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# How Much Sustainable Knowledge Will Soon-to-Be Experts in Slovenia Have? Findings of Higher Education Study Programs' Analysis

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**Abstract:** *Environmental topics are gaining more and more important both in the European Union and in Slovenia in the last decade. Climate changes (floods, droughts, and heat waves), pollution (soil, water, and air), management of invasive species, noise pollution, food self-sufficiency, sustainable development in the field of tourism, etc. are particularly present both in Slovenian Eastern and Western cohesion region. However, the level of knowledge about environmental challenges and competences of current experts and leaders to effectively manage and deal with them is perceived to be too low. The paper examines the inclusion of sustainable competences, knowledge, and skills in higher education programs in Slovenia to predict the level of sustainable knowledge. Slovenian soon-to-be professionals will be empowered by the Slovenian higher education system (Daneshjoo et al., 2020). Analysis included the content of 956 higher education study programs on the individual course level. In the next phase, a comprehensive comparative analysis of the situation in the areas of higher education and environmental education was performed. The factors based on which comparison was made are field of study, type of institution, level of study and number of subjects in the program that include some sustainable content. Non-parametric tests were used to determine statistically significant differences are the Mann-Whitney U test and the Kruskal-Wallis H test.*

## 1. INTRODUCTION

The doctrine of sustainability science is widely acknowledged as a tool for attaining global sustainability and is becoming the core philosophy of national and international developmental agendas, also as a part of the United Nations Sustainable Development Goals (SDGs) that acknowledges the role education plays in the promulgation of Sustainable Development (SD) by acting as a thread that concatenates the other SDGs. Hence, it is gaining global popularity as an academic discipline (Piza et al., 2018; Priyadarshini & Abhilash, 2020).

## 2. LITERATURE REVIEW

Higher education for sustainable development addresses ill-defined, highly-complex real-world problems, such as climate change, pollution of environmental media, exhaustion of resources, overproduction of phosphorus and nitrogen, biodiversity loss, or unjust distribution of wealth as well as circular and shared economy and de-growth. The relevance of the topic is recognized within the United Nations SDGs (United Nations, 2015). As a part of SDG 4 (quality education), Target 4.7 states "that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship

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and appreciation of cultural diversity and culture's contribution to sustainable development" (United Nations, 2015). In general, there is a broad understanding that higher education plays a crucial role in the transformation of studies and society toward a more sustainable development paradigm (Barth & Michelsen, 2013; Benton-Short & Merrigan, 2016; Viegas et al., 2020). Thus, higher education for sustainable development needs to be transformative in the sense of challenging worldviews, assumptions, and values we as a society hold (Brudermann et al., 2019; Howlett et al., 2016).

Researching relations of education for SDG was already done by Kopnina (2020). Despite the willingness of many educational institutions worldwide to embrace the SDGs, given escalating sustainability challenges, their research questions examine whether SDG no. 4 is desirable as a future education for all. Many challenges outlined by the SDGs are supposed to be solved by "inclusive" or "sustainable" economic growth, assuming that economic growth can be conveniently decoupled from resource consumption. Yet, the current hegemony of the "sustainability and growth" paradigm has increased inequalities and pressure on natural resources, exacerbating biodiversity loss, climate change and resulting in additional social tensions. Therefore, paradoxes of sustainable development need to be defined and teaching for sustainability should also consider various examples of alternative education (e.g., indigenous learning, ecopedagogy, ecocentric education for steady-state and circular economy, empowerment and liberation) that emphasizes planetary ethics and degrowth.

One such case can be identified in increasing student internationalization that increases the availability of sustainability education especially for students from lower-income countries (Bell et al., 2020) but demands them to fly frequently and consequently be less sustainable. This has however changed recently with online studies. Lack of interest in the staff for improvements might also be challenging (Eppinga et al., 2020).

The topic gains importance in recent years which can also be seen in the steep increase in the number of related publications. All studies are more or less concise – the lack of environmental and sustainability education and the development of new innovative frameworks to improve it can be seen all over the world (Brudermann et al., 2019; Daneshjoo, K; Haghighi, HM; Talaei, 2020; Daub et al., 2020; Do, 2020; Eppinga et al., 2020; Glavič, 2006; Vagnoni & Cavicchi, 2015; Valderrama-Hernández et al., 2019). However, this is especially true for the Global South (Ulmer & Wydra, 2020). Not just the quantity of programs and courses but the way how we teach should significantly change to allow us to get to a more sustainable future (Kopnina, 2020; Wamsler, 2020). The increasing importance of sustainability education is visible in changing university degree catalogues to make sustainability focus more visible to students and their future employers (Zorio-Grima, 2020).

