.0%)	2 (5.0%)
Women	29 (35.0%)	29 (72.5%)
Men	53 (65.0%)	10 (25.0%)
Average age, years	43.7 (20–78)	27.7 (21–58)
Owners of their houses	Majority	Few
Renting their apartments	Few	Majority
Religious denomination	65 (80%) Catholic	15 (37%) Lutherans 16 (38%) non religious

2.6. Outcomes

The principal component analysis loads 65 variables, as well as 69 participants at the Mexican HEI, and 37 participants at the German HEI who fully responded the questionnaire. The Rasch model loads 20 variables, 80 participants at the Mexican HEI, and 37 participants at the German HEI.

2.6.1. PCA results

The data for each HEI were analyzed by means of a principal component analysis [32] with a varimax rotation which did not converge after 25 iterations at both HEIs. Three of six of the various indicators of factorability were poor: the matrix of correlation coefficients, Kaiser–Meyer–Olkin measures of sampling, and the on-diagonal values of the anti-image correlation matrix. However, the last three indicators load a good factorability level; the Bartlett test shows the data have a probability of factorability and high values in communalities, and the very low residual values from the matrix of reproduced correlations indicate optimum outcomes.

Within the data, 21 and 18 components were found for UAMA and LULIfUK respectively, with an eigenvalue of greater than 1.0; they explain 79.78% and 86.68%, respectively, of associated variance as opposed to 40–60% [33,34] from previously mentioned models; therefore this is a very promising model. Scree plots indicate 21 and 17 components, very close to the eigenvalue. The communalities values were above an average of 0.7; this means that the variables had much in common with each other even though fewer than one hundred subjects participated [32].

Cronbach's alpha for the entire UAMA sample was 0.643 and 0.779 for the LULIfUK sample, though both are considered fairly unreliable questionnaire scales, due to possible chance error caused by the measuring instrument.

The results of this exploratory study show that not all of these key variables can be proven to be significant. However, ascription of responsibility, universal values, and personal intelligences seem to be the main factors explaining sustainable behavior, as shown in Table 3. This table shows the pattern found as a representative relation of latent variables, which were the leading factors underlying behavior for sustainability in each university. In the left-most column, saturation values from the component matrix extracted using the PCA method are presented. The second and third columns are composed of the first four components of the initial matrix for each university; Mexican HEI components appear in the middle and German components to the far right. There are no data for this high saturation value (0.7–0.8) at UAMA; however variables 32 and 38, pertaining to the latent variable "ascription-of-responsibility", appear for LULIfUK. The same is true for variables 14, 16 and 11 for the latent variable of universal values. For middle saturation values (0.6) related to the first component, UAMA loads variable 47 under the personal intelligences latent variable and variable 38 under the latent variable "ascription-of-responsibility", the same as in the LULIfUK sample for high saturation values. The lower saturation values (0.4–0.5) for the first component at UAMA associate twice the variables of those at LULIfUK. The number of participants at UAMA was twice those of LULIfUK. Ascription of responsibility, universal values and personal intelligences appear more frequently than the other two latent variables "awareness of consequences" and "demographics".

The results from PCA show, in an exploratory manner, that the model could help to determine factors underlying behavior for sustainability by decision-makers at higher educational institutions, as it shows which variables have influence over key subjects. Nevertheless, future research should consider additional HEI and a greater number of participants. Furthermore, an iterative process (test, correct, and retest) is necessary in order to obtain a more precise measuring instrument.

Table 3
Pattern of first four components found by the PCA and the representing linking latent variables at universities.

PCA values	UAMA components (Mexican HEI)				LULIfUK components (German HEI)			
	1	2	3	4	1	2	3	4
	Variables				Variables			
Higher 0.7–0.8					V32^{I} V38^{I} V14^{II} V16^{II} V11^{II}		V2^{II}	V64^{V}
Middle 0.6	V47^{III} V38^{I}		V22^{IV}		V33^{I} V28^{IV} V23^{IV}	V45^{III} V4^{II}	V49^{III} V47^{III}	V35^{I} V60^{V}
Lower 0.4–0.5	V21^{II} V49^{III} V16^{II} V33^{II} V17^{II} V14^{III} V46^{I} V52^{III} V50^{I} V42^{III} V4^{II} V6^{II} V8^{II} V35^{I} V32^{I} V10^{II} V57^{I} V46^{III} V44^{III} V53^{III} V18^{II} V28^{IV} V15^{II} V13^{II}	V18^{I} V44^{III} V20^{II} V15^{II} V51^{III} V41^{III} V43^{III} V64^{V}	V36^{I} V30^{IV} V48^{III} V9^{II} V31^{I} V40^{III}	V5^{II} V13^{II} V65^{V} V12^{II}	V31^{I} V52^{III} V9^{II} V19^{II} V17^{II} V51^{III} V36^{I} V32^{I}	V17^{II} V10^{II} V40^{III} V21^{II} V18^{II} V44^{III} V22^{IV} V18^{II} V50^{III} V3^{II} V29^{I} V55^{III}	V46^{III} V15^{II} V17^{II} V3^{II} V56^{III} V57^{III} V27^{IV}	V61^{V} V5^{II} V65^{V} V38^{I} V51^{III} V41^{III} V37^{I} V7^{II}

