

# Pedagogical Needs of Faculty Members for Sustainability Education

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## ABSTRACT

The appearance of sustainability challenges in the fields of agriculture and natural resources could be derived from the inadequate attention of higher education system in the development of sustainability education. One of the strategies in sustainability education is the integration of sustainability in teaching and learning strategies that can strengthen student's competencies for sustainability actions in the future. Therefore, this study has been conducted to analyze pedagogical needs of faculty members for sustainability education through the lens of B.Sc. graduates who were studied at University College of Agricultural and Natural Resources, University of Tehran. This study limits the pedagogy to teaching and learning strategies. To conduct the study, 120 B.Sc. graduates in different disciplines, in four five-year intervals between 1971 and 2011 were selected using simple random sampling and Cochran Formula. The data were gathered from the questionnaire. Validity of questionnaire was obtained through the opinions of thematic experts and its reliability through Cronbach's alpha. After that, the data were analyzed using the descriptive and inferential statistics by SPSS v.20. The results indicated the mean of use level of faculty members from teaching and learning strategies for sustainability education was 4.34 from 10. So, in different intervals, this amount had no significant change. Among strategies, first to third priority is related to: Expressing the applications of disciplinary content in real situations, linking different issues, and providing learning opportunities using field visits. Also, the lowest usage is related to these strategies: use of the teaching team in a course, formation of the learning groups to class discussions, and giving multidisciplinary exercises and projects to students. Therefore, the professional development of faculty members should be designed for reinforcing pedagogical skills.

**Keywords:** Teaching; Faculty member; Sustainability education; Pedagogy

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## 1. Introduction

The sustainability education is providing the teaching and learning process for the development of knowledge, skills, values, and perspectives based on the ecology principles due to revise and redesign life systems such as social, economic, political, and educational<sup>[1]</sup>. Some sustainability competencies are critical thinking, creative thinking, interdisciplinary collaboration, empathy, system thinking, commitment to sustainability, and sustainability knowledge that sustainability education wants to nurture these in the individuals. Sustainability education is not seeking indoctrination, but includes the empowerment of people for action to sustainability challenges and the creation of desirable things<sup>[2]</sup>.

Barcelona Declaration (2004)<sup>[3]</sup> has pointed out revision in the teaching and learning strategies for sustainability education. It is notable there is not a global and inclusive formula for sustainability education<sup>[4]</sup>. This type of education moves toward active, participative and multidisciplinary strategies and develops learning for individual and social change<sup>[5]</sup>.

In higher education, sustainability education needs to make a change in conventional approaches for teaching and learning. These approaches equip and motivate the students to participate in creating a sustainable future<sup>[1]</sup>. In fact, it is related to the development of learning and teaching strategies that can motivate learners to responsibly act towards their local and global environments.

Pedagogy is a core issue in reorienting education towards sustainability. Lusted (1986)<sup>[6]</sup> believed that pedagogy includes teaching and learning strategies, and interactions of between educator, learner, and knowledge. From the pedagogical lens, some definitions have emphasized that sustainability education is the creation of space for new ways of thinking, valuation and action, participation, pluralism, diversity, deep agreement, as well as a space for polite disagreement and autonomy<sup>[7]</sup>.

Sipos (2005)<sup>[8]</sup> introduced a new pedagogy for sustainability education entitled transformative sustainability learning (TSL). He states TSL organize the link among thinking, skills, and feeling by integrating learning and teaching strategies, and learners can fully embrace the path of sustainability and change the global and local perspectives of social-ecological justice. Sustainability education does not accept the learning with transitional nature. It tends to transformative nature<sup>[9]</sup>. TSL attempts multidisciplinary, practical, and place-based education and research<sup>[10]</sup>.

Self-Reflective learning is needed to sustainability education. Students should hear different opinions and they are continuously encouraged to struggle with their assumption<sup>[11]</sup>. Sterling (2004b)<sup>[12]</sup> points out the creative, critical, and participative education.

Interactive learning is needed to develop cognitive abilities. Strategies of interactive learning can be used for developing cognitive abilities. Some of these strategies include the question and discussion technics, group activities, project based learning, problem based learning, case based learning, simulation, and imagination<sup>[13,14,15]</sup>.

