

School gardening as a means to influence pupils' nutritional attitudes and behavior: A study at general and vocational high schools in Vienna

Thilo Rademacher

University of Natural Resources and Life Science, Vienna, Austria,
Thilo.Rademacher@web.de

Friedrich Leisch

University of Natural Resources and Life Science, Vienna, Austria,
friedrich.leisch@boku.ac.at

Valentin Fiala

University of Natural Resources and Life Sciences, Vienna, Austria
vahli@gmx.at

Bernhard Freyer

University of Natural Resources and Life Sciences, Vienna, Austria
bernhard.freyer@boku.ac.at

Abstract: The impact of school gardening on nutritional attitudes and behavior regarding purchase and consumption of food is explored with pupils who participated in school gardens. The researchers of the recent study conceptualized a framework of potential factors influencing nutritional behavior based on empirical data with pupils from general and vocational high schools in Vienna. Three hundred and sixteen pupils, aged between 16 to 21, were interviewed in a cross-sectional study. The pupils who participated in school gardening are significantly better informed about sustainability than the pupils who did not. There is a significant difference between pupils who took part in school gardening and those who did not, regarding their self-assessment towards their connection to nature and sustainability. The total consumption of vegetables has increased within the families of participating pupils by 17%. School gardening seems to promote pupils' reflection on their own diet as well as foster a favorable attitude towards a healthy and sustainable diet. We conclude that the implementation of school gardening has a significant positive impact on pupils' attitude and behavior towards sustainable diets.

Keywords: School gardening, quantitative method, nutritional attitudes and behavior, general and vocational high school pupils, Vienna

Thilo Rademacher completed his Master in Applied Plant Science at the University of Natural Resources and Life Science, Vienna, Austria. Previously he completed his Bachelor in Horticultural Science at the Leibniz University of Hanover, Germany.

Friedrich Leisch is a Professor of Statistics in the Institute of Applied Statistics and Computing, University of Natural Resources and Life Sciences Vienna, Austria.

Valentin Fiala is a research assistant of the working group of transdisciplinary system research and a PhD student at the Division of Organic Farming at the University of Natural Resources and Life Sciences Vienna, Austria.

Bernhard Freyer is a Professor and Head of the Division of Organic Farming as well as the working group of Transdisciplinary Systems Research at the University of Natural Resources and Life Sciences, Vienna, Austria.

Introduction

According to a 2012 EU census, 21% of the Austrian population lived in urban and 32% in intermediate areas (BMLFUW, 2014). However it has to be considered that the rural area of Austria is diverse, and that there are many rural areas with strong relations to urban centers (Dax, Favry, Fidschuster, Oedl-Wieser, & Pfefferkorn, 2008). In Austria, relocation of families from rural landscapes to large cities was observed, resulting in a 11% increase in urbanization between 2001 and 2011 (Statistics-Austria, 2013).

The average amount of farmland per farm increased in Austria from 9.6 ha in 1951 to 18.7 ha in 2013 (BMLFUW, 2015). In 1951, 1.624.034 people worked in the Austrian farming sector, whereas by 2013 this number was reduced to 414.410 (Statistics-Austria, 2014). Austrian consumers purchase the vast majority of their food in supermarkets or discount stores. In 2009, only 12% of food was sold using various forms of direct agricultural marketing (AMA, 2009). These developments led to a situation where fewer people had direct experiences with food production and farming.

Because of the long supply chains from farmer to consumer, pupils sometimes have no understanding of their food with regard to where and how it is grown and produced (Clugston & Calder, 2007). Furthermore, in many cities, pupils have limited exposure to wild spaces or food production landscapes. Most of the time, they spend their days in school buildings and eat snacks or meals composed of highly processed foods. Adolescents who grow up in urban cities or landscapes have little relation to nature and agricultural production of food (Kingery-Page, Hunt, & Teener; Pierce, 2012).

It is time to accommodate new strategies of human nutrition, based on food from low input, local, seasonal and agroecological production (Lairon, 2012). In international school education, there is a growing international attention on ecological and societal aspects of food systems. There is a clear concern that humans need to learn to develop healthy and sustainable methods of nutrition for the present as well as the future (BMBF, 2013; Larson, Story, Eisenberg, & Neumark-Sztainer, 2006). From that perspective, it is time to rethink school curricula to accommodate new strategies of human nutrition, based on food from low input, local, seasonal and agroecological production. One of these strategies is the implementation of school gardens.