Note: Latent variables are: I – Ascription of responsibility, II – Universal values, III – Personal Intelligences, IV – Awareness of consequences, V – Demographics. All variable are at Annex 1. PCA values = saturation values extracted by principal component analysis method.

2.6.2. Rasch model outcomes

In relation to results obtained from the Rasch model at UAMA, observations show that students almost always show the highest probability values in the five dimensions, and faculty members the lowest. "Effectiveness" [4] is the most likely behavior performed by the three types of subjects, as shown by the probability value of 0.09. "Solidarity"[5] and "Anticipation"[6] were the least likely to be shown, however "Anticipation" is the most unlikely behavior, obtaining the lowest probability among the three groups of participants. "Austerity"[7] and "Deliberation"[8] offer intermediate probability values of 0.05 and 0.01 respectively.

At LULIfUK, administrators consistently offered the highest probability in all five dimensions, although a bias exists as the category only consists of two administrators and probability calculations are very sensitive to the number of participants. One of the recommendations of this study is to keep the same number of participants in each category. "Austerity" was the most likely

[4] Effectiveness is the tendency to respond swiftly to demands.
[5] Solidarity is the tendency to be concerned about and to act in favor of others.
[6] Anticipation is the expectation of future actions or outcomes.
[7] Austerity is prudent and conservative behavior in the face of an uncertain world.
[8] Deliberation is the act of directing actions toward a specified end.

behavior to be performed by the three categories of participants, as shown by the probability value of 0.17. "Solidarity" and "Anticipation" were the behaviors least likely to be shown among all questions; "Anticipation" was the least likely behavior, obtaining the lowest probability across the three types of subjects. "Effectiveness" and "Deliberation" offer intermediate probability values of 0.09 and 0.01, respectively.

Outcomes from the Rasch model show that a simple behavior was relatively easier to demonstrate when participants showed high probability values (0.17 as compared to values closer to zero).

On a policy basis, in order to encourage higher education for sustainability, ascription of responsibility, values, personal skills, and simple behavioral traits must be fostered as principal determinants for all three types of subjects at an HEI regardless of the socio-economic structure of the nation in which the HEI is located.

Regardless of similarities and differences found between countries, the world situation requires educating critical, responsible, and fair citizens, and thus the DESD objectives may be achieved. In order to achieve such a citizenry, basic necessities must be adequately met: physiological needs, security, love, and belonging. Only when these needs are met may people realize themselves and attain a high level of self-esteem [35].

3. Areas of intervention and actions for changing beliefs

Political scientists believe that coordinating individual behavior for the common good is an eternal problem and point out four basic areas in which behavior may be changed in a coordinated manner. The four areas identified [36] are:

(a) Religious and moral approaches which appeal to values and aim to change broad worldviews and beliefs;
(b) Education to change attitudes and provide information;
(c) Efforts to change the material incentive structure of behavior by providing monetary and other types of rewards or penalties; and
(d) Community management, involving the establishment of shared rules and expectations.

Actions involving combinations of these four areas of intervention could modify individual behavior in favor of the common good. However, moral and incentive-based approaches both have generally disappointing track records and are coercive. Meanwhile, the community-based approach, which acts upon people's need for belonging, combined with education, may have potential to modify people's beliefs and attitudes to some extent without coercion in the long run.

This study shows that alternative learning methods such as game playing [37,38] and art exploration [39–41] may be integrated into the four main activities developed by higher education institutions – teaching, research, outreach, and physical campus operations. In the area of community management, group psychotherapy [42] and personnel management [35] may modify individuals' potential for creativity, compassion, ethics, love, and spirituality. The goal is for individuals to find profound significance in their work relations in order to attain self-actualization. Table 4 summarizes a schema of principal HEI activities, the two areas of intervention mentioned, and four alternative learning methods.

