SURVEY ASSESSING KNOWLEDGE, SKILLS, INTERESTS AND ATTITUDES OF SECONDARY
EDUCATION STUDENTS AND TEACHERS, RELATED TO THE THEMES OF THE PROJECT

REPORT OF FINDINGS – *GREECE*

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Introduction

The present report has been compiled in the frame of the Erasmus + project "GOODFOOD – Education to become responsible food consumers". The project aims at raising awareness on sustainable and responsible food consumption taking into account the food cycle environmental impacts and the need for a balanced and healthy diet, and making school and STEM more effective and attractive to students, by proposing and testing a learning methodology for secondary education based on the STEAM approach and the IBL (Inquiry-Based Learning) approach, on the theme of sustainable food consumption.

The present report forms part of the initial outputs of the project, and aims at analyzing and presenting the findings of a survey carried out in the 1st Lyceum of Rafina, Greece, on May 2022. The objective of the survey implemented was to chart the current knowledge, skills, interests and attitudes of secondary education students in relation to the themes proposed by the project, i.e. sustainable food production, sustainable food consumption, and balanced and healthy diet. The survey also aimed at identifying the students' perception towards the different disciplines brought together in the STEAM approach (i.e. Science, Technology, Engineering, Art and Math), as well as regarding the relation of the project themes to subjects taught at school. Finally, the survey also drew on the teachers' attitudes, perceptions and existing knowledge and skills related to the educational approaches proposed by the project and the project themes.

The survey was implemented through a specially designed questionnaire that was administered online to secondary education students and teachers of the 1st Lyceum of Rafina, a small town and harbor on the east coast of Attica, Greece. In the following chapters there is a brief description of the survey context, the methodology that was applied, and the analysis of the survey findings. Finally, the report conclusion draws on the main survey findings in connection to the specific context and the survey methodology.

The Context

The secondary education system in Greece

Secondary education in Greece comprises two stages: Gymnasium (Junior High School), a three-year school for ages 12-15, after which students can attend Lyceum, another three-year school for ages 15-18. All levels are overseen by the Ministry of Education, Research and Religious Affairs, which exercises centralized control over state schools, by prescribing the curriculum, appointing staff and controlling funding. Private schools also fall under the mandate of the Ministry, which exercises supervisory control over them. At a regional level, the supervisory role of the Ministry is exercised through Regional Directorates of Primary and Secondary Education, and Directorates of Primary and Secondary Education operate in every Prefecture.

There are 5 types of Gymnasia according to their special orientation:

1. General Gymnasium (entrance from the primary school is automatic)

2. Musical Gymnasium (to enter this type of school students must pass certain exams on a musical instrument)

3. Art Gymnasium (to enter this type of school students must pass certain exams on either arts, dance, or theater)

4. Experimental Gymnasium (to enter this type of schools students must pass certain exams on Maths, Science, Reading Comprehension and Writing)

5. Church Gymnasium

Similarly, there are 7 types of Lycea according to their special orientation:

1. General Lyceum

2. Vocational Lyceum

3. Athletic Lyceum (to enter this type of school students must pass certain exams on a sport like football, basketball, volleyball, gymnastics, polo, swimming etc.)

4. Musical Lyceum (to enter this type of school students must pass certain exams on a musical instrument)

5. Art Lyceum (to enter this type of school students must pass certain exams on either arts, dance, or theater)

6. Experimental Lyceum (to enter this type of schools students must pass certain exams on Mathematics, Science, Reading Comprehension and Writing [the last two are written as one])

7. Church Lyceum

The 1st General Lyceum of Rafina

The 1st Lyceum of Rafina is a General Lyceum, similar to the vast majority of Lycea (senior high schools) in Greece, therefore offering general education to its students. In terms of science education, the core of science subjects includes Mathematics (incl. Algebra and Geometry), Physics, Chemistry and Biology. In each of the 3 grades, students have an option to select either optional subjects (e.g. on the first grade students may select Geology and Management of Natural Resources) or an orientation group. The Science orientation group in the 2nd grade includes the subjects of Mathematics and Physics, while the Science Studies orientation group in the final 3rd grade includes Mathematics, Biology, Physics, Chemistry and Information Technology.

The school is located in Rafina, a small coastal town 28 km to the east of the Greek capital Athens. The harbor of Rafina offers daily routes to the Aegean islands and Evia. The school is situated at the top of a hill called Ohiro (meaning fortress – the name was given during the Nazi occupation when the German army had built there a complex of shelters, command offices and storage facilities). The neighbouring beach "Marikes" gathers every summer the locals, who swim under the early Helladic acropolis of Asketario.

The local context – Learning activities already carried out on the project themes

Learning activities carried out in the subject of Biology

In the framework of the 1st Grade Biology course, the students have carried out a series of learning activities on the themes of **Nutrition and Health**. These activities focused on the connection between nutrition and cardiovascular diseases, the connection between nutrition and diabetes, the effects of the widespread use of plastics on humans and other organisms, anorexia nervosa, etc. These activities linked to the curriculum of the Biology course in the 1st Grade, which focuses on the circulatory, nervous and reproductive systems.

In the framework of the 2nd Grade Biology course, the students have carried out a series of learning activities on the themes of Nutrition and Health, through topics such as pollution, bioaccumulation, climate change, the cycle of carbon and nitrogen with chemical fertilizers , as well as topics that connect nutrition with the body's immune system, as well as allergies. The Biology course in the 2nd Grade focuses on three topics:

- Humans and Health

- Humans and the Environment

- Evolution

The students also built a composter in March 2020, just before schools closed due to the COVID 19 pandemic. The wooden composter is placed at the entrance of the school and was painted by the students themselves. Since then, little by little, the students bring fermentables and leave them in the composter. Students' participation is not great, but this is something the school hopes to improve through the GOODFOOD project.

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The school also has a small school garden. Located on a nice terrace of the school, the students have placed many pots of various sizes, in which they use the Compost produced from the composter.

<u>Learning activities carried out in the subject of Physical Education</u>

In the framework of the PE course, the school implemented a series of lessons about the value of fruits and vegetables to our health. The students, with the assistance of the PE teacher, compiled a table of FOODS, where the information gathered on each type of food was recorded and the cells were colored according to the effect of foods on the human body (e.g. against cancer, protecting the heart, helping prevent strokes, regulating blood pressure, etc.). The students also prepared a list of the "7 don'ts after eating", and the students printed the Table and the rules to use at home to inform the rest of their family.

In a second series of lessons, the students learned about the Basic Metabolic Rate (BMR), how they can calculate it according to the available mathematical formulas, what factors affect it and how it can be used to improve our health. A basic outline of the information we worked with is shown in the attached file "basic metabolic rate".

avocado	Helps prevent diabetes	Reduces cholesterol	Helps prevent heart attacks	Regulates blood pressure	Makes the skin soft
banana	Protects our heart	Helps soften coughing	Strengthens bones	Regulates blood pressure	Stops diarrhoea
grapefruit	Helps prevent heart attacks	Helps lose weight	Helps to prevent strokes	Against prostate cancer	Reduces cholesterol
mango	Against cancer	Supports memory	Regulates the thyroid	Helps digestion	Protects against Alzheimer's
artichoke	Helps digestion	Reduces cholesterol	Protects our heart	Stabilises blood sugar levels	Protects against Hepatitis
anana	Strengthens bones	Relieves from cold symptoms	Helps digestion	Eliminates nodules	Stops diarrhoea
apricot	Against cancer	Regulates blood pressure	Protects vision	Protects against Alzheimer's	Slows down ageing
oats	Reduces cholesterol	Against cancer	Helps prevent diabetes	Cures constipation	Makes the skin soft
yoghurt	Protects against ulcers	Strengthens bones	Reduces cholesterol	Supports the immune system	Helps digestion
sweet potato	Protects vision	Good for mood	Against cancer	Strengthens bones	
plum	Slows down ageing	Cures constipation	Supports memory	Reduces cholesterol	Prevents cardiovascular diseases
olive oil	Protects our heart	Helps lose weight	Against cancer	Helps prevent diabetes	Makes the skin soft
carrot	Protects vision	Protects our heart	Prevents constipation	Against cancer	Helps lose weight
watermelon	Protects the prostate	Helps lose weight	Reduces cholesterol	Helps to prevent strokes	Regulates blood pressure

Extract from the FOODS table developed by the students

The survey methodology

The survey was conducted through a specially designed questionnaire that was circulated to secondary education students and also, with minor adjustments in order to be more relative, to teachers of the 1st Lyceum of Rafina. The questionnaire was designed in English in order to be common to all 3 countries implementing the survey, and was then translated to Greek and administered online to students and teachers.

The survey among students took place on Monday and Tuesday 16-17 May 2022. Following an introductory session by teachers who informed the students of the 1st and 2nd grades of the General Lyceum about the project aim and the objectives of the survey, including brief instructions on how to fill in the online questionnaire, the students filled in the online questionnaire using the facilities in the IT room of the school. Teachers of the Lyceum also filled in the online questionnaire especially adjusted for them over the period 16-22 May 2022.

In total, there were 94 responses from secondary education students and 12 responses from teachers.

The survey questionnaires were designed with a focus on self-assessment, the respondents offering their own perceptions regarding their knowledge, skills, interests and attitudes towards the themes and methodology proposed by the project. The online questionnaires included an introductory section including a description of the survey objectives and information on data handling, asking the participants for their consent for taking part in the survey – only participants who gave their consent were able to carry on filling out the questionnaire. Following the introductory section, the questionnaires were structured in 4 sections:

1. Profile – This section included key information on the respondents' profile, i.e. gender, age and grade for the students; and gender, age range, ages of students taught, expertise, subject currently teaching and years of teaching experience for the teachers.
2. Knowledge - The aim of this section was to assess the participants' level of knowledge regarding the project themes, i.e. issues related to food production and consumption.
3. Skills – This section aimed at identifying the current level of competence regarding skills in relation to the proposed learning approaches of Inquiry-Based Learning and STEAM, as well as in relation to digital learning tools proposed.
4. Interests, perceptions, attitudes - This section included questions that aimed at measuring the participants' interest in the project themes, as well as to map their perceptions and attitudes on notions and ideas related to the project.

In questions where the Likert scale was used, a 4-point scale was adopted deliberately so as to avoid offering the "safe" middle option and provoke informed responses. An "I don't know" option was also offered to the participants.

Part of the questionnaire was adapted from the related questionnaire of ROSE (the Relevance Of Science Education), a cooperative research project with wide international participation, addressing mainly the dimensions of how young learners relate to the environmental issues, as well as Science and Technology.

The duration of filling in the questionnaire by respondents did not exceed 15 minutes, as foreseen.

Analysis of findings

Students survey

The analysis of the findings of the students survey are presented here, following the 4 sections' structure of the questionnaire, i.e. Profile, Knowledge, Skills, Interests-Perceptions-Attitudes.

