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Indicators of sustainability in vocational education and training institutions

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Abstract

The paper presents the indicators of sustainability in vocational education and training institutions (VET), which define the tasks of the institutions according to the VET 4.0 strategy and the European Union's objectives. The purpose of this paper is to present and analyze the role of VET in raising awareness of changing economic and social practices and habits that damage the environment in order to ensure the living conditions of present and future generations. The research was conducted among the institutions of a vocational training center, using management interviews, data collection, and document analysis as research methods for examining easily traceable indicators of education in terms of human, social, natural, and economic resources. The main findings show that vocational education and training institutions also play a key role in sustainability. In addition to their educational tasks, another important task is to increase their efficiency and effectiveness in the area of sustainability. The conclusion of the work is that these schools can achieve sustainable development through preventive actions. As a practical implication, the VET needs to be aware of their energy consumption, their choice of means of transport, and the avoidance and prevention of pollution. They have to implement sustainable operations and education for sustainability both inside and outside of school.

Keywords: Vocational education and training, Sustainability, Dual training.

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1. Introduction

"One generation goes, another comes, but the Earth will always remain" –it can be read in the Book of Ecclesiastes [1]. Perhaps it can be regarded as the earliest articulation of the issue of sustainability. Sustainability must also be addressed in the face of the natural damage caused by economic growth, environmental damage that threatens health, depleting energy resources, and climate change. All of these are also reflected in the European Union's requirements and strategic goals for

vocational training. "The question is what they are doing, and what they can do to ensure that their sustainability is on an evolving trend" [2].

The most visible indicators, i.e., those that are present in the daily life of the schools and the conclusions drawn from them, are the most relevant to the relationship of the institutions studied with sustainability. The drop-out rate (number of students leaving during the school year), social responsibility (voluntary work), sustainable energy use (energy consumption/energy production ratio), and waste collection are regarded as the most visible indicators. There are many definitions and approaches to sustainability. Some of them are cited below. “Sustainability means prioritizing the needs of all life forms and of the planet by ensuring that human activity does not exceed planetary boundaries” [3]. Future generations must also be able to live in the present in a way that will be possible in the future. This requires a balance between technological progress and environmental awareness. “It is fundamental that learners understand the future as open and something that can be shaped collectively. Creativity, imagination, and being aware of our emotions and intuitions can inform our ability to envision alternative futures” [3]. The school's mission is to educate students for sustainability. Creativity and thinking in terms of possibilities promote effectiveness in sustainability in social, economic, and environmental terms. Schools can bring progress in line with technology through their teaching and learning work. "Sustainable development is a complex issue, but a simple concept: it means that we must maintain an economic growth model that ensures that people do not consume more resources than our planet can provide” [4].

The National Academy of Engineers has expressed the need for sustainability in engineering education in its report titled The Engineer of 2020: Visions of Engineering in the New Century [5]. For higher education institutions, a sustainable development path is an aspiration. In the case of the vocational training center under study, the current practice in Hungarian secondary education institutions is presented. Sustainable education is a lifelong learning process and an integral part of quality education that enhances the cognitive, social, emotional, and behavioral dimensions of learning [6]. In addition to a definition of sustainable education, their paper presents a picture of changes in higher education. The strength of the literature presented is that it illustrates the components of sustainability and sustainable development. The weakness is that the effectiveness of sustainability has not been examined for secondary education institutions.

Ramsarup et al. also argue that there is little research on the greening of vocational education and training. They argue that the focus of VET thinking should be on people rather than the economy and that consideration for the planet should be added Ramsarup et al. [7]. Usman et al. [8] studied technoparks as catalysts for sustainability in vocational schools. They found that curricular changes through technoparks had a positive impact on students' skills and collaboration [8]

The aim of this study is to review the economic, natural, and social dimensions of sustainability and to present the sustainability work and development opportunities in secondary schools in a way that has not been done before. Sustainability is the preservation of sustainable development, the quality of the environment, the quality of human life, and economic viability [9]. Sustainability is the key issue of the future, for which it is necessary to consciously raise the younger generations to be responsible.

2. Materials and Methods

The drive for sustainability is present in schools, although they are at the beginning of this process. The assumption is that examples of the environmental, social, and economic dimensions of sustainability can be seen in everyday operations. To prove this hypothesis, let us look at competencies and attrition in the social dimension, waste management, energy use, and transport in the case of natural resources, as well as specific cooperation with farmers' organizations and dual training in the economic dimension. During the study, preliminary telephone interviews were conducted with the directors of the vocational training centers to clarify some of the institutional characteristics of the data collection table sent out. Document analysis and data collection involved a review and analytical examination of the VET center's measurement data. Figure 1 shows the detailed flow of the research. In September 2023, principals were asked by email to fill in a spreadsheet, to write a request for data on sustainability indicators in their school, and then to confirm the data in the spreadsheet by phone. The telephone conversations, which lasted about half an hour per person, were noted down and read back to ensure that what was said was understood. Data available in the central register (e.g., pupil numbers, measurement results) were checked. The information was then organized and grouped into separate tables, separating indicators for the environmental, social, and economic dimensions. Consumption data and energy consumption are in the environmental dimension. Results of competence measurement, project methodology, drop-out rates, and social responsibility are in the social dimension. Dual training is in the economic dimension.