The objective of school gardening is to teach pupils about the origins and production of food, and for this, there is a need for environmental education (Mukoni, 2013). The process of teaching pupils where their food is grown and produced is characterized by environmental pedagogical strategies like experiential learning (Parmer, 2006). Holistically, experiential learning involves combining pupils' experience, awareness, cognition and behavior to engage them in ecological issues (Dunkley, 2016). Pupils therefore learn to change their own diet, which means that they can shape their own nutrition pattern in a more ecological and sustainable way.

On the foundation of the work of Verstraeten et al. (2014), the researchers of the present study conceptualize a framework of potential factors influencing nutritional behavior in Viennese pupils (Figure 1). In the context of school gardening, schools can influence the pupils' nutritional attitudes and behavior, as well as sociocultural conditions such as families' values and rules. Individual factors such as subjective norms, attitudes or behavioral intentions are the driving forces to influence pupils' nutritional behavior (Hackman & Knowlden, 2014). Further influencing factors on nutritional behavior include sociodemographic characteristics like pupils' age, habitat and level of education (De Bruijn et al., 2007; K. Harris & Mullan, 2009; Vermeir & Verbeke, 2008).

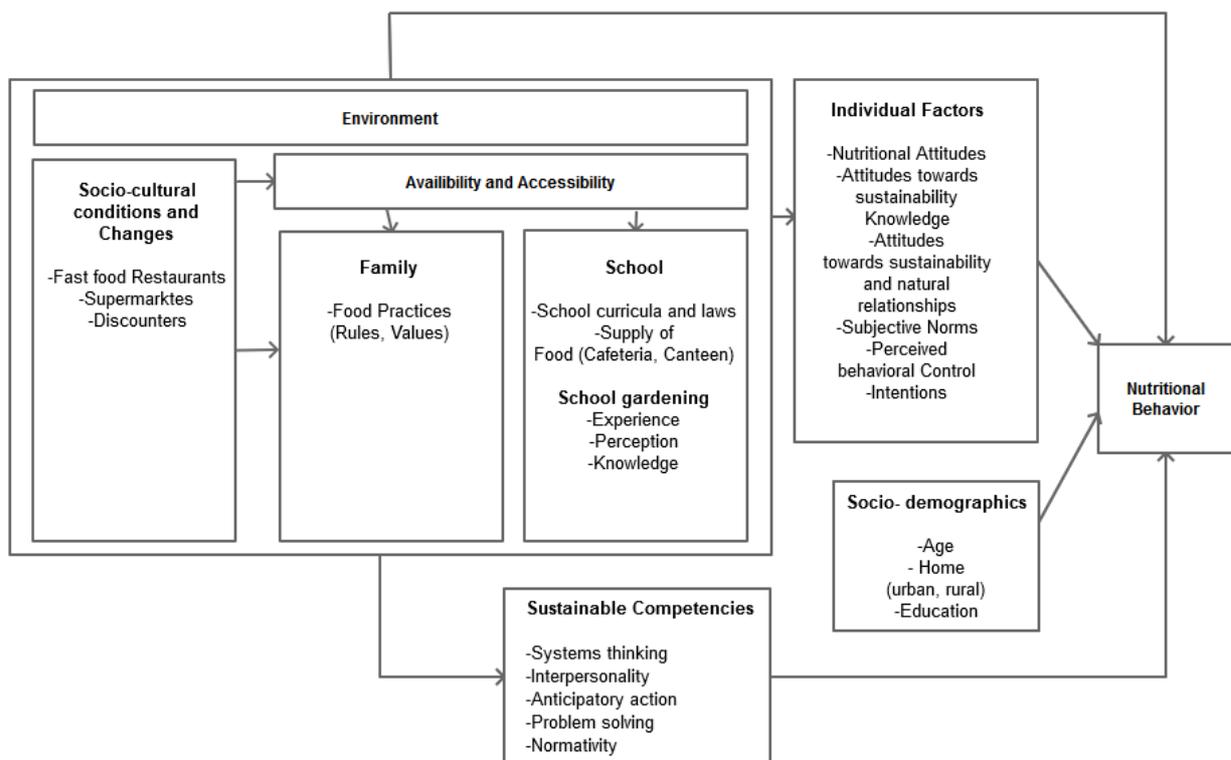


Figure 1: *Conceptual framework of potential factors influencing nutritional behavior in Viennese pupils modified according to Verstraeten et al. (2014).*

