

Article

Shaping Pro-Environmental Attitudes through Higher Education—A Preliminary Study

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Abstract: Several authors argue that some types of academic education not focused on sustainability can also shape—at least some—competencies relevant to sustainability and turn students into more engaged individuals. The main goal of this article was to check this possibility based on the results of an e-questionnaire from 66 fresh graduates of a business-oriented university based in Poland. We found that respondents rated highly both the competencies that the university taught in the general sphere related to sustainable development and those important for their professional life and wanted further development of both groups of these competencies. Through regression analysis, we also found that the perceived development of SD competencies does not predict respondents' ecological worldview. Of the studied predictors for ecological worldview, only female gender and mission- or socially-driven dream job remained in the regression model, accounting for approximately 18.6% of the variation in ecological worldview.

Keywords: sustainable development competencies; new ecological paradigm; education for sustainable development; university



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1. Introduction

The limits to growth report [1] opened a public concern for the need for sustainable development and created strong political support for an “Education for sustainable development” to change people’s attitudes and to achieve values, skills, and behaviour consistent with sustainable development. To this day, education for sustainable development (ESD) is considered a response to the needs identified in the United Nations agendas [2], as well as the European Commission commitment to the Green Deal to reach zero net emissions of greenhouse gases in 2050, while maintaining the European Union’s economic competitiveness. An observable result of the interest in ESD at the tertiary level of education involves changes in curricula that introduce special programs concerning this topic and systems of their verification [3,4], not only in developed countries but also in those whose economies are currently experiencing rapid growth [5].

The authors of UNESCO’s roadmap for ESD [6] define ESD as “a lifelong learning process and an integral part of quality education that enhances cognitive, social, and emotional and behavioral dimensions of learning. It is holistic and transformational and encompasses learning content and outcomes, pedagogy, and the learning environment itself.” [6] (p. 8). They also emphasize that ESD is often “interpreted with narrow focus on topical issues rather than with a holistic approach on learning content, pedagogy, and learning outcomes to bring about the fundamental behavioral shift to sustainable development.” [6] (p. 9).

Since the 1970s, many universities have been introducing courses aimed at raising environmental awareness or, more broadly, knowledge, skills, and attitudes related to sustainability. It was believed that the best way to realize the idea of education for sustainable development was to create courses devoted precisely to these issues and introduce them

into the curricula as a complementary subject, although studies have shown the varying effectiveness of such courses depending on the academic discipline (major) studied [7]. One may think, and some authors suggested this as early as the end of the 20th century (see: [8,9]), that EDS can be implemented in at least two ways: through (a) stand-alone sustainability courses (supplementing the curriculum with an additional course) or (b) enriching the objectives of various courses to develop competencies important for sustainable development (SD competencies) [10]. Every so often, certain opinions emerge, suggesting that any kind of education [11], and especially higher education [12,13], is conducive to the formation of EDS-related competencies, and so SD competencies can appear as a byproduct of courses where main learning outcomes are not related to the idea of sustainable development, ecology, or social responsibility. Opportunities for this increase especially when academic education focused on developing critical thinking [10] is conducted using teaching tools recommended for SD competency development [14–16].

There are many studies about the effectiveness of stand-alone sustainability courses [17–21] or general university studies oriented partly towards sustainability [20,22–25]. Some previous studies showed that even stand-alone sustainability courses [21,26] and education oriented for sustainability [22–25] are only partially successful in changing the attitudes of students. Other research assessed students' sustainability competencies [16,22,23,27] or checked if students are aware that the university is attempting to build a sustainability orientation, and if so, is the scale of these activities correlated with students' pro-ecological attitudes [21,24–26]? Several studies argue [10,28,29] that active learning methodologies, which are commonly used in modern business schools, are tools that are appropriate for developing critical thinking and sustainable attitudes in students.

In contrast to the mentioned above literature (on the effectiveness of stand-alone sustainability courses and education oriented towards sustainability as a policy implemented by university authorities), there is little knowledge about SD competencies developing as a side effect of educational activities in universities that do not have programs focused on building sustainable competencies [13]. It is also interesting to see whether SD competencies developed in this way and especially the awakened willingness to acquire or strengthen these competencies have an influence on fresh graduates' ecological worldview. Therefore, the main objectives of this article included investigating whether alumni who have not participated in stand-alone sustainability courses or frequented universities supporting sustainability admit that their studies have influenced them to develop or strengthen SD competencies and, more importantly, whether they feel the willingness to acquire or strengthen them, and whether the level of these developed and desired SD competencies can predict their pro-ecological attitudes.

The paper is structured as follows—the next section is devoted to a terminological discussion and a literature review concerning the universities' ways of shaping sustainable competency. The next two sections contain the methodology of the study and results. The fifth section contains a discussion of the results and the formulation of directions for further research. The text concludes with a summary of the findings.

2. Theoretical Background and Hypotheses Development

2.1. EDS and SD Competencies Shaped by Universities

The discussion of what competencies themselves [30,31], and SD competencies, in particular, are [3,9,20,32], has been going on in the literature for years. Traditionally, it has been assumed that competencies go beyond knowledge and skills and encompass all the qualities of an individual that enable them to act effectively in the area to which these competencies apply, and only sometimes do they equate competencies with knowledge and skills only [30,31]. A more precise definition of these elements for specific areas, and thus sustainable competency, in particular, is essential as long as education seeks to measure the effects of its implementation. However, as one study notices, “the practice of assessing students' sustainability competencies is still in its infancy” [32] (p. 117). This is despite the fact that universities run a number of programs specifically aimed at shaping

such competencies [3,4,33], suggesting a natural need for tools to measure the effects of such activities.