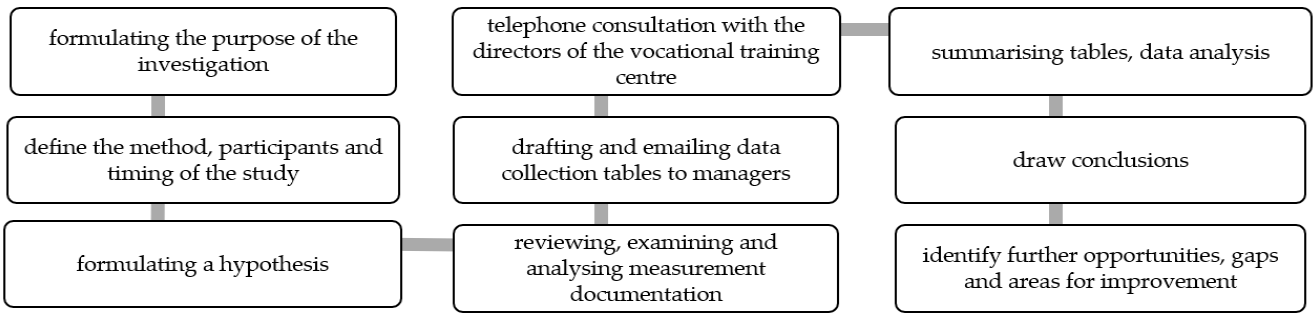

Figure 1.
Research flow.

3. Results

3.1. Sustainability in Schools

The presence of sustainability in schools can be monitored in their daily operations. The examination presented in this paper was conducted in the institutions of the Győr Vocational Training Centre. The Minister of Vocational Education and Training, acting in his capacity as the maintainer of the state vocational education and training institutions belonging to the Győr Vocational Training Centre (hereinafter: the Centre), decided to restructure the state vocational education and training institutions pursuant to Section 23 (c) of Act LXXX of 2019 on Vocational Education and Training. Accordingly, from 1 July 2020, the Centre will include 19 institutions in the cities of Győr and Mosonmagyaróvár. These include technical schools, vocational schools, primary schools, a high school, and a special vocational school. The main objective of the Győr Vocational Training Centre is to provide a sufficient number and quality of skilled workers for the region's businesses, for small and large enterprises [10]. The research covered 15 schools providing technical training. They have the same owner, the same values, the same challenges, the same management vision, the same tasks, and the same problems. However, the economic environment is different in the two cities (Győr and Mosonmagyaróvár). Consequently, the educational offer and therefore the student mix is different (Table 1). Instead of the relatively long name of the Institutes, numbers will be used in Tables 2 and 3 to indicate the particular school.

Table 1.
The technical and vocational training schools of the Győr Vocational Training Centre and the sectors they teach.

Schools	Training sectors	Number of the institute
Baross Gábor Bilingual School of Economics (Győr)	Business and Management	1
Bercsényi Miklós Transport and Sports School (Győr)l	Specialized Mechanical and Automotive Engineering, Electronics and Electrical Engineering, Transport and Transportation, Police and Public Service, Sports	2
Bolyai János Technical School (Mosonmagyaróvár)	Information Technology and Telecommunications, Transport and Transportation, Business and Management	3
Deák Ferenc School of Economics (Győr)	Business and Management	4
Gábor László School of Construction and Woodworking (Győr)	Construction, Wood and Furniture Industry	5
Glück Frigyes Tourism and Hospitality Technical and Vocational School (Mosonmagyaróvár)	Tourism Hospitality	6
Hild József Construction Technical School (Győr)	Construction	7
Hunyadi Mátyás Technical College (Mosonmagyaróvár)	Mechanical Engineering, Specialized Mechanical Engineering and Vehicle Manufacturing, Trade, Construction, Transport, and Transportation	8
Jedlik Ányos Mechanical Engineering and Information Technology Technical College and College (Győr)	Mechanical Engineering, Information Technology and Telecommunications	9
Kossuth Lajos Technical College and College (Győr)	Electronics and Electrical Engineering, Beauty, Creative	10
Krúdy Gyula Tourism and Hospitality Technical College (Győr)	Tourism and Hospitality	11
Lukács Sándor Automotive and Mechanical Engineering Technical College (Győr)	Specialized Mechanical Engineering and Vehicle Manufacturing, Mechanical Engineering, Civil Engineering, Mining and Metallurgy	12
Pálffy Miklós Trade and Logistics Technical College (Győr)	Trade, Transport and Forwarding	13
Pattantyús-Ábrahám Géza Technical College (Győr)	Electronics and Electrical Engineering, Computer Science and Telecommunications	14
Sport and Creative Technical College (Győr)	Sport, Creative	15