Profile

In terms of the gender of the respondents, most of the 94 students who took part in the survey are female; a small percentage preferred not to state their gender or stated other (i.e. non-binary). The majority of the participating students (65%) studies at the 1st Grade of the Lyceum, and this is evident in the age distribution of the participants: the majority of the respondents is 16 years old, while smaller percentages around 20% each represent students 15 and 17 years old.
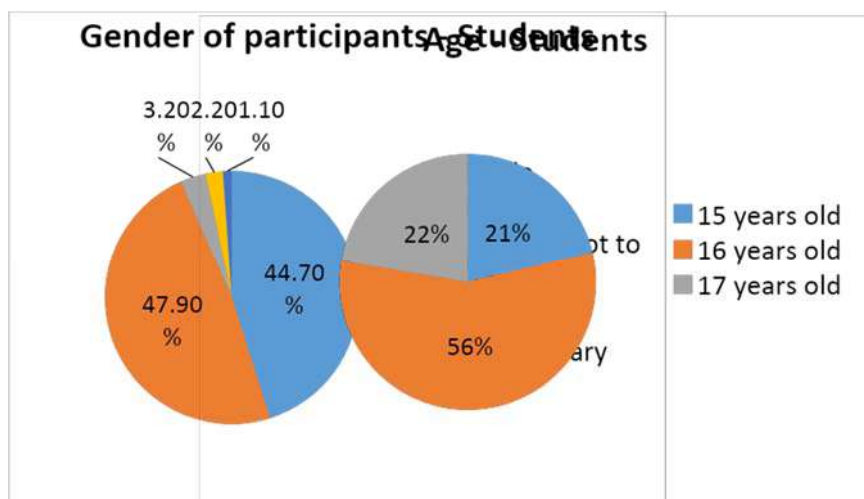

Knowledge

The participants were initially asked what foods they mostly relate to the Mediterranean diet, from an extensive list of food types. The students' responses to this question reveal a good level of knowledge, the vast majority selecting olive oil, fish/seafood, pulses, fresh fruits and vegetables as the types of food mostly related to the Mediterranean diet. Lower on the students' list (selected by approximately half the respondents) are food types like whole bran cereals, dairy foods, unsalted nuts, red wine and tomato sauce. It is interesting to point out that an important proportion of the students (40%) place white meat, a type of food strongly linked to the Mediterranean Diet, together with white cereals (bread, rice, pasta). Red meat, as well as salted nuts, although placed lower in terms of relation to the MD, were still selected by 30% of the respondents. Overall, the results in this question indicate that, although there is a good level of knowledge regarding foods related to the MD, there are also misconceptions to a great extent: the Mediterranean diet is not a pescatarian diet, as the majority of the respondents seem to indicate.

Foods mostly related to Mediterranean diet - Students
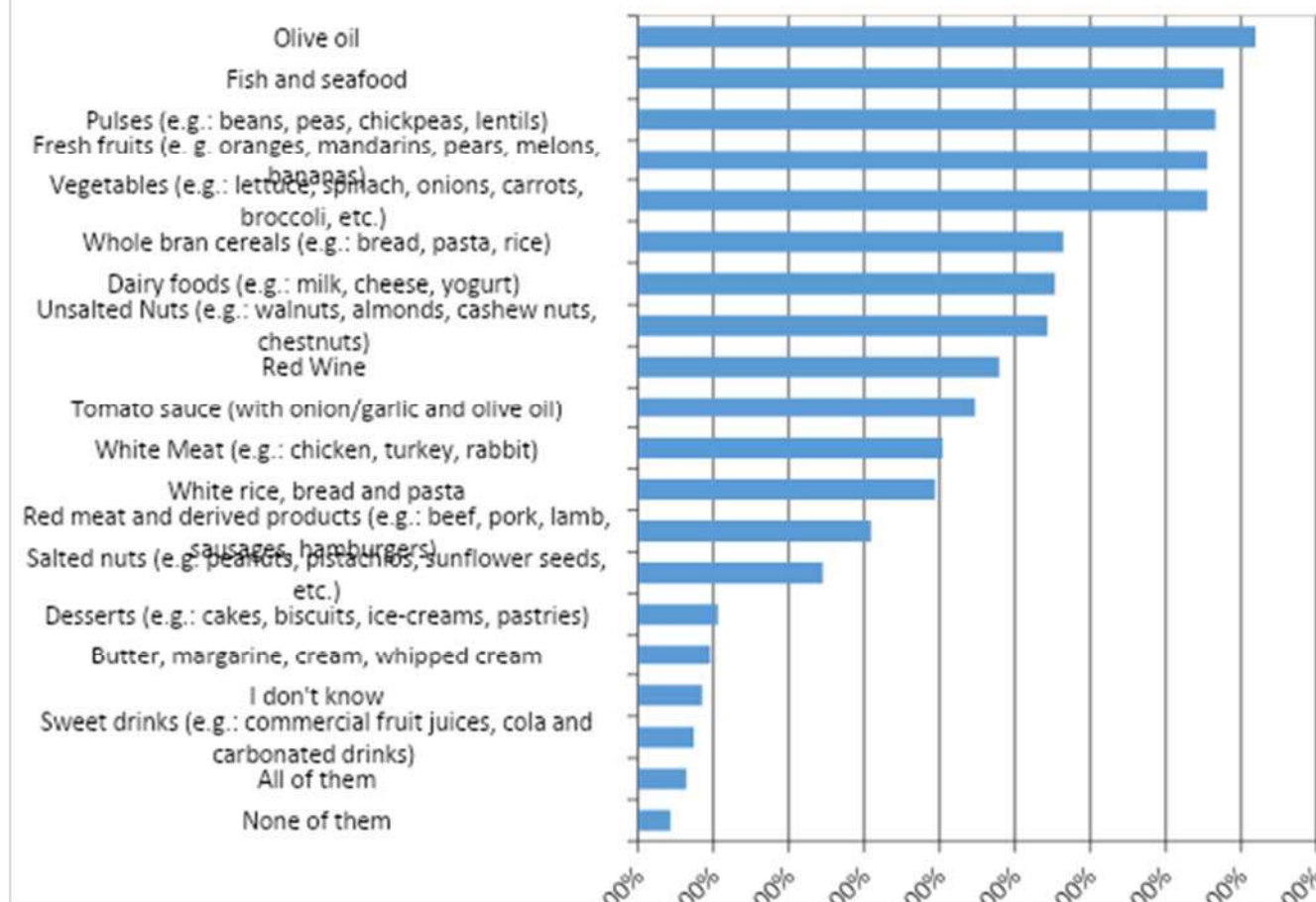
The following question required from the students to state how important they consider certain aspects with regard to a healthy diet. The vast majority of the students consider the consumption of fruits and vegetables as very important, while eating home-made food and eating at regular times in a day are also considered very important aspects by most of the students. Consuming organic food and unprocessed food, food rich in fiber or with no preservatives/additives, and following a diet with reduced sugars and saturated fats, are also considered as important factors for a healthy diet by the vast majority of the participating students. Less importance is attributed to aspects like eating in moderate quantities, consuming locally produced food and food that is typical in the traditional cuisine, as well as consuming less meat, although the majority of the students consider these aspects as important or very important. The only offered aspect that the majority of the students attribute little or no importance to is following a vegan or vegetarian diet. Overall, the students reveal a good level of knowledge regarding aspects of a healthy diet.

Importance to a healthy diet - Students
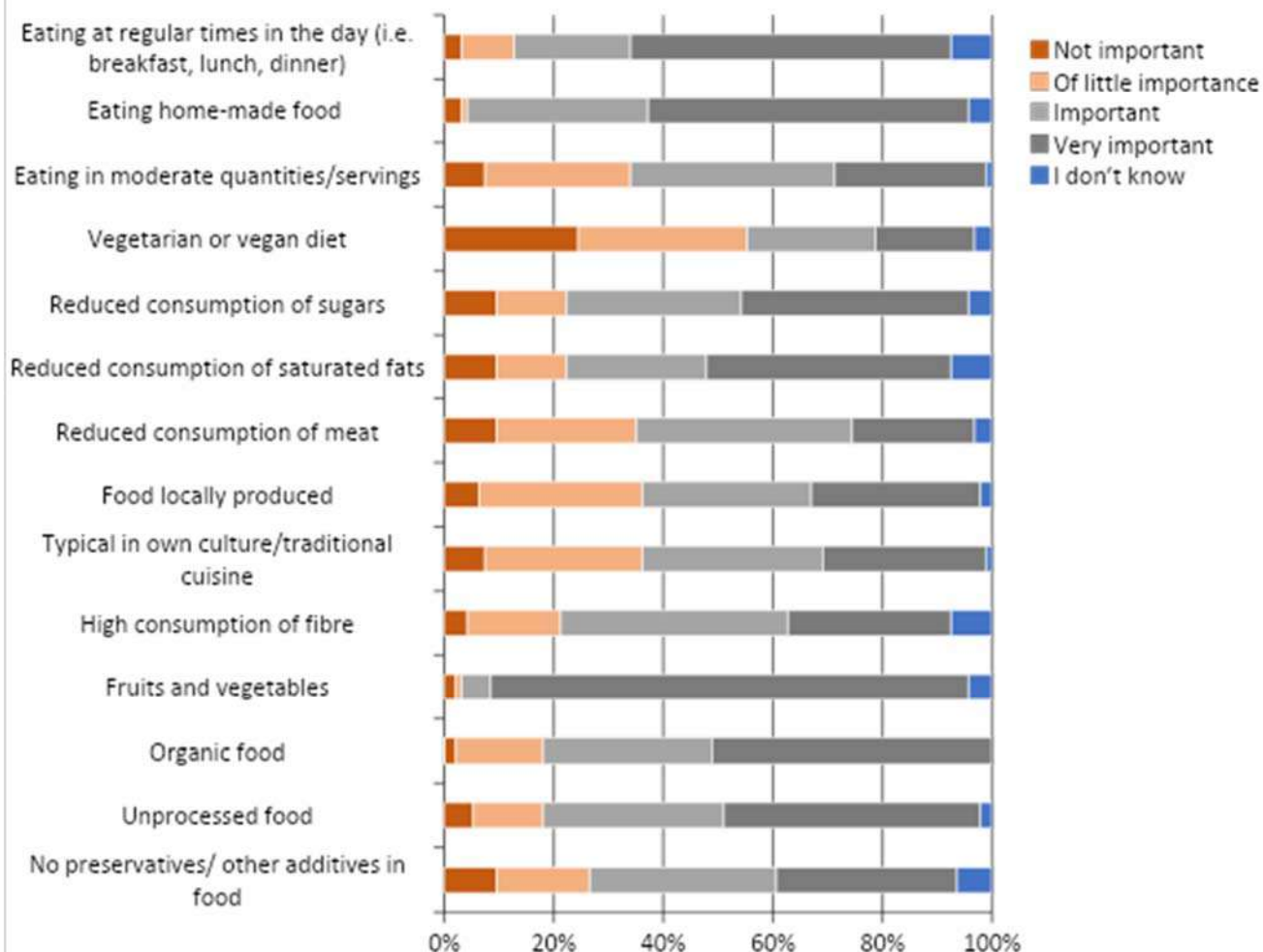
The students were also invited to select to what extent certain aspects connect to sustainable food production. Overall, the majority of students reported high or moderate connection of all proposed aspects to sustainable food production, revealing a good level of knowledge. However, an important proportion of the students (just below 20%) stated they don't know whether aspects like "developing new sources of food" or "low waste" connect to sustainable food production, revealing gaps of knowledge on important aspects of sustainable food production. The highest connection recorded was "production by organic farming", while local production and low environmental impact (i.e. efficient use of water and energy) were also attributed high connection to the theme. On the other hand, more than 30% attributes no or

low connection to developing new sources of food, low production cost and little packaging, which are important aspects to sustainable food production.