There are many publications in which the influence of school gardening on pupils' nutritional attitudes and behavior are analyzed. Quantitative methods with a pre- and post-test design were used in the research on pupils' attitudes and behavior (Baldivia et al., 2014; Gatto, Ventura, Cook, Gyllenhammer, & Davis, 2012; Jones et al., 2012; Pierce, 2012; Ratcliffe, Merrigan, Rogers, & Goldberg, 2011; Stephens, 2014). The studies indicate that in schools with a gardening project, pupils eat more fruit and vegetables. Moreover, pupils have a better knowledge of growing fruit and vegetables as well as a better understanding of healthy ingredients. The pupils in these programs learn about the knowledge of using crop rotation for growing different vegetables can reduce the application of pesticides in plant production.

In 1993 Pehofer (2010) analyzed the status quo of ecological school programs in Austria using a questionnaire. From the 1586 initiatives only a few dealt with school gardening. For Vienna, there are no recent scientific studies on the analysis of the influence of school gardening on pupils' nutritional attitudes and behavior.

Because only a few researchers described the age group of 16- to 21-year-old pupils in the context of school gardening (Jones et al., 2012; Parmer, 2006; Pierce, 2012), we argue that this group is of specific interest due to the fact they represent those who are on the brink of becoming a relevant consumer group. Therefore our objective was to understand the 16- to 21-year-old pupils' nutritional awareness toward sustainable aspects in nutrition, and the influence of participation in school gardening on pupils' sustainable nutritional attitudes and behaviour. Furthermore our intention was to construct a conceptual framework whilst explaining aspects of sustainable nutrition by analyzing pupils' attitudes and behavior. In relation to our objective, our research question was: "Does the pupils' participation in school gardening influence their nutritional attitudes and behavior?"

Method

This study is based on quantitative data collected in five schools in Vienna about the pupils' attitudes and behavior after participation in school gardening programs. The study follows a cross-sectional and ex-post-facto design. The school gardening programs were introduced independently of the study. Measurements were taken via paper-and-pencil questionnaires.

Questionnaire

We collected data via a validated questionnaire. The questionnaire was conceptualized based on behavioral and environmental psychological models which applied to topics of sustainable diets (Ajzen & Fishbein, 1980; Fila & Smith, 2006; Hackman & Knowlden, 2014; Lautenschlager & Smith, 2007). The setup of statistical scale level has been selected for nominal and ordinal scales. Parameters of pupils' age and school type have been determined to confer a representativeness of the sample.

The questionnaire consists of anonymous open and closed filtered questions. In total, the questionnaire consisted of 29 questions. The questionnaire is based on Likert Items. In the questionnaire, sustainability and environmental attitudes toward purchase and diet are examined only in closed questions. This is examined using question batteries in the form of Likert Items. To design the layout of the questionnaire, the free software tool LimeSurvey (Schmitz, 2012) was used.

In a pre-test questionnaire in June 2014, 18 pupils from one school were interviewed using a Computer Assisted Personal Questionnaire (Baker, 1992), which was improved using feedback from pupils and teachers on the sections concerning attitudes, intentions and behavioral questions.

The questionnaire took place in Vienna, Austria from June 2014 to December 2014. Here the sustainable nutritional awareness of pupils aged 16 to 21 was explored. 35 pupils did not answer the complete questionnaire but rather gave only incomplete answers.

Sample

The sample selection followed the rules of quantitative sampling. Indicators for the selection of schools were similarities in school gardening practices, the distance of schools to each other and pupils' age. Pupils from five high schools in Vienna were selected to participate in the study. School composition included: Two vocational schools (one private, one public), two high schools (one private, one public) and one Waldorf school. Of these schools, four had gardening programs and one did not. One-hundred and eleven pupils of school gardening and 170 pupils of non school gardening classes in the age groups of 16 to 21 have been selected.