A review of the tools used to assess these competencies [32] shows that scaled self-assessment dominates, followed by tests (conventional or scenario-based) and tools that require qualitative, expert interpretation, such as reflective writing, interviews, or performance observation. Other measures are also used to assess the degree of achievement of SD competencies, allowing comparison of results before and after an educational intervention (course, semester, study), such as the revised New Ecological Paradigm scale [34].

There is some diversity of opinion about what SD competencies are [9,23], and the search for a definition of key competencies concerning sustainability for use in higher education courses has not yielded a single set of these key competencies [35]. Distinctions of this set of competencies vary, although authors of subsequent attempts [9,14,32] often refer to the framework of key competencies in sustainability by Wiek et al. [36]. They distinguished five key competency areas: systems-thinking competence, anticipatory competence, normative competence, strategic competence, and interpersonal competence, which are interlinked, and each of them contributes a specific part to sustainability problem-solving processes. This set of key competencies in sustainability was defined in opposition to “regular or basic” competencies, as distinct but not confined to “critical thinking, communication, pluralistic thinking, research, data management, etc.” [36] (p. 211).

This list was not complete, and quite quickly [4] it was supplemented with a sixth key competence, namely integrated problem-solving competence. Based on this list, a Delphi study with a group of sustainability experts [3] expanded it to include two additional ones: intrapersonal and implementation competence, as relevant to the action directed at achieving the goals derived from the analysis.

The second strand of research on creating a list of competencies had a different starting point from the list of so-called “Gestaltungskompetenz” (“shaping competencies”) constructed by G. de Haan [37] as a set of key competencies, which are expected to enable active, reflective, and cooperative participation in actions toward sustainable development. These lists emphasize the roles of teamwork and the ability to work together in teams that are diverse, not only when it comes to their members but also perspectives, empathy, self-reliance, and the ability to take ethical action. Common to these two approaches is the consideration of competency in anticipatory thinking, but also systemic thinking identified by Rieckmann [38], who listed twelve competencies.

The functioning of the two strands illustrates well the consequences of the starting point in creating a set of EDS competencies—that is, starting with a certain list from which a group of experts in the Delphi cycle begin their work, forming a vision of the definition of the situation for which competency is identified. The diversification in this starting point, that is, the understanding of the underlying situation the competencies are intended to address, makes it difficult to arrive at a universally shared list of competencies for ESD. At present, the dominant approach [3,9,32] is the one that separates teamwork on problem-solving from core competencies specific to ESD developed from the models based on the approach by Wiek et al. [36]. The model adopted in the current study, developed by Lozano et al. [14], falls within this trend. It analyzes twelve competencies: systems thinking; interdisciplinary work; anticipatory thinking; justice, responsibility, and ethics; critical thinking and analysis; interpersonal relations and collaboration; empathy and change of perspective; communication and use of media; strategic action; personal involvement; assessment and evaluation; and tolerance for ambiguity and uncertainty. The list takes into account some elements necessary for teamwork but focuses attention more on individual skills, such as systems thinking. At the same time, it has already proved useful in analyzing the formation of competencies for ESD, not so much by academic programs aimed at specific environmental problems but by academic education overall, as it has been shown how the formation of these competencies occurs through various methods of educational work.

Such a starting point is appropriate for our study, which postulates that any educational activity in higher education can shape competencies, some of which is part (or all) of

the competencies for ESD. This approach was common in the late twentieth century when universities did not have separate programs geared toward sustainability-specific competencies, and the move toward separate ESD-oriented programs was only postulated and described as experimental [38]. This approach is in line with Holdsworth and Thomas [8], who identified one type of (ESD) education, where the main aim is to raise competencies for sustainability without challenging the current paradigm or curriculum. This distinction is sometimes described as follows: “EDS can be integrated in higher education vertically and horizontally. The former integrates sustainability through specific sustainability-related courses while the latter includes sustainability within the regular courses in the study plan” [24] (p. 339). The horizontal inclusion of sustainability awareness-supporting activities could be performed as an effect of political decisions made by the university [27] or state authorities [39] or, as in our case, as a side effect of competencies acquired by students at the university. Several authors tried to assess if university studies (ones not directed towards ecological problems) increase the level of SD competencies [23,27] or create a pro-ecological worldview [25], but, to our knowledge, this is the first attempt to check if the level of acquired in this way SD competencies correlates with pro-ecological worldview. Even if such a comprehensive approach towards ESD seems to neglect the specifics of raising awareness of ecological concerns, the very emphasis on a problem-oriented approach to analyzing the situation and the focus on seeing the multiple consequences of actions that are shaped—at least declaratively—by higher education institutions can be expected to translate into the formation of competencies for sustainability in alumni, and consequently environmental attitudes.

2.2. New Ecological Paradigm

The original NEP (New Environmental Paradigm) scale [40] consists of 12 items that focused on three aspects: (1) humanity’s ability to upset the balance of nature, (2) the existence of limits to growth for human societies, and (3) humanity’s right to rule over the rest of nature [41] (p. 427), and was supposed to form a “fundamental component of people’s belief system vis-à-vis the environment” [40] (p. 428). Higher NEP scores indicate an ecocentric system of beliefs (humans as part of the natural system) and a lower, anthropocentric one (humans as superior to other parts of nature).