In sustainability education, a specific teaching strategy is not chosen, but a range of teaching strategies is used. The important aspects of pedagogy in sustainability education include encouraging students to ask the questions. This involves inclusive approaches and interactive queries for teaching and learning. Such approaches do not impede the use of teacher-centered methods but underline the student-centered activities such as discussion, role play, simulation, as well as the range of creative and experimental activities. Sustainability is not only knowledge content, attitude is also important. Therefore, lecture is not only effective method for teaching it<sup>[16]</sup>. Cohen (2007)<sup>[17]</sup> states that collaborative learning, experiential learning and field trips are important in creating sustainability mindsets. Young people prefer learning with experience and work orientation<sup>[18]</sup>. Place-based learning is also referred to as a strategy for sustainability Education<sup>[19]</sup>. Using the local environment as a place for field work, service and research projects is considered as an important aspect of place-based learning<sup>[20]</sup>. Service learning due to the participatory nature and empirical relevance to civil intervention goals has a good application in the sustainability education. This type of learning integrates community services with education and thinking. Steinke *et al.* (2002)<sup>[21]</sup> explain that services learning strategy provides an effective way for learners to have a position in order to take the responsibility of civil participation. Visiting the locations such as a farm, research parks, an organization or department that is related to the curriculum provides the direct interaction with learners about the topics to learn. Participatory learning has important learning outcomes including personal and social responsibility, the ability of complex problem solving and developing practical skills<sup>[22]</sup>. In this strategy, educator provides conditions, activities, and life problems for learners to engage them<sup>[23]</sup>.

It is necessary to encourage learners for expressing ideas, perceptions, feelings, and values, creation of an open learning environment, creation of opportunity for discussion and dialogue in class, and analysis of case studies are effective strategies for sustainability education<sup>(7)</sup>. Segalas (2009)<sup>[24]</sup> has stated that project-based learning involves skills such as solving problems, understanding the role in community, social skills for the teamwork, professional skills related to discipline, planning, management, and evaluation skills, and meta cognitive skills. In project-based learning, using multidisciplinary approaches is very effective. Educators hope that multi-disciplinary approaches will strengthen critical thinking skills, problem solving and the ability to understand complex issues that are effective in solving sustainability problems<sup>[25]</sup>. Burns (2009)<sup>(1)</sup> believe that social constructivism is most relevant learning theory to sustainability education. Educators should give the opportunities aiming at interaction students. This strategy wants to encourage students to pay attention to multiple perspectives.

Wals and Jickling (2002)<sup>[26]</sup> have considered some issues about educational change for sustainability education such as from consumptive learning to creative learning, from educator centered education to learner centered education, from theory based learning to action based learning, and from the accumulation of pure knowledge to problem-centered issues.

Sustainability education promotes learning to know, learning to do, learning to be, learning to live together, and learning to transform oneself and society as the basis in developing sustainability. Based on the significance of sustainability education in higher education and nurturing sustainability competencies, this study has been conducted to analyze pedagogical needs of faculty members for sustainability education. In this study, the pedagogy is limited to teaching and learning strategies.

## 2. Material and method

This study was a correlational-descriptive research. 120 of B.Sc. graduates from 1991 to 2011 at the University College of Agriculture and Natural Resources, University of Tehran, were selected as the sample. A questionnaire was designed consisting 27 items (scale of 1 to 10). From the graduates were asked to specify how much faculty members (educators) were working on each strategy in their teaching. Cronbach's alpha was used to measure reliability that was equal to 0.97. To better verify the items defined for the variable of teaching and learning strategies for sustainability education, the researcher has used the confirmatory factor analysis by LISREL that results was presented in **Table 1** and Appendix 1. Based on the criteria for judging the fit indices of the mode, the confirmatory factor analysis model has suitable fit. So, data were analyzed using descriptive and inferential statistics such as extent of mean, standard deviation, and coefficient of variation. Mean comparison was done through parametric tests including one sample t test and F test. SPSS Software was applied for data analysis. Faculty members' use of teaching and learning strategies for sustainability education from graduates' viewpoints were categorized as "low", "fairly low", "fairly high" and "high" based on the collective 'use score'. Score ranges for low, fairly low, fairly high and high use have been determined by mean and standard deviation, as follows:

