Students' knowledge and expectations about sustainable food systems in higher education

Paola Migliorini, Alexander Wezel, Eve Veromann, Carola Strassner, Dominika Średnicka-Tober, Johannes Kahl, Susanne Bügel, Teresa Briz, Renata Kazimierczak, Hélène Brives, Angelika Ploeger, Ute Gilles, Vanessa Lüder, Olesa Schleicher-Deis, Natalia Rastorgueva, Fabio Tuccillo, Liina Talgre, Tanel Kaart, Diana Ismael and Ewa Rembiałkowska
(Author affiliations can be found at the end of the article)

Received 6 December 2019
Revised 20 April 2020
13 June 2020
Accepted 13 June 2020

Abstract

Purpose – To clarify needs and requests of the young generation to the contemporary and future education on food systems, this paper aims to examine the following issues: students' background knowledge, students' behaviour as consumers and food citizenship, most interesting topics of SFS for students and students' preferences and expectations in developing different skills, topics and preferences in teaching/learning methods.

Design/methodology/approach – This study was performed as an online-survey amongst eight European Universities in seven European Union (EU) countries to which 1,122 students responded. Data was analysed with descriptive and multivariate statistical analyses.

Findings – Taste and Health are the most important values and motives that influence students' food buying and consumption decisions, but significant differences were found amongst students from different universities and countries. The most important topics for students for future teaching courses are "organic food", "fair trade", "organic agriculture" and most important skills to learn are "ability to make a judgement and justify decisions" and the "ability to create and innovate". Excursions and field trips as teaching methods was given the highest ranks.

Research limitations/implications – Different study programmes and cultural backgrounds of the participating students in the different universities could be a limiting factor for the interpretation of some results.

Originality/value – These results provide a basis for improvement of higher education in the EU towards sustainable food systems based on experiential learning/teaching methods.

Keywords Experiential learning, Sustainability, Teaching methods, Consumer food choice, Education for sustainable development, Graduate employability

Paper type Research paper

1. Introduction

The issue of sustainable development education is the subject of intergovernmental discussions. UNESCO has been promoting the programme "Education for Sustainable Development" since 1992. The programme is targeted at developing competencies that

This study has been carried out within the project SUSPLUS "Innovative Education towards SFS" (www.suplus.eu), no. 2016–1-PL01-KA203-026652, funded by the Erasmus+ programme of the EU. This publication reflects only the authors' views. The European Commission and Erasmus+ National Agency are not responsible for any use that may be made of the information it contains. The authors further thank all participating students for their contributions to the survey.

International Journal of Sustainability in Higher Education

1467-6370
DOI 10.1108/IJSHE-12-2019-0356

empower individuals to reflect on their own actions, considering their current and future social, cultural, economic and environmental impacts, from a local and a global perspective (UNESCO, 2017). Education is not a transfer of knowledge, but a space of dialogue to increase the creativity of individuals and groups. It focusses on the capacity of people to discover their vital interests and allows them to freely express their own reflections based on both their experiences and discoveries (Migliorini and Lieblein, 2016). However, experiential learning is at a tipping point where it needs to transition from the enthusiasts towards the mainstream of academics that require local or regional evidence that experiential learning and its assessment are both beneficial and manageable (Quinn and Shurville, 2009).

Contemporary education to achieve sustainable development goals (SDGs) should develop specific learning objectives in three domains as follows:

(1) cognitive domain, comprising knowledge and thinking skills;

(2) socio-emotional domain, including social skills as collaboration, negotiation, communication, self-reflection and self-refinement; and

(3) behavioural domain, comprising action competencies (UNESCO, 2017), indispensable for the development of sustainable food systems (SFS).

Thus, the expected increase in world population to about nine billion people in 2050 (United Nations, 2017) and climate change challenges raise the question of how to produce sufficient food and thereby require reconsideration of agricultural activity, food production, distribution, consumption and waste. Further, how to develop food systems that will be environmentally, socially, politically, culturally and economically sustainable? The resolution of this will require a holistic approach, interdisciplinary knowledge and specific skills of the new professionals. Moreover, in contemporary society, consumers' awareness and knowledge about food and food systems, as well as choice and behaviour for food is crucial for SFS (FAO, 2013; Geiger *et al.*, 2017). Achieving and maintaining SFS needs a collaborative approach (United Nations, Department of Economic and Social Affairs, 2013). Education for Sustainable Development has suggested several actions (UNESCO, 2014) for fostering curriculum change such as:

- research, assessment and sharing of experience on how curriculum change has been approached;
- investment of staff and financial resources;
- inclusion of competencies development in curriculum, professional standards, certification and accreditation of teachers;
- support for teachers in the classroom; and
- increased capacity-building for policymakers, education leaders and educators.

Beyond these proposed actions in education, the development of SFS needs also to consider consumers' food citizenship and the question of how it is linked or included in European innovative educational programmes of agri-food systems. The scientific community defines the practise of engaging in food-related behaviours as food citizenship (Wilkins, 2005). Food citizens and food citizenship are emerging concepts that support the development of democratic, socially, economically and environmentally SFS. The concept of food citizenship emphasises the need to move beyond food as a commodity and people as consumers (Welsh and MacRae, 1998). Expressions of food citizenship are reshaping the relation between food practises and the market, as well as with public institutions in ways that go beyond material

and economic exchange and that contribute to a "moralisation" (or even "civilisation") of food economies (Renting *et al.*, 2012). Active citizens have the skills, knowledge and understanding to be able to make informed decisions about their communities and workplaces with the aim of improving the quality of life in this setting (Booth and Coveney, 2015). Implicit in active citizenship are various degrees of activities according to their values and beliefs (Kriflik, 2006). The sensitisation of the young generation and future adults is of crucial importance here. Wilkins (2005) states an important role of universities in food citizenship and suggested that students should think about the kind of food system they want to support through their food choices during their higher education. Having a generation of active consumers, which are agricultural professionals at the same time, is a very important step towards food citizenship. This, in turn, entails the necessity of new approaches in education for young agricultural and food sector professionals that could provide to students contextual knowledge and specific skills, such as critical and creative thinking, skills to handle complexity and change (Lieblein *et al.*, 2004) and could use the Hilimire (2014) concept of experience-theory-supplement [1] in HE programmes. A recent major research report, which attracted a response from nearly 6,000 students across the UK, shows that first-year students believe their university should be responsible for actively incorporating and promoting sustainable development to prepare their students for graduate employment (Drayson *et al.*, 2014). By definition, all higher education is a preparation for life, work and future learning. In the current climate of changing conditions and economic uncertainty, there is much debate on "graduate attributes" around the question of what dispositions, understanding, competencies and skills might be the most important for graduates to have when they leave university (Booth, 2010).

The main goal of this paper is to define pathways for improvements in the incorporation of SFS (and all related disciplines and competences development) in European higher education.

To achieve this goal, it is necessary to understand students' knowledge and expectations about SFS and implications for future higher education programmes and in particular on relevant issues/areas required professional skills and the teaching/learning methods. This includes the analyses of:

- students; background knowledge;
- students' behaviour as consumers and their level of food citizenship;
- most interesting topics of SFS for students; and
- students' preferences and expectations in developing different skills, topics and preferences in teaching/learning methods.

This gives rise to the following research questions, which are the basis of this paper:

RQ1. What is students' background knowledge on SFS and its topics?

RQ2. How does students' behaviour as a consumer affect food citizenship (motives/values in buying food and their habits in shopping and cooking)?

RQ3. What elements of SFS are the most interesting for students and should be included in contemporary education programmes?

RQ4. What are the most preferable and interesting skills, topics and teaching/learning methods according to students as to young professionals of SFS?

2. Materials and methods

2.1 Design and methodology

The data collection and analysis and the results of this paper were part of the European Union (EU) SUSPLUS (Innovative Education towards SFS) project (SUSPLUS, 2019). To answer the research questions, an online questionnaire was developed with the "QuestionPro" tool to interview Bachelor, Master and PhD students from different study programmes in Europe. The questionnaire consisted of 24 questions (including open-ended questions, multiple choices and Likert scale) and it was organised in three main parts. The first one was on "present attitude" and contained questions on food citizenship with food and lifestyle habits (values and motives for food buying and consumption decisions, frequency of buying food and cooking). The second part was on "your understanding and background knowledge" and contained questions on students' current knowledge on and experience in food systems education (students' opinions on the importance of different elements of SFS, if they have ever had courses on SFS, different topics related to SFS covered in different study programmes). The third part was about students' "expectations" for future higher educational curricula (needed skills, future teaching courses and innovative teaching/learning methods). The questionnaire was translated into local languages according to the country origin of the main participating partner universities or higher education institutions (Table 1).

