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Education Effects on Participant's Awareness: Zero Waste Management Education in Istanbul Technical University (ITU) Ayazağa Campus

Kadriye Elif Maçin[1]*, Osman Atilla Arıkan[2], İbrahim Demir[3]

[1] *Istanbul Technical University, Department of Environmental Engineering, 34469, Maslak/Istanbul, Turkey.*

[2] *Istanbul Technical University, Department of Environmental Engineering, 34469, Maslak/Istanbul, Turkey.*

[3] *Istanbul Technical University, Department of Environmental Engineering, 34469, Maslak/Istanbul, Turkey.*

**Corresponding Author email: macin@itu.edu.tr*

Abstract

Turkey Ministry of Environment and Urbanization published Zero Waste (ZW) Regulation in July 2019. "Zero Waste Management Act" (ZWMA) was started in Istanbul Technical University (ITU) Ayazağa Campus as a part of a larger scale project called as "Green Campus". Education is first and crucial step to success in the sustainability acts. The aim of this study was to determine ZW management education effects on participant's knowledge. In this scope; ZW educations were given to administrative staff in 2019-2020 academic year. This study was conducted by using online questionnaires. The questionnaires included questions related to educational content and instructor, participant's willingness to ZW management and technical aspects of ZW approach. The results showed that 82% of the participants understood waste management (WM) hierarchy priority clearly and 93% understood recycling containers classification in the new ZWMA. However, they were confused about current WM practices in Turkey, totally 52% of participants chose recycling, composting and recovery as most frequently applied WM practices instead of landfilling. Based on the results it is understood that education has a significant positive effect on participant's knowledge. This study contributes to existing knowledge of WM by providing data about participant's awareness and it would be pioneer to further sustainability activities in the campus.

Key words

Education, higher education institutions (HEIs), sustainability, university, zero waste.

1. INTRODUCTION

Sustainability term had stepped into human's life in the 1970s with the understanding of human beings cannot survive without the "environment" [1]. Sustainable development was defined as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs.*" by UN [2]. Higher Education Institutions (HEIs) have started interest with the sustainability concept after the UN Stockholm Conference in 1972 [3]. However, UN- Conference on Sustainable Development in 2012 (Rio+20) was a milestone in terms of the importance of the relationship between (Sustainable Development Goals) SDGs and education [1].

Universities have new responsibilities for reaching SDGs after the Rio conference [1]. University campuses are complex systems where all education and researches are carried out by consuming material, energy and water [4]. Sustainability in universities was defined as *"A higher educational institution, as a whole or as a part, that addresses, involves and promotes, on a regional or a global level, the minimization of negative environmental, economic, societal, and health effects generated in the use of their resources in order to fulfill its functions of teaching, research, outreach and partnership, and stewardship in ways to help society make the transition to sustainable life-styles."* by Velazquez [5].

HEIs are basically creating ideas and solutions by consuming products where they also have environmental, economic and social responsibilities for the society. Besides, universities should be pioneer to other institutions. Hence, universities are morally responsible for finding practical and theoretical solutions to environmental problems [6]. In this purposes, universities have been attempting various plans to become more sustainable or green campuses [7]. However, it was recently discovered that education is a key for long term success of sustainability goals in universities. Education activities regarding sustainability could be planned formal or non-formal way. Conferences, seminars and workshops are considered as non-formal education while undergraduate, graduate courses and certificate programs defined as formal education [5]. Formal education could be done via distance learning or on campus under the scope of curriculum [5]. Non-formal education could be done any time during an academic year without strict plan and date unlike the formal education.

Istanbul Technical University (ITU) started sustainability educations with Zero Waste Management (ZWM) in September 2019. Educations were conducted under the scope of non-formal education. However, ITU sustainability vision includes formal education for following years. ZWM was chosen as a first education topic because the Ministry of Environment and Urbanization was published Zero Waste Regulation in July 2019 [8]. According to regulation, universities are responsible for reaching zero waste (ZW) goal to landfills. Waste management (WM) studies have generally focused on environmental consequences and left out other sustainability pillars which are economic and social [9]. Hence, this study is expected to be the first step of "ZWM goal" developed within the scope of a sustainability vision at ITU. It will be an important opportunity to see education effects on participant's awareness and the changes in WM activities.