When asked to relate key aspects to a sustainable diet, the vast majority of the students attributed high or moderate connection to all aspects proposed in the questionnaire. The highest connection was attributed to health benefits, while the environmentally friendly aspect was also reported as having a high connection by most students. High nutritional value was given a high or moderate connection to sustainable diet by more than 80% of the students. However, around 25% of the students attributed low or no connection to aspects like the hedonic component of a sustainable diet (i.e. whether the food is tasty and

Connection to "sustainable food production" - Students
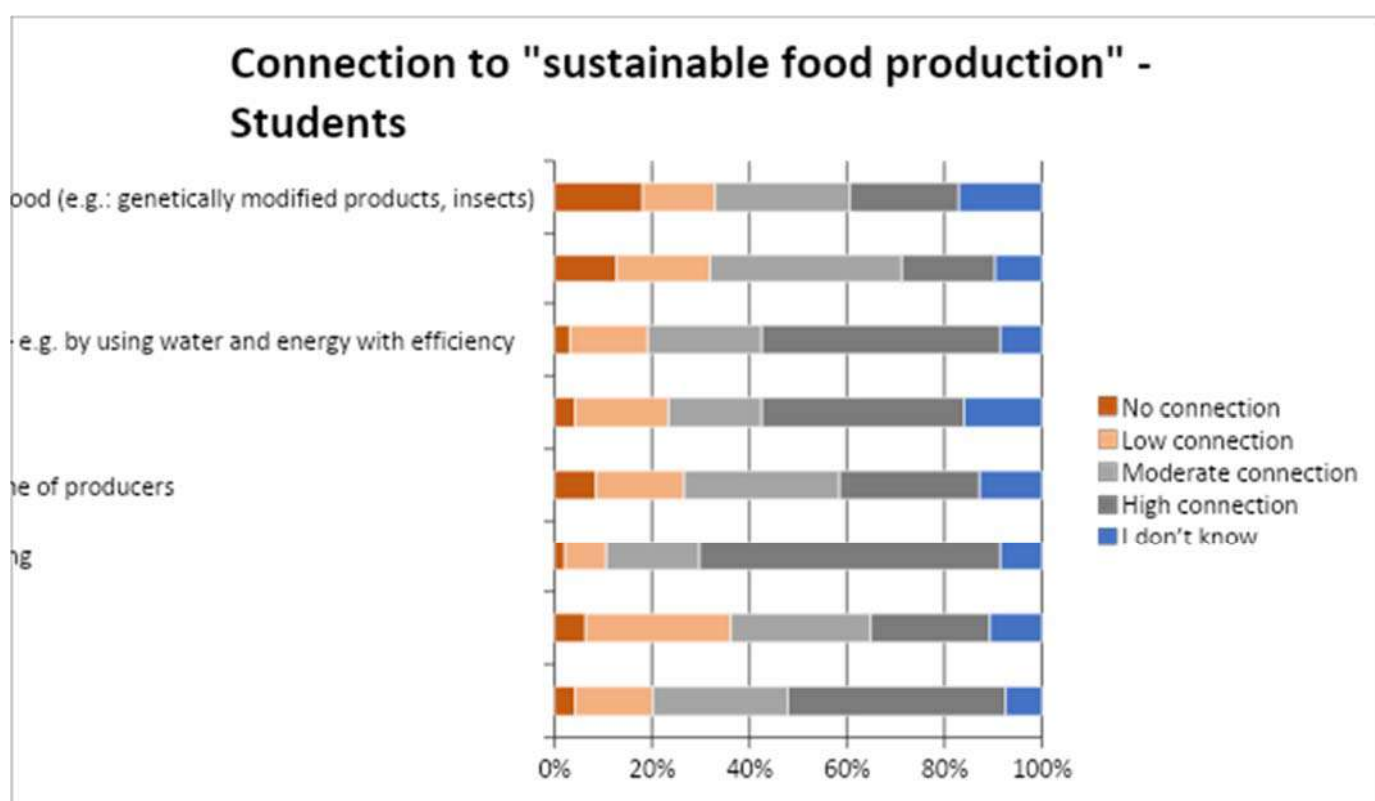
pleasurable) and whether it is affordable.

Connection to "sustainable diet" - Students
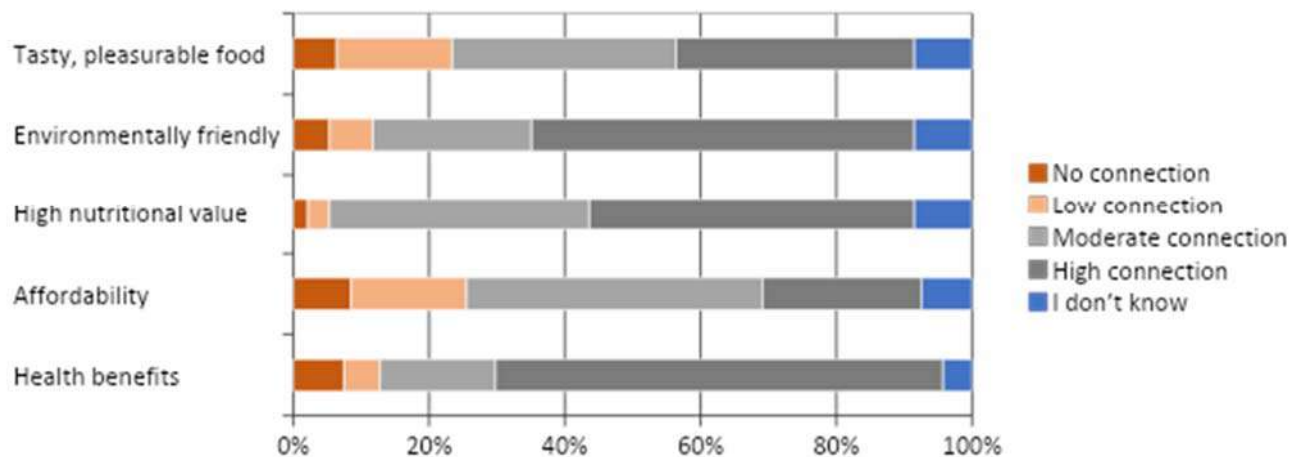
On the following question, the students were asked to rate their knowledge regarding specific issues related to sustainable food. Gaps of knowledge by most of the participating students were identified mainly in issues like sustainable farming, food chains, diseases associated with dietary/lifestyle habits and eating disorders. On the opposite, the higher levels of knowledge were recorded on the nutritional value of food and its importance for wellbeing – this finding relates to the learning activities already carried out at the school, that focused on these topics. Also, sufficient knowledge was recorded by the majority of the students on the issues of food waste/recycling and eating disorders.

Knowledge on issues - Students
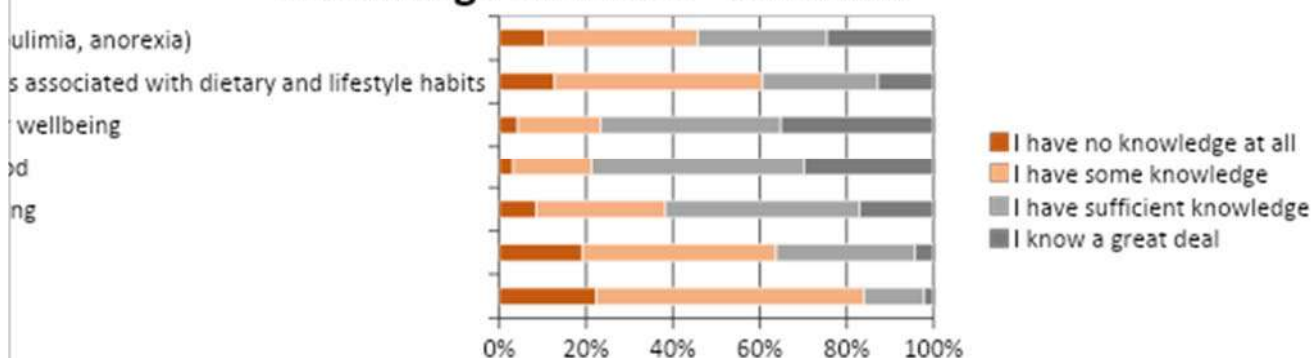
The next question focused on the students' knowledge of the terminology linked to sustainable food production, and sustainable and healthy diet. The students were requested to respond on whether they know the terms proposed, whether they have heard them but don't know what they mean, or whether they do not know them. Students seem to be familiar with the terms "climate change", "nutritional value", "genetically modified food" and "greenhouse gas emissions", however the majority do not know the meaning of the terms

"Carbon footprint", "Ecological footprint", "Biodiversity" and "Antioxidants". Finally, most of the students have not even heard the term "virtual water".

Knowledge of terms - Students
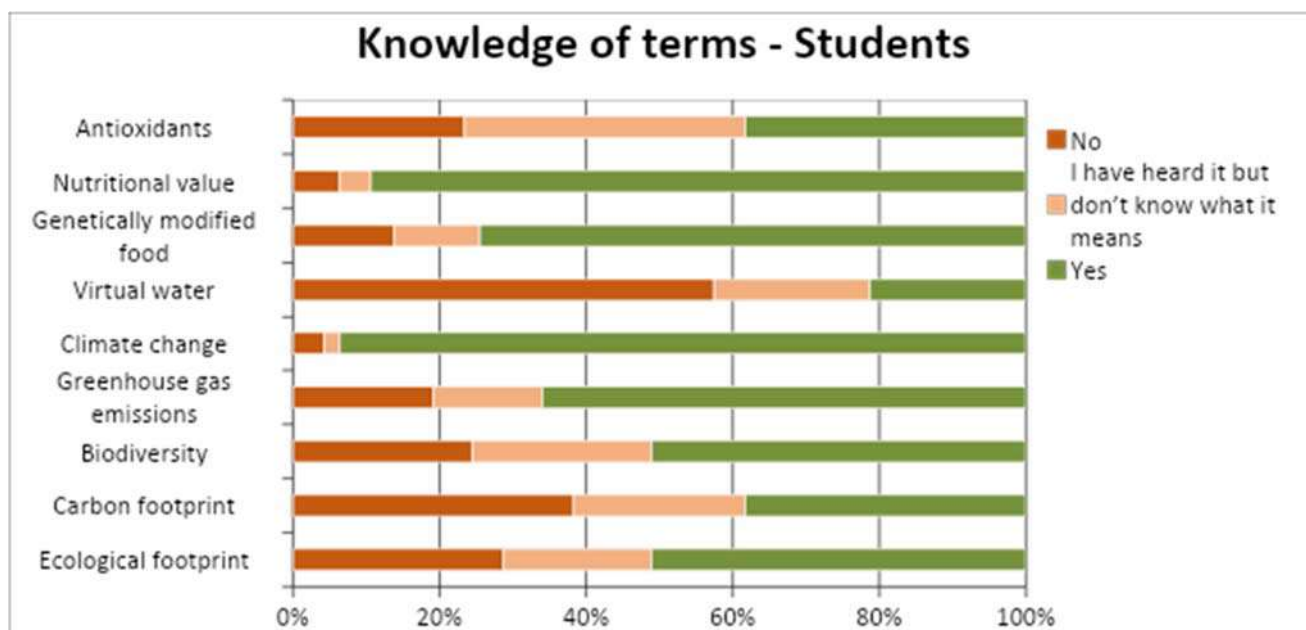
The students were also asked to relate a wide range of school subjects within the scope of the proposed STEAM approach to core themes of the project, i.e. food 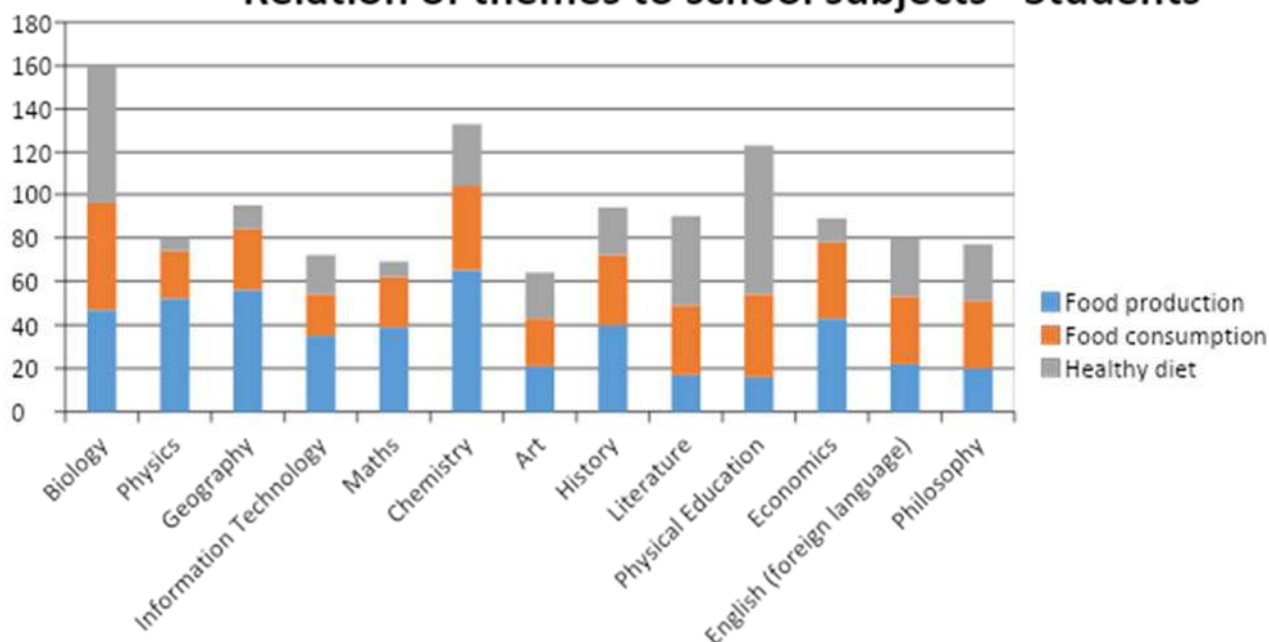production, food consumption and healthy diet. Biology, Chemistry and P.E. (Physical Education) are seen as mostly relevant to all 3 themes proposed – Biology seen as equally relevant to all 3 themes, Chemistry as relevant mainly to food production, and P.E. as relevant mainly to the theme of healthy diet. Geography and Economics are seen as relevant mainly to the themes of food production and consumption, History is seen as relevant equally to all 3 themes, and Literature is seen as relevant mostly to food consumption and healthy diet. Less relevance was attributed to the subjects of Physics, information Technology, English (foreign language) and Philosophy. The least relevant subjects, according to the students' views, are Math and Art. The low relevance attributed to certain subjects reveals gaps in the national educational curriculum – for example Art is not included in the Lyceum curriculum, and the practical application of IT and Math to other fields is limited.