A healthy spread of students across participating universities was used for data collection through the dissemination of the online questionnaire link. Students could choose the language of their preference. Besides, incorporation of snowball sampling assisted in participation diversity, involving other universities in Europe.

In total, 923 of 1,122 responding students came from the project partner universities, namely, Estonian University of Life Sciences (EMU, Estonia) 106, Muenster University of Applied Sciences (MUAS, Germany) 173, Kassel University (UoK, Germany) 121, ISARA Agro School for Life (ISARA, France) 113, University of Copenhagen (UCPH, Denmark) 105, University of Gastronomic Science (UNISG, Italy) 58, Technical University of Madrid (UPM, Spain) 98 and in Warsaw University of Life Sciences (SGGW, Poland) 149 students. Furthermore, 199 students from other study programmes in the same seven

Table 1. Project partner universities and their main focus

Country	University name	Acronym	Focus
Estonia	Estonian University of Life Sciences	EMU	Agriculture, environment, production and marketing agricultural products, landscape protection and preservation
Germany	Muenster University of Applied Sciences	MUAS	Home economics, food and nutrition sciences, facility management and sustainability
Germany	Kassel University	UoK	Organic agriculture, international food business and consumer studies and SFS
France	ISARA, Agro School for Life and Lyon	ISARA	Agronomy, agroecology environment and agri-food systems
Denmark	University of Copenhagen	UCPH	Food nutrition and diets
Italy	University of Gastronomic Science	UNISG	Food culture, food sustainability, food quality and food sovereignty
Spain	Technical University of Madrid	UPM	Agriculture, agronomy and food economy
Poland	Warsaw University of Life Sciences	SGGW	Food quality

European countries completed the questionnaire (Estonia 2, Germany 9, France 128, Denmark 3, Italy 45, Spain 10 and Poland 2). Although most participating students had the nationality of the study country, about 7% of students had other nationalities (European and Non-European).

Analyses for each question of the questionnaire were carried out for the whole data set, as well as for each partner university per country and also separating "other" students coming from non-partner universities, which also participated in the survey. Some analyses considered the level of the study year and gender.

2.2 Statistical analyses

Because of the distribution of the data not being normal, the Kruskal-Wallis non-parametric test (in SAS 9.4; SAS Institute, Inc., Cary, NC, USA) was used to assess significant differences for each categorical independent variable. Significant differences between the partner universities were calculated with the pairwise Wilcoxon tests followed by Bonferroni corrections for multiple testing. The relationships between multiple-choice answers were studied using two-way frequency tables and the Fisher exact test. To discover common patterns in different university students' choices, principal component analyses were performed. All results were considered statistically significant if $p \leq 0.05$.

3. Results and discussion

3.1 General data characterising the respondents

Amongst the 1,122 students were 74% female and 36% male students but with different spreads amongst the countries. The highest presence of participating women was in Warsaw University (87%) and the lowest in Madrid University (55%). The mean age of participated students was 23 years, with a range from 17 to 44 years. Students from Bachelor (study Years 1-3), Master (Years 4-5) and PhD studies were, respectively, 55%, 40% and 5%. First-year students participating in the survey were 33%, 25% studying in the second year, 21% in the third year and 23% in the fourth or fifth year. Most students studied food/nutrition science (39%), 28% of the students studied agricultural/horticultural sciences, 10% in environmental sciences and 24% came from other study programmes.

3.2 Students' background knowledge on sustainable food systems and its topics

Results on students' background knowledge show that about two-thirds of them (67%) were interested in the topic SFS, while a little bit more than half (57%) stated that they (UPM 73%, UCPH 64%, SGGW 63%) had neither had a course nor covered topics related to SFS (data not shown). Table 2 shows the topics related to SFS that have been covered in students' university programmes, according to the students.

UNISG, UoK and ISARA students mentioned many of the topics presented that are covered in their programmes, especially when compared to UCPH, SGGW and MUAS that seem more specialised on a few topics. The Spanish (UPM) and Estonian (EMU) universities have intermediate results. In particular, UNISG covers topics of "slow food", "food safety" and "green revolution" more than other universities; UoK of "organic food" and "organic agriculture", while ISARA have also courses that include the topic "genetically modified organisms (GMO)". These three universities also cover "agroecology", "food box schemes" and "permaculture" topics more than other universities. Moreover, ISARA and UNISG are amongst the nine universities that most deal with "food security", compared to the others.

Table 2.
Different topics related to SFS covered in different study programmes of nine universities in Europe as stated by students

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Organic food	2, 1	0, 7	2, 0ab	2, 2ac	2, 2abc	2, 2acd	2, 1abc	1, 6e	2, 3cd	1, 9be	2, 4d	***
Fair trade	2, 5	0, 6	2, 4a	2, 4a	2, 4a	2, 7b	2, 3a	2, 3a	2, 4ab	2, 5ab	2, 6b	***
Slow food	2, 6	0, 6	2, 5a	2, 7ab	2, 7abc	2, 9c	1, 4d	2, 8bc	2, 8c	2, 5a	2, 8bc	***
GMO	2, 2	0, 6	2, 0a	2, 7b	1, 7c	2, 3de	2, 0ad	2, 0a	2, 4e	2, 1a	2, 3de	***
Conventional agriculture	2, 1	0, 7	1, 9a	2, 2bc	1, 7a	2, 2bcd	1, 9abd	1, 9ad	1, 8a	2, 4c	2, 3c	***
Agroecology	2, 3	0, 8	2, 0ab	2, 7cd	1, 7e	2, 6cdf	2, 1abe	1, 7ae	2, 3bf	2, 8c	2, 5df	***
Organic agriculture	2, 1	0, 7	1, 8a	2, 2bc	1, 8a	2, 4b	1, 9ac	1, 4d	2, 1abc	2, 3b	2, 4b	***
Permaculture	2, 7	0, 5	2, 6ab	2, 8c	2, 3d	2, 8c	2, 5abd	2, 5ad	2, 8c	3, 0e	2, 8bc	***
Precision agriculture	2, 7	0, 6	2, 4ab	2, 9cd	2, 3a	2, 9cde	2, 8cef	2, 6bf	2, 2a	2, 9d	2, 7ef	***
Green revolution	2, 5	0, 6	2, 5ab	2, 8c	2, 4a	2, 6bd	1, 9e	2, 4a	2, 3ab	2, 8cd	2, 6ab	***
Traditional food/ regional food	2, 3	0, 7	2, 4a	2, 5a	1, 9b	2, 8c	1, 7b	2, 5a	1, 9b	2, 4a	2, 4a	***
CSA	2, 6	0, 6	2, 6a	2, 7ab	2, 2c	2, 8ab	2, 6a	2, 2c	2, 6a	2, 9b	2, 7a	***
Food box schemes	2, 7	0, 5	2, 8ab	2, 8a	2, 5c	2, 8ab	2, 5cd	2, 5cd	2, 7ad	2, 9b	2, 7acd	***
Food sovereignty	2, 6	0, 6	2, 5ab	2, 8cd	2, 4ae	2, 8cd	2, 1e	2, 2e	2, 6abc	2, 9d	2, 6bc	***
Food security	2, 3	0, 7	2, 5a	2, 4a	1, 9bc	2, 3ad	1, 7b	2, 1cd	2, 2ad	2, 5a	2, 2ad	***
Food safety	2, 1	0, 8	2, 3a	2, 2ab	1, 8c	2, 1abc	1, 4d	2, 2a	1, 8bc	2, 2a	2, 2ab	***
SDGs	2, 3	0, 7	2, 0a	2, 6bc	1, 8d	2, 7b	2, 3acef	2, 3ef	1, 9ad	2, 5bce	2, 2af	***
Vegetarianism	2, 6	0, 5	2, 9a	2, 4b	2, 7acd	2, 6bc	2, 6bcd	2, 6bcd	2, 7acd	2, 4b	2, 7ad	***
Veganism	2, 7	0, 5	2, 9a	2, 5b	2, 8acd	2, 6bc	2, 7abcd	2, 7bcd	2, 8acd	2, 5b	2, 8ad	***
Food loss and waste	2, 3	0, 6	2, 3abcd	2, 4ac	2, 1b	2, 4acd	2, 1bd	2, 2abd	2, 3abcd	2, 4acd	2, 5c	***

Notes: Respondents could choose between 1 = covered in a whole course, 2 = only a few lectures and 3 = not covered. Kruskal–Wallis tests; ***marks $p < 0.0001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test); a, b, c, d, e, f mean statistical differences between the universities

3.3 Students' behaviour as consumers and their level of food citizenship

To answer *RQ2* (How students' behaviour as consumers affect food citizenship?) the authors describe below the data of two determinants of consumer behaviours, namely, "values and motives for food purchasing and eating" and "food purchasing and cooking frequency" of students.