In 2000 Dunlap et al. [41] published a revised version of the NEP. In addition to the name change (the adjective “environmental” was replaced by “ecological”), the authors added items measuring two additional aspects: human exemptionalism and the likelihood of an ecocrisis, modified some of the items from the original NEP Scale, and added the “unsure” category. The revised NEP scale consists of 15 items—three for each of the five aspects: the reality of limits to growth, antianthropocentrism, the fragility of nature’s balance, rejection of human exemptionalism, and the possibility of ecocrisis [41] (p. 432).

The dimensionality of the NEP scale is a topic of ongoing debate. Various studies identified 1 to 5 NEP dimensions [42,43]. On a sample of Polish respondents, the obtained two-factorial structure was deemed (named by authors: Human Power and Limits of Nature) more appropriate, but the newly revealed solution was still not completely satisfactory according to the obtained psychometric parameters [44]. Dunlap et al. [41] argued that the decision to highlight two or more dimensions in the NEP Scale “should depend upon the results of individual study.” (p. 431). Face validity of emerging dimensions and the lack of high correlations between them should encourage researchers to employ these dimensions as separate variables. In other cases, they recommend treating the NEP scale as a single variable. Xiao and Buhrmann propose to “reinterpret the many findings of multidimensionality as not showing the inadequacy of the NEP scale, but revealing the variation in the degree of coherence of the NEP within different groups and populations.” [43] (p. 183).

Despite these problems with the nature of the scale and the presence of other approaches to measuring environmental attitudes in the literature [45,46], the NEP scale still appears to be the most popular tool, the gold standard measure of the pro-environmental

worldview [42]. As Bernstein and Szuster [46] stated: “it remains dominant because the alternatives are either unidimensional, or lack theoretical coherence.” (p. 76).

2.3. Hypotheses Development

Most of the studies on the evaluation of SD competencies are concerned with stand-alone courses on sustainability (i.e., shaping these competencies within ESD). However, the competencies considered as SD are mostly universal, and their development does not necessarily have to be related to the topics of the classes but to the way they are conducted (e.g., forming critical thinking—[10]), and especially to the selection of teaching tools. Lozano et al. [14], in their classification, included the following pedagogical approaches for sustainability education: case studies, interdisciplinary team teaching, lecturing, mind and concept maps, project-based learning, problem-based learning, community service learning, jigsaw /interlinked teams, participatory action research, eco-justice and community, place-based environmental education, supply chain analysis, and traditional ecological knowledge.

K. Shephard [29] states that “the essence of education for sustainability is a quest for affective outcomes” (p. 88), i.e., values, attitudes, feelings, appreciation, and motivations. Thus she recommends the most appropriate teaching strategies to develop or to strengthen abilities from the affective domain (i.e., receiving, responding, valuing, organization, and characterization [47]): discussion, open debate, role playing, problem-based learning, engaging with role models, simulations, games, group analysis of case studies, expert engagement, and perspective sharing via reflection.

If education is to influence the development of such competencies as, for example, critical thinking, tolerance for ambiguity and uncertainty, empathy, and change in perspective, and thus lead to the transformation of perspectives and points of view, which should provide transformative learning experiences. Since one of the main pillars of transformative learning is a critical reflection [48], those experiences that are critical reflection facilitators are preferred. These include live simulation and simulation games, theater-based sessions, group model building, participatory design [49], and other active learning methods. These are methods that not only stimulate participants to actively act and solve problems but include, as an integral part, debriefing, both in written and oral (preferably collaborative) form, resulting in an understanding of the long-term consequences of actions carried out.

Thus, assuming that not only stand-alone courses on sustainability contribute to the development of SD competencies (that systems thinking or critical thinking competency enhanced during computer simulation or project management or entrepreneurship classes is still systems thinking competency, valuable also in other contexts), the subject of our study was the SD competencies of fresh graduates who did not attend stand-alone courses on sustainability.

In addition, let us remember that students acquire knowledge, competencies, and skills not only through university courses, and it is not so much the achievement of a certain level of SD competencies upon completion of a course or degree program that should be considered a success, but the hope of life-long competence development, through informal, self-directed learning. Therefore, as the main measure of educational success, we took desired SD competencies, that is, willingness to acquire or strengthen SD competencies. Another reason to apply this measure is the well-known imperfection of self-assessments of one’s competencies [50], while ratings of willingness to acquire or strengthen one’s own competencies reflect not so much an assessment but a need (evaluating it as important).

The level of achievement and willingness to acquire or strengthen SD competencies is worth comparing with the self-assessment of the level of achievement and the need to develop other skills. We chose two obvious measures, efficient work performance (in the role of an employee) and entrepreneurship, in addition to two not highly valued in contemporary business education [51,52]: rote learning and competition. These first two competencies are related to the perception of the university as a place that directly prepares

for professional roles: an employee or an entrepreneur (employer). The latter two are measures of errors in education.

Fresh graduates at the threshold of entering adulthood have understandable concerns about the sufficiency of their preparation for the transition to the workplace [53–55]. This is understandable, especially in view of the dominant narrative about the gap between the competencies obtained in higher education and the demands of the labor market [53,54]. Therefore, we expected that respondents' perceived development of their competencies through university courses would be rated lower than the willingness to acquire or strengthen both SD competencies and other skills.