Relation of themes to school subjects - Students

Legend: Food production, Food consumption, Healthy diet

Subjects (x-axis): Biology, Physics, Geography, Information Technology, Maths, Chemistry, Art, History, Literature, Physical Education, Economics, English (foreign language), Philosophy
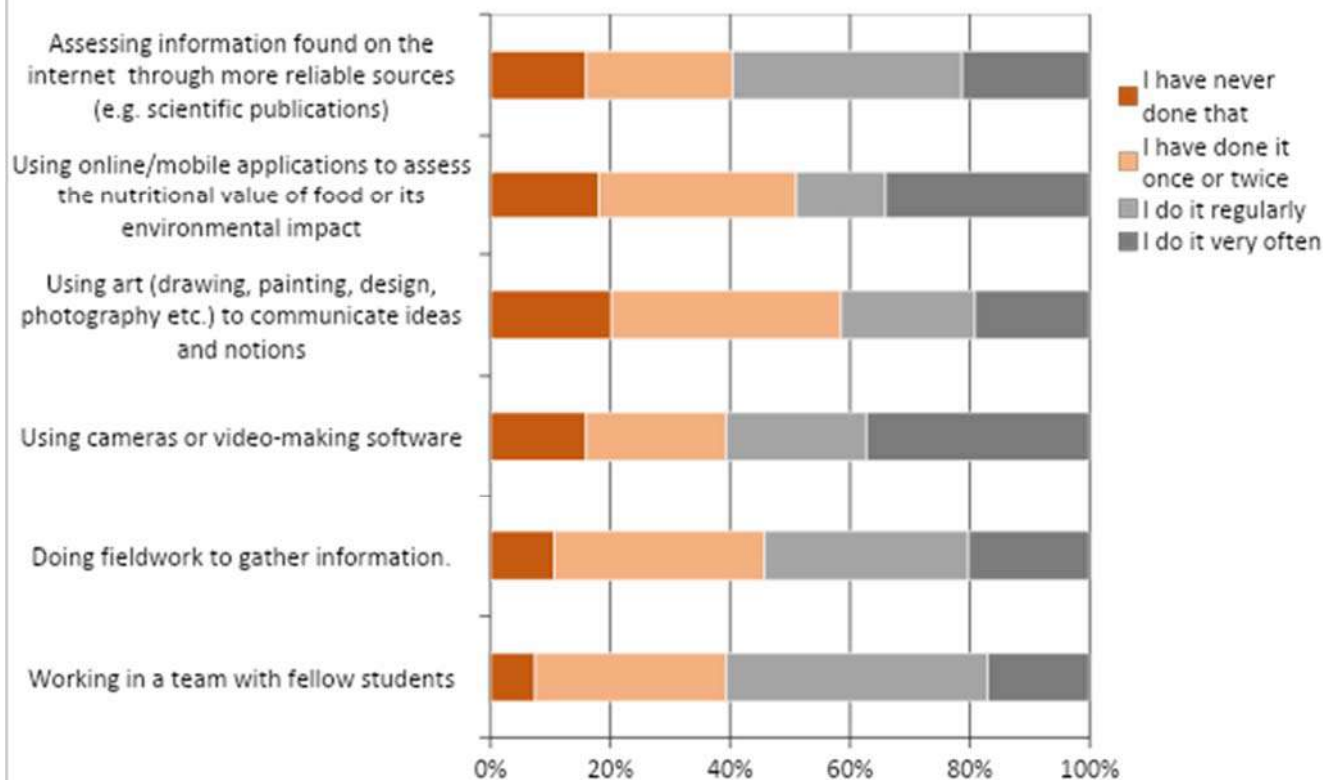
Skills

The participating students were asked to rate how often they have performed different activities related to a set of skills which are relevant to the proposed learning approach and the tools foreseen for its implementation. The recorded results indicate that most of the students (60%) report they often work in a team with their fellow students, use cameras or video-making software, and assess information found on the internet through more reliable sources. A smaller proportion of the participating students (close to 50%) have regular experience with doing fieldwork to gather information, or using mobile applications to assess the nutritional value of food or its environmental impact. On the opposite, most of the students do not report they use Art often to communicate ideas and notions; in fact, 20% of the students stated they have never done it. This last finding reflects the educational system's failure to integrate art in the curriculum of upper secondary education in Greece, an important issue to take into account when proposing a STEAM learning approach. Furthermore, it is important to highlight that, although the majority of the students seem to have working experience in most of the activities suggested, an important proportion of the students (40% - 50%) have very limited or no experience at all. The proposed learning methodology should take this into account and not assume that students already possess the skills necessary to carry out the proposed learning activity; instead, practical examples, guidance by the teachers, and practice in class should be used to assist the students in feeling more comfortable with carrying out the learning activities.

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Skills - Students

Assessing information found on the internet through more reliable sources (e.g. scientific publications)

Using online/mobile applications to assess the nutritional value of food or its environmental impact

Using art (drawing, painting, design, photography etc.) to communicate ideas and notions

Using cameras or video-making software

Doing fieldwork to gather information.

Working in a team with fellow students

Legend:
- I have never done that
- I have done it once or twice
- I do it regularly
- I do it very often

0%   20%   40%   60%   80%   100%

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Interests – perceptions – attitudes

The first part of this section focuses on the students' interest in learning about a range of issues on the project themes, and in carrying out key activities of the proposed learning approach, including the use of applications foreseen and involving their parents and friends in their project activities.

The vast majority of students (80%) appear to be very or moderately interested in learning about all the issues proposed. Strongest interest is shown for issues of a personal dimension connected to a healthy diet, like associating dietary habits with health, and learning about ways to lead a sustainable and healthy diet, however issues of a civic dimension connected to sustainable production and consumption (i.e. causes and impacts of climate change on food production, benefits of being a sustainable consumer, impact of eating habits to the environment, methods of food production) also attract the students' interest.
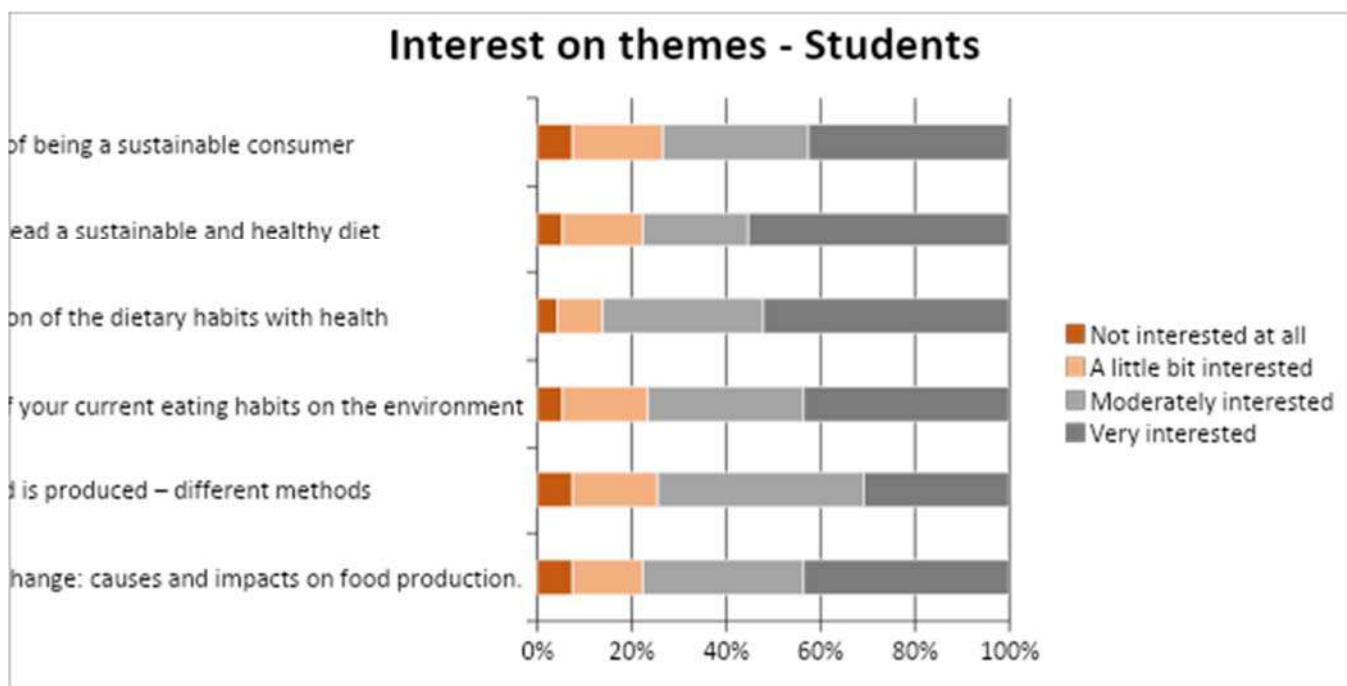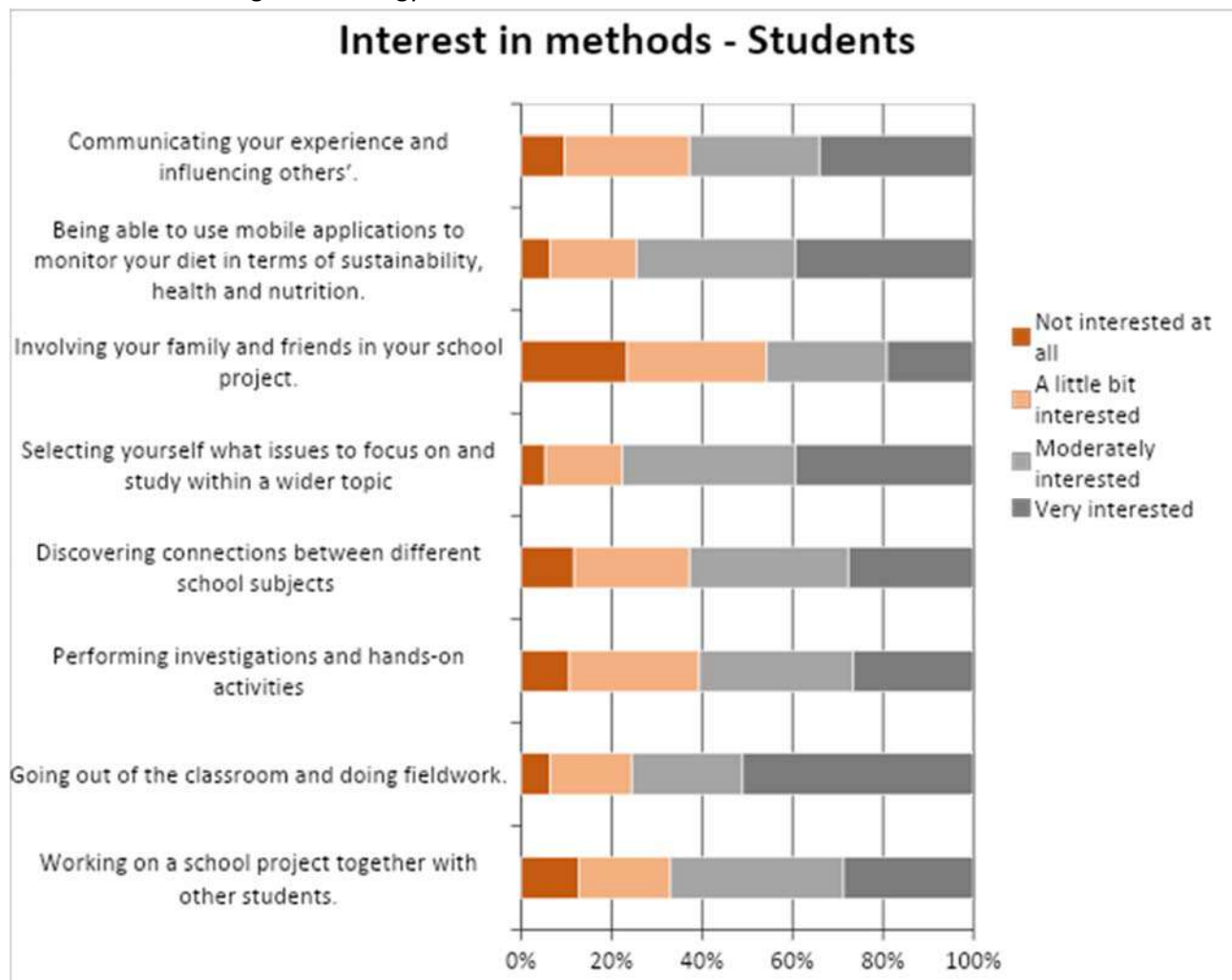