3.3.1 Values and motives of students for food purchasing and eating. Significant differences can be found amongst students from different universities in the values that influence food buying and consumption decisions (Table 3).

Overall, "taste" and "health" are the most important values and motives for students, whereas "special diet" or "tastes from childhood" were ranked lowest. UoK and UNISG stand out from other universities as their students were mostly motivated in their choices by values such as "environmental" and "social" impact, whereas "price" was considered as less important compared to other university students. SGGW students ranked "environmental impact" and "local production" significantly lower than other universities. However, similarly to UNISG students, SGGW students were strongly influenced by the "list of ingredients" when food shopping. Moreover, the "tastes from childhood" were more important triggers for purchase decisions for SGGW and EMU students compared to others. On the other hand, "animal welfare" was the value that motivates the two German University students more than the others.

When analysing the relationships between different answers for all students (Figure 1), it is observed that students who made their purchasing decisions based on environmental impact also strongly cared about animal welfare, the social impact of the food, as well as that food was produced locally and labelled accordingly. In addition, students who prioritised environmental impact in food purchasing did not consider price as an important factor (the authors have found a negative correlation between environmental impacts and price). Also, there was a weak negative correlation between environmental impact and taste in general, as well as childhood tastes. Students who were "price-sensitive" and usually making their purchasing decisions based on price did not care about animal welfare, particular label, local production and social impact (Figure 2). The correlation between animal welfare and particular label and special diet suggests that these students might be vegetarians, and therefore, are paying extra attention to the labelling and animal welfare.

Students that cared about the childhood tastes of food also appraised the taste and prices of food but were in opposition to other proposed answers such as animal welfare, environmental impact and special diets (Figure 2). Particular labels, local production, the composition of the product, exotic production and health explain the highest variance on the first axis and are positively correlated. According to principal component analyses, the food shopping and eating motives and values of students were not strongly influenced by the taste and health of food (Figure 2).

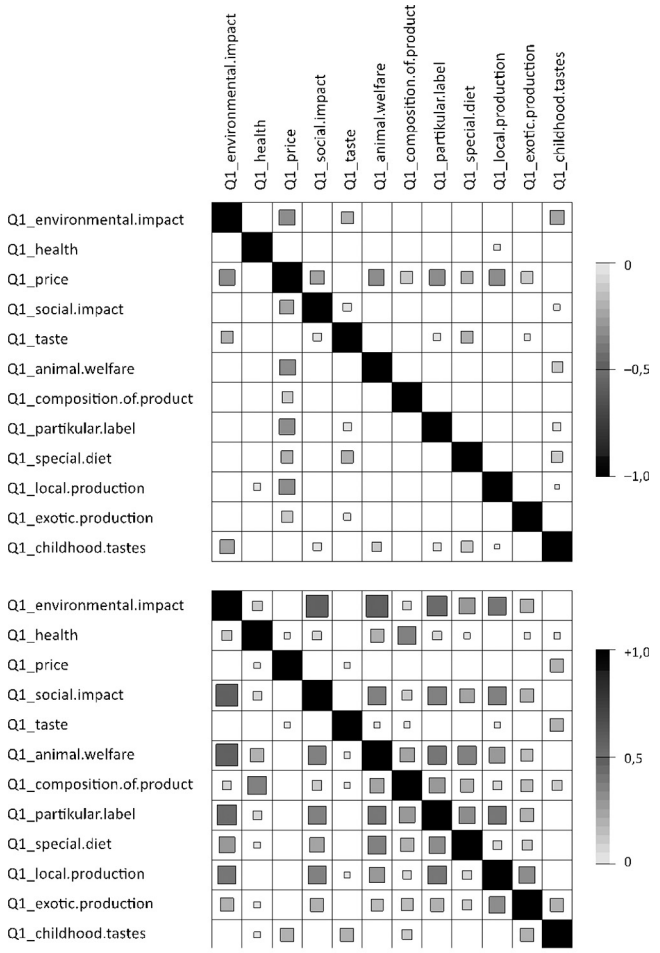
No differences were observed for the parameters of gender, academic degree and study field of students related to food purchasing and eating (Figure 3). However, the price of food was important for students from SGGW and UPM, whereas environmental impact and animal welfare were important aspects for students from UoK (data not shown).

Our results confirm assumptions of Hilimire and McLaughlin (2015) and of Silva *et al.* (2019), that consider American students as consumers and purchasers of food, and found value "taste" and "price" as the most important motives. Looking into comparisons amongst universities, differences could be explained by a mix of cultural attitudes and educational focus. In the German and Italian universities (UoK, MUAS and UNISG), where a stronger environmental and social issue focus exists in the study programme (university focus in sustainability and organic farming), students are more aware of those connected impacts

Table 3.
Values and motives of students for food shopping and eating

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Taste	2, 8	0, 4	2, 9ab	2, 9a	2, 8ab	2, 7b	2, 8ab	2, 8ab	2, 8ab	2, 9a	2, 8ab	**
Health	2, 7	0, 5	2, 7abc	2, 8abc	2, 6a	2, 6ab	2, 7abc	2, 6ab	2, 8bc	2, 8c	2, 7abc	**
Price	2, 5	0, 6	2, 5ab	2, 5a	2, 5ab	2, 5ab	2, 2c	2, 2c	2, 7b	2, 6ab	2, 5a	***
List of ingredients	2, 5	0, 6	2, 4a	2, 5ab	2, 4ab	2, 3ab	2, 7bc	2, 5ab	2, 3ab	2, 8c	2, 5ab	***
Environmental impact	2, 3	0, 6	2, 1a	2, 3ab	2, 4ab	2, 3ab	2, 5bc	2, 7c	2, 1a	1, 8d	2, 4b	***
Animal welfare	2, 3	0, 6	2, 2ab	2, 5cd	2, 2ab	2, 4ac	2, 4abc	2, 7d	2, 0b	2, 1ab	2, 3ab	***
Local production	2, 3	0, 6	2, 2abc	2, 3abd	2, 5de	2, 1ac	2, 5bde	2, 5e	2, 0cf	1, 8	2, 5de	***
Particular label	2, 1	0, 7	1, 9ab	2, 2c	2, 3cd	2, 1ac	2, 2acd	2, 5d	1, 9ab	1, 8	2, 3cd	***
Social impact	1, 9	0, 7	1, 6a	1, 9b	1, 8ab	1, 8ab	2, 3cd	2, 5c	2, 0bd	1, 7	2, 0bd	***
Exotic production	1, 7	0, 7	1, 7abc	1, 7abc	1, 7abc	1, 4a	1, 9b	1, 7abc	1, 6ac	1, 6abc	1, 8bc	**
Tastes from childhood	1, 6	0, 7	2, 0a	1, 5bcd	1, 4bc	1, 3b	1, 7ade	1, 4bc	1, 7cde	1, 9ae	1, 5bcd	***
Special diet	1, 5	0, 7	1, 2a	1, 7bc	1, 4ad	1, 7bcd	1, 5abcd	1, 8b	1, 4acd	1, 4acd	1, 5cd	***

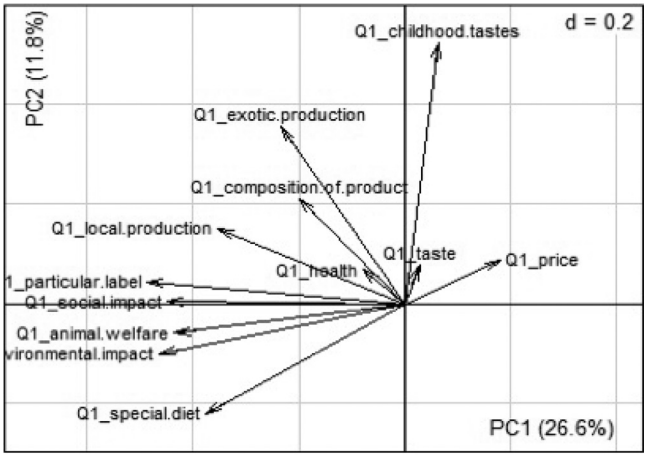
Notes: Respondents could choose between 1 = not important, 2 = moderately important, 3 = very important; SD = standard deviation. Kruskal–Wallis tests; **marks $p < 0.001$; ***marks $p < 0.0001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test)



Note: Bigger squares and more intensive colour denote stronger correlations, upper figure shows negative (from 0 to –1.0) and lower positive correlations (from 1.0 to 0)

Figure 1.
Correlations between different values and motives of students for food shopping and eating

when buying food and price becomes less important. It must also be said that many German students might have a good income level and students at UNISG, being in a private University, would, thus, often have a good financial background, so the price of food might become less a limiting factor for them. When there is a university focus on "food quality" (SGGW and UNISG), the "list of ingredients" becomes more important when making a decision about buying and making food. Moreover, the "tastes from childhood" were more important triggers for purchase decisions for SGGW and EMU students compared to others. This could be explained by the contemporary social development of these countries and by the fact that students, in the recent past, were eating very traditional food cooked at home by their grandmother (Vanhonacker *et al.*, 2010; Zakowska-Biemans, 2012).