Research on sustainability education has neglected to integrate entrepreneurial skills into other relevant competencies such as foresight, complex problem-solving, and interdisciplinarity. Education for sustainable development (ESD) is a key element of the 2030 agenda for sustainable development. Its aims form one of the targets of the sustainable development goal on education SDG 4.7 (Sustainable Development Goal) and it is considered a driver for the achievements of all 17 SDGs. Eight key competences in sustainability are (The Competences in Education for Sustainable Development, 2012):

1. Systems thinking competency,
2. Anticipatory competency,
3. Normative competency,

4. Strategic competency,
5. Collaboration competency,
6. Critical thinking competency,
7. Self-awareness competency,
8. Integrated problem-solving competency.

## 3. MATERIALS AND METHODS

The analysis included the content of 956 Slovenian higher education study programs on the individual course level. In the next phase, a comprehensive comparative analysis of the situation in the areas of higher education and environmental education was performed. Keywords were addressed at examining course topics and content. The sustainability score of the proposed program was calculated as a score of 6 keywords determined by a group of experts in the field of sustainable development: 1) "green/environmental"; 2) "environmental protection", 3) "sustainable development/sustainability", 4) "circular (economy)", 5) "ecology(-cal)", 6) "social responsibility" and related acronyms and synonyms. The factors based on which comparison was made are field of study, type of institution, level of study and inclusion in the name of the subject. Non-parametric tests were used to determine statistically significant differences: Mann-Whitney U test and Kruskal-Wallis H test.

Analysis was made for all three study degrees (bachelor, master, and doctoral) and was investigated according to 9 study fields classified by CLASIUS-P (1. Educational science and educating teachers (professors); 2. Art and humanities; 3. Social, business, management and law studies; 4. Natural science, mathematics and computer engineering; 5. Technics, production technologies and construction; 6. Agriculture, forestry, fishery, veterinary studies; 7. Health and social care, 8. Services and 9. Unclassified). Data were collected for public universities and faculties, applied science universities, private faculties, and high schools. Class "Unclassified" (CLASIUS-P no. 9) was excluded from the survey since no study program was defined as class no. 9 – "unclassified".

Courses within study programs were further investigated to define the three most frequent and three less frequent topics related to environmental sustainability and to identify which topics are currently seen as a priority in environmental sustainability-related subjects. Cross-sections were also investigated to see which topics are well interconnected and which still lack strong interconnections.

## 4. RESULTS AND DISCUSSION

To investigate statistically significant differences among different study programs which belong to different Klasius P-16 fields, Kruskal-Wallis H test was performed. Statistically significant differences were found ($\chi^2$=52,965, p<0,01). According to the Mean Rank values for different groups of study programs, we can conclude that the most sustainable contexts can be found in Slovenian HEI programs from the field of arts and humanities, services and environmental safety as well as engineering, manufacturing technology and construction while the less sustainable contexts can be found in study programs related to health and social work (Table 1).

To investigate statistically significant differences among different study programs on different study levels, Kruskal-Wallis H test was performed. Statistically significant differences were found ($\chi^2$=11,947, p<0,01). According to the Mean Rank values for different groups of study programs,

we can conclude that the less sustainable contexts can be found in Slovenian university programs; all other levels have an approximately similar level of sustainable context (Table 2).

**Table 1.** Kruskal-Wallis H test results: field of study

| Kruskal-Wallis H | KLASIUS P-16 | N | Mean Rank |
|---|---|---|---|
| 52,965** | education | 22 | 454,64 |
| | arts and humanities | 12 | 740,17 |
| | social business law and administrative sciences | 149 | 497,06 |
| | natural sciences, mathematics, computer science | 342 | 446,2 |
| | engineering, manufacturing technology and construction | 209 | 517,79 |
| | agriculture, forestry, veterinary, fishing | 121 | 419,4 |
| | health and social work | 19 | 257,21 |
| | services, environmental safety | 82 | 585,96 |
| | Total | 956 | |

**Source:** own research

**Table 2.** Kruskal-Wallis H test results: level of study

| Kruskal-Wallis H | Degree programs | N | Mean Rank |
|---|---|---|---|
| 11,947** | Professional | 253 | 498,25 |
| | University | 249 | 428,39 |
| | Master | 309 | 489,94 |
| | Ph.D. | 145 | 505,72 |
| | Total | 956 | |

**Source:** own research

To investigate statistically significant differences among different study programs taught in private and public institutions, the Mann-Whitney U test was performed. Statistically significant differences were found (U=63734,5, p<0,05). According to the Mean Rank values for different groups of study programs, we can conclude that statistically significant more sustainable contexts have study programs taught in private institutions compared to study programs taught in public institutions (Table 3).