Regarding aspects of the proposed learning approach and tools, students appear to be mostly interested in aspects related to Inquiry-Based Learning, i.e. selecting themselves what issues to fucus on and explore within a wider topic, and going out of the classroom and doing fieldwork. Students also show strong interest in using the proposed tools, i.e. mobile applications to monitor their diets in terms of sustainability, health and nutrition. Most of the students are also interested in working together with their fellow students on a school project, communicating their experience in order to influence others, discovering connections between school subjects, and performing investigations and hands-on activities, although their interest is more balanced. Finally, the students recorded the less interest out of the activities proposed for involving their families and friends in their school project, with most of the participating students stating they are a little or not at all interested. The students' reluctance in involving their friends and family in their school project may link to their lack of experience in involving their families and friends in any of their school work, since such

initiatives are rare in the national educational curriculum. In any case, this finding should be the focus of further analysis through a focus group meeting and discussions with teachers and the students themselves, in order to identify the reasons and develop ways to overcome this in the learning methodology.

Interest in methods - Students

The second part of this section focuses on the students' perceptions and attitudes regarding issues related to the environment, healthy and sustainable diets, and aspects of the proposed learning approach like teamwork and using mobile applications. In general, students seem to be aware of the importance of environmental problems and have a positive attitude towards the protection of the environment and the need to have an active role in this effort. Moreover, the vast majority of students seem to be aware of the importance of their choices as consumers towards a sustainable and healthy diet and state they are willing to change their own eating habits to achieve it. Students also appear to have very positive attitudes towards the use of technology and online applications for learning purposes, while being aware of the dangers in always trusting the information they find on the internet. However, a relatively high proportion of the participants, ranging between 20-30 % does not share their fellow students' awareness and positive attitudes towards environmental issues.

Attitudes - Students
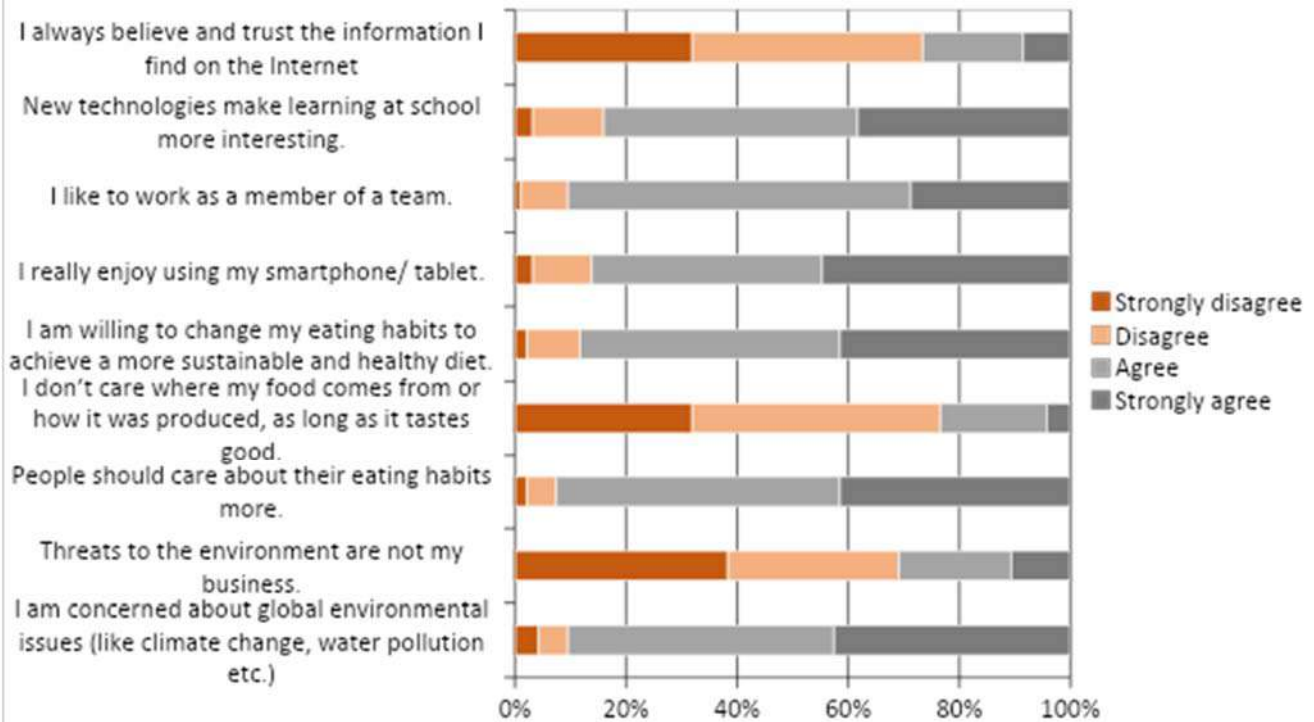
The next part of this section focuses on the students' perceptions and attitudes regarding the different components included in the STEAM learning approach, i.e. Science, Technology, Engineering, Arts (including the Humanities together with visual arts) and Math. The students were asked to rate how comfortable they feel with regard to each of these disciplines. Most students reported they feel comfortable with natural science subjects like Physics, Chemistry, Biology etc. (although a 20% stated they do not feel comfortable at all), as well as with Technology (i.e. the application of science for practical purposes). The students feel less comfortable with the rest of the disciplines proposed, i.e. Arts, Humanities, Math and Engineering, with almost 1 in 2 students stating they only feel a little comfortable or not comfortable at all. Especially with regard to Math, more than 30% of the students stated they do not feel comfortable at all.

How comfortable Students feel with:
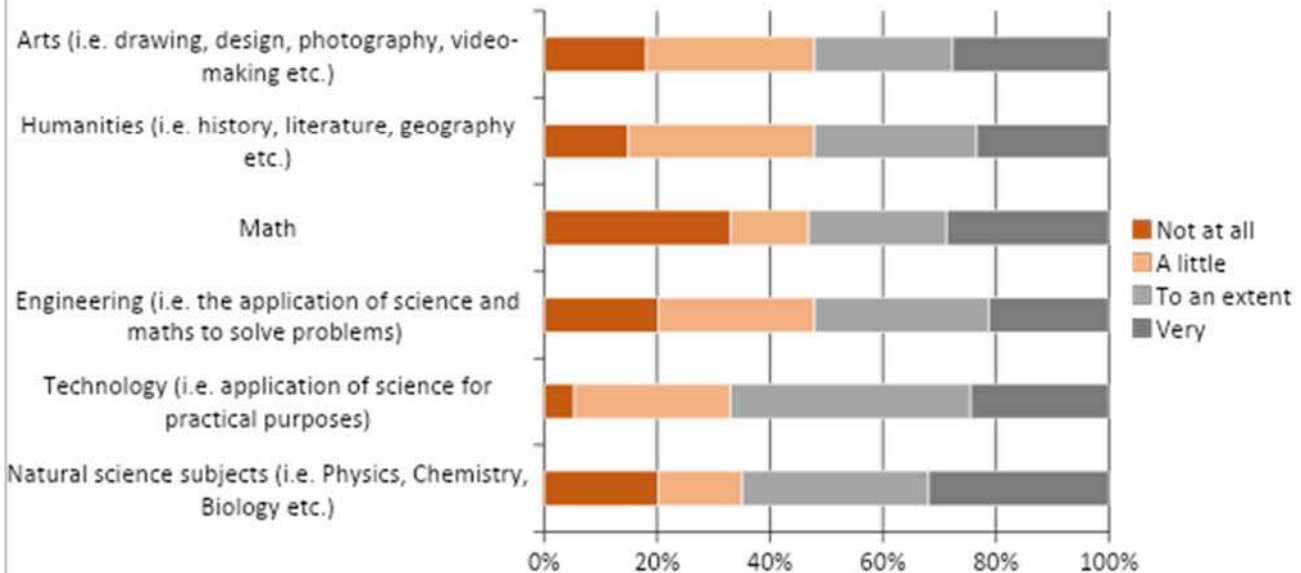
The following charts present the results of the question with regard to male and female students. It is important to note that male students seem to feel less comfortable with Arts and, to an extent, with the Humanities (i.e. History, Literature, Geography etc.) in comparison to their female fellow students. On the opposite, female students clearly appear to feel less comfortable with Math, Engineering and Technology in comparison to male students; especially with regard to Math, 1 in 2 female students stated they do not feel at all comfortable.

This finding confirms the trend reported in relevant research such as the PISA surveys, that there are statistically significant variations between male and female students concerning their engagement with different disciplines of the STEAM approach. In turn, it also confirms the GOODFOOD project's premise for an urgent need to apply a truly interdisciplinary STEAM learning methodology that incorporates different disciplines into the study of a real-life theme that concerns and attracts the interest of students in secondary education.