The aim of this study is to determine ZWM education effects on participant's knowledge. In this scope; education was given about ZWM and sustainability to ITU Ayazağa administrative staff. Also new ZWM plan in ITU Ayazağa Campus was introduced to participants. Then, a questionnaire was conducted to learn participant's knowledge and suggestions about ZWM activities. Environment, economy and social aspects are three pillars of sustainability and they should examine simultaneously for sustainability goals. In this scope; questionnaire results will be considered while planning future ZWM activities in the campus. The previously published research using surveys were conducted with campus stakeholders to understand their awareness and willingness about sustainability initiatives [3],[10]. This study will contribute to the current literature with adding information regarding successful sustainability activities in particular WM in HEIs.

2. MATERIAL AND METHOD

ZW educations were given to administrative staff one in fall and three in spring semesters in 2019-2020 academic year. Education information was covered not only about ZW but also on sustainability, WM practices in Turkey and circular economy concepts. Since all education content and lecturer were exactly the same in all four educations, it was possible to evaluate the overall results together. Questionnaire sent to participants online after education and 10 days have given them to answer. Questionnaire was answered by totally 89 people.

The questionnaire was aimed to learn (i) participant's thoughts about education and (ii) participant's knowledge about educational content. The 5 point Likert scale questions were used to learn the participant's thoughts about education itself. Multiple choice questions were used for educational content. Also an open ended question was asked to learn suggestions of participants regarding to ZWM activities on campus and further educations.

The possible limitation of the study could come from non-responders, participants who participated in education but did not answer the questionnaire. However, their ratio is below than 10 % of the participant's and this ratio can be accepted according to previous survey study [10].

3. RESULTS AND DISCUSSION

One of the important aspects of the questionnaire is to learn the participant's thoughts about ZW education and the results are shown in Table 1. According to the results 87.2 % of participants were found education successful and efficient. Also, 82.2% thought that their awareness about environmental issues was increased after education.

Table 1. Participants thoughts about education (%)

Education (%)	Strongly disagree	Disagree	Neither agree or disagree	Agree*	Strongly agree*
Education contribution to you is very high and it is helpful for raising your awareness	1.1	2.2	14.4	34.4	47.8
Education is generally successful and efficient	0.0	1.1	11.2	29.2	58.4
Clarity of presentation/education is high	0.0	1.1	10.0	38.9	50.0
The performance of the educator/lecturer is enough and efficient	1.1	0.0	10.0	35.6	53.3

*Sum of strongly agree and agree is accepted as understanding of the concept

Results in Table 2 shows that 82.4 % of the participants understand WM hierarchy priority clearly. However, they are confused about current WM practices in Turkey, totally 52% of participants choose recycling, composting and recovery as a most frequently applied WM practices instead of landfilling. Even though recycling rate has increased in recent years, landfilling is still the most applied WM method in Turkey [11].

Table 2. Participants knowledge about WM (%)

WM questions (%)	Disposal	Recycle	Reuse	Reduce	Prevention
Which one is the first step of waste hierarchy (priority)?	0.0	1.1	0.0	16.5	82.4
	Recycle	**Recovery**	**Compost**	**Incineration**	**Landfill**
Which WM method is the most practiced method in Turkey?	34.8	6.7	10.1	5.6	42.7

The waste will be separated four waste categories in order to increase recycling on campus. Blue container will be used for paper and cardboard while green for glass, yellow for plastic/metals and grey for other wastes. It is apparent from Table 3 that 93.3% participants understand recycling containers separation in the campus. 94.4 % of participants, known glass and paper wastes container color right while 87.6% known plastic wastes colors.

Table 3. Participants knowledge about the ZWM in ITU after education (%)

ZWM in İTÜ (%)	1	2	3	4	<4
What will be the number of containers in ITU-ZWM ?	0.0	0.0	5.6	93.3	1.1
Which one is the color of glass wastes ?	**Red**	**Blue**	**Green**	**Yellow**	**Grey**
	0.0	1.1	94.4	3.4	1.1
Which one is the color of paper wastes ?	**Red**	**Blue**	**Green**	**Yellow**	**Grey**
	0.0	94.4	1.1	2.2	2.2
Which one is the color of plastic wastes ?	**Red**	**Blue**	**Green**	**Yellow**	**Grey**
	0.0	1.1	9.0	87.6	2.2

Education also included information related to economic aspects of sustainability since three main pillars of sustainability, which are environmental, economic and social, are merged each other. *Which economy approach is preferred for the ZW goal?* question was asked in questionnaire and most of the participants understood the circular economy and ZW relationship. According to Figure 1, most of the participants (69.3%) chose circular economy is more sustainable economy approach which encourages waste upcycling activities for reaching ZW goal.