Overall, the sample includes 316 pupils, of which 281 pupils answered all questions of the questionnaire. The survey took place in school classes. The questionnaire took 20 minutes on average per pupil. Pupils who participated in the questionnaire were still living within their families. This means that their nutritional attitudes are influenced and chosen from the parents. Regarding the study, this leads to a homogeneous sample. A researcher was present in the classroom during the questionnaire, so that pupils could ask questions in case anything was unclear and to guarantee that the setting of the questionnaires was equal in all classes. The researcher was chosen to be present in order to limit the influence pupils could impose on each other and to give them the opportunity to express their proper opinion.

Statistical Analysis

The dataset was statistically analyzed using SPSS V. 21.0 (IBM, 2012). The reliability of all items of a question battery was tested for internal consistency using Cronbach's alpha. Descriptive statistics were used to evaluate means and standard deviation. The group of 20 to 21 year-old pupils has been removed in the analyses, because of the small sample size ($n=9$).

P-values to test for significant differences were computed by using inferential statistics. A normal distribution of all data is not given, so we used the exact Fisher's test as a robust non-parametric statistic test method.

The hypergeometric distribution is a distribution for sampling without replacement, where the degrees of freedom are an input. There do not exist any degrees of freedom in the presentation of our results because the exact Fishers' test was used, and this does not include degrees of freedom as an input. We used this test because after crosstabulation the sample sizes were smaller than five. Exact test analyses (C^2 distribution, with the Monte Carlo 2-sided significance) were conducted for all P-values to compare pupils' attitudes and behavior between pupils who did and did not participate in school gardening at a significant level of alpha equal to 5%.

The interpretation of the result is classified in four groups depending on the p-value obtained in each case. The groups are as follows:

P-value	Interpretation
$p \leq 0.001$	highly significant
$p \leq 0.01$	very significant
$p \leq 0.05$	significant
$p > 0.05$	not significant

Results

With reference to the research objective, the following conceptual framework factors (Figure 1) are presented in the results:

- pupils' nutritional attitudes;
- their self-assessment toward sustainability knowledge;
- the self-assessment of their connection on nature and sustainability;
- the nutritional behavior of families of pupils who participated in school gardening.

Sample socio-demographics

In Austria, compulsory schooling starts with a child's sixth birthday and lasts nine school years. In the first four years, the attendance of a primary school is obligatory. After primary school, children can either attend a general secondary school (5th to 8th grade), an academic secondary school (5th to 12th grade), a vocational school (9th grade), a vocational middle school (9th to 11th grade), or a vocational high school (9th to 13th grade).

Thirty-six percent of tested pupils were male and 64% female. Sixteen to seventeen-year-olds represented 51% (n=143) and 18 to 19 year-olds 46% (n=129) of the sample population. The 20 to 21 year-olds are the smallest group with 3% (n=9). Austrians are the most common nationality in the sample, making up 95% of the sample population. The German and Swiss nationalities together represent 4%. Eighty-two percent of the pupils' homes were located in Vienna, and the remaining 19% were in Lower Austria.

Pupils who were in the beginning or finishing their high school were interviewed. One question concerned what type of school pupils had attended after completing their 9-year compulsory schooling. Most pupils in the study had attained the grammar-school graduation (52%) and 21% of pupils had a Waldorf-school graduation. Thirteen percent of the pupils had a vocational business school graduation. The remaining 9% of the pupils graduated in new middle and cooperative middle schools. Five percent of the pupils graduated in secondary modern school while <1% finished a graduation outside Austria.

The representativeness of pupils' attitudes and behavior is not given for Vienna, because the analyzed school gardening programs are to be seen differently from each other. The study was restricted to five schools with different school types and school gardening curricula in different areas in Vienna, with that, generalizability is limited. Therefore, the results may not be generalizable to other populations.

Nutritional attitudes of pupils who participated in school gardening

The questionnaire item "Is food produced in school gardens more sustainable than that available in discount stores?" was formulated to show what attitudes pupils held regarding school gardens, food production and the availability of sustainable healthy food in discount stores.

Forty-nine percent of pupils held the attitude that food produced in school gardens is more sustainable than that which is available in discount stores, whereas 20% of pupils did not hold this attitude. Fifty-two percent of pupils believed, and 13% of pupils did not believe,

that in school gardens healthier food is produced than that which is available in discount stores.