Level of comfort - Male Students
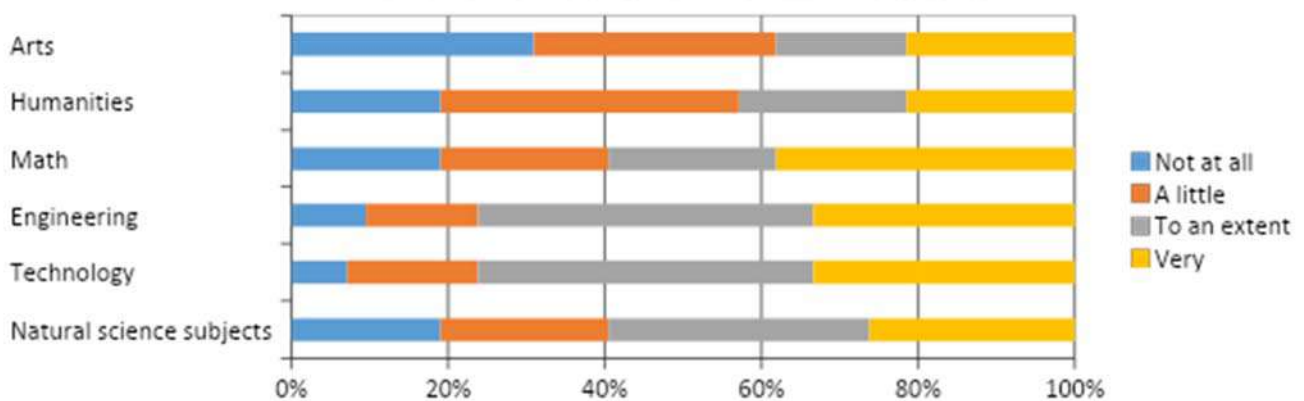
Level of comfort - Female Students
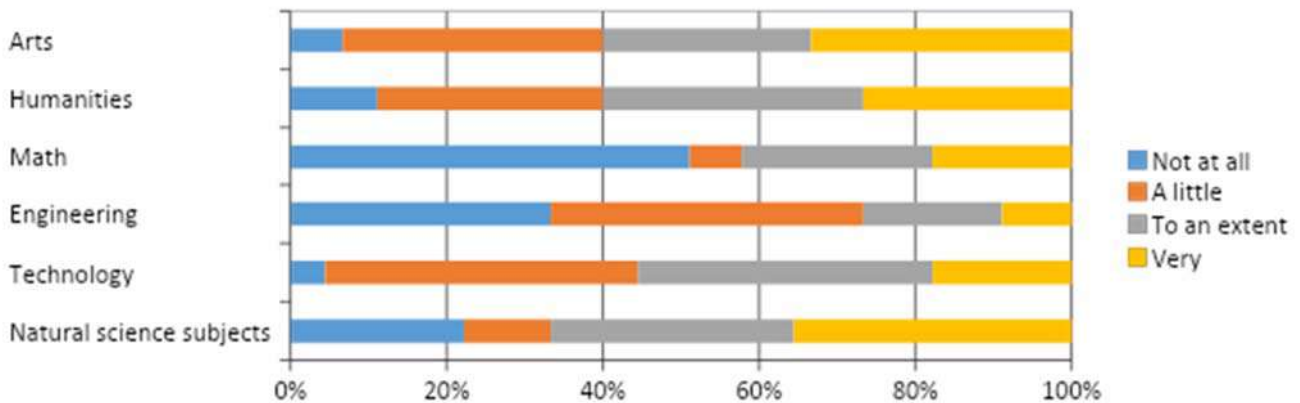
The next question focuses on whether students' personal interests or hobbies relate to the project theme, by examining the frequency of doing a related set of activities. Most students stated they often cook, select personally the food to buy, check the nutritional value of food or additives/preservatives on the packaging, and select organic food to buy. On the opposite, they do not usually check the origin of food, use an application to calculate the nutritional value of food or its environmental impact, or search for the effects of a particular food on health. It is important to note that 70% of the participating students have at least once used an application to calculate the nutritional value of food or its environmental impact, and this experience can be valuable in applying these tools for learning purposes.

Finally, the students were asked whether they follow a special diet, in order to assess how many follow a certain diet due to their lifestyle choices. The results reveal that 17% of students follow a special diet:

- ➢ 4 students are vegetarian,
- ➢ 6 are pescatarian, and
- ➢ 5 students follow a certain diet due to their religious beliefs
- ➢ 1 student follows a semi-vegetarian diet, i.e. eating only a specific type of meat.

Personal engagement - Students

Bar chart showing personal engagement of students across the following categories, rated as Never, Sometimes, Often, and Very often:

- Selecting organic food to eat
- Searching for the effects of a particular food on health
- Using an application to calculate the nutritional value of food or its environmental impact
- Checking the nutritional value of food or additives/preservatives on the packaging
- Checking the origin of food
- Personally selecting the food to buy
- Cooking

Legend:
- Never
- Sometimes
- Often
- Very often

Axis: 0% 20% 40% 60% 80% 100%

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Teachers' survey

The analysis of the findings of the teachers' survey are presented here, following the 4 sections' structure of the questionnaire, i.e. Profile, Knowledge, Skills, Interests-Perceptions-Attitudes.

<u>Profile</u>

Out of the 12 teachers who filled in the survey questionnaire, 7 are male and 5 are female. The majority is aged between 35 and 54 years old. They have different specialisations as follows:

- Languages/literature: 3 teachers
- Information Technology: 3 teachers
- Biology: 1 teacher
- Theology: 1 teacher
- Math: 1 teacher
- P.E. : 1 teacher
- Physics: 1 teacher
- Economics: 1 teacher

Their teaching experience varies greatly, including from relatively new teachers (2 years of experience) to very experienced teachers (41 years of experience).
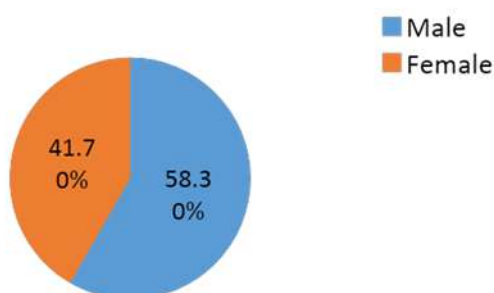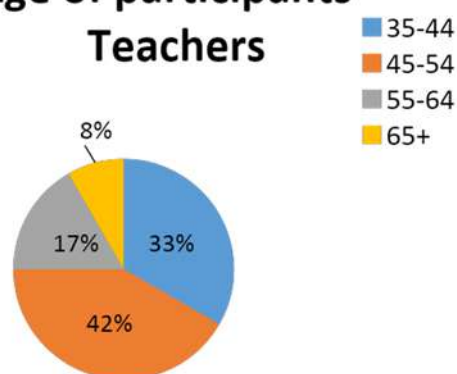
When asked to relate different types of food to the Mediterranean Diet (MD), teachers demonstrated a good level of knowledge, listing first foods that associate strongly to the MD like olive oil, fresh fruits, pulses, fish and seafood, as well as whole bran cereals, dairy foods, vegetables, red wine and unsalted nuts. In addition, they list at the bottom foods like butter/margarine/cream, desserts, white cereals and red meat. Similar to the students'

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results, the teachers rank white meat rather low in the list of foods related to the MD, revealing again a misconception that white meat is not included in the MD.

When asked to rate different proposed aspects in terms of their importance for a healthy diet, the teachers again demonstrated a good level of knowledge. The vast majority stated that most of the aspects proposed are important or very important for a healthy diet. The exception, similar to the students' results, is the aspect of following a vegetarian or vegan diet,

Foods mostly related to Mediterranean diet - Teachers

ranges, mandarins, pears, melons, bananas)

, peas, chickpeas, lentils)

s (e.g.: bread, pasta, rice)

ilk, cheese, yogurt)

ttuce, spinach, onions, carrots, broccoli, etc.)

: walnuts, almonds, cashew nuts, chestnuts)

h onion/garlic and olive oil)

hicken, turkey, rabbit)

ved products (e.g.: beef, pork, lamb, sausages, hamburgers)

nd pasta

es, biscuits, ice-creams, pastries)

cream, whipped cream

commercial fruit juices, cola and carbonated drinks)

anuts, pistachios, sunflower seeds, etc.)

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where their views appear divided – half of them think it is important or very important, while the rest believe it is of little or no importance. In combination to the students' results, it is clear that there is a gap of knowledge regarding the role of a vegetarian or vegan diet in terms of health, and this should be taken into account in the design of the learning methodology and modules.

In terms of connecting certain aspects to sustainable food production, the majority of teachers attributes high connection to issues like low environmental impact, local production,

Importance to a healthy diet - Teachers
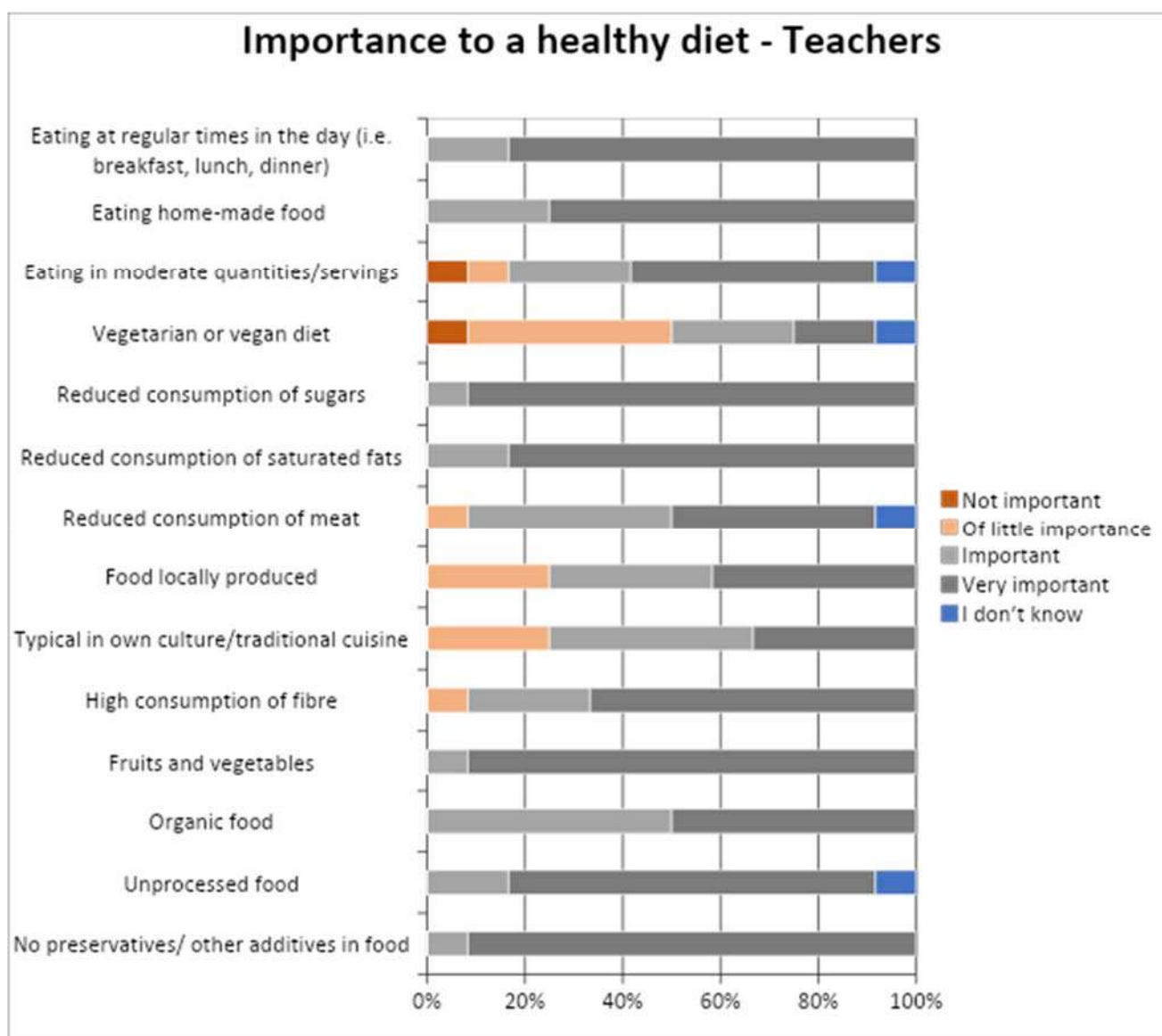
production by organic farming, securing a sustainable income for producers, and involving little or no packaging. The vast majority attributes only moderate connection of low waste to sustainable food production. On the opposite, developing new sources of food is ranked as having low connection to sustainable food production. The aspect of low cost seems to have divided the teachers' views, while 2 of the teachers stated they don't know. Overall, although the teachers demonstrate a good level of knowledge, there are gaps of knowledge on certain
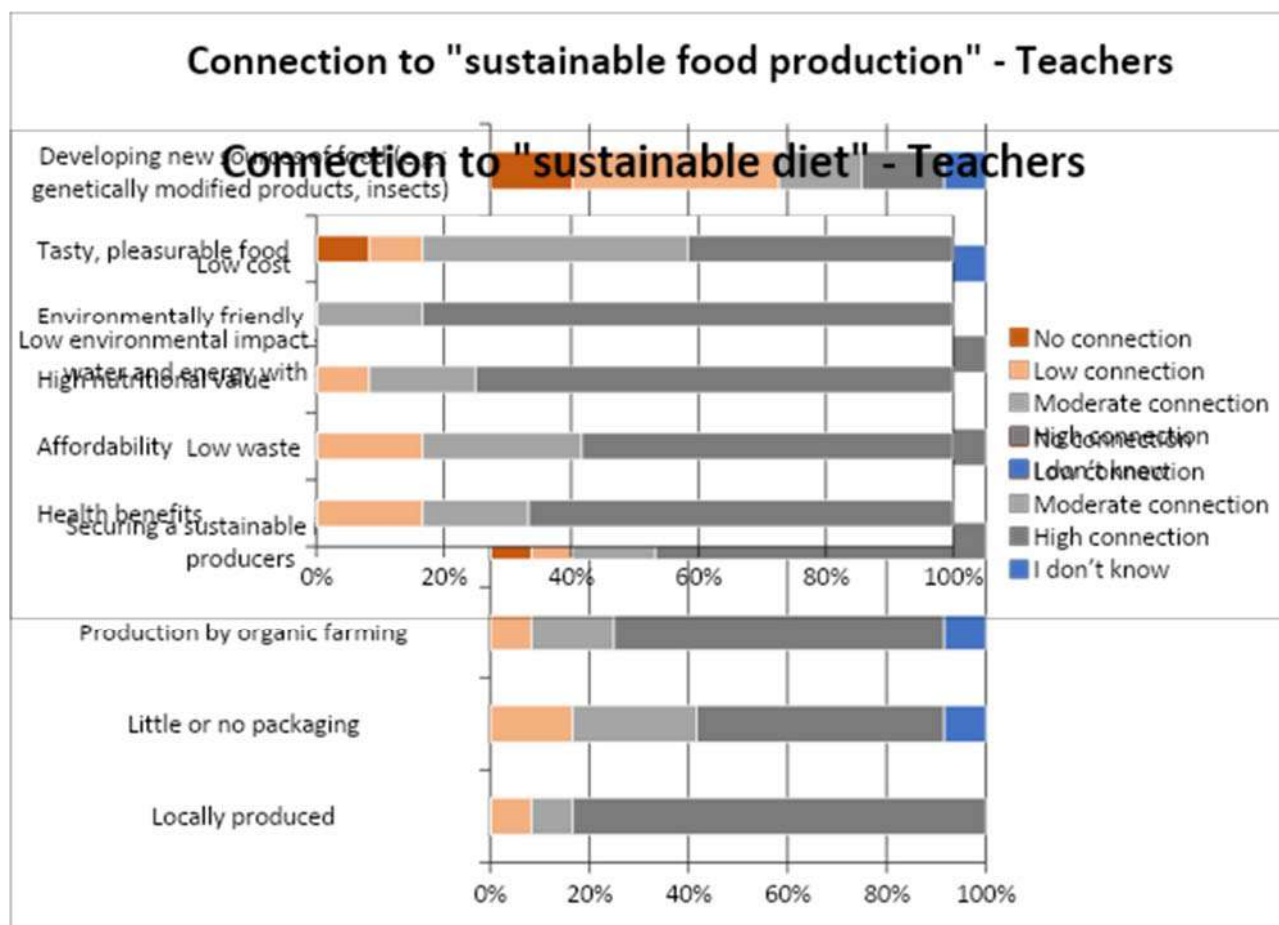
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issues like the development of new sources of food and the production cost in relation to sustainable production.