Note: The length and direction of arrows denote the weights of single questions concerning the first two principal components

Figure 2.
Results of principal component analysis of the values and motives of students for food shopping and eating

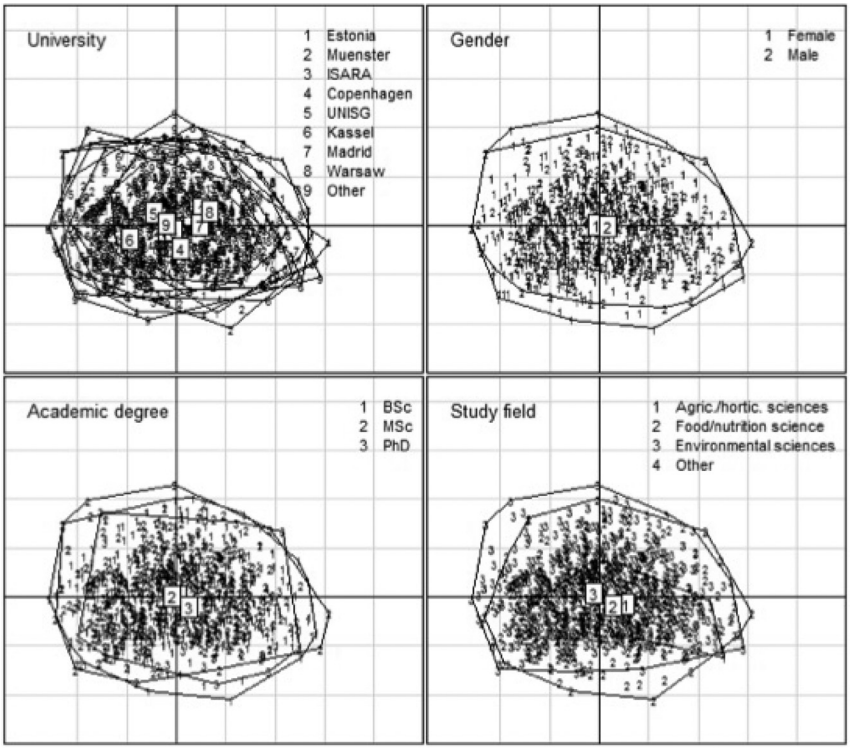


Figure 3.
Results of principal component analysis of values and motives of students for food shopping and eating regarding the origin of the university, gender, academic degree and study field Each group is marked with its type number and centroids of different groups are denoted with the larger numbers in boxes

3.3.2 Students food purchasing and cooking. Almost half of the students interviewed were in charge of buying food in the household where they were living (44%) (data not shown). Another 37% were also responsible for buying, but share the responsibility for this task with somebody else. A majority of the students buy food two to three times per week, followed by a group buying once a week (Figure 4). However, differences amongst Universities are present and in particular students from Danish, German and Italian universities buy food more frequently (two to three times a week) than students at Estonian, French and Polish universities (once a week), while the least frequent with two to three times per month were most of the Spanish respondents (data not shown).

The majority of students claimed to cook food every day or two to three times a week, respectively, 52% and 34% (Figure 5). However, following the same trend as buying food, differences amongst universities are present and in particular students from Italian, Danish and German universities that cook food more frequently (every day) compared to Estonian, Polish and French university respondents (two to three times a week) and the Spanish only once a week (data not shown).

Differences amongst frequency in buying and cooking food could be explained with the fact that the students at UNISG, UCPH, MUAS and UoK are off-site, while in UPM the majority of students are residents with the family of origin. At UNISG and UoK the majority of students come from other countries or far away from the university town (UNISG, 2018),

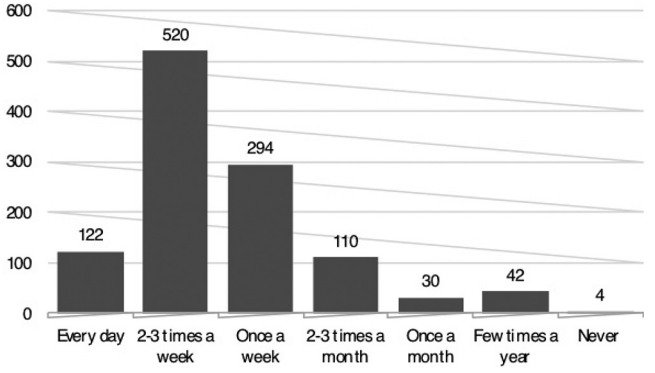


Figure 4.
Number of students buying food for the household (n = 1,122)

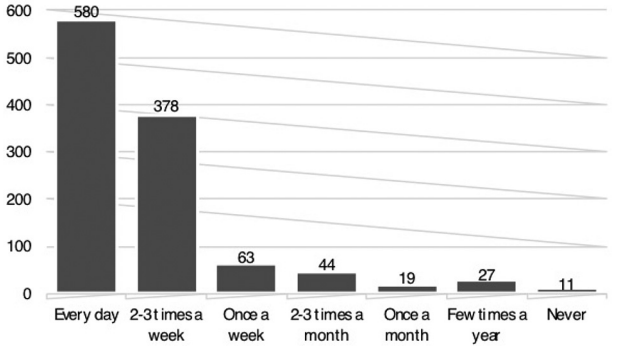


Figure 5.
Number of students that cook in the household they are living in (n = 1,122)

while in UPM 70% of undergraduate students are from the same town, around 24%–28% are from other parts of Spain and less than 1% from foreign countries and so a great majority of them live with their families (UPM, 2018), and therefore, often they are not responsible for buying and cooking.

Given this, the authors may say that factors affecting students' consumer behaviour (social background, family cooking traditions, students' residency, cultural and financial background) have an impact on the student's food citizenship. At the same time, the HE programmes could increase the level of the student's food citizenship through enlarging their knowledge related to SFS and through the facilitation of their acting skills. Undoubtedly, this will require alternative teaching approaches such as action learning (Migliorini and Lieblein, 2016).

3.4 Students' preferences on sustainable food systems elements

All university students considered all listed elements as important for SFS (Table 4) with "food availability" and "healthy ecosystem" on top. However, significant differences were present on all variables amongst universities, except for food availability that is equally considered as principal. Generally, students from the universities in Germany, France and Italy gave higher scores to all the elements compared to students at universities in Spain and Poland, although the difference was mostly only 0.2–0.4 points. This could be explained with the fact that in UPM (73%) and SGGW (63%) had no course in SFS in their HE Programme (p. 3.2) so they did not have enough background knowledge. That is why HE Programmes in all universities need to be reconsidered to provide a stronger background to SFS to the students.

3.5 Expectations for future teaching programmes for skills, topics and methods

When students were asked about their interest for leaning different skills, they indicated as most interesting the "ability to make judgements and justify decisions" and the "ability to innovate and create" (Table 5). Also, the other skills were considered with high interest: the ability to adapt/to act in new situations, the ability to compare and analyse different opinions, creative problems solving skills, possessing basic knowledge and communication skills.

The three lowest-ranked skills were the ability to "work in a lab", "search for relevant information in the internet" and "work under time pressure". However, there are differences amongst the universities. The Polish and Estonian University students considered more interesting than others to know "how to work in a lab"; UNISG and UPM more "communications" skills' and ISARA and UNISG the "ability to adapt to/to act in new situations". UoC students consider less interesting the "ability to work under time pressure" and "team working skills". Those results could be explained either by the student' need for that competence (if they do not have yet) or by already gained those competencies in previous HE programmes and so they do not consider them as important. Skills development is of crucial importance to "empowering students to assume a greater role in their decisions in education and to prepare them to better deal with the uncertainties and complexities of the future" (Hilimire *et al.*, 2014; Francis *et al.*, 2017). In future HE curricula, competence development should be planned carefully as an embedded part of the course, as already introduced by the Bologna process, that began in 2005 in EU for the standards of accreditation defined by the ENQA-European Association for Quality Assurance Higher Education [European Association for Quality Assurance in Higher Education (ENQA), 2015].