3.1. Educational area of intervention

Behavioral achievements among individuals at HEI who have previously overcome internal barriers are quite specific, such as increasing their knowledge or degree of commitment. Education can make a difference in people's behavior, but there are serious limits to what may be accomplished. In the short term, education is only successful when principal barriers to action (for example, individual attitudes) are successfully modified. When such barriers are eliminated, individual actions, such as depositing cans in the recycling bin or adjusting the thermostat on the air conditioner, or even buying high-efficiency appliances, may be accomplished. Reducing external barriers requires greater effort – for example, community organizing or even changing national legislation. Education may have important indirect effects over the long term, such as when education affects people's political preferences; this in turn influences government policy to reduce external barriers to sustainable behavior. Education is only likely to induce behavior which is already compatible with people's deeper values [42].

The aim of education toward sustainability is to develop a way of life which includes all behavioral facets, where humans interact responsibly in their physical and social environments.

Table 4
Four relevant learning methods in two human intervention areas within university activities.

Human intervention area HEI activities	Education	Community management
Teaching Research	GAMING (Vigotsky)	GROUP PSYCHOTHERAPY
Outreach Campus management	ART(Heidegger)	PERSONNEL MANAGEMENT (Maslow)

3.2. Community management area of intervention

According to the model developed in this paper, moral norms play a decisive role in the management of collective resources. That is, in the area of community management, group pressure is exerted through participatory processes and modification of individual behavior. Group psychotherapy and personnel management both offer examples of cases where individuals in a given community have been able to modify their behavior. Accordingly, if the management intervention area is applied toward a redefinition of the individual's role in industrial development, material gain, and social and cultural evolution in to meet essential needs, then people may be guided toward sustainable behavior.

A key characteristic of community management is that social norms become shared rules [41], as fulfillment works upon a self-imposed rule that the participatory process develops from the bottom up among group members, and because people believe that what they are doing is correct, or at least necessary. As the majority of people internalizes community norms and makes them their own, surveillance by authorities is minimal, and individuals do not feel coerced. Rules for interaction exist among group members that lead to informal social pressure and therefore self-control. People internalize group norms because they have participated in creating them, because they have seen their value for themselves and their community, and because norms have become part of community meaning by which sharing with others helps to maintain trusted relationships. The fields of education and community management can be modified to achieve education for sustainability.

4. Conclusions

The aim of this article is to discern – through development, testing, and validation of a socio-psychological model – the key factors which should be fostered at an HEI in two nations with greatly different cultures and socio-economic structures in order to direct education toward behavior for sustainability. According to the outcomes of this study, ascription of responsibility, universal

values, personal intelligences, and simple traits seem to be the key factors in fostering such education. Therefore, policies should be designed to encourage those psychological variables related to personality features of individuals and their motivations in order to modify their beliefs.

This proposed model is based on personal norms and suggests that personal norms, if activated, are experienced among individuals as feelings of personal obligation, either denying or not denying the consequences of their behavioral choices regarding the welfare of others. The model is highly valid and stable because it was tested with reliable analytical procedures. The four important latent variables are highly correlated, but the model is still in an exploratory stage. The number of participants was small, and surveys were carried out at only two HEIs. Future research will require a greater number of participants and institutions. Anticipation is the behavior most unlikely to be shown by students, faculty members, and administrators; effectiveness is the dimension most likely to be shown in the developing-nation university, and austerity is the most likely for a developed-nation university. Students and administrators obtained the highest probability in almost every psychological dimension and faculty members obtained the lowest probability.

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Appendix 1. Questionnaire

Values (variables are randomized and ordered according to type of value)

Power
- V7 Social power, control over others, dominance. (I)
- V15 Health.
- V5 Authority, the right to lead or command. (I)

Achievement
- V3 Ambitious, wealth, material possessions, money. (I)
- V2 Influential, having an impact on people and events. (I)

Hedonism
- V12 Enjoying life. (I)

Stimulation
- V10 Varied life, filled with challenge, novelty, and change. (I)

Self-direction
- V6 Creativity.
- V21 Choosing one's own goals.