There were no significant differences between the percentage of pupils that believed that in school gardens more sustainable $C^2=(N=111)=4,48, p = .20$ or healthy $C^2=(N=111)=1,90, p = .60$ food is produced than that which is available in discount stores.

Most of the pupils held the attitude that in school gardens healthier and more sustainable food is produced than that available in discount stores, but the differences are not significant (Table 1) between those two terms.

Table 1: *Nutritional attitudes towards sustainable and healthy food of pupils who participated in school gardening*

Questionnaire Items		Statistic parameters			
		Percentage of Pupils	M	SD	N
The food produced in school gardens is more sustainable than that which is available in discount stores	true	49	1,96	1,15	111
	somewhat true	26			
	somewhat untrue	6			
	Untrue	20			
The food produced in school gardens is more healthy than that which is available in discount stores	true	52	1,81	1,04	111
	somewhat true	27			
	somewhat untrue	7			
	untrue	13			

Annotation. M=Mean, SD= Standard deviation, N= Sample Size.

Influence of participation in school gardening on pupils' self-assessments towards sustainability knowledge

A well-founded knowledge about sustainable relations can positively influence pupils' nutritional behavior. There is a highly significant difference in the perceived sustainability knowledge between the pupils who participated in school gardening programs and those who did not $C^2=(N=281)=15,07, p < .001$.

Of the 111 pupils who participated in a school gardening program, twenty-nine percent describe their level of knowledge as "good" and 58% as "somewhat good". Of the 170 pupils

who did not participate in school gardening programs 14% describe their knowledge as “good” and 59% as “somewhat good”. It is worth nothing that 26% of pupils who did not participate in school gardening have a rather negative attitude towards their sustainability knowledge (Table 2).

Table 2: *Pupils who did and who did not participate in school gardening and their self-assessments towards their sustainability knowledge*

Participation in school gardening	Pupils' self-assessments towards their sustainability knowledge	Statistic parameters			
		Percentage of pupils	M	SD	N
Yes	Good	29	1,86	0,68	111
	Somewhat	58			
	Somewhat bad	12			
	Bad	2			
No	Good	14	2,15	0,65	170
	Somewhat	59			
	Somewhat bad	26			
	Bad	1			

Annotation. M=Mean, SD= Standard deviation, N= Sample Size.

Influence of participation in school gardening on pupils' self-assessments towards their connection to nature and sustainability

According to our framework (Figure 1), connection on nature and sustainability can positively influence pupils' nutritional behavior. In the questionnaire, we ask the pupils about their connection to nature and sustainability. There is a significant difference $\chi^2(N=281)=9,92$, $p = .015$ between pupils who did and did not participate in school gardening in regard of their self-assessments towards their connection to nature and sustainability.

Thirty-seven percent of pupils who did not and 63% of those who did participate in school gardening programs say that they have a connection with nature and sustainability. Twenty-six percent of pupils who did and 74% who did not participate in school gardening think that they have do not have a connection with nature and sustainability at all. There is an equal number of pupils who do and do not have this connection with nature and sustainability (Table 3).

Table 3: Pupils who did and who did not participate in school gardening and their self-assessments towards their connection on nature and sustainability

Participation in school gardening	Pupils' self-assessments towards their connection to nature and sustainability	Statistic parameters			
		Percentage of pupils	M	SD	N
Yes	True	51	1,70	0,80	111
	Somewhat True	37			
	Somewhat untrue	26			
	Untrue	50			
No	True	50	1,97	0,76	170
	Somewhat True	63			
	Somewhat untrue	74			
	Untrue	50			

Annotation. M=Mean, SD= Standard deviation, N= Sample Size.

Nutritional behavior of families of pupils who did and who did not participate in school gardening

Table 4 shows the purchase behavior of families of pupils who did or did not participate in school gardening and their significant or non significant differences.

The difference in the purchase of vegetables or fruits in the organic store and organic supermarket between the families of the pupils that participated in school gardening and those who did not, according the interpretation groups is classified as highly significant.

The difference in the purchase of vegetables or fruit in the discount stores and farmers' shops between the families of the pupils participated and those who did not in the school gardening is classified as very significant.