Hypothesis 1. *Perceived development of both SD competencies and other skills will be rated lower than the willingness to acquire or strengthen them.*

Hypothesis 2. *Perceived development of other skills will not be higher than the perceived development of SD competencies.*

Hypothesis 3. *Willingness to acquire or strengthen SD competencies will not be lower than the willingness to acquire or strengthen efficient work performance and entrepreneurship.*

Our main objective is to see if we are correct in assuming that willingness to acquire or strengthen SD competencies is a better predictor of ecological worldview than the perceived development of SD competencies. However, let us not forget that there are other factors affecting the ecological worldview. Many authors investigating socio-demographic factors influencing environmental concern, attitudes, worldviews, and behavior found that women are more environmentally oriented than men [42,45,56]. Gender-environmentalism relations were explained by different moderators, for example, differences in emotional empathy [57,58], social dominance orientation [58], and personality traits [59]. However, there are also studies that do not support gender influence on environmental orientation. For example, Balador et al. [60], who examined the environmental attitudes of stakeholders of the building construction industry in New Zealand, found no significant differences between genders in environmental attitudes. Similarly, Kovács et al. [61], who studied Hungarian middle-class participants, found that there are no significant differences between women's and men's NEP levels. Dyr and Prusik [44], who analyzed the results of their study on a Polish sample, found that only some of the NEP and General Ecological Behaviour subscales correlate with gender.

When planning the first job after graduation in services related to people and their needs (such as education or health care), a job directly related to environmental protection, in a non-governmental organization, or a mission- or socially-driven dream job can be an indicator of greater sensitivity to the needs of the environment and ecological worldview. In Poland, such a choice of life path goes hand in hand with low chances of high earnings, as wages in these industries range from 2/3 to 90% of the country's average earnings [62]. This suggests that there is an incentive stronger than high financial gains available in other industries, where average earnings can be as high as twice the country's average.

Thus, we made the following prediction:

Hypothesis 4. *Willingness to acquire or strengthen SD competencies is a better predictor of ecological worldview than perceived development of SD competencies. Other predictors of ecological worldview include gender and mission- or socially-driven dream job.*

3. Study Design and Methodology

3.1. Participants and Method

Sixty-six alumni from a business university took part in the research. The e-questionnaire was sent on few days after their thesis defense, and participation in the study was fully voluntary. Circa 2/3 of invited alumni took part in the research.

A large majority of the respondents are females (72.2%). Three participants in the gender question chose “Other/I do not want to answer this question.” When asked about their dream job, the largest number of respondents (47.0%) chose business services, while mission- or socially-driven jobs (environmental work, NGO work, services related to people and their needs—including care services, health care, education) were selected by 28.8%. One participant did not answer this question.

3.2. Measures

3.2.1. SD Competencies

For SD competencies, the list proposed in [14] was selected. Developed (thanks to classes at the university) and desired (by the alumni themselves) sustainable development competencies were measured using the following items, each of which was preceded by the phrase: “Do you think you acquired or developed, through university courses, competencies in . . . ”(in the developed SD competencies study) or “Do you want to gain or increase your competences in . . . ”(in the desired SD competencies study):

- Systems thinking (understanding the characteristics of dynamic systems, identifying cause-effect loops and positive and negative feedback loops, awareness of the dependence of behavior on time and initial conditions versus time and sensitivity to initial conditions)?
- Interdisciplinary work (the ability to combine knowledge and methods from different science disciplines when solving problems)?
- Anticipatory thinking (anticipating the future actions of other people and organizations, formulating various scenarios for the future, taking into account the risk)?
- Justice, responsibility, and ethics (taking responsibility for your actions, concern for honesty and justice)?
- Critical thinking (the ability to question other people’s opinions and common ways of acting, the ability to critically reflect on one’s own actions, judgments, and opinions)?
- Interpersonal relations and collaboration (how to communicate effectively with others, how to negotiate and act in conflict situations, how to work in a group and share knowledge in it)?
- Empathy and change of perspective (understanding the needs, activities, and perspectives of others, solidarity, empathy, acceptance of the diversity of views of cultural differences)?
- Communication and use of media (critical assessment of media content and the ability to select reliable sources of information, the ability to communicate effectively in an intercultural context, the ability to select and use appropriate information and communication technologies)?
- Strategic action (developing strategies, planning and implementing projects, managing processes and projects, and motivating others to work)?
- Personal involvement (taking initiative, self-improvement, learning)?
- Assessment and evaluation (creating appropriate evaluation criteria and making choices in the event of a conflict of interest, different goals of different people, and contradictory information)?
- Tolerance for ambiguity and uncertainty ((dealing with the deficit of information, with the diversification and/or contradiction of goals and interests, and the inability to predict all the effects of the actions taken)?

Participants responded on a seven-point Likert-type scale (from 1—strongly disagree to 7—strongly agree).

Principal component analysis of 12 SD competencies (the Kaiser–Meyer–Olkin Measure of Sampling Adequacy = 0.918, Bartlett’s test of sphericity: $\chi^2 = 1231.667$. $df = 66$. $p < 0.001$) extracted one component that accounted for 64.17% of the variance. Cronbach’s Alpha = 0.948. That is why we decided to create SD competencies indexes by averaging scores across the twelve developed and twelve desired SD competencies’ ratings.

Questions concerning SD competencies (developed and desired) were followed by four questions exploring the sense of achievement derived from courses and willingness to acquire or strengthen the four additional skills:

Do you think you acquired or developed, through university courses, competencies in/ Would you like to acquire or develop competencies in:

- Efficient work performance (planning projects in time and making efforts and systematic efforts to achieve the goals set)?
- Entrepreneurship (finding gaps in the market and creating a business based on those observations)?
- Fast memorization (learning a variety of—often not very useful—things by heart quickly)?
- Competition (how to be better than others in any area)?