Universalism
- V19 Equality, equal opportunities for all.
- V1 A world of peace, free from war and conflict.
- V14 Unity with nature, fitting into nature.
- V11 Social justice, correcting injustice, care for the weak.
- V4 Broad-minded.
- V9 Prevention and protection of the environment, conservation of natural resources.

Benevolence
- V16 Responsible

Tradition
- V17 Respecting the earth, harmony with other species.
- V18 Moderate
- V20 Accepting one's portion in life.

Conformity
- V13 Self-discipline, self-restraint, resistance to temptations.

Security
- V8 Social order.

Awareness of consequences
- V22 In general, do you think that climate change, which is sometimes called the greenhouse effect, will be a very serious problem for you and your family, somewhat of a problem for you and your family, or won't really be a problem for you and your family?
- V23 Do you think that climate change will be a very serious problem for the country as a whole, somewhat of a problem, or won't really be a problem for the country as a whole?
- V24 Do you think that climate change will be a very serious problem for other species of plants and animals, somewhat of a problem, or won't really be a problem for other species of plants and animals?
- V25 Next, I'd like you to consider the problem of loss of tropical forest. Do you think this will be a very serious problem for you and your family, somewhat of a problem for you and your family, or won't really be a problem for you and your family?
- V26 Do you think that loss of tropical forest will be a very serious problem for the country as a whole, somewhat of a problem, or won't really be a problem for the country as a whole?
- V27 Do you think that loss of tropical forest will be a very serious problem for other species of plants and animals, somewhat of a problem, or won't really be a problem for other species of plants and animals?
- V28 Next, I'd like you to consider the problem of toxic substances in the air, water, and soil. Do you think that this will be a very serious problem for you and your family, somewhat of a problem for you and your family, or won't really be a problem for you and your family?
- V29 Do you think that toxic substances in the air, water, and soil will be a very serious problem for the country as a whole, somewhat of a problem, or won't really be a problem for the country as a whole?
- V30 Do you think that toxic substances in the air, water and soil will be a very serious problem for other species of plants and animals, somewhat of a problem, or won't really be a problem for other species of plants and animals?

Ascription of responsibility
- V31 The government should take stronger action to clean up toxic substances in the environment.
- V32 I feel a personal obligation to do whatever I can to prevent climate change.
- V33 I feel a sense of personal obligation to take action to stop the disposal of toxic substances in the air, water, and soil.
- V34 Business and industry should reduce their emissions to help prevent climate change.
- V35 The government should exert pressure internationally to preserve the tropical forest.
- V36 The government should take strong action to reduce emissions and prevent global climate change.
- V37 Companies that import products from the tropics have a responsibility to prevent destruction of the forests in those countries.
- V38 People like me should do whatever we can to prevent the loss of tropical forests.
- V39 The chemical industry should clean up the toxic waste products it has emitted into the environment.

Personal Intelligences[1] (trait level at the end of each statement and variables are randomized).

Effectiveness
V54 Believes oneself to be capable of a job, 1
V56 Doubts his/her own ability, 2
V40 Anticipates obstacles to a goal, 3
V43 Takes calculated risks to reach a goal, 4

Solidarity
V44 Relates well to people of diverse backgrounds, 3
V53 Can see things from someone else's perspective, 4
V42 Solicits others' input, 2
V57 Establishes and maintains close relationships at work, 4

Anticipation
V48 Acts impulsively, 2
V45 Remains composed and positive, even in stressful situations, 4
V49 Personally leads change initiatives, 3
V47 Advocates change despite opposition, 4

Austerity
V50 Keeps his/her promises, 1
V51 Acknowledges mistakes, 3
V41 Adapts ideas based on new information, 1
V59 Changes overall strategies, goals, or projects to fit the situation, 4

Deliberation
V58 Hesitates to act on opportunities, 1
V55 Cuts through red tape or bends rules when necessary, 3
V46 Leads by example, 1
V52 Articulates a compelling vision, 4

Demographics
V60 What kind of housing do you have?
V61 Do you own your house/apartment?
V62 Under what religious denomination were you born?
V63 Sex
V64 Year of birth
V65 Are you: Student, Faculty, or Administrator?
V66 What level of studies have you obtained?

Notes: All scales were scored so that scores indicate strong endorsement of the concept.

I = Indicates a question regarding an attitude which was inverted upon creating the scales.

Unless otherwise noted, response categories were: Strongly agree, Somewhat agree, Neutral, Somewhat disagree, Strongly disagree.

[1]Response categories were: Consistently, Often, Sometimes, Rarely, Never.

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