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THE STUDENTS' SURVEY OF EDUCATION FOR SUSTAINABLE DEVELOPMENT COMPETENCIES: A COMPARISON AMONG FACULTIES

Michele Biasutti and **Alessio Surian**
University of Padova, Italy

Abstract

The paper reports research employing a quantitative approach to investigating the competences of university students about educating for sustainable development (ESD). Participants were 467 bachelor students of the following five areas: social sciences, educational sciences, applied sciences, engineering and health sciences. The Student Survey of Education for Sustainable Development Competencies was employed. Internal consistency and factor structure of this questionnaire were investigated by assessing Cronbach's alphas and by performing exploratory factor analysis. Data were subjected to ANOVA for comparing the students of the five faculties. The relevance of factors and the differences between students of different areas were discussed considering also how to infuse ESD principles in university curricula. The aim is reorienting university study programmes in various faculties to prepare students about sustainable development issues.

Key words: *higher education, student competencies, education for sustainable development survey, quantitative approach, reorienting university programmes*

Background

The United Nations (UN) launched the United Nations Decade (UND) (2005–2014) of Education for Sustainable Development (ESD), and it provides a set of teaching and learning principles and tools (http://www.UNESCO.org/education/tlsf/). According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2004, 2009), ESD is

- education that allows learners to acquire the skills, capacities, values and knowledge required to ensure sustainable development;
- education at all levels and in all social contexts (family, school, workplace, community);
- education that fosters responsible citizens and promotes democracy by allowing individuals and communities to enjoy their rights and fulfil their responsibilities;
- education for life-long learning;
- education that fosters the balanced development of the individual.

Within this international scenario, Haigh (2005) highlights the needs for higher education to green the university curriculum (Jones, Selby, & Sterling, 2010; Rieckmann, 2011). Scott (2009) explores what environmental education researchers might learn from the previous 30 years of work and presents some of the current challenges in doing and using research. Scott (2009) suggests that greater openness to new approaches should be promoted, as well as different ways of thinking and working, more understanding across cultures and a stronger research focus on understanding the relationship between sustainability, society and learning. According to Scott (2009), there are two main reasons for the environmental education community to reach out to other researchers and users of research, especially to policy makers:

According to Scott and Gough (2010), higher education (HE) students' experience

> is quite different from that in schools as HE courses tend to focus on specialist and discipline-specific matters, rather than on the broad-based, community and citizenly, focus that we've seen with schools. Although there are attempts to broaden this out (…) doing so remains problematic, as does making sense of the currently fashionable, but rather unfocused, talk about sustainability literacy as some common entitlement of all higher education students (p. 3738).

Scott and Gough (2010) also stress that universities value the pursuit of knowledge and must, therefore, insist on its present and ongoing incompleteness – in the face of those who, for whatever reason, wish to extrapolate to final, general truths. Sustainable development refers to all aspects of our intellectual lives and will require us to husband what we know, eschew glib certainties and confront the future with an open, learning orientation (Scott & Gough, 2010).

The purpose of the current study is to add some missing data in this scenario considering the competences self-perceived by students about ESD. Such kind of competences are fundamental because they orient the students behaviours and attitudes involved in the university study (Biasutti, 2010, 2012). A sufficiently large number of participants will be considered in this research employing quantitative data collection techniques.

The current research

The objective of the current research was to compare university students of different areas in their competences about sustainable development (SD). The aim was to explicate some of the indications which appeared in the background literature and reject how the differences between faculties and degree organisation could affect the students' conceptions. The current research compares students' competences about ESD in the following five areas: social sciences (educational psychology and social psychology bachelors), educational sciences (primary teacher education), applied sciences (biology, chemistry, agriculture bachelor), engineering (environmental engineering bachelor) and health sciences (medicine). It involves a large number of participants and employs quantitative data collection techniques with parametric statistical analysis.

Research question and hypothesis

Based on a review of the literature, the study was implemented on the basis of the hypothesis that university students have different competences about ESD depending on the faculty they represent. In detail, the following research question was considered: *Are there any significant differences between students in their ESD competences in relation to ESD attitudes, learning to be, learning to live together sustainably, learning to know, learning to do, learning to transform oneself and society?*

Method

A quantitative study design was used for collecting data in this research. In order to obtain responses from a large participant group, a questionnaire with closed questions was used.

The questionnaire

The questionnaire *Student Survey of Education for Sustainable Development Competencies* (SSESDC) was developed especially for this research by the research team directed by professor Vassilios Makrakis within the framework of RUCAS Tempus project. The questionnaire is composed of several parts including attitudes towards ESD and the following five pillars: learning to be, learning to live together sustainably, learning to know, learning to do and learning to transform oneself and society.