3.2.2. Ecological Worldview

Ecological worldview was measured on the revised New Environmental Paradigm scale [41]:

1. We are approaching the limit of the number of people the Earth can support;
2. Humans have the right to modify the natural environment to suit their needs (reversed);
3. When humans interfere with nature, it often produces disastrous consequences;
4. Human ingenuity will ensure that we do not make the Earth unlivable (reversed);
5. Humans are seriously abusing the environment;
6. The Earth has plenty of natural resources if we just learn how to develop them (reversed);
7. Plants and animals have as many rights as humans to exist;
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations (reversed);
9. Despite our special abilities, humans are still subject to the laws of nature;
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated (reversed);
11. The Earth is like a spaceship with very limited room and resources;
12. Humans were meant to rule over the rest of nature (reversed);
13. The balance of nature is very delicate and easily upset;
14. Humans will eventually learn enough about how nature works to be able to control it (reversed);
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

Participants responded on a seven-point Likert-type scale (from 1—strongly disagree to 7—strongly agree). The Cronbach’s $\alpha = 0.765$. For the NEP11 item (The Earth is like a spaceship with very limited room and resources), the very low item-total correlation (0.012) was noticed. After excluding this item, Cronbach’s α increased to 0.786, which indicates an acceptable level of internal consistency. We decided to exclude this item, especially since the metaphor “The Earth as a spaceship” is not popular in Poland, so this question could cause consternation.

By taking into account the dimensionality discussion, the principal component analysis with Varimax rotation was conducted to reveal the factor structure of the scale. The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.772, and the Bartlett test of sphericity ($\chi^2 = 300.32$, $df = 91$, $p < 0.001$) proves the adequacy of the correlation matrix. The analysis extracted four components (Table 1) that accounted for 64.40% of the variance.

Table 1. Rotated component matrix vs. Dunlap’s NEP aspects.

Item	Component				NEP Aspect [31]
	1	2	3	4	
NEP8rev	0.839				The fragility of nature’s balance
NEP14rev	0.796				Rejection of human exemptionalism
NEP4rev	0.784				Rejection of human exemptionalism
NEP12rev	0.660		0.521		Antianthropocentrism
NEP6rev	0.645				The reality of limits to growth
NEP10rev	0.537	0.339	0.496		The possibility of ecocrisis
NEP13		0.803			The fragility of nature’s balance
NEP3		0.714		0.482	The fragility of nature’s balance
NEP15		0.701		0.353	The possibility of ecocrisis
NEP9			0.737		Rejection of human exemptionalism
NEP2rev	0.366		0.646		Antianthropocentrism
NEP7		0.344	0.483	−0.437	Antianthropocentrism
NEP5				0.762	The possibility of ecocrisis
NEP1				0.683	The reality of limits to growth

Note: The table shows loadings greater than 0.30 only.

The first factors load most heavily six items that represent all five aspects of NEP [31]: the reality of limits to growth (NEP6rev), antianthropocentrism (NEP12rev), the fragility of nature’s balance (NEP8rev), rejection of human exemptionalism (NEP4rev and NEP14rev), and the possibility of ecocrisis (NEP10rev). Each of the other factors covers two aspects. Like “most studies” [43] (p. 181), including [41], our research did not reveal factors corresponding to the hypothetical NEP aspects. In view of the above and because of an acceptable level of internal consistency, we decided to treat an average of 14 NEP items as a single measure of ecological worldview.

IBM SPSS Statistic software (ver. 27) was used to conduct all statistical analyses. The criterion for statistical significance was set at 5%.

4. Results

The Wilcoxon signed-rank test was used to compare SD competencies and other skills developed during university education and desired by respondents. The results of this test are given in Table 2. All Z values are based on negative ranks. Only for two SD competencies (justice, responsibility and ethics, and personal involvement) and one from other skills (fast memorization) are the differences insignificant at the 95% level. Moderate effect sizes were found for interdisciplinary work, anticipatory thinking, strategic action, efficient work performance, and entrepreneurship. In other cases, effect sizes are small. Thus, hypothesis 1 is partially supported.

In order to verify Hypothesis 2, two related-samples Friedman’s two-way analyses of variance were performed. They revealed that there are significant differences in the distributions of:

- Developed SD competencies and other skills ($\chi^2 = 57.67$. $df = 15$. $p < 0.001$);
- Desired SD competencies and other skills ($\chi^2 = 32.41$. $df = 15$. $p = 0.006$).

Table 3 presents mean ranks of developed and desired SD competencies and other skills. Pairwise comparisons revealed the following significant differences.

Table 2. Comparisons of developed and desired SD competencies and other skills.