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Food availability	2, 8	0, 5	2, 6a	2, 7a	2, 8a	2, 7a	2, 8a	2,8a	2, 8a	2, 8a	2, 8a	ns
Healthy ecosystems	2, 8	0, 5	2, 7ab	2, 9c	2, 8abc	2, 8abc	2, 9ac	2,9c	2, 6b	2, 3d	2, 9c	***
Future generations	2, 7	0, 5	2, 6a	2, 8ab	2, 8ab	2, 7ab	2, 8ab	2,9b	2, 6ac	2, 3c	2, 7ab	***
Minimal negative impact	2, 7	0, 5	2, 7ab	2, 8acd	2, 8acd	2, 7abc	2, 9acd	2,9d	2, 4b	2, 5b	2, 9cd	***
Encouraging local production	2, 6	0, 6	2, 7abcd	2, 6abœ	2, 7acd	2, 5abe	2, 7abcd	2,8d	2, 4be	2, 4e	2, 7cd	***
Humanity	2, 7	0, 5	2, 7abc	2, 7abd	2, 8ad	2, 5c	2, 8abd	2,9d	2, 5bc	2, 5bc	2, 7abd	***
Animal welfare	2, 6	0, 6	2, 5ab	2, 8cd	2, 5ab	2, 6abc	2, 7acd	2,8d	2, 3b	2, 5ab	2, 7acd	***
Being economically sound	2, 6	0, 6	2, 3a	2, 7bc	2, 8b	2, 3a	2, 7bc	2, 8bc	2, 6c	2, 2a	2, 6bc	***
Biodiversity	2, 6	0, 5	2, 6ab	2, 6ab	2, 8ac	2, 6ab	2, 8ac	2, 8c	2, 4bd	2, 3d	2, 8ac	***

Notes: Respondents could choose between 1 = not important, 2 = moderately important, 3 = very important; SD = standard deviation. Kruskal–Wallis tests: ns marks not significant; ***marks $p < 0.0001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test)

Table 4.
Students' opinions on the importance of different elements of a sustainable food system

Table 5.
Interest of students for learning different skills

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Analytical problem-solving skills	2, 5	0, 6	2, 3a	2, 4ab	2, 7c	2, 4ab	2, 7bc	2, 5abc	2, 4abc	2, 5abc	2, 5bc	***
Creative problem solving skills	2, 6	0, 6	2, 5a	2, 6ab	2, 7ab	2, 5a	2, 8ab	2, 7ab	2, 7ab	2, 8b	2, 6ab	*
Ability to work in a lab	2, 2	0, 7	2, 5ab	2, 2c	2, 0c	2, 1c	2, 1ac	2, 0c	2, 3ac	2, 6b	2, 1c	***
Ability to search for relevant information in the internet	2, 2	0, 7	2, 3a	2, 3a	2, 2a	2, 0a	2, 2a	2, 2a	2, 3a	2, 2a	2, 2a	ns
Communication skills	2, 6	0, 6	2, 5ab	2, 6ac	2, 6abc	2, 4b	2, 8c	2, 6ac	2, 7ac	2, 5abc	2, 5ab	**
Team working skills	2, 5	0, 6	2, 3ab	2, 5ac	2, 7c	2, 2b	2, 4ab	2, 5ac	2, 5ac	2, 4a	2, 5ac	***
Ability to adapt to/to act in new situations	2, 6	0, 6	2, 5ab	2, 6ac	2, 8c	2, 3b	2, 8ac	2, 6ab	2, 6ac	2, 7ac	2, 7ac	***
Ability to work under time pressure	2, 3	0, 7	2, 2ab	2, 4ac	2, 2ab	2, 0b	2, 3abc	2, 2ab	2, 6c	2, 4ac	2, 2ab	***
Ability to innovate and create	2, 7	0, 5	2, 6ab	2, 6ab	2, 8a	2, 4b	2, 7ab	2, 8a	2, 8a	2, 7a	2, 7a	***
Possessing basic knowledge	2, 6	0, 5	2, 7a	2, 7a	2, 7a	2, 4b	2, 6ab	2, 7a	2, 6ab	2, 6ab	2, 6a	***
Ability to compare and analyse different opinions	2, 6	0, 6	2, 6a	2, 6a	2, 7a	2, 4a	2, 6a	2, 7a	2, 6a	2, 5a	2, 6a	ns
Ability to make judgements and justify decisions	2, 7	0, 5	2, 6ab	2, 7a	2, 8a	2, 4b	2, 7ab	2, 7a	2, 7a	2, 6ab	2, 7a	***

Notes: 1 = not interesting, 2 = moderately interesting, 3 = very interesting; SD = standard deviation. Kruskal–Wallis tests; *marks $p < 0.01$; **marks $p < 0.001$; ***marks $p < 0.0001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test)

Four out of five students think that a course or topic in SFS at the university level will be useful for their future employment. Overall, their evaluation of the importance of the various topics for future teaching courses (Table 6) shows the highest interest for "organic food", "organic agriculture" and "fair trade", whereas "food box schemes", "CSA" (community supported agriculture)' and "PDO/PGI (protected designation of origin/protected geographical indication)", are considered less important. UoK was the one that stands out for rating "organic agriculture" as a very interesting topic for a future teaching course and "organic food", the final one is not different from UPM and UNISG. On the other hand, SGGW students consider "agroecology" as less important compared to other students. Moreover, the students of the EMU, MUAS and SGGW considered "slow food" an interesting topic for a future teaching course.

These results correlate to values and motives affecting students' food choices (Table 3). The link between "health" and "taste" consumers' values and interest in organic food is confirmed by different scientific researchers such as Zanoli and Naspetti (2002), Smith and Palladino (2010) and Padel *et al.* (2009). These authors assumed that consumers associate organic food with health, good taste and environmental concerns; and defined these attributes as affecting factors to organic purchase behaviour. Thus, data of Tables 3 and 6 demonstrate a high level of students' food citizenship and confirm the aforementioned role of universities in it.

Regarding the interest and preferences of students in different teaching methods (Table 7), overall, students from around Europe show a high level of interest for "field trips and excursions" and "seminars and interactive workshops", while "e-learning" is considered as less interesting. "Lectures with a discussion" and "international courses" get higher preference than "group work", "cooperation with schools". "Regular lectures" are ranked second lowest.

However, there are differences amongst the nine universities. The more enthusiastic in considering several teaching methods are UNISG, UPM and ISARA, students. Students from UoK considered "regular lectures" with higher preference compared to the other universities, while students from UNISG and UPM prefer "lectures with discussions" more than others and ISARA shows the highest value of interest given to "group work". On the contrary, SGGW and UCPH students preferred less "seminars and interactive workshops" than all other universities.

Italian, Spanish and Polish university students are very positive to "international courses", while students at UPM consider the "e-learning courses" more interesting than others. UCPH students showed moderate interest for "cooperation with schools".

Correlation analyses (data not shown) showed that regular lectures were negatively correlated with all other teaching methods except lectures with discussions. Students whose favourite teaching method is "seminar" not only liked to participate in "field trips and excursion", "group work" and "international courses" but also like to "collaborate with schools". "E-learning" as a teaching method was positively correlated with "group work" and "international courses". Actually, e-learning could be considered in two ways, namely, a very passive learning method (reading and listening online classes) and a very active and participatory one (group work and international collaboration).

