



Implementing the Topic of Sustainable Nutrition In and Outside the Classroom Based on an Inquiry-Based Teaching Approach

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Abstract

The intention of this paper is to outline the theory-driven development of a teaching and learning module on the topic of 'sustainable nutrition'. Building on the model of educational reconstruction, the self-determination theory as well as the approach of inquiry-based learning, teaching and learning materials are evolved to implement the conception of an educated sustainable nutrition in and outside the classroom. To establish a causal relationship between aspects of sustainable nutrition and healthy diets the food trend 'smoothie' is employed. In four learning units (e.g. workshops), held at an Austrian youth centre and at a botanical garden as part of the H2020-EU-project "BigPicnic: Big Questions - engaging the public with Responsible Research and Innovation on Food Security", juveniles (aged 14-18) tested the educational materials. Besides moderate participant observation, data were gathered by recording learners' oral contributions. The preliminary findings seem to suggest that the teaching and learning materials made particular components of the complex topics of nourishment and sustainability accessible to learners. Consequently, the presented teaching model may give suggestions on how the topic of a healthy and sustainable nutrition can be inbuilt into integrated science lessons in and outside the classroom.

Keywords: *socioscientific issues, decision-making, education for sustainable development, model of educational reconstruction;*

1. Introduction

In recent years, there has been growing interest in the high relevance of food and nutrition to people's personal lives as well as its impact on the local, regional and global society [1; 2]. The European Horizon 2020 project "BigPicnic" aims for both, addressing issues related to the umbrella concept of 'food security' and developing educational activities for stimulating the public debate [1]. Food education is not just about conveying scientific expertise but also about recognizing and questioning societal value systems [1; 2]. Scholars of the Stockholm Resilience Centre have demonstrated that "food" connects to all of the 17 Sustainable Development Goals (SDGs). Furthermore, they propose that the scientific community should move away from the sectorial approach segregating social, economic and ecological developments and think of them as inextricably linked [3]. Hence, a central question that needs to be addressed in this context is which aspects learners should take into account in their diets to comply with the so-called "principles of a sustainable nutrition" [4]. So far, in didactic teaching and learning research, the topic of nutrition has been dealt with health issues primarily. However, this restriction of the field of vision corresponds neither to the nourishing habits of juveniles, nor to the nourish-specific challenges, which our society faces [5]. Previous research has concentrated on the identification of nutritional orientations of students and the derivation of guidelines for learning environments, which aim to foster students' abilities regarding sustainable nutrition [5]. Astonishingly, little attention has been paid on the establishment of educational materials that impart an appropriate understanding of both, a healthy diet and a sustainable nutrition system. A key issue, therefore, is to make these socially highly controversial issues suitable for teaching in and outside the classroom with the goal of education for sustainable development, by including nutritional orientations of young people on the one hand, and ecological, economic, social and health implications of nutrition on the other.

2. Theoretical background

Based on the model of educational reconstruction following Kattmann and colleagues [6], in the clarification and analysis of the science content, a suitable scientific understanding of sustainable nutrition is driven from literature. Nutrition aspects regarding smoothies as a meal are used to mediate the learning process. The term 'sustainable nutrition' tends to be commonly referred to von Koerber, Männle and Leitzmann's concept of a "«wholesome nutrition» [...], a mainly plant-based diet, where minimally processed foods are preferred" [4, p. 3]. This concept incorporates five dimensions:



individual, environment, economy, society and culture. It includes seven so-called “principles of a sustainable nutrition”, ranked according to their potential to save on CO₂-equivalents. These are 1) preference of plant-based foods; 2) organically grown foods; 3) regional and seasonal products; 4) reference of minimally processed foods; 5) fair trade products; 6) resource-saving housekeeping, and 7) delicious meals. Following these seven recommended actions, a sustainable nutrition contributes to the requirements for health, environmental, economic and social compatibility simultaneously. Due to the reason that Austrian pupils do not eat enough fruits and vegetables [7], a current food trend, namely fashionable smoothies, has been used to establish a relationship between aspects of a sustainable nutrition. In this sense, a smoothie is according to de Moura et al. [8, p. 216] “a drink composed of a mixture of vegetables (e.g. fruits, vegetables), [...] being a high creamy, healthy beverage.” Hence, a self-made smoothie from fresh, regionally and organically produced as well as fair-trade certificated ingredients of the season perfectly links to the conception of a sustainable nutrition.