- Min<A<Mean-SD: A= Low
- Mean-SD <B<Mean: B = Fairly Low
- Mean <C<Mean+SD: C= Fairly High
- Mean+SD <D<Max: D = High

RMSEA	IFI	CFI	SRMR	GFI	NNFI	NFI	$\chi^2/df$
.09	.88	.88	.06	.72	.86	.80	2.1

**Table 1.** Fit indices of confirmed factor analysis model for teaching and learning strategies

## 3. Results

### Priority setting faculty members' use of teaching and learning strategies for sustainability education from graduates' viewpoints

Teaching and learning strategies for sustainability education listed based on the priority of use (**Table 2**). Expressing the applications of disciplinary content in real situations (CV=.410), connecting among different issues in class (CV=.425) and providing learning opportunities using field visits (CV=.462) are at the top of the list. While giving multidisciplinary exercises and projects to students remained the lowest priority on account of its highest coefficient variation.

Teaching and learning Strategy for sustainability education	Mean	S.D	C.V	Priority
Expressing the applications of disciplinary content in real situations	5.76	2.36	.410	1
Connecting among different issues in class	5.52	2.35	.425	2
Providing learning opportunities using field visits	5.54	2.56	.462	3
Providing practical exercises and projects for students	5.42	2.62	.483	4
Expressing issues related to the teaching content in the form of questions from	5.02	2.49	.496	5

students				
Use of different samples for applying theoretical concepts	4.68	2.53	.540	6
Use of different educational tools in class	4.57	2.53	.553	7
Providing opportunities for students to participate together (a group working)	4.55	2.52	.554	8
Providing opportunities for students to present solutions related to problems	4.37	2.48	.567	9
Providing opportunities for students to connect with nature	4.72	2.96	.570	10
Educators use of events and personal experiences as examples of issues presented at teaching	4.38	2.51	.573	11
Providing opportunities for students to use campus as a laboratory for their actions and better understanding	5.13	3.02	.588	12
Providing opportunities for students to use the environment as the place for professional services and practical work	4.58	2.70	.589	13
Respect of educators to the views of students and to use their ideas in teaching	4.42	2.68	.606	14
Providing opportunities for students to express their opinions concerning content	4.48	2.77	.618	15
Providing opportunities for students to discuss about real world issues (globally/locally) and to connect them with discipline	4.31	2.67	.619	16
Providing opportunities for students to image content in mind	4.06	2.61	.643	17
Providing opportunity for students to reflect on content in class	4.25	2.77	.652	18
Providing opportunities for students to expressing their disagreements	4.03	2.65	.657	19
Providing opportunities for students to think about cultural, social, economic, and environmental consequences of actions and decisions related to discipline in local, national, and global communities	3.98	2.69	.676	20
Encouraging students to use the real world issues for doing class assignments	3.98	2.73	.686	21
Providing opportunities for students to express feelings concerning subjects	3.58	2.59	.723	22
Analysis and assessment of actions in different places (locally and globally) as part of content by educators	3.24	2.49	.768	23
Use of simulation methods for presenting professional issues	3.35	2.65	.791	24
Use of teaching team in a course	3.53	2.94	.833	25
Formation of learning groups for class discussions	3.01	2.54	.844	26
Giving multidisciplinary exercises and projects	2.81	2.47	.879	27

\* Mean range: 0-10

**Table 2.** Priority setting faculty members' use of teaching and learning strategies for sustainability education from graduates' viewpoints

**Table 3** shows the percentage of graduates scoring in the low, fairly low, fairly high and high levels of faculty members' use of teaching and learning strategies for sustainability education. It could be inferred from the **Table 3** that majority of respondents fell into fairly low. Also, 55% of responses were below average.