Results show that students prefer more interactive and hands-on teaching tools. However, for example, for excursions and field trips it strongly depends on their organisation and embedded students' activity, particularly on discussion and dialogue with professionals. According to Hilimire *et al.* (2014), class discussions are a systematic reflection tool that is essential in learning from experience (Baker *et al.*, 2005). Classroom conversations can be a particularly powerful form of reflection because they facilitate

Table 6.
Interest of students for topics of future teaching courses

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Organic food	2, 5	0, 6	2, 5ab	2, 5a	2, 4ab	2, 4ab	2, 5abc	2, 8c	2, 5abc	2, 5ab	2, 3b	***
Fair trade	2, 5	0, 6	2, 4abc	2, 6a	2, 5ab	2, 2c	2, 4abc	2, 6ab	2, 4abc	2, 3bc	2, 5abc	**
Slow food	2, 2	0, 7	2, 5a	2, 3ab	2, 2b	1, 9c	2, 2bc	2, 2b	2, 1bc	2, 5a	2, 1bc	***
Agroecology	2, 3	0, 7	2, 3abc	2, 1ad	2, 7e	2, 1abd	2, 4bce	2, 6ce	2, 4bc	1, 9d	2, 5ce	***
Organic agriculture	2, 5	0, 6	2, 5ab	2, 4ab	2, 6a	2, 4ab	2, 5ab	2, 8c	2, 5a	2, 2b	2, 5ab	***
PDO and PGI	2, 2	0, 7	2, 1ab	2, 1a	2, 5c	1, 9a	2, 2abd	2, 1ab	2, 4cd	2, 0a	2,3bcd	***
Local food	2, 4	0, 7	2, 6ab	2, 3cde	2, 7a	2, 2c	2, 6abde	2, 4bcde	2, 3cd	2, 4abcde	2, 5abe	***
CSA	2, 2	0, 7	2, 1abc	2, 0a	2, 4bd	2, 0ac	2, 3abcd	2, 4d	2, 1abc	2, 0ac	2, 3bcd	***
Food box schemes	2, 1	0, 7	2, 0ab	2, 0ab	2, 3a	1, 8b	2, 1a	2, 1a	1, 9ab	2, 1a	2, 1a	***
SDGs	2, 4	0, 6	2, 3ab	2, 4ac	2, 6cd	2, 1b	2, 5acd	2, 5acd	2, 5cd	2, 3ab	2, 6d	***

Notes: 1 = not interesting, 2 = moderately interesting, 3 = very interesting; SD = standard deviation. Kruskal–Wallis tests; **marks $p < 0.001$; ***marks $p < 0.0001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test)

Variable	All 1,122	SD	Estonia (EMU) 106	Germany (MUAS) 173	France (ISARA) 113	Denmark (UCPH) 105	Italy (UNISG) 58	Germany (UoK) 121	Spain (UPM) 98	Poland (SGGW) 149	Other 199	*p*-value
Regular lectures	2, 0	0, 6	2, 0abc	2, 2ad	1, 8b	2, 2acd	2, 2acd	2, 3d	1, 9bc	1, 9b	1, 9bc	***
Lectures with discussion	2, 5	0, 6	2, 4ab	2, 5abc	2, 6acd	2, 4abc	2, 8d	2, 6acd	2, 7cd	2, 3b	2, 5abcd	***
Seminars/interactive workshops	2, 6	0, 6	2, 6ab	2, 6a	2, 7a	2, 3bc	2, 7a	2, 7a	2, 6ab	2, 2c	2, 7a	***
Field trips and excursions	2, 8	0, 4	3, 0a	2, 8bc	2, 9ab	2, 6c	3, 0ab	2, 8bc	2, 9ab	2, 9ab	2, 9ab	***
Group work	2, 2	0, 7	2, 2abc	2, 0a	2, 5d	2, 0ab	2, 1abc	2, 0ab	2, 4cd	2, 2bcd	2, 3cd	***
International courses	2, 5	0, 7	2, 3ab	2, 4abc	2, 5acd	2, 2	2, 9e	2, 4abc	2, 8de	2, 7de	2, 6cde	***
E-learning courses	1, 7	0, 7	1, 6ab	1, 6a	1, 6ab	1, 5a	1, 4a	1, 5a	1, 9b	1, 8ab	1, 7ab	**
Cooperation with schools	2, 2	0, 7	2, 2abc	2, 1ab	2, 4ac	1, 9b	2, 3ac	2, 1abc	2, 2ac	2, 2ac	2, 3c	***

Notes: 1 = not interesting, 2 = moderately interesting, 3 = very interesting; SD = standard deviation. Kruskal–Wallis tests; ***marks $p < 0.0001$ significant differences; **marks $p < 0.001$ significant differences; different letters note significant differences between universities (post hoc pairwise Wilcoxon test)

Table 7.
Interest and preferences of students in different teaching methods

dynamic learning. By combining lecture-related readings with experience through field trips, students develop new ideas and perspectives (Hilimire *et al.*, 2014). In addition, combining experience and theoretical knowledge reinforces students' confidence in teachers and professionals (Waldenström *et al.*, 2008; Parr and Trexler, 2011).

E-learning was less appreciated by students (Table 7), but students' judgement could vary depending on the type of e-learning and if it is followed up by furthermore interactive teaching course or more exchange between students and teachers integrated into e-learning modules (blended learning). This became evident when e-learning was combined with a more interactive course organised in the SUSPLUS project (Strassner, 2018). Students ranked e-learning much higher after this experience.

Immediate exposure to an experience-based activity, as a centred activity in a food system programme, has been demonstrated as a powerful means of supporting students' investment in and engagement with learning (Ison, 1990; Lieblein *et al.*, 2007; Lieblein and Francis, 2007). This can be done through field/farm/producers visits, food tasting and any other real-life experience. Real-life experience can play an important role in connecting academic theory with complex food system approaches, scenarios and practises and student's personal backgrounds (Hilimire, 2016). These teaching/learning approach corresponds to the students' preferences as shown by the results. Moreover, the ability to create and innovate was a skill sought by our student sample. This skill can be well developed through case studies (Hilimire *et al.*, 2014) and transdisciplinary and transactional learning, i.e. university – business collaboration (Soini *et al.*, 2019) because of their potential for encouraging creativity and innovation. Experiential learning could also respond to students' demands to develop teamwork skills if they are requested to collaborate in groups (Parr and Trexler, 2011). Thus, food systems programmes are adapted to contemporary and efficient pedagogy (Hilimire, 2016). In addition, participatory and non-hierarchical approaches in learning are desirable for food systems programmes. Indeed, each student already has personal knowledge of food systems because food is a universal part of human experience. By the three more asked skills of our survey, the authors understand that students ask to become actors of their learning, with "[. . .] teachers assuming a broader role as mentors or guides in the learning process and not as primary agents of one-way information transfer" (Francis *et al.*, 2017).

3.6 Study limitations

Different study and cultural backgrounds of the participating students in the different universities could be a limiting factor for the interpretation of some results. However, this diversity also provides insight for context-specific SFS programmes. Firstly, the share of international students in universities is an important factor that affects students' food choices and preferences. For example, local students (which have the nationality of the study country) have different consumer behaviour comparing to the international students. Therefore, different proportions of local and international students in the universities affected the research results. Secondly, as Table 1 shows, the universities have different foci and cover specific topics to each HE Programme. Thus, this could impact students' background knowledge, consumer behaviour and educational preferences for future teaching skills, topics and methods for SFS.

4. Conclusions

Contemporary global challenges raise the question on the future development of SFS; this, in turn, will require specific skills and competencies of future food professionals and appropriate higher education programmes. At the same time, young food specialists are

food consumers and they can impact the development of food systems not only through their professional activity but also though their consumer choices and food activism.

RQ1 – students' background knowledge and its topics. For the majority of students, the topics of SFS are interesting. At the same time, SFS is not covered enough in all the EU universities. This indicates the necessity to improve HE Programmes of SFS at various universities to have more instruments for understanding the complex and broad vision of sustainability.

RQ2 – students' behaviour as consumers and their level of food citizenship and

RQ3 – most interesting topics of SFS for students, are interrelated. The results show that the values and motives of students for food purchasing and eating are connected with their interest and engagement in SFS aspects. The importance of several aspects of SFS is differently perceived by students from different countries. The results of the preferred topics in SFS show that students consider food availability as the most interesting topic, thereby demonstrating they stronger connect SFS with food security compared to social and economic aspects of sustainability in food. Students with a better academic background in SFS, consider healthy ecosystems, future generations, minimal negative impact, encouraging local production, humanity, animal welfare and biodiversity as more important than students with less exposure to SFS-related modules. So, proper HE programmes can better prepare students to become aware consumers and active players of SFS.

RQ4 – students' preferences and expectations in developing different skills, topics and preferences in teaching/learning methods. The research demonstrated students' preference for some skills ("ability to make judgements and justify decisions" and the "ability to innovate and create") and topics ("organic food", "organic agriculture" and "fair trade"), as well as their preference in experiential learning/teaching method (excursions and field trips). These should be more strongly considered in the design of the future HE programmes in SFS.

So overall, an experiential learning-based teaching programme, which provides skills for making judgements, innovation and creation, considers enhancement of foods citizenship in the programme and that has strong elements regarding organic food and fair trade could be a model for new HE programmes in EU.