The difference in the purchase of vegetables or fruit in the health food store and farmers' markets between the families of the pupils participated and those who did not in the school gardening is classified as significant.

The difference in the purchase of vegetables or fruit in supermarkets and vegetables and fruit boxes between the families of pupils participated and those who did not in the school gardening is classified as not significant.

On average, the families of the pupils who did participate shopped at discount stores once a month whereas families of the pupils who did not participate in school gardening shopped once a week at discount stores.

In the families of the pupils who did participate in school gardening, the average rate of shopping at organic store and organic supermarket remained once a month. On average the families of the pupils who did not participate never shopped at an organic store or an organic supermarket.

The average rate of shopping at farmers' shops, supermarket and vegetables and fruit boxes remained equal for families of pupils who did or who did not participate in school gardening.

Table 4: Shopping sites of vegetables or fruit of the families of pupils' who did or who did not participate in school gardening

SP	Shopping sites						
	Discount stores	Super-market	Health food store	Organic store and organic supermarket	Vegetables and fruit boxes	Farmers' shops	Farmers' markets
Participation in school gardening							
M	3,94	2,49	4,59	3,71	4,77	4,77	4,27
SD	1,19	0,81	0,74	1,14	0,57	0,52	0,86
No participation in school gardening							
M	3,38	2,36	4,76	4,28	4,88	4,90	4,53
SD	1,20	0,82	0,60	1,02	0,46	0,40	0,75
Whole Sample							
M	3,61	2,41	4,69	4,06	4,84	4,85	4,43
SD	1,22	0,82	0,67	1,10	0,51	0,46	0,80
C ²	16,72	8,06	8,83	22,52	6,38	10,57	9,89
PV	.001	.085	.042	<.0001	.10	.006	.024

Annotation. Legend: SP=Statistic parameters, C²=Chi-Square values based on Fishers' exact Test, PV= P-values, M= Mean, SD= Standard deviation. P-values are based on Fishers' exact Test at 5% significance Level. The sample size for pupils who did participate is 111 and for pupils who did not participate in school gardening 170. Means are representing the families purchase frequency with, 1= Daily, 2= Several times a week, 3= Once a week, 4= Once a month, 5= Never.

Furthermore the vegetable consumption of the families of pupils who participated in school gardening has changed. It is essential to note that in total, the vegetable consumption in-

creased by 17% and in addition, 22% of the pupils said that the vegetable consumption has moderately increased in their families.

Discussion

Nutritional attitudes of pupils who participated in school gardening

It is crucial that pupils perceive school gardens as places of sustainable food production. If this is achieved pupils can become multipliers and communicate this idea to friends or family. Thus, the understanding of gardens as a place where healthy eating behavior can be improved can also be shared with more people.

The pupils' attitudes that sustainable and healthy food is produced in the school garden, but not in discount stores are important individual factors that influence their nutritional behavior. The results showed that many pupils are of the opinion that in school gardens more healthy and sustainable food can be produced than bought in discount stores. Young people who live at home with their family are influenced by different parental food habits, and pupils' nutritional patterns depend on the families' food choices (Jenkins & Horner, 2005). Pupils' participation in school gardening can cause reflection on their own beliefs, values and attitudes towards sustainable and healthy nutritional behavior.

Pupils' positive attitudes towards sustainability, which result from school gardening, have to be resilient against their families' potential negative attitudes towards sustainability. Thus, school gardening as a pedagogical intervention instrument for the development of pupils' sustainability awareness has to apply in very school-specific ways, because a promotion of awareness depends on pupils' interests and their families' values, which can differ widely. Apart from aspects related to personal awareness, motivation and taste of parents, the families' accessibility to healthy and sustainable food is strongly influenced by their purchasing abilities, therefore their socio-economic status. In the future, it is possible that through pupils' participation in school gardening that their attitude towards their own nutritional behavior can be changed, given that the pupils leave their home and their families' surroundings.

Pupils' who did or did not participate in school gardening and their self-assessment towards their sustainable knowledge

In the present study, only the self-assessment of the pupils' sustainability knowledge was asked for and not their actual knowledge on sustainability. School gardening leads, for pupils who participated in it, to be able to better assess their own sustainability knowledge. These pupils attained a more substantial and differentiated self estimation of their knowledge through the participation in school gardening than pupils who did not. This result can be seen positively, because the participation in school gardening makes them recognize more sustainability relevant correlations between nutrition and sustainability than pupils who did not participate.