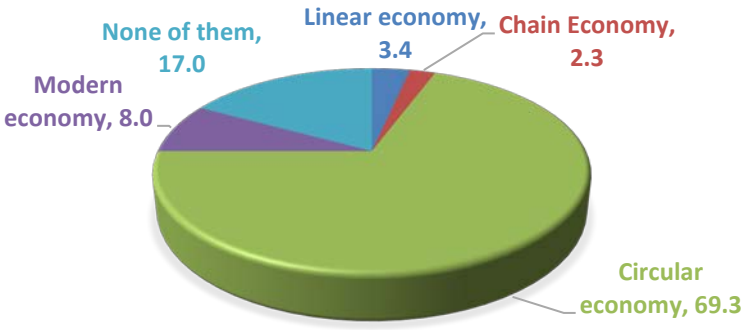

Figure 1. Which economy approach is preferred for the ZW goal?

The questionnaire also had an open ended question to learn participant's suggestions about further ZWM activities and future educations. Most of the participants were pleased with education and they recommended to give this education regularly to all stakeholders of the campus. They also suggested to create posters and slogans about ZWM to change perceptions of people. There were different opinions about "waste reduction in daily life" examples in education. While some participants were very pleased with examples other says they should be expanded to all activities in a daily life, for instance; energy and water savings in the university. Although the main goal was to measure the success of education, some participants complained about questionnaire itself, they were perceived the questionnaire as an exam. The knowledge of the participants about ZW was learned verbally before the education. The questionnaires were held after the education to "find out the success of the education". This situation prevented the comparison of before and after knowledge of participants by questionnaire. Therefore, the difference in participant's knowledge can be followed by behavioral changes for instance; the change in the amount of waste and recycling performance in the campus.

4. DISCUSSION

This study set out with the aim of assessing the effect of ZWM education on participant's knowledge. The results of this study in **Table 2** indicate that participants perfectly understood WM hierarchy priority, however; they were confused about current WM practices in Turkey. Although landfill was chosen as the most selected answer with 42.7% in the questionnaire, it is still far away from the real life. Almost 80% of the municipal wastes were still sent to landfills in Turkey [11]. A possible explanation of this result may be the main focus of the education, which is representing ZWM concept and its relationship with sustainability. Although current WM practices in Turkey were mentioned in the education, the main focus was on waste prevention and recycling options for reaching ZWM goal.

It is understood from **Table 3** that study was reached the main goal which is increasing participant's knowledge about ZWM activities. Even the least known question, which is the color of plastic waste containers, had 87% correct response. The one of the possible reason of this result is that plastic wastes container color is less known compared to paper and glass containers. Blue and green containers already exists in the current waste management system. However, even though red and yellow colors are new options in questionnaire no one selected red containers as answer for new ZWM activities in ITU. These results support the idea of education and sustainability activities have positive effects on participant's knowledge. A study conducted in Turkey concluded that students who took sustainability courses and/or studied at universities or where sustainability practices conducted, had tendency to research the sustainability subject personally [12]. Also, they had enough knowledge to define sustainability [12]. Similar work in Lithuania has shown that; green university students (universities applied to the UI GreenMetric Ranking system) are more sensitive to the sustainability activities than non-green university students [13].

The WM also has substantial economic consequences in addition to the environmental results. For instance; the recycling activities in campuses will contribute profit of university budget [14]. Hence, participant's awareness about economy and WM relationship is crucial and according to Figure 1. 69.3% of participants were familiar with circular economy concept after education.

Environmental changes depend on behavioral changes of the public [6]. Administrative staff is an important "stakeholder" on campuses, but this education must also be applied to other stakeholders. This suggestion also came from the participants at the open ended question in survey. Students are the most effective stakeholder group in terms of population. This kind of education attempts are important since they help to create a culture in campus even though the results are not seen right away [6]. It is also important that they carry this culture to their professional lives when they become alumni. Hence, university commitments on SDGs or other

environmental topics should be compatible with curriculum to increase participation of campus stakeholders. This will help to increase student's awareness about sustainability and other environmental goals such as ZWM. Further studies on ZWM topic are recommended especially in order to follow education effects on behavioral changes of participants as well as change in WM performance of the campus.

5. CONCLUSION

The aim of this study was to understand education effects on participant's knowledge in aspects of ZWM. However, individual attempts are not enough. Clear vision and a management are essential for long-term success of sustainability. Sustainability activities in ITU have been continuing with top-down approach. It is understood from both face to face interviews and questionnaire results that people are willing to participate sustainability acts. However, they don't have any attempts before the initial act comes from the university management. WM has economic and social consequences besides environmental ones. Hence, this study is assumed as a crucial step for the sustainability studies in campus. As it is suggested by participants these educations should be expanded to all stakeholders on campus. Formal WM and sustainability education program should be included in all undergraduate curriculum.

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

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