The results of the research are based on students' point of view and:

- show a comparative overview of the SFS Programme between eight universities from different EU countries and highlights some differences;
- revealed the pathways for improvements of HE Programmes geared towards SFS; and
- provide a contribution to the role of HE for food citizenship, particularly in the European countries.

Note

1. This concept includes learning methods, four of which are defined by Hilimire *et al.* (2014): an initial exposure to a food system, pedagogical approaches to case studies, learning based on experience and group learning cooperative.

References

Baker, A.C., Jensen, P.J. and Kolb, D.A. (2005), "Conversation as experiential learning", *Management Learning*, Vol. 36 No. 4, pp. 411-427.

Booth, A. (Ed.) (2010), *What Do We Want our Students to Be? Higher Education Lecture Series*, Centre for Integrative Learning, University of Nottingham, Nottingham.

Booth, S. and Coveney, J. (2015), *Food Democracy: From Consumers to Food Citizen*, Springer, Singapore.

Drayson, R., Bone, E., Agombar, J. and Kemp, S. (2014), *Student Attitudes towards and Skills for Sustainable Development*, Higher Education Academy, NewYork.

European Association for Quality Assurance in Higher Education (ENQA) (2015), *Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)*, ENQA, Brussels, available at: www.enqa.eu/wpcontent/uploads/2015/11/ESG_2015.pdf (accessed 27 March 2018).

FAO (2013), "Healthy people depend on healthy food systems", *Sustainable Food Systems for Food Security and Nutrition*, available at: www.fao.org/fileadmin/templates/getinvolved/images/WFD_issues_paper_2013_web_EN.pdf (accessed 28 February 2019).

Francis, C., Jensen, E., Lieblein, G. and Breland, T. (2017), "Agroecologist education for sustainable development of farming and food systems", *Agronomy Journal*, Vol. 109 No. 1, pp. 23-32.

Geiger, S., Fischer, D. and Schrader, U. (2017), "Measuring what matters in sustainable consumption: an integrative framework for the selection of relevant behaviors", *Sustainable Development*, Vol. 26 No. 1, pp. 18-33.

Hilimire, K. (2016), "Theory and practice of an interdisciplinary food systems curriculum", *NACTA Journal*, Vol. 60 No. 2, pp. 227-233.

Hilimire, K. and McLaughlin, B. (2015), "Students' suggestions for food systems curricula at a liberal arts college", *Agroecology and Sustainable Food Systems*, Vol. 39 No. 8, pp. 845-860.

Hilimire, K., Gillon, S., McLaughlin, B., Dowd-Uribe, B. and Monsen, K. (2014), "Food for thought: developing curricula for sustainable food systems education programs", *Agroecology and Sustainable Food Systems*, Vol. 38 No. 6, pp. 722-743.

Ison, R.L. (1990), *Teaching Threatens Sustainable Agriculture*, Sustainable Agriculture Programme of the International Institute for Environment and Development, available at: www.researchgate.net/profile/Ray_Ison/publication/238710404_Teaching_Threatens_Sustainable_Agriculture_International_Institute_for_Environment_and_Development/links/564a9a2908ae127ff986b30c.pdf

Kriflik, L. (2006), "Consumer citizenship: acting to minimise environmental health risks related to the food system", *Appetite*, Vol. 46 No. 3, pp. 270-279.

Lieblein, G., Breland, T.A., Østergaard, E., Salomonsson, L. and Francis, C. (2007), "Educational perspectives in agroecology: steps on a dual learning ladder toward responsible action", *NACTA Journal*, Vol. 51 No. 1, pp. 37-44.

Lieblein, G. and Francis, C. (2007), "Towards responsible action through agroecological education", *Italian Journal of Agronomy*, Vol. 2 No. 2, p. 83.

Lieblein, G., Østergaard, E. and Francis, C. (2004), "Becoming an agroecologist through action education", *International Journal of Agricultural Sustainability*, Vol. 2 No. 3, pp. 147-153.

Migliorini, P. and Lieblein, G. (2016), "Facilitating transformation and competence development in sustainable agriculture university education: an experiential and action oriented approach", *Sustainability*, Vol. 8 No. 12, p. 1243.

Padel, S., Roklinsberg, H. and Schmid, O. (2009), "The implemantation of organic principles and values in the European regulation for organic food", *Food Policy*, Vol. 34 No. 3, pp. 245-251.

Parr, D. and Trexler, C. (2011), "Students' experiential learning and use of student farms in sustainable agriculture education", *Journal of Natural Resources and Life Sciences Education*, Vol. 40 No. 1, p. 172.

Quinn, D. and Shurville, S. (2009), "From little things big things grow: scaling-up assessment of experiential learning", *Campus-Wide Information Systems*, Vol. 26 No. 5, pp. 329-344.

Renting, H., Schermer, M. and Rossi, A. (2012), "Building food democracy: exploring civic food networks and newly emerging forms of food citizenship", *International Journal of Sociology of Agriculture and Food*, Vol. 19 No. 3, pp. 289-307.

Silva, E., Klink, J., McKinney, E., Price, J., Deming, P., Rivedal, H. and Colquhoun, J. (2019), "Attitudes of dining customers towards sustainability-related food values at a public university campus", *Renewable Agriculture and Food Systems*, Vol. 34 No. 1, pp. 1-6.

Smith, S. and Paladino, A. (2010), "Eating clean and green? Investigating consumer motivations towards the purchase of organic food", *Australasian Marketing Journal*, Vol. 18 No. 2, pp. 93-104.

Soini, K., Korhonen-Kurki, K. and Asikainen, H. (2019), "Transactional learning and sustainability co-creation in a university – business collaboration", *International Journal of Sustainability in Higher Education*, Vol. 20 No. 6, pp. 965-984.

Strassner, C. (2018), "aspects of sustainable food systems", *A Guide for Innovative Education towards Sustainable Food Systems*, pp. 6-8, CC BY-NC-SA 4.0, available at: http://susplus.eu/wpcontent/uploads/2019/02/SUSPLUS_O2_Booklet.pdf

SUSPLUS (2019), "Innovative education towards sustainable food systems", available at: http://susplus.eu/

UNISG (2018), "Strategic plan", available at: www.unisg.it/en/administration/storia-e-missione/ (accessed 7 October 2019).

United Nations (2017), "World population prospects: the 2017 revision, key findings and advance tables", Working Paper No. ESA/P/WP/248.

United Nations, Department of Economic and Social Affairs (2013), *World Economic and Social Survey 2013: sustainable Development Challenges*, UN, available at: www.un.org/en/development/desa/policy/wess/wess_current/wess2013/WESS2013.pdf

UPM (2018), "Perfil de estudiantes de grado", *Observatorio Académico Vicerrectorado de Calidad y Eficiencia*, Universidad Politécnica de Madrid. April 2018.

Vanhonacker, F., Lengard, V., Hersleth, M. and Verbeke, W. (2010), "Profiling European traditional food consumers", *British Food Journal*, Vol. 112 No. 8, pp. 871-886.

Waldenström, C., Salomonsson, L., Francis, C., Moulton, M. and Lieblein, G. (2008), "Individualized student-centred education: a prototype for an agroecology BSc programme", *International Journal of Agricultural Sustainability*, Vol. 6 No. 4, pp. 236-247.

Welsh, J. and MacRae, R. (1998), "Food citizenship and community food security: lessons from Toronto, Canada", *Canadian Journal of Development Studies/Revue Canadienne D'études du Développement*, Vol. 19 No. 4, pp. 237-255.

Wilkins, J.L. (2005), "Eating right here: moving from consumer to food citizen", *Agriculture and Human Values*, Vol. 22 No. 3, pp. 269-273.

Zakowska-Biemans, S. (2012), "Żywność tradycyjna z perspektywy konsumentów", *Żywność Nauka Technologia Jakość*, Vol. 19 No. 3.

Zanoli, R. and Naspetti, S. (2002), "Consumer motivations in the purchase of organic food: a means-end approach", *British Food Journal*, Vol. 104 No. 8, pp. 643-653.

Further reading

Buckler, C. and Creech, H. (2014), Shaping the future we want: UN Decade of Education for Sustainable Development; final report, Unesco, available at: http://unesdoc.unesco.org/images/0023/002301/230171e.pdf (accessed 30 January 2019).

Kolb, A. and Kolb, D. (2005), "Learning styles and learning spaces: enhancing experiential learning in higher education", *Academy of Management Learning and Education*, Vol. 4 No. 2, pp. 193-212.

Lefin, A.L. (2009), *Food Consumption and Sustainable Development: An Introduction*, *Institut pour un Développement Durable*, *Ottignies*.