The first part is composed of demographic questions such as gender and questions about previous experiences related to SD: if students have taken a course that relates directly to sustainable development, if students have taken a course that includes some relevant issues to sustainable development and if students have done a course assignment or project that concerns sustainable development. Also, the sources of information about sustainable development used by students were considered, such as newspapers, the internet, university courses, TV, etc.: the actions taken during the past month for sustainable development reasons, such as switched off unnecessary lights, purchased eco-labelled and fair-trade products, recycled cans, glass or paper, used carpooling, purchased environmentally friendly products, etc.

The most frequently used teaching and learning methods in students' courses were considered, including lecturing, project-based learning, interactive engagement, case-based instruction, inquiry-based learning, interdisciplinary teaching, problem-based learning, tech-supported instruction, placed-based learning, discovery learning. Also the functions of education most preferred by students, such as to replicate the existing society and culture, to train people for future employment, to help people develop their potential, to encourage change towards a fairer society and a better world were assessed, as well as the attitudes towards ESD.

The main part of the survey evaluated the students' ESD competences about the following five pillars: learning to be, learning to live together sustainably, learning to know, learning to do and learning to transform oneself and society. The last part of the survey concerns the following specific areas: applied sciences, educational sciences, health sciences, business/economic, engineering, social sciences. A different set of questions was proposed in relation to each area.

The questionnaire was constructed considering the prior literature and closed questions were used. In most of the parts, a set of statements was presented, and participants were asked to express agreement or disagreement on a six-point Likert scale (1 = not at all, 2 = poor, 3 = fair, 4 = good, 5 = very good, 6 = excellent). In order to provide construct validation, a panel of experts were asked to comment on the questionnaire. Revisions based on these comments were included in the final version of the questionnaire.

Participants and procedure

Participants were 467 students enrolled in the last year in several degree courses in a north-east Italian university. The students' distribution in the five areas was as follows: social sciences: 142; educational sciences: 69; applied sciences: 102; engineering: 85; health sciences: 69.

Participants were invited to fill in the questionnaire at the end of a university lesson, without consulting each other. Participants were informed that the questionnaire would remain anonymous, and they were encouraged to give accurate and truthful answers. The aim of the research was specified as to elicit students' competences about several aspects of ESD. It took an average of 40 minutes to complete the questionnaire.

Results

The collected data consisted of participants' responses to the SSESDC. SSESDC generated quantitative data which were analysed using statistical analysis such as descriptive statistics and Cronbach's alpha. In these sections, the authors present only the results in reference to the following six scales which were considered monofactorial: attitudes, learning to be, learning to live together sustainably, learning to know, learning to do, and learning to transform oneself and society. An ANOVA was also conducted with gender and faculties as independent variables. For all analyses Statistical Package for the Social Sciences (SPSS) 17.00 for Windows was used.

Reliability Cronbach's alpha

The reliability analyses were determined by measuring the internal consistency of each scale of the six scales calculating the Cronbach's alpha. Alpha coefficients for the five pillar scales ranging from .861 to .901 were well above the .70 standard of reliability with the exception of the attitude scale which had a Cronbach's alpha of .604. Since the 10-item attitude scale involves several key sustainability issues, and it did not reach the 0.70 standard of reliability, it should be further investigated whether an item reduction would increase the scale reliability while still providing useful information. The Cronbach's alphas for the five UNESCO pillars scales were as follows: learning to be .861; learning to live together sustainably .871; learning to know .891; learning to do .901; learning to transform oneself and society .888.

ANOVA

An ANOVA was conducted for each of the following scales of the questionnaire: attitudes, learning to be, learning to live together sustainably, learning to know, learning to do and learning to transform oneself and society. Independent variables were the following: gender and faculty.

With regard to the independent variable *faculty*, the differences between participants resulted in statistically significant differences for the following four scales of SSESDC: *attitudes* $F = 7.91$, $p < .01$; *learning to live together sustainably* $F = 4.59$, $p < .01$; *learning to know* $F = 3.91$, $p < .01$; *learning to do* $F = 3.38$, $p < .05$.

The results informed us that we had an overall significant difference in means for the five faculties in the four scales, but we do not know where those differences occurred. A follow-up analysis was performed with the Bonferroni multiple comparisons of means post-hoc test, which allows us to discover which specific means differed assessing the significant differences between faculties for each scale. Some differences were found.

As far as the scale "Attitudes" is concerned, statistically significant differences were found between:

- "Engineering" (mean = 3.1; SD = .65) and "Applied sciences" (mean = 2.80; SD = .63) ($p < .05$);
- "Engineering" (mean = 3.1; SD = .65) and "Health sciences"(mean = 2.77; SD = .56) ($p < .05$);
- "Engineering" (mean = 3.1; SD = .65) and "Social sciences" (mean = 2.62; SD = .64) ($p < .01$).