The following indicators are used to examine the appearance of sustainability. Within human resources, competencies and dropouts in education; among social resources, the proportion of people engaged in voluntary work; within natural resources, sustainable energy use and characteristics of waste collection; and finally, the special form of economic relations, dual training. Let us look at the current practices, using the examples of fifteen schools. The research is based on information obtained from the Centre's management and indirectly from the heads of the institutions (Table 2).

Table 2.
Schools of the Győr Vocational Training Centre, sustainability data.

Number of the institute	Drop-out rate (number of students leaving during the school year)	Social responsibility (voluntary work)	Sustainable energy use (energy consumption/ energy production ratio)	Waste collection	Dual training*
1	11	482	31,955 kWh / 34,644 kWh	Selective	0/482
2	85	844	-	Selective	21/920
3	34	352	-	Selective	0/352
4	40	492	-	Selective	0/492
5	44	0	97,541 kWh/ 28,506 kWh	Selective	0/451
6	29	108	-	-	0/276
7	19	527	43,010 kWh/ 34,017 kWh	Selective	0/527
8	49	400	53,598 kWh/ 14,408 kWh	-	60/671
9	31	914	136,117 kWh/ 7,308 kWh	-	18/914
10	119	431	-	Selective	82/655
11	57	606	195,252 kWh/ 7,495 kWh	Selective	2/863
12	100	755	-	Selective	79/1324
13	39	501	38,263 kWh/ 22,683 kWh	-	20/636
14	6	586	12,888 kWh/ 4,104 kWh	Selective	82/606
15	31	302	-	-	0/302

Note: *Dual training: Number of technician students/ total number of full-time students in dual training in the academic year 2021/22. Of the full-time students, 11-12-13 year olds can participate in dual training. Source: Own compilation of authors

3.2. Energy Use

The column named "Sustainable energy use" (Table 2) shows that 7 of the 15 schools do not have solar panels to help reduce energy consumption. In the other schools, with one exception, the energy produced is less than the energy consumed. It is true that some of these schools were equipped with a solar park during the school year. Overall, at the central level, the savings in terms of financial resources are significant since energy is produced compared to what would be the case if all actual consumption had to be paid for. To determine the savings from energy generation, it would be worthwhile to determine the floor area of the buildings, the number of people using the building, the duration of use, whether energy-efficient appliances and lighting are installed, and whether the institution has an energy-saving strategy. In the case of PÁGISZ, energy efficiency is reflected both at a strategic level and in the form of regulations. Energy-saving devices, agreed between the users of the institution, are energy-saving, and their use is limited in time. Curtains in the school do not block natural light; the lighting is modern and economical, and both students and staff consciously monitor the use of lighting. The professional content of the sectoral training courses in electronics-electro technology, information technology and telecommunications helps integrate energy awareness into everyday life in an active way. Young people interested in these professions can more easily understand the importance of using technology and of working towards sustainability.

3.3. Project Attitude

Both the strategies of the European Union and nations regulating vocational training stipulate and expect project-based education and the use of project methodology, as they are the best ways to develop the competences effectively and efficiently required by the labor market. In addition to professionalism, during education, it is crucial to focus on cooperation, problem-solving, creativity, and effective communication. The development of emotional intelligence, environmental awareness, and sustainability also has to be part of everyday teaching and learning. The regulation, which determines the schedule of the school year, also names theme weeks, which are implemented through projects in most institutions.

3.4. Competence Results, Drop-Outs

Table 2 shows a measure of drop-outs, the number of students leaving in an academic year. This number is also not indicative of the actual number of students who drop out. The correct drop-out rate is the number of students who leave school without having completed their education, but it is not known whether these students complete their studies in another school after leaving school. Yet, a dropout figure is needed. In Hungarian vocational education and training, the electronic register records students at risk of dropping out, who have a GPA below 3.00, or a subject with a GPA below 2.00, or a certified or certified absence from school that exceeds the legal limit. In the case of drop-outs, the percentage for each institution can be described as the ratio of the number of pupils in the school to the number of pupils leaving during the school year. Based on the data in Table 2, for the 15 mentioned schools of the Győr VET Centre, this ratio is 7.57 % as an average