Variable	Level	Frequency	Frequency (%)	Cumulative (%)
faculty members' use of teaching and learning strategies for sustainability education	Low (.52-2.36)	20	16.7	16.7
	Fairly low (2.37-4.34)	46	38.3	55.0
	Fairly high (4.35-6.33)	30	25.5	80.0
	High (6.34-8.81)	24	20.0	100
	Total	120	100	

min: .52                      max: 8.81                      mean: 4.34                      SD:1.99

**Table 3.** Frequency distribution of faculty members' use of teaching and learning strategies for sustainability educa-

tion from graduates' viewpoints

### Identifying viewpoints of different graduates during 20 years ago

We want to know if people who were graduated during 1991-2011 have different responses statistically in term of faculty members' use of teaching and learning strategies for sustainability education. Therefore, graduates were categorized into four group based on their graduation time. Based on the results of F-test in **Table 4**, there is not statistically and significantly difference among means of faculty members' use levels of learning and teaching strategies for sustainability education from viewpoints of four groups.

Variable	Group	Mean	F	Sig
faculty members' use of teaching and learning strategies for sustainability education	Graduates of 1991-1996	4.34	.004	1.00
	Graduates of 1996-2001	4.34		
	Graduates of 2001-2006	4.31		
	Graduates of 2006-2011	4.37		

**Table 4.** Analysis of graduates' viewpoints of different years regarding faculty members' use of teaching and learning strategies for sustainability education

### Identifying pedagogical needs of faculty members

The one sample t-test was conducted to determine if a statistically significant difference existed between mean of use of each strategy from a sample used in the study and test value (5). Based on the **Table 5**, strategies that mean score of them was statistically and significantly lower than test value, they were highlighted in table.

Teaching and learning Strategy	Test value:5 t
Expressing applications of disciplinary content in real situations	3.517**
Connecting among different issues in class	2.407*
Providing learning opportunities using field visits	2.318*
Providing practical exercises and projects for students	1.744 <sup>ns</sup>
Expressing issues related to the teaching content in the form of questions from students	.073 <sup>ns</sup>
Use of different samples for applying theoretical concepts	-1.407 <sup>ns</sup>
Use of different educational tools in class	-1.879 <sup>ns</sup>
Providing opportunities for students to participate together (a group working)	-1.960*
Providing opportunities for students to present solutions related to problems	-2.801**
Providing opportunities for students to connect with nature	-1.156 <sup>ns</sup>
Educators use of events and personal experiences as examples of issues presented at teaching	-2.687**
Providing opportunities for students to use campus as a laboratory for their actions and better understanding	.453 <sup>ns</sup>
Providing opportunities for students to use the environment as the place for professional services and practical work	-1.689 <sup>ns</sup>
Respect of educators to the views of students and to use their ideas in teaching	-2.387*
Providing opportunities for students to express their opinions concerning content	-2.044*
Providing opportunities for students to discuss about real world issues (globally/ locally) and to connect them with discipline	-2.836**
Providing opportunities for students to image content in mind	-3.948**
Providing opportunity for students to reflect on content in class	-2.964**
Providing opportunities for students to expressing their disagreements	-4.023**
Providing opportunities for students to think about cultural, social, economic, and environmental consequences of actions and decisions related to discipline in local, national, and global communities	-4.143**

Teaching and learning Strategy	Test value:5 t
Encouraging students to use the real world issues for doing class assignments	-4.082**
Providing opportunities for students to express feelings concerning subjects	-5.996**
Analysis and assessment of actions in different places (locally and globally) as part of content by educators	-7.724**
Use of simulation methods for presenting professional issues	-6.822**
Use of teaching team in a course	-5.492**
Formation of learning groups for class discussions	-8.583**
Giving multidisciplinary exercises and projects	-9.716**

**Table 5.** Comparing means of faculty members' use of teaching and learning strategies for sustainability education and Test value

## 4. Conclusion

Based on the results, the faculty members' use average of learning and teaching strategies for sustainability education was 4.34 from 10 at a time span of 20 years (1991-2011). Also, analysis of the graduates' point of views at different time reveals that during these 20 years there has been no change in the use level of faculty members of studied strategies, and this could show that no attempt has been made to improve this process. In other words, sustainability education has not been a concern for the university community. It is important to note that the majority of faculty members in this college are graduates of agriculture and natural resources disciplines and they have not passed the courses related to learning and teaching issues in their curriculum during their studies. Therefore, when they became an educator they tend to use the pedagogy that they have trained through it during their studies. Therefore, their pedagogical knowledge is low. It is a suggestion to introduce faculty members with sustainability education and teaching and learning strategies for sustainability education through professional development planning by the university college based on the pedagogical needs highlighted into **Table 5**. Based on the **Table 4**, strategies which their mean differences from test value are negative and statistically significant, these need to be considered and improved.