Rieckmann, M. (2017), *Education for Sustainable Development Goals: Learning Objectives*, UNESCO Publishing.

Sterling, S. (2013), "The future-fit framework: an introductory guide to teaching and learning for sustainability in HE (guide)", *Journal of Education for Sustainable Development*, Vol. 7 No. 1, pp. 134-135.

Author affiliations

Paola Migliorini, University of Gastronomic Sciences, Pollenzo, Italy

Alexander Wezel, Agro School for Life, ISARA-Lyon, Lyon, France

Eve Veromann, Estonian University of Life Sciences, Tartu, Estonia

Carola Strassner, Department of Food – Nutrition – Facilities, Münster University of Applied Sciences, Münster, Germany

Dominika Średnicka-Tober, Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Warsaw, Poland

Johannes Kahl, Department of Organic Food Quality and Food Culture, University of Kassel, Kassel, Germany

Susanne Bügel, Department of Nutrition, Exercise and Sports, University of Copenhagen, Copenhagen, Denmark

Teresa Briz, Department of Agricultural Economics, CEIGRAM, Universidad Politécnica de Madrid, Madrid, Spain

Renata Kazimierczak, Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Warsaw, Poland

Hélène Brives, Agro School for Life, ISARA-Lyon, Lyon, France

Angelika Ploeger, Department of Organic Food Quality and Food Culture, University of Kassel, Kassel, Germany

Ute Gilles, Department of Organic Food Quality and Food Culture, University of Kassel, Kassel, Germany

Vanessa Lüder, Department of Food – Nutrition – Facilities, Münster University of Applied Sciences, Münster, Germany

Olesa Schleicher-Deis, Department of Food – Nutrition – Facilities, Münster University of Applied Sciences, Münster, Germany

Natalia Rastorgueva, University of Gastronomic Sciences, Pollenzo, Italy

Fabio Tuccillo, University of Gastronomic Sciences, Pollenzo, Italy

Liina Talgre, Estonian University of Life Sciences, Tartu, Estonia

Tanel Kaart, Estonian University of Life Sciences, Tartu, Estonia

Diana Ismael, Department of Organic Food Quality and Food Culture, University of Kassel, Kassel, Germany, and

Ewa Rembiałkowska, Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Warsaw, Poland

About the authors

Paola Migliorini is an Agroecologist, Assistant Professor in Agronomy and Crop Production at the University of Gastronomic Sciences. She is a Convenor of the Master in Agroecology and Food Sovereignty and Course Leader in Agroecology, Sustainable and Organic Agriculture, Agrobiodiversity and Supervisor of the Ecogarden project at UNISG. She is the author of 100 technical and scientific papers in international and national journals, monographs, book chapters and conference proceedings and partner leader in several interdisciplinary projects related to agricultural aspects of food at EU, national and regional level. She deals with the issues of sustainability evaluation with agroecological indicators, agrobiodiversity, soil quality, soil fertility, biodiversity, energy efficiencies, organic farming, long term experiment, local varieties and participatory plant breeding, education and action-learning and innovation in teaching. Moreover, she is a President of Agroecology Europe and Vice-President of IFOAM AgriBioMediterraneo. Paola Migliorini is the corresponding author and can be contacted at: p.migliorini@unisg.it

Alexander Wezel is an Agroecologist and Landscape Ecologist and currently Research Director of Isara, France. Moreover, he is the coordinator of an international master course in Agroecology and teaching different courses there. In his research, he focusses on analysing world-wide interpretations and definitions of agroecology and agroecological practises, as well as on different topics dealing with agroecosystems analysis and management. He particularly deals with the issues management of biodiversity, water quality, ecological corridors and conservation biological control.

Eve Veromann is an Associate Professor in applied Entomology in the Plant Health Chair, Estonian University of Life Sciences. She is responsible for several courses on organic farming, climate-smart agriculture and integrated pest management. In her research, she is mostly focussed on sustainable and environmentally sound plant protection strategies both in focal and landscape level, biological pest control, organic farming and tritrophic interactions between plant-pest-natural enemies, etc.

Carola Strassner is a specialises in food systems sustainability, a whole systems approach to sustainability in the field of food and nutrition, especially out-of-home (Horeca) context, alternative food networks and the organic food system. She is programme director for the MSc degree Sustainability in Service Management and Food Industries.

Dominika Średnicka-Tober works as a Research Associate and Lecturer at the Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Nowoursynowska 159C, 02-776 Warsaw, Poland She is an Author and Co-author of a number of scientific publications and has broad experience in international research and educational projects in the area of quality, safety and health impacts of organic foods, as well as the sustainability of the food systems.

Johannes Kahl is a Professor Head of Department for Organic Food Quality and Food Culture Department of Organic Agricultural Sciences University of Kassel. Research priorities, namely, ecological food and nutrition systems; ecological food quality and processing; system approaches. He is a Chair of the Food Quality and Health Association. Johannes organised international conferences on organic food quality and health impact in Prague and Warsaw. He is an expert in organic food systems.

Susanne Bügel is a Professor in Nutrition with a focus on organic and sustainable diets and Deputy Head of Department responsible for education.

Teresa Briz is an Associate Professor at the Agricultural College and a Researcher of CEIGRAM of the Universidad Politécnica de Madrid, Spain. Her interests fall broadly on consumer preferences and the food value chain of different products in both developed and developing countries. She has been involved in several projects related with the organic sector, in collaboration with international partners.

Renata Kazimierczak works as a Researcher and Lecturer at the Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Nowoursynowska 159C, 02-776 Warsaw, Poland. Her main research interests focus on the impact of agricultural practises on different quality dimensions of organic and non-organic foods and their health-related aspects. She is an author of numerous scientific publications on the nutritional and sensory value of plant origin foods from organic production and co-worker of numerous national and international research and educational projects, including the Erasmus+ programme.

Hélène Brives, Researcher at ISARA in Sociology, agricultural advice, innovation and role of knowledge. Teaching activities, namely, sociology of agriculture and survey methods in social sciences; agricultural consulting; sociology of organisations; environmental sociology, risk and expertise.

Angelika Ploeger is a Professor at the University of Kassel, Faculty of Organic Agricultural Sciences. Head of Section of Special Partnerships for SFS. Areas of research, namely, organic food quality and food culture; nutritional studies, food sovereignty; sustainable production and consumption; sustainable agricultural and food systems.

Vanessa Lüder is an MSc at FH Münster, Germany and Research Assistant at Hochschule Osnabrück (Germany), Faculty of Agricultural Sciences and Landscape Architecture.

Olesa Schleicher-Deis is an MSc at FH Münster, Germany, Faculty of Home Economics and Nutritional Sciences, Facility Management.

Natalia Rastorgueva, PhD is a Research Fellow of the project H2020 Nextfood in the University of Gastronomic Sciences. Her research interests include Agricultural Economics and Sustainable Development and Education in agri-food systems.

Fabio Tuccillo is a graduate of the University of Gastronomic Science. He is currently pursuing a master's degree in Food Science at the University of Helsinki. His expertise includes food chemistry, food technology and consumer science, and he approaches them in a broader and holistic way. fabio.tuccillo@gmail.com

Liina Talgre, PhD, is an Associate Professor at the Estonian University of Life Sciences. She recently focussed on soil fertility and weed dynamics in organic farming. She has experience in research coordination and knowledge transfer. She is teaching the subject ,sustainable crop husbandry and organic farming- to master students.

Tanel Kaart received his PhD in mathematical statistics in 2006 at the University of Tartu, Estonia. Currently, he holds the position of Professor in Data Science in Estonian University of Life Sciences. His research interests focus on statistical methods (especially modelling and multivariate statistics) applied in life sciences (animal and plant science, medicine, genetics, psychology and ecology).

Diana Ismael is a PhD candidate at Kassel University. She worked on the development of a new method in sensory evaluation to measure consumer's implicit emotions. Her research focusses especially on consumers' emotions and behaviour, sustainable food system and sensory science.

Ewa Rembiałkowska is a Professor in the Department of Functional and Organic Food, Institute of Human Nutrition Sciences, Warsaw University of Life Sciences, Nowoursynowska 159C, 02-776 Warsaw, Poland. In her research activity deals with the SFS, nutritional value of organic food and its influence of organic food on human health. Prof Rembiałkowska is an Author of >200 papers, in that 42 papers in the impact factor journals. She is a vice-Chairman of the research association FQH www.fqhresearch.org/en/fqh-home.html and a board member of the research international society ISOFAR http://isofar.org/isofar/. She has been leading a number of international and Polish projects in the area of organic food and farming.