**Table 3.** Mann-Whitney U test results: type of institution

| Mann-Whitney U | Type of institution | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| 63734,5* | Private | 185 | 519,49 | 96105,5 |
| | Public | 771 | 468,66 | 361340,5 |
| | Total | 956 | | |

**Source:** own research

To investigate statistically significant differences among different study programs having at least one subject includes at least one keyword in the name of the subject, the Mann-Whitney U test was performed. Statically significant differences were found (U= 71305,5; p<0,05). According to the Mean Rank values for different groups of study programs, we can conclude that statistically significant more sustainable contexts have study programs having at least one subject with at least one previously defined sustainable keyword compared to study programs that do not have it (Table 4).

**Table 4.** Mann-Whitney U test results: inclusion in the name of at least one subject

| Mann-Whitney U | Inclusion in the name of at least one subject | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| 71305,5** | no | 415 | 379,82 | 157625,5 |
| | yes | 541 | 554,2 | 299820,5 |
| | Total | 956 | | |

**Source:** own research

## 5. FUTURE RESEARCH DIRECTIONS

In reviewing study programs and the subsequent analysis of the obtained data, it was possible to detect extremely large differences between study programs and specific HEIs. This was noted among HEIs within the same University and even more among the different public or private HEIs in the Republic of Slovenia. On the one hand, this result is logical, as the HEIs are primarily focused on specific areas of the economy; on the other hand, such diversity is challenging and requires better insight into the integration of particular topics for future graduates of specific fields. Graduates of some HEIs or study programs can be much better acquainted with environmental sustainability than others, i.e., graduates of comparable programs and degrees of other HEIs. It was also revealed that in private HEIs, there are fewer subjects related to environmental and sustainability-related topics. However, the number of study programs among private HEIs is also considerably lower. Given the legislative framework and direction of EU development and its research programs, including funding of priority research and study areas, it is expected that environmental sustainability topics will be at the forefront due to the focus of Horizon Europe (2021-2027) and its funding opportunities related to the circular economy, sustainable development, alternative resources, and smart and resilient society.

A study by Mróz et al. (2018) revealed that sustainable development promotion and teaching are not among the priorities and therefore, teachers/professors are not well prepared to use them in teaching/lecturing. We can see that according to a comprehensive and detailed analysis of Slovenian HEIs, there is already low to medium inclusion of environmental sustainability-related topics in most of the study fields. However, some study fields and programs are lacking regarding sustainability education. While sustainability and "green" business are being set as a top priority of the EU strategy for 2019-2024 and after the COVID-19 crisis recovery, further promotion of sustainability education is needed to fulfill this objective. This is only possible if current students and future managers are about to become more aware of environmental and social challenges, gain knowledge on how to address them and be able to create sustainable and resilient business opportunities, a sustainable public sector, and transform society on the road towards more sustainable oriented development paradigm.

## 6. CONCLUSION

The presented results identified crucial fields that were urgent to be approved. In the first phase, all university study programs in Slovenia should upgrade at least 5% of its contents with sustainable content. This should be made as an offer of at least one subject including content related to the sustainable transition. In the second phase, more attention should be given to the study programs taught in public universities with no subjects with sustainable contexts. Last but not least, more attention should be given to the Klasius P-16 study fields with less sustainable contexts. A minimum of at least 5 % of sustainable development contents subjects should be an integrative part of all HEI study programs in Slovenia, so more attention and support should be given to the fields that currently do have not them (for example programs related to health and social work).

Based on study findings, it can be recommended to establish a smaller "organization" or council for the systematic and continuous monitoring of priority topics integrated into higher education study programs and the preparation of an improved database of what is taught within specific courses and study programs. This should not be done only on the level of HEIs but also

regionally monitored and diversified among public and private HEIs. It is also more than welcome to encourage interdisciplinary teaching, including different aspects of environmental protection and sustainable development into full-time study programs of all kinds and integrating at least one elective course tied to environmental sustainability into each study program. This would enable all interested students to deepen their knowledge in sustainability science no matter what their primary study focus is. Since creating new subjects and hiring sustainability experts might be expensive and irrational for small HEIs, one solution is also seen in the implementation of joint projects and elective subjects throughout study programs that would need sustainability science integrated into their curricula to transfer knowledge to HEIs without strong integration of sustainability education. This solution is also suitable for the HE system since it does not bring high additional costs for the HE studies system.

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