The pupils' knowledge of sustainability can positively influence their nutritional behavior. In the following study Baldivia et al. (2014) showed that before participation in school gardening programs pupils' were not familiar with the term sustainability and after participation 100% of the pupils were familiar with this term. This study as well as the study at hand show sensitization effects for sustainability through school gardening programs.

Our results confirm the finding from Joshi and Azuma (2006), that school gardening promotes pupils' knowledge of their own diets and the origin of fruit and vegetables, for instance from sustainable agricultural production. According to Feenstra (2002), school gardening as a teaching tool has a high potential for pupils to obtain knowledge and skills to critically question and assess industrial agriculture and the related problems for the food system. In comparison to theoretical sustainability classes, in school gardening has the additional benefit that pupils can obtain knowledge of sustainability in practical ways (Meltzer, 2014).

It is a positive result that the self-assessed knowledge of the Viennese pupils' increased through participation in school gardening programs. This can encourage the pupils to reflect critically on their own diet. The pupils are more capable to reflect on sustainable aspects of their own diet theoretically and practically after participation in school gardening than what they have been before.

Pupils who did or did not participate on school gardening and their self-assessment towards their connection to nature and sustainability

In school gardening programs, the pupils learned how to grow plants and produce their own food. During school gardening, pupils had the chance to improve their connection to nature and sustainability. Fifty-one percent who did participate in school gardening think that they have and 37% think that they somewhat have a connection with nature and sustainability. This self-assessment shows that they are more sustainably responsible, and this promotes the pupils to strengthen their own relation to sustainably produced food. Furthermore, with a connection to nature, pupils are more sensitive to purchase from local farmers, which promotes short transport distances of vegetables from producer to the consumer.

Stevens (2016) showed that in contrast to our results there have been no significant changes for enjoyment of nature, sense of oneness and sense of responsibility for 19-year-old pupils' who participated in school gardening programs.

Nutritional behavior of families of pupils who did or did not participate in school gardening

In the families of pupils who participated in school gardening, the vegetable consumption increased by 17%. This positive effect has been sufficiently demonstrated by other studies (Gatto et al., 2012; Morgan et al., 2010; Parmer, 2006; Ratcliffe et al., 2011).

Meltzer (2014) notes that a majority of pupils, who participated in school gardening programs would rather buy fruit and vegetables at farmers' markets than in grocery stores. The results of the present empirical case study for Vienna confirm in part Meltzers' (2014) results. Families of pupils who did participate, purchase fruit or vegetables in farmers' shops rather more than families of pupils who did not participate in school gardening. Families of pupils who did participate, shopped for fruit or vegetables in supermarkets once a week and families of pupils who did not participate in school gardening shopped for fruit or vegetables in supermarkets several times a week.

In the context of the conceptual framework of potential factors influencing pupils' nutritional behavior (Figure 1), it is illustrated that socio-cultural, family and school influences have an impact on the pupils' nutritional behavior. Subjective peer norms play a role in adolescent nutritional behavior and are an important target for health promotion. Addressing norms that

encourage healthy eating may be more promising in changing behavior than norms that discourage unhealthy eating (Stok et al., 2015). Pedersen, Grønhøj, and Thøgersen (2015) highlight that first, healthy eating interventions should aim at strengthening self-efficacy and positive outcome expectations among adolescents, and second, the family context should be included when implementing healthy eating interventions. For example, in most cases, at home the parents decide with which food the family will nourish itself. That means that a successful school gardening program should include school and family specific factors, which is necessary to effectively promote healthy, sustainable eating patterns among pupils.

In the following studies, school gardening had an impact on both the pupils and their families.

Studies have shown, that pupils' and their parents' involvement in school gardening extended the impact to consume healthier food as well as to the rest of the family e.g. brothers or sisters. School gardening promoted reflection on the act of eating and on food, through the knowledge gained from direct contact with growing food crops. The experience had an impact on both the children and the families involved with the activities. Contact with food production provided knowledge on the way it is grown. In practice, this resulted in concrete dietary-related changes, greater knowledge of the food system, greater appreciation of the food itself as well as motivation to try new types of food (Tarricone Garcia, Pereira Coelho, and Bógus, 2017).