3. Methodology: Designing a theory-driven learning environment

Motivation and interest of the learners are essential elements of a successful and sustainable learning process, which is why these components have been considered for designing the learning unit [9; 10; 11]. In her study, Gralher identifies several, prevalingly ego- and ethnocentric, nutritional orientations of students as most important aspects for young people’s dietary habits. She derives four guidelines for planning lessons to promote student’s ability for a sustainable nutrition behaviour [5]. The presented teaching concept particularly relies on Gralher’s recommendations. Building on the approach of inquiry-based learning [12; 13] and Bybee’s 5E instruction model [14], a workshop has been designed to provide an overview of the conception of a sustainable nutrition by making smoothies (Tab 1). The objectives of this course are: 1) make participants aware of their own nutritional behaviour; 2) strengthen awareness of the effects of one’s own nutritional behaviour; 3) demonstrate sustainable eating habits, and 4) provide knowledge for an informed decision. By scaffolding the learning process and with the help of self-reliant and active discovery, workshop participants try to exemplify their previously established hypotheses and conjecture. Teenagers (mainly aged 14-18) worked with the educational materials in four 90 minutes workshops. Two workshops took place at a youth centre in a Tyrolean small town; participants were mainly male apprentices between 14 and 18 years, some of them with a migration and refugee background. Two workshops were held at the Botanical Garden of the University of Vienna; students attended a private lower secondary school, were 13 to 14 years old and hold a multicultural background. Data were collected using moderate participant observation and by recording the learners’ oral contributions to small group and plenary discussions. A case study approach was used to analyse the data.

Tab. 1. Overview of the didactic preparation in form of a curricular or extracurricular workshop

PHASE	CONTENT	METHOD & MATERIAL
Preparation of the place of performance	Preparing the workplaces and smoothie-bar; Preparation of several smoothies	
Welcome; presentation of the procedure	Guidance on the issue of ‘sustainable nutrition’	Informing entry into teaching
Tasting of several smoothies; allocation of the participants to their workplaces <i>Engagement</i>	First discussion on the topics of sustainable nutrition and smoothies; group allocation	Tasting of smoothies; worksheet
Presentation of the research question or problem <i>Engagement</i>	Presentation or finding process of a research question depending on the level of requirements of the participants	Research question(s); if necessary: concept cartoon for the common finding of a research question (inquiry level 3); brainstorming
Preparation of smoothies by means of a test protocol <i>Exploration & Explanation</i>	Preparation of smoothies; discussion on the topic of sustainable nutrition	Independent working in small groups; recording; working and testing materials



	(answering the research question and key questions)	
Presentation and marketing of the smoothies <i>Explanation & Evaluation</i>	Bringing together the evidence and thoughts; finding and illustrating demands on sustainable nutrition habits in connection with the food trend smoothie; repeating and consolidating the learning content	Presentation by the group speaker; critically plenary discussion and reflection; justification of the results
Farewell	Tasting of self-made smoothies; closing words	Give-away: recipes and recommendations for preparing smoothies

4. Results and discussion

The statements of the workshop participants specifically highlighted the importance of a sustainable diet and food system. Preliminary results show that after participating in these workshops, key concepts such as nutritional aspects of fresh-made smoothies in opposition to convenience smoothies (e.g. content of sugar, fibre, vitamins, phytochemicals); the origin (e.g. regional and seasonal foods); transport distance (e.g. global food chains), and transport routes (e.g. different means of transportation, emission of climate-active gases) of fruits and vegetables recurred throughout the dataset. Moreover, participants explicitly addressed ecological effects in relation to cultivation of these food crops (e.g. organic farming, use of herbicides and pesticides in monocultures). Social (e.g. fair trade) and occasionally economic aspects of the cultivation, trade and marketing of food were raised in plenary discussions at the end of the workshops. The issue that smoothies are rather a meal than a drink in terms of its nutritional effects was mentioned frequently. It was striking that learners showed vivid situated engagement, which maintained nearly throughout most of the 90 minutes time span.

5. Conclusions and recommendations

The findings, so far, seem to suggest that the inquiry-based educational materials are successful in supporting learners to make a link between sustainable nutrition and food trends such as smoothies. A more detailed data analysis and future research are required to confirm whether the knowledge gained by the learners in this course is also applied in every day decision making, and whether the acquisition of knowledge leads to sustainable nutritional behaviour. The investigation demonstrated that the teaching approach applied in both, formal and informal educational institutions, lead to an awareness in particular components of sustainability and shows the potential to create and expand nutritional knowledge in this area. However, the findings ought to be treated as tentative until further research is conducted to determine the likelihood that awareness will lead to behavioural nutrition change.

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