SD Competencies and Other Skills *	N	Developed			Desired			Wilcoxon Signed Rank Test		
		Mean	SD	Me	Mean	SD	Me	Z	Sig.	Effect Size
Systems thinking	65	4.92	1.72	5	5.48	1.50	6	−2.386	0.017	0.21
Interdisciplinary work	65	5.11	1.52	5	5.89	1.09	6	−3.773	<0.001	0.33
Anticipatory thinking	65	5.00	1.52	5	5.98	1.07	6	−4.388	<0.001	0.38
Justice, responsibility, and ethics	64	5.41	1.60	6	5.71	1.27	6	−1.018	0.309	
Critical thinking	65	5.20	1.56	5.5	5.95	1.20	6	−3.394	<0.001	0.30
Interpersonal relations and collaboration	65	5.38	1.56	6	5.87	1.29	6	−1.963	0.050	0.17
Empathy and change of perspective	65	5.28	1.54	6	5.81	1.39	6	−2.348	0.019	0.21
Communication and use of media	65	5.17	1.79	6	5.79	1.22	6	−2.036	0.042	0.18
Strategic action	65	4.94	1.61	5	5.84	1.17	6	−3.575	<0.001	0.31
Personal involvement	64	5.41	1.60	6	5.81	1.39	6	−1.852	0.064	
Assessment and evaluation	64	5.05	1.58	5	5.86	1.19	6	−3.188	0.001	0.28
Tolerance for ambiguity and uncertainty	65	5.00	1.58	5	5.73	1.43	6	−3.205	0.001	0.28
<i>Efficient work performance</i>	65	5.08	1.43	5	6.06	1.04	6	−4.404	<0.001	0.39
<i>Entrepreneurship</i>	65	4.37	1.81	5	5.83	1.33	6	−4.946	<0.001	0.43
<i>Fast memorization</i>	65	4.89	1.89	5	5.22	1.90	6	−1.210	0.226	
<i>Effective competition</i>	64	4.62	1.69	5	5.19	1.90	6	−2.520	0.012	0.22

* Other skills are given in italics.

Table 3. Developed and desired SD competencies and other skills—mean ranks.

Developed SD Competencies and Other Skills *	Mean Rank	Desired SD Competencies and Other Skills *	Mean Rank
Personal involvement	9.86	<i>Efficient work performance</i>	9.67
Justice, responsibility, and ethics	9.85	Anticipatory thinking	9.13
Interpersonal relations and collaboration	9.81	Critical thinking	9.05
Communication and use of media	9.24	Interpersonal relations and collaboration	9.02
Empathy and change of perspective	9.13	Empathy and change of perspective	8.74
Critical thinking	9.05	Personal involvement	8.72
Interdisciplinary work	8.74	Assessment and evaluation	8.70
Assessment and evaluation	8.57	Tolerance for ambiguity and uncertainty	8.61
Anticipatory thinking	8.39	<i>Entrepreneurship</i>	8.61
<i>Efficient work performance</i>	8.29	Interdisciplinary work	8.57
Systems thinking	8.28	Communication and use of media	8.48
<i>Fast memorization</i>	8.07	Strategic action	8.45
Tolerance for ambiguity and uncertainty	7.82	Justice, responsibility, and ethics	8.13
Strategic action	7.81	<i>Fast memorization</i>	7.60
<i>Competition</i>	6.81	<i>Competition</i>	7.37
<i>Entrepreneurship</i>	6.26	Systems thinking	7.16

* Other skills are given in italics.

- Level of fast memorization development was rated significantly lower than interpersonal relations and collaboration ($p = 0.038$); justice, responsibility, and ethics ($p = 0.034$); and personal involvement ($p = 0.034$);
- The level of tolerance for ambiguity and uncertainty development was rated significantly lower than interpersonal relations and collaboration ($p = 0.018$); justice, responsibility, and ethics ($p = 0.016$); and personal involvement ($p = 0.016$);
- Level of strategic action development was rated significantly lower than interpersonal relations and collaboration ($p = 0.017$); justice, responsibility, and ethics ($p = 0.016$); and personal involvement ($p = 0.015$);
- Level of competition development was rated significantly lower than assessment and evaluation ($p = 0.037$); interdisciplinary work ($p = 0.022$); critical thinking ($p = 0.008$);

empathy and change of perspective ($p = 0.006$); communication and use of media ($p = 0.004$); interpersonal relations and collaboration ($p < 0.001$); justice, responsibility, and ethics ($p < 0.001$); and personal involvement ($p < 0.001$). Level of entrepreneurship development was rated significantly lower than fast memorization ($p = 0.031$); systems thinking ($p = 0.016$); efficient work performance ($p = 0.016$); anticipatory thinking ($p = 0.011$); assessment and evaluation ($p = 0.006$); interdisciplinary work ($p = 0.006$); critical thinking ($p = 0.001$); empathy and change of perspective ($p = 0.001$); communication and use of media ($p < 0.001$); interpersonal relations and collaboration ($p < 0.001$); justice, responsibility, and ethics ($p < 0.001$); and personal involvement ($p < 0.001$);

- Level of willingness to acquire or strengthen fast memorization was rated significantly lower than efficient work performance ($p = 0.015$);
- Level of willingness to acquire or strengthen competition was rated significantly lower than critical thinking ($p = 0.047$), anticipatory thinking ($p = 0.037$), and efficient work performance ($p = 0.007$);
- Level of willingness to acquire or strengthen systems thinking was rated significantly lower than critical thinking ($p = 0.026$), anticipatory thinking ($p = 0.020$), and efficient work performance ($p = 0.003$).

Pairwise comparisons of the levels of competencies development show that none from other skills is ranked significantly higher than any SD competence. Entrepreneurship development is ranked significantly lower than most SD competencies (10 of 12), similarly to competition development (8 of 12). Thus, Hypothesis 2 is supported.

Systems thinking is the only SD competence in which the level of willingness to acquire or strengthen is rated significantly lower than efficient work performance. There are no significant differences between levels of willingness to acquire or strengthen entrepreneurship and SD competencies. Thus Hypothesis 3 is partially supported. On the other hand, only a few from desired SD competencies are significantly higher rated than the competition and fast memorization.