In comparison to the results of Tarricone Garcia, Pereira Coelho, and Bógus, 2017, also the present study results indicate that in the families of the pupils who did participate in school gardening, the vegetable consumption increases, even if the parents did not participate in school gardening with their children. Tarricone Garcia, Pereira Coelho, and Bógus, 2017, found out, that after school gardening pupils had a better knowledge on nutrition. In addition, in the present study, pupils who did participate in school gardening had a better self-assessment on sustainability than pupils who did not participate.

Ozer (2007) stated that the goal of improving adolescents' diets through school gardening appears to be better achieved when parents take part in the school gardening program, parental participation improves discussions within the family about healthy food choices (Ozer, 2007). Furthermore there is a positive benefit associated to school gardening, because pupils had greater motivation to ask their parents to start vegetable gardens at home (Davis, Spaniol, & Somerset, 2015).

Also, a school's own locally produced food supply in cafeterias and canteens has a positive impact on pupils' nutritional behavior. It should be noted that there is often a food infrastructure between schools, discount stores, grocery stores or fast food restaurants, and that pupils nourish themselves during recess by the easiest and fastest means. Furthermore, fast food restaurants, supermarkets and discount stores use a lot of advertising strategies, whereby young people will be stimulated and influenced in their diet (J. Harris, L., Bargh, & Brownell, 2009). Direct producer–consumer strategies are popular in Austria (Schermer, 2015), through discount stores' market strategies, e. g. open large food markets, which generate large purchasing power of consumers through aggressive advertisement strategies as well as promotion of private brands (generally one product line and the use of exclusive brands are very common)(Colla, 2003). For farmers who locally produce and sell vegetables or fruit it is very

difficult to keep up with discount stores' marketing strategies. The food price and brand are the most crucial food purchasing factors for parents (Petty, 2012).

Conclusion

Experiential spaces effect on forming sustainable nutritional awareness

This study evaluated school gardening programs by answering the question "Does the pupils' participation on school gardening influence their nutritional attitudes and behavior?" This is the first research for the age group of 16 to 19 year-old pupils in Austria. The results clarify that school gardening plays a distinctive role in raising awareness of sustainability aspects in pupils' own nutrition. The evaluative framework confirms that school gardening can be a pedagogical tool to improve knowledge and connections towards sustainability as well as to sensitize pupils about nutrition attitudes and behavior.

Linking food nutrition with sustainability plays an important role in promoting ecological nutrition (Keding, Schneider, & Jordan, 2013; Teherani-Krönner & Rückert-John, 2016). Through the linking of these nutritional attitudes, sustainability knowledge, the transition to develop ecological nutritional patterns can be promoted.

Gardening has to be adapted to the specific school and family conditions (Curricula, pupils' background and upbringing, pupils' interests, age or families' values and norms). It should be noted that under the Viennese school conditions, school gardening had a significant impact on pupils' nutritional attitudes and behavior. These results indicate that the participating pupils will be able to nourish themselves with fruit and vegetables produced in a sustainable and healthy way. It is ecologically worthwhile, that through the participation in school gardening pupils' reflection on their own nutrition and changes in their nutrition patterns are promoted.

In the future, research using longitudinal studies on sustainable nutritional awareness is necessary, because analyzing the impact of school gardening on the development from adolescent to adult attitudes and behavior will significantly improve applicability and reliability of these impacts and provide the best replication of school gardening programs (Phibbs & Relf, 2005).

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Thilo Rademacher completed his Master in Applied Plant Science at the University of Natural Resources and Life Science, Vienna, Austria. Previously he completed his Bachelor in Horticultural Science at the Leibniz University of Hanover, Germany.



Friedrich Leisch is a Professor of statistics in the Institute of Applied Statistics and Computing, University of Natural Resources and Life Sciences Vienna, Austria.



Bernhard Freyer is a Professor and Head of the Division of Organic Farming as well as the working group of Transdisciplinary Systems Research at the University of Natural Resources and Life Sciences, Vienna, Austria.



Valentin Fiala is a research assistant of the working group of transdisciplinary system research and a PhD student at the Division of Organic Farming at the University of Natural Resources and Life Sciences Vienna, Austria.