In a similar question regarding the connection of certain aspects to a sustainable diet, the

teachers demonstrate a good level of knowledge, attributing moderate or high connection to all the aspects proposed.

On the next question, teachers were asked to rate their levels of knowledge with regard to specific issues within the project themes. As presented in the chart below, most of the participating teachers claim to have sufficient knowledge on issues related to a healthy diet like the nutritional value of food, the importance of food for wellbeing, cardiovascular diseases associated with dietary habits, and eating disorders. Also, most teachers claim to have sufficient knowledge on the issue of food waste and recycling. On the contrary, teachers' knowledge is limited with regard to issues associated with sustainable food production and consumption, like sustainable farming and food chains. These findings are related to the learning activities already implemented at school, that focused on the themes of healthy diet and food waste/recycling (construction of a school composter).

Knowledge on issues - Teachers

Legend:
- I have no knowledge at all
- I have some knowledge
- I have sufficient knowledge
- I know a great deal

Categories:
- Eating disorders (e.g. bulimia, anorexia)
- Cardiovascular diseases associated with dietary and lifestyle habits
- Importance of food for wellbeing
- Nutritional value of food
- Food waste and recycling
- Food chains
- Sustainable farming
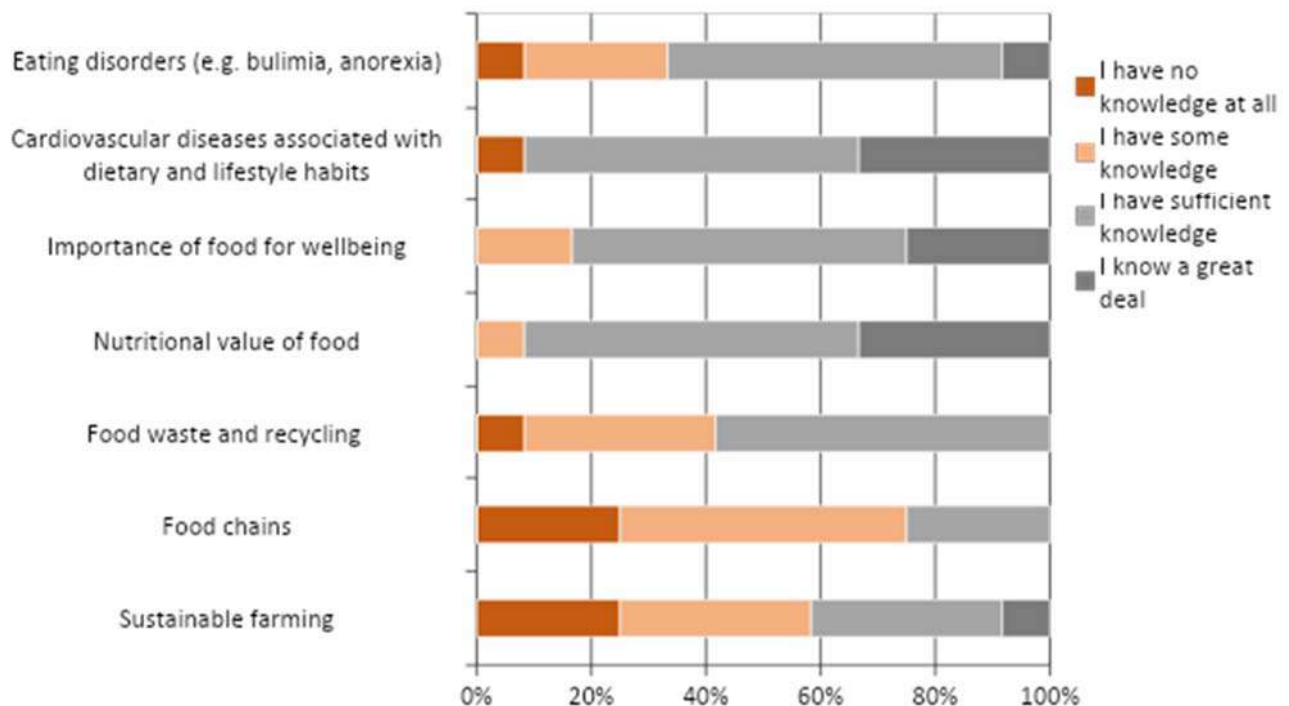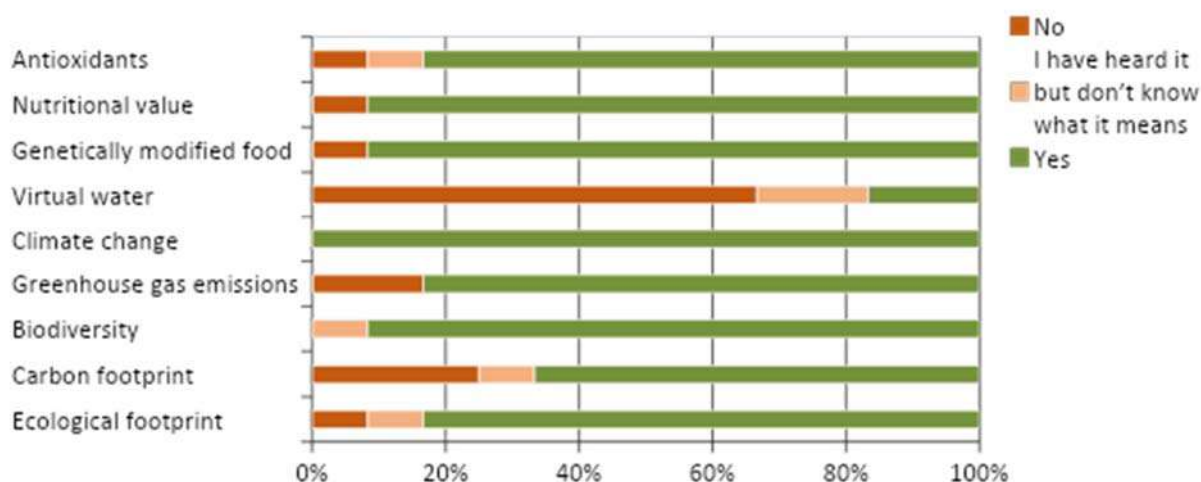
With regard to the teachers' knowledge of the terminology presented, the participating teachers appear to be familiar with all the terms presented, except the term "virtual water" that is unknown to the vast majority. This term should be introduced and explained in the related learning modules.

Knowledge of terms - Teachers

The participating teachers were also asked to relate central project themes like food production, food consumption, and healthy diet, to a wide range of school subjects. The results are similar to the results in the students' survey, with Biology and Chemistry seen as mostly relevant to all 3 themes; however, the teachers also highlight the role of History as an all-round subject that connects to all project themes. Similar to the students' responses in this question, Economics and Geography are seen as relevant mainly to the theme of food production, while P.E. is mainly related to healthy diet. It is important to note that – similar to the students' responses – the teachers do not see a strong relation of Art and Math to the project themes; the importance and role of these subjects in the proposed learning methodology should be clearly demonstrated.

Relation of topics to school subjects - Teachers
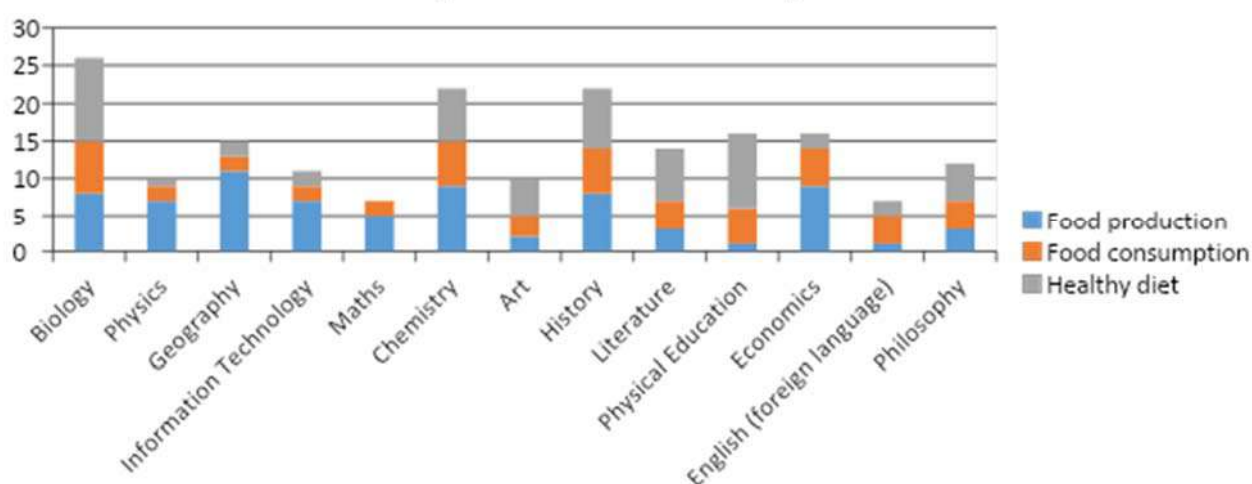
In the next two questions, teachers were asked to rate their knowledge and experience on the Inquiry-Based Learning (IBL) and STEAM learning approaches proposed by the GOODFOOD project, and share their views on possible limitations of implementing an integrated STEAM learning methodology in their school and the Greek secondary education system.