Table 4 presents descriptive statistics and correlations between the NEP index and its assumptive predictors. Contrary to our assumptions, willingness to acquire or strengthen SD competencies does not correlate with the NEP index and therefore was excluded from the assumptive predictors pool. For the remaining predictors, multiple regression with backward elimination was conducted.

Table 4. Descriptive statistics and correlations among NEP index and its assumptive predictors.

Variable	M	SD	Correlations			
			1	2	3	4
1. NEP index	5.07	0.800				
2. Willingness to acquire or strengthen SD competencies	5.83	0.963	−0.035			
3. Perceived development of SD competencies	5.09	1.316	−0.194	0.319 **		
4. Gender (1—female, 0—male)	0.78	0.419	0.386 **	−0.121	−0.040	
5. Dream job (1—mission- or socially-driven, 0—other)	0.29	0.458	0.320 **	−0.045	−0.297 *	0.175

Note: * Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level.

The analysis excluded from the model perceived development of SD competencies. (Table 5). The two remaining predictors accounted for approximately 18.6% of the variation in ecological worldview (R Square = 0.211, adjusted R -Square = 0.186). The model is statistically significant, $F(2, 59) = 7.99$, $p < 0.001$, and the variance inflation factor (VIF) indicates acceptable level of collinearity [63].

Table 5. The final linear regression model.

Model	Unstandardized Coefficients		Stand. Beta	t	Sig.	95.0% C.I. for B		Correlations		VIF
	B	Std. Error				L.B.	U.B.	S.P.	S.S.P.	
(Constant)	4.433	0.190		23.326	<0.001	4.052	4.813			
Gender	0.641	0.217	0.347	2.958	0.004	0.207	1.075	0.342	0.1170	1.03
Dream job	0.425	0.200	0.250	2.128	0.037	0.025	0.825	0.246	0.0605	1.03

Notes: C.I.—confidence Interval L.B.—lower bound, U.B.—upper bound, S.P.—Semi-partial, S.S.P.—Squared semi-partial, VIF—variance inflation factor.

The squared multiple semi-partial correlation coefficients indicate that gender uniquely accounts for 11.7%, and mission- or socially-driven dream job accounts for 6.05% of the variation in ecological worldview. This result is in line with previous studies [12,42,45] also conducted in Poland [64], showing that women are more sensitive to environmental issues than men. The exclusion of SD competencies from the model suggests that academic education, which does not target specific problems of sustainable development, does not lead to changes in the sphere of values (at least, its effects do not correlate with the level of ecological values professed by the student), separating the sphere of competencies from the sphere of professed values.

The strong separation of the sphere of values from the sphere of skill-oriented education, already suggested by Weber [65] as an important issue for university education, means that values are shaped by problem-oriented thinking of a particular kind (involving a value of certain character, e.g., ecological problems), and general skill-oriented teaching is not sufficient for their formation.

5. Discussion

The purpose of the text was to analyze the relationship between students' ecological worldview and declared willingness to acquire or strengthen SD competencies and the perceived development of SD competencies. The discussion of whether SD competencies can be shaped only through educational activities based on analyses focused on these problems or whether they are also shaped by general academic education continues in the literature [8,10,12,16,17,21,23]. Every so often, some argue that certain types of academic education not focused on sustainability also shape—at least some—competencies relevant to sustainability and turn students into more engaged individuals [10,13,27]. On the basis of an e-questionnaire of 66 fresh graduates of a business-oriented university based in Poland, we found that they rated highly both the competencies that the university taught in the general sphere related to sustainable development and those important for their professional life. Students believed that these competencies were worth further development. Through regression analysis, we also found that SD competencies do not predict ecological worldviews. Of the studied predictors of ecological worldview, only female gender and mission- or socially-driven dream job remained in the regression model, accounting for approximately 18.6% of the variation in ecological worldview.

This result encourages further research and needs some commentary. The relatively high evaluation of competencies shaped by universities—both SD competencies and preparation for professional roles—undermines the opinions cited in the text about the limited value, from the perspective of students' expectations, of contemporary academic education in Poland [53]. This strong opinion is limited by the methodology used in our study, namely, self-assessment by students based on the name and definition of a given competency. First, it is therefore not out of the question that, despite the fact that the competency-related questions were annotated with explanations, not all respondents understood the individual SD competencies in the same way. This was recently pointed out by Curtis et al. [66], who noted that it would be difficult to expect a terminological consensus from respondents

when it is not found in the literature. In the case of our study, this problem may have been more significant, as we used an e-questionnaire, so there was no way to make sure that respondents read the explanations. Additionally, the measurement of competence through self-assessment, despite the fact that this type of approach dominates the literature [9], is clearly skewed, so the necessary direction of further research to solidify the indicated statement is to replace this measurement either through measurements triangulating subjective opinions or, better, some type of measurement analyzing the actual student activity.

The second important result, also suggesting a positive assessment of the university in preparing graduates for life in pursuit of sustainable development, relates to the higher ratings of the desired level that respondents assigned to SD and professional competencies. It suggests a readiness to continue developing these competencies in the form of lifelong learning and, at the same time, shows that the university has succeeded in stimulating the need to develop competencies related to the sphere of sustainability. This argumentation is, of course, subject to similar limitations—both in terms of how it is measured and the partially incidental nature of the sample. This is consistent with the results of Aleixo et al. [25], which showed that students want the university to increase SD competency activity development. However, as our students rated their desire to increase all positively loaded competencies higher, this may be a warning signal about the declarative meaning of a “desire to increase” (which may be an artefactual result caused by the positive loading of “more education”).