Based on the results, high priority of pedagogical needs of faculty members is related to multidisciplinary strategies. In this University College, various departments work on an island basis and separately. Students are not encouraged to carry out interdisciplinary projects. Students and faculty members do not know the missions and issues that different departments work on. Therefore, it is suggested to increase inter and multidisciplinary collaborations and dialogues among faculty members of different departments to get notify the educational and research backgrounds. Also, the strategy of forming learning groups in the class has an undesirable status from use level and requires the urgent attention. The formation of learning groups makes it possible for individuals to learn autonomously and through the ways of learning of others. This strategy also provides the context for teamwork.

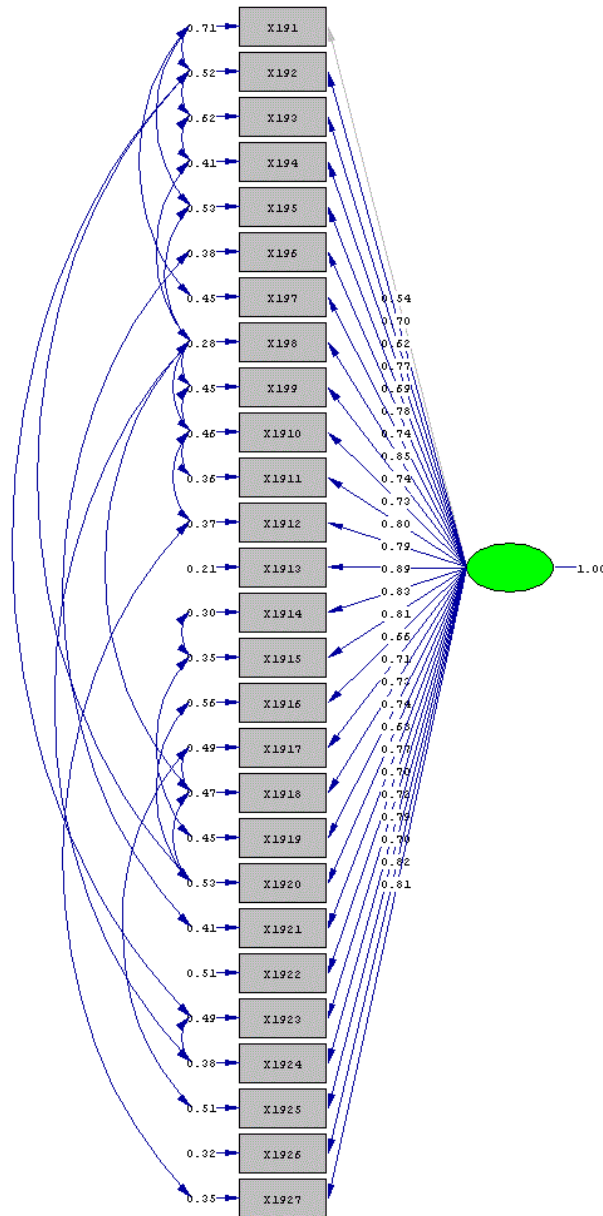
The results also suggest that faculty members should move toward collaborative, creative and critical learning and teaching strategies and lead classes toward mutual discussions. Faculty members have to create more opportunities for students to interact with each other and to express ideas and feelings.

The nature of teaching and learning strategies for sustainability education highlighted that they take more time than traditional teaching approaches. This issue is a reason for medium use level of faculty members from these strategies. Over attention to knowledge goals of learning results in this fact that other goals such as developing thinking skills are not ignored. Therefore, the need to use these strategies is not felt, then the two phenomena called learning to be and learning to live together are on the sidelines.

## Conflict of interest

The author declares he has no conflict of interest.

## Appendix



Chi-Square=625.74, df=299, P-value=0.00000, RMSEA=0.096

**Appendix 1.**

Confirmatory factor analysis model for teaching and learning strategies for sustainability education

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