of the results of each school, which was below the EU average of 9.7 % in 2021. The EU target for 2030 is 9 %. 3 of the 15 schools studied are above the EU average, which is very encouraging. The tasks set out in the action plans and the steps to implement them can be passed on as good practice by the successful schools, helping them to achieve below the target everywhere. The results of the competency assessment are detailed in Table 3. Differences from the average of the standard technician are marked with a background red color. The majority of the evaluated fifteen institutions are in a favorable position with good average results. Of the three weakest schools, two are from Mosonmagyaróvár and one from Győr, and the sectors they teach are not exclusive but rather varied, with the exception of one school. An examination of the reputation of the schools and the results of the pupils admitted to the schools would help to draw more accurate conclusions. It is interesting to note that for the 14-15-16 age group (9th grade students) at the Technical School, the best results are in attention, memory and study skills, with national averages above 70 % for each, while the weakest are in mathematics and vocabulary, with averages of 50 % and below.

Table 3.
The results of the 2022/23 input assessment of vocational competence in the technical schools of Győr SZC (in percent).

Number of the institute	Mathematics	Subject vocabulary	Vocabulary	Reading comprehension	Mother tongue	Attention	Memory	Learning skills
1	59.58	75.54	46.20	66.27	70.03	85.49	81.78	84.50
2	56.52	72.55	41.33	57.95	66.00	84.18	82.63	83.77
3	59.48	75.35	44.03	62.31	69.02	85.19	84.01	84.87
4	66.83	75.07	44.58	69.29	69.89	86.96	78.42	84.68
5**	38.61	65.21	29.22	50.60	57.98	66.93	64.87	66.38
6	41.15	69.16	43.13	58.59	63.93	80.54	72.27	78.33
7	72.57	79.08	53.45	76.19	75.01	91.47	80.93	88.66
8	44.77	68.93	49.29	51.90	63.69	81.06	78.57	80.40
9	77.09	80.56	52.96	72.23	75.43	88.13	81.61	86.39
10	40.70	70.15	38.05	56.55	63.62	75.03	73.56	74.64
11	59.13	74.87	46.14	68.56	69.86	83.82	81.34	83.16
12	56.16	72.51	41.94	57.38	65.98	75.51	80.16	76.75
13	57.98	74.42	46.46	63.48	68.86	86.88	79.27	84.85
14	63.88	76.62	45.11	61.78	70.00	83.77	87.04	84.64
15	57.44	72.84	43.46	65.29	67.56	84.36	76.10	82.16
National technician	50.00	70.48	40.82	59.22	64.63	76.83	76.25	76.68

Note: ** Vocational training is provided in the school only at the moment.

3.5. Social Responsibility

Table 2 shows the number of students involved in social responsibility. Students enrolled in a technician course are 100 % involved in social responsibility. Completion of a statutory level of community service required for the school leaving examination. Work for the community, without financial reward, for a socially recognized, important purpose is part of the educational tasks of the school.

3.6. Dual training

Vocational education and training legislation allows for vocational education and training to take the form of dual training in schools and out-of-school for farm apprentices. Based on a specific, economic understanding of sustainability, the most economical type of training is that which is not provided at school but on another site (with energy consumed elsewhere) by external trainers. It is truly cost-effective and resource-efficient, whether in terms of material or human resources. Table 2 shows that eight out of fifteen schools surveyed have students in dual training. This depends on both the economic environment and the sectors taught. In the case of the farming, sport and creative sectors, there is a lack of receptiveness on the part of companies to employ and train students. Four institutions show a relatively high number of students in dual training, these are marked in green, three of them in Győr and one in Mosonmagyaróvár; the sectors are technical.

4. Discussion

An overview of the sustainability indicators in the schools of the VET centre reveals that they are already present in the secondary schools, in social, economic, and environmental dimensions. Previously, they had not been examined in this way in secondary education. No similar research has been conducted before, and there are no benchmarks against which to compare the data in this study. However, it can be argued that education for sustainability is an important task in vocational training, in schools, and in dual training companies. A future direction for research could be to follow up and compare the data found to demonstrate measurable improvement. The hypothesis that examples of environmental, social, and economic dimensions of sustainability in their day-to-day operations can be seen has therefore been confirmed. Although the performance of the various schools in the VET centre varies in the different dimensions, improvements in efficiency can be

achieved by means of creative thinking and by exploiting the opportunities offered by the path of development. In addition to technological progress, the conscious use of energy, environmental awareness, continuous self-education, and the extension of economic links will lead to a more sustainable future. As a continuation of this research, a greater focus on energy efficiency could be considered separately for each indicator, for each institution. For example, quantitative measurements of energy consumption and production, calculated as a percentage of energy consumption and production, could be used to justify a comparative analysis of the data collected for a number of school years over time.

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