The most important result of the survey is that ecological worldview is not related to the level of shaped and desired competencies. This requires a series of further studies before concluding that it is essential for the education of ecologically committed people not only to develop SD competencies but also to develop these competencies in a specific way, namely one that triggers changes in the sphere of values. It is consistent with the reasoning proposed by Shephard et al. [67], emphasizing that cognitive changes by themselves do not cause changes in attitudes (belonging to the affective domain of learning).

Previous research has convincingly shown that education focused on the analysis of specific environmental problems (i.e., ESD) can modify students’ values and, therefore, also induce changes in the affective domain of learning. Whether such modification can occur when using teaching tools that develop SD-related competencies independently of the content taught requires an extension of the research proposed in our article. This is because the results of the survey showed that the level of environmental attitudes is relatively high, but there is no positive correlation with the level of SD competencies acquired at the university or expected by students.

The perception that cognitive competencies do not translate into value changes should no longer be completely valid in the modern world. Weber’s [65] classic approach, suggesting the separation of the sphere of values from the sphere of higher education, is difficult to maintain. This is not only because of the permeation of the values espoused by lecturers into the content they teach (something Weber fought against) but also because of the institutional and media environment in which modern students live. The belief that self-restraint must be implemented in the actions of modern society in order to strive for sustainability is part of the mainstream media’s message, as well as those social groups with which—at least some—students identify. In this sense, Weber’s postulate is unfulfillable in the face of the environmental catastrophe facing the world. Thus, the assumption that students will independently apply the cognitive competencies they possess to the analysis of environmental problems becomes understandable, as these problems are constantly encountered by young people. However, the observed lack of a correlation between the level of cognitive competence and ecological attitudes suggests that students do not apply the acquired competencies to analyze ecological problems of the modern world independently. This may be due to students’ concerns about their future, both those related to the natural phase of their life cycle and those stemming from media information and activist groups’ beliefs that it may be too late to implement the necessary self-restraints.

By taking the values obtained in the measurements of competencies based on self-assessment as accurate, the fact of the relatively high level of students' pro-environmental attitudes may be due to both the teaching itself and the values involuntarily inscribed in this teaching or the values in the environment in which the students live. No relationship between ecological worldview and the level of SD competencies shaped by the university suggests either a lack of transfer of these SD competencies to everyday life (to analyze topics other than university-related ones) or that students draw the values that are relevant to them in the modern world from different currents of social life (as in, they do not reach conclusions based on a similar starting point). Assuming measurement validity, this suggests the immaturity of these students as they separate spheres of life—the world of academia from the world of everyday life—and do not use the cognitive competencies obtained for analyses that change their attitudes. This is in line with certain opinions describing the weaknesses of higher education in Poland.

An alternative explanation, referring to the actual difficulty of transferring skills to an area other than the one in which they were shaped (the so-called difficulty of generalizing the educational effect), which suggests the necessity of subject-oriented education for sustainability, requires further research to confirm that when descriptive data are treated as ambiguous in media discourse, people educated in Polish universities have difficulties drawing conclusions by thinking about such data not only on the cognitive sphere but also in terms of their own attitudes. Therefore, it would be necessary to identify the conditions that hindered the transfer of competencies into these situations and, on the basis of applying them to data about the world in which young people live, change their attitudes according to the drawn conclusions. A possible factor blocking such a transfer may be the fear of living in a futureless world. This makes it difficult to make the leap between applying one's competencies to content analysis outside the university and changes in attitudes. If such an explanation turned out to be accurate, it would suggest the need for additional action in higher education focused on dealing with existential anxiety or facilitating the transfer of competencies to situations where there is information chaos that can be harmful to students.

6. Conclusions

The text analyzed the relationship between students' ecological worldview and declared willingness to acquire or strengthen SD competencies and perceived development of SD competencies. On the basis of an e-questionnaire of 66 fresh graduates of a business-oriented university based in Poland, it was found that neither developed nor desired SD competencies are predictors of ecological worldview. We found that fresh graduates rated highly both the competencies that the university taught in the general sphere related to sustainable development and those important for their professional life, as well as believing that these competencies are worth further development. Through regression analysis, we found that of the studied predictors of respondents' ecological worldview (a list that includes developed and desired SD competencies, female gender, and mission- or socially-driven dream job), only female gender and mission- or socially-driven dream job remained in the regression model, accounting for approximately 18.6% of the variation in ecological worldview.

These results add to the discussion of whether some SD competencies can be shaped only through educational activities based on analyses focused on sustainability-related issues or whether they are also shaped by general academic education [8,10,12,16,17], giving an argument for the second line of this research. However, the results suggest that these SD competencies alone are insufficient to build the ecological worldview. We suggested several further research in the discussion section, which are needed to investigate the possibility that general university education could support the ecological worldview creation by developing SD competencies.

The article adds to the discussion on promoting changes towards sustainability in higher education by indicating the necessity of conducting additional educational interven-

tions, necessary if SD competencies are to lead to a pro-ecological worldview in alumni. Similarly to the use of ICT in people management [68], university education must take into account the emotional elements of students if it really intends to achieve changes for sustainability by creating SD competencies as a side-effect of university teaching not directed specifically towards sustainability goals.

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Abbreviations

ESD Education for sustainable development;
SD Sustainable development.

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