As for the scale "Learning to live together sustainably", statistically significant differences were found between: "Social sciences" (mean = 3.92; SD = .83) and "Health sciences" (mean = 3.46; SD = .76) ($p < .01$).

As for the scale "Learning to know", statistically significant differences were found between:

- "Engineering" (mean = 3.77; SD = .76) and "Educational sciences" (mean = 3.67; SD = .74) ($p < .05$);
- "Applied sciences" (mean = 3.73; SD = .73) and "Educational sciences" (mean = 3.67; SD = .74) ($p < .05$).

As far as the scale "Learning to do" is concerned, statistically significant differences were found between:

- "Applied sciences" (mean = 3.89; SD = .75) and "Educational sciences" (mean = 3.55; SD = .66) ($p < .05$);
- "Engineering" (mean = 3.89; SD = .70) and "Educational sciences" (mean = 3.55; SD = .66) ($p < .05$).

With regards to the independent variable "Gender", the differences between participants resulted in statistically significant differences for the following three scales of SSESDC:

Attitudes: $F = 15.55$, $p < .01$ with female mean = 2.7, SD = .62 and male mean = 2.94 and SD = .64;

Learning to know: $F = 9.54$ ($p < .01$); female mean = 3.51; SD = .79; male mean = 3.73; SD = .74;

Learning to do: $F = 4.25$ ($p < .05$) female mean = 3.72; SD = .72; male mean = 3.86; SD = .71.

No statistically significant differences have been found for the other three scales.

Discussion

Several significant differences between students of different areas in their competences about sustainable development were found.

With regard to the differences between faculties, a more enhanced pro-sustainability attitude was determined among engineering students who show a significant advantage when compared through the Bonferroni multiple comparisons of means post-hoc test with applied sciences, health sciences and social sciences students. It is worth mentioning that the engineering students who participated in the research have a specific environmental focus and are therefore more familiar with issues of sustainability.

In a similar way, it was to be expected that social sciences students would show an enhanced pro-social profile. This is true, although the only group of students who are significantly less socially oriented when compared to social sciences students are health sciences students.

Educational sciences students seem to privilege the social dimension over the knowledge and the "to do" dimensions of sustainability when compared to engineering and applied sciences students who score significantly higher on the learning to know and learning to do scales. It must be noted that these knowledge and do scales favour technical contents related to global and environmental issues who are less familiar to students of educational sciences.

It must be noted that no significant differences were found for the learning to be scale. Concerning this scale, generally students consider themselves quite able (3.97 on a 1–6 scale) to adopt sustainable lifestyle and to have a concern and an awareness concerning global sustainability issues.

No significant differences were found either for the learning to transform scale (where students on average rate themselves 3.84 on a 1–6 scale).

Concerning gender differences, a significant male advantage was found concerning the attitudes, learning to know and learning to do scales. It must be noted that the faculties of engineering and applied sciences that scored significantly higher than education science faculty on these scales have also a significantly higher percentage of male students.

While the score that students attribute to themselves on a 1–6 scale is relatively low on average for the attitudes scale (2.78), such self-assessment is more optimistic concerning their ability to live together in a sustainable way (3.74), to know ESD contents (3.68) and to do (3.86). Beyond the significant differences that were found by this research across faculties, these data support the view that there can be an identity of interest between higher education and sustainable development (Scott & Gough, 2010). In addition, they are a significant snapshot of students' attitudes and competences at the bachelor level. How should higher education institution follow-up such scenario and introduce elements of critical thinking and critical pedagogy that are essential to foster responsible attitudes in this field? Buchan, Spellerberg and Blum (2007) show that at postgraduate level, sustainability education is often embedded within single-

discipline subjects, rather than being taught per se as a separate subject. There are only a few reports in the literature (Eagan, Cook, & Joeres, 2002) on subjects which combine the following three features: at postgraduate level; interdisciplinary; based on an international view of sustainability.

Implications for future developments

In this paper, the students' perspectives about their competences on ESD were collected adopting a quantitative methodology. Results provided evidence of the students' differences in the various faculties for the following five UNESCO pillars: learning to be, learning to live together sustainably, learning to know, learning to do and learning to transform oneself and society.

The results of the current study have implications for this research field. It could be interesting to revise the university curricula infusing ESD principles according to the students characteristics which emerged in the current research. In addition, in further research it could be verified if the revised curricula are more effective than standard programmes by adopting an experimental design with two groups, for contrasting the effects and the results of the two courses.

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Correspondence:

Michele Biasutti, Professor, Department of Philosophy, Sociology, Education and Applied Psychology, University of Padova via Beato Pellegrino, 28–35137, Padova (Italy). Tel.: 049 8274545. Email: michele.biasutti@unipd.it