The results presented in the chart below demonstrate that although the vast majority of teachers are familiar and have experience in implementing the IBL approach in their teaching, their knowledge and experience with the STEAM approach is more limited. Only 7 out of the 12 teachers report they know the meaning and applications of STEAM, and 6 out of 12 claim to have already used it in practice and feel well-prepared to implement it. However, all teachers declare their interest in taking part in project-based teaching, and agree that the STEAM approach is useful and the STEAM skills are increasingly necessary for the students in order to engage in a knowledge-based economy (this excludes 3 teachers who stated they do not know the meaning of STEAM and therefore cannot respond on its usefulness). Additionally, although most teachers claim that they often work together with their colleagues from other curriculum subjects on a common topic, often do project work with their students within the school curriculum, and have taken part in project-based teaching, all participating teachers agree that the teachers should be better prepared for cooperation among them and project-based learning. Finally, most of the teachers (7 out of 12) believe that the implementation of a STEAM methodology has many limitations in their school.

The following question focuses on possible limitations of applying an integrated STEAM education at school. Although the teachers in their majority believe that there is interest among teachers and students in applying the STEAM approach, and believe it is possible to integrate STEAM into the school curriculum, they support there are knowledge gaps among the teachers about the methodology, and rank limitations in applying STEAM in their school as follows:

- 10 out of 12 teachers believe that the organization of classes at school makes it hard to implement a STEAM methodology.
- 7 out of 12 teachers believe that the national education system is not prepared to integrate a STEAM methodology, and there are time limitations in the school programme.
- Finally, half of the participating teachers support that there is no sufficient equipment to carry out a STEAM methodology.

Overall, the findings in this section of the survey strongly indicate the need for supporting schools and teachers in applying STEAM, in two ways:

- Training in the STEAM learning approach in order to prepare them sufficiently for implementing STEAM at school, and
- Offering them a learning methodology that takes into account the limitations of a strict school programme that leaves no time for additional learning activities, and therefore is flexible and practical.

Teachers' knowledge and experience of STEAM and IBL

Legend:
- Not at all
- A little
- To an extent
- Very much
- I don't know

Row labels (partially visible):
- ...rning approach in class
- ...ng approach in education
- ...the school curriculum.
- ...other curriculum subjects on a common topic.
- ...operation among them and project-based learning.
- ...y has many limitations in our school.
- ...engage in a knowledge-based economy.
- ...M methodology.
- ...aching.
- ...AM methodology.
- ...EAM methodology.

Limitations of integrated STEAM education
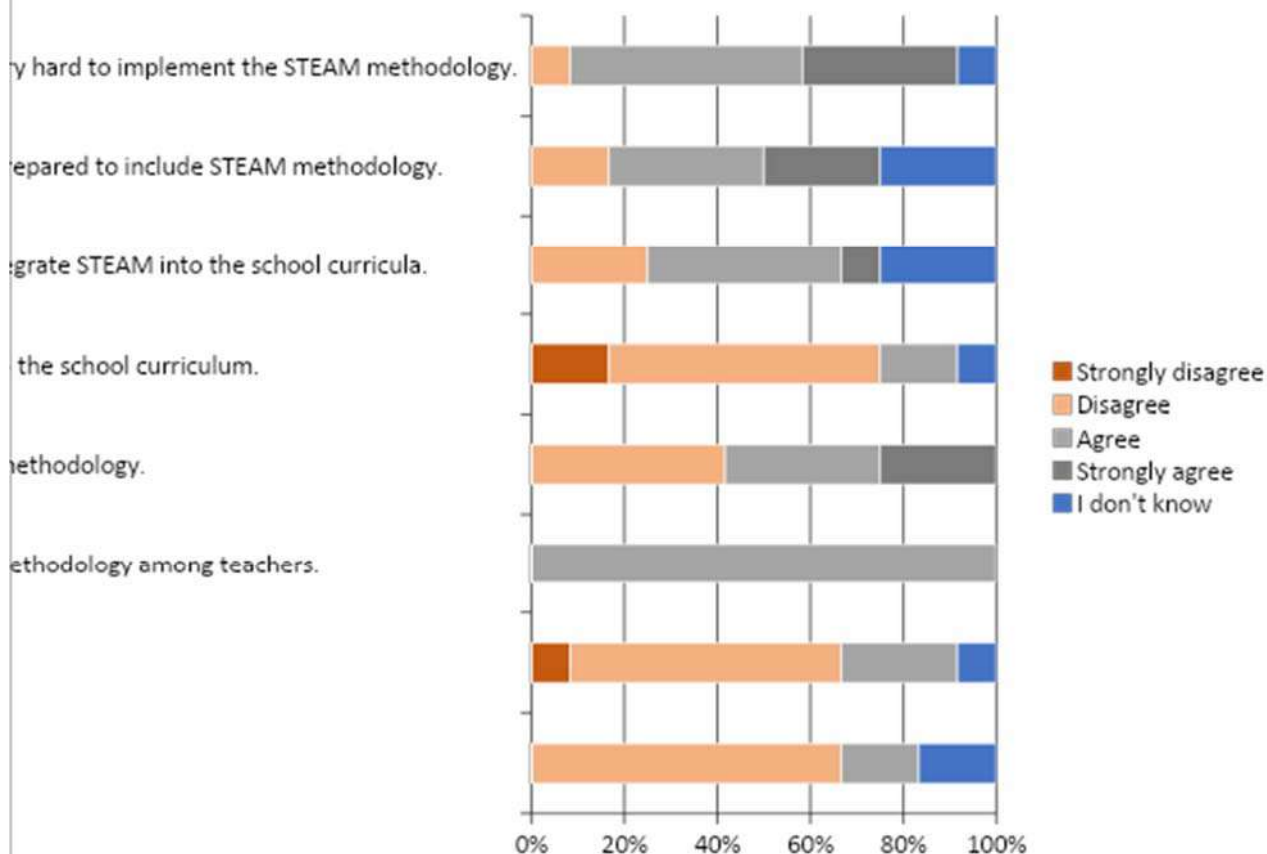
Skills

Under this section, teachers were asked to report how often they have carried out a certain set of activities, in order to assess their level with regard to skills that are considered key to implement the proposed learning approaches.

The majority of teachers report they regularly or very often guide their students to work in teams, do fieldwork to gather information, keep to deadlines, communicate opinions and ideas verbally, and use office applications like Word, Excel and Powerpoint. Moreover, most of the teachers claim they regularly use smartphones or tablets in their teaching work at school. On the contrary, most of the teachers have very limited experience in collaborating with their colleagues from other disciplines on a common project course. Moreover, 5 out of the 12 teachers have never used applications to monitor the nutritional value or sustainability of food.
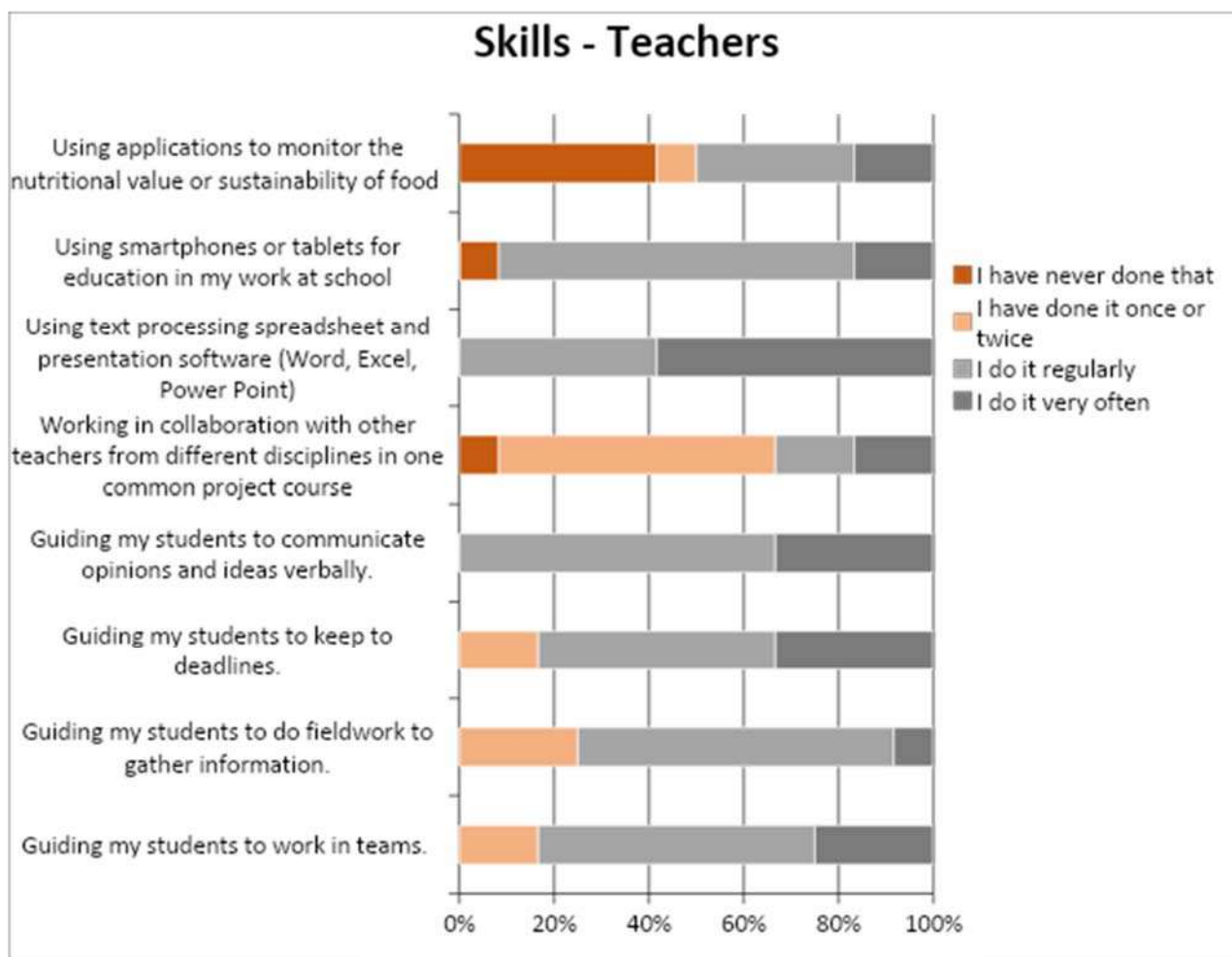
The findings under this section of the survey confirm the need to provide a clear and practical collaboration framework within the GOODFOOD learning methodology, as well as guidance and training on how to use and integrate digital tools (online applications) foreseen for

monitoring purposes, to assist the teachers in applying the integrated interdisciplinary STEAM approach proposed.

Skills - Teachers

Legend:
- I have never done that
- I have done it once or twice
- I do it regularly
- I do it very often

Categories:
- Using applications to monitor the nutritional value or sustainability of food
- Using smartphones or tablets for education in my work at school
- Using text processing spreadsheet and presentation software (Word, Excel, Power Point)
- Working in collaboration with other teachers from different disciplines in one common project course
- Guiding my students to communicate opinions and ideas verbally.
- Guiding my students to keep to deadlines.
- Guiding my students to do fieldwork to gather information.
- Guiding my students to work in teams.

Interests – perceptions – attitudes

The vast majority of the participating teachers appear to be very interested in teaching about issues especially related to the themes of the project, whether linked to sustainable food production (i.e. the causes of climate change and its impact on food production, different methods of food production), sustainable food consumption (i.e. the impact of our current eating habits on the environment, benefits of being a sustainable consumer), and healthy diet (i.e. ways to lead a sustainable and healthy diet, and the association of dietary habits with health).

Additionally, most teachers are very interested in applying certain key aspects of the proposed methodology – working on a school project together with their students and experts, collaborating with colleagues from different disciplines in one interdisciplinary project course and establishing closer connections between different school subjects, taking the students on fieldwork, instructing them on the use of online/mobile applications for learning purposes and on ways to investigate in order to verify information found on the internet, and supporting the students in communicating their findings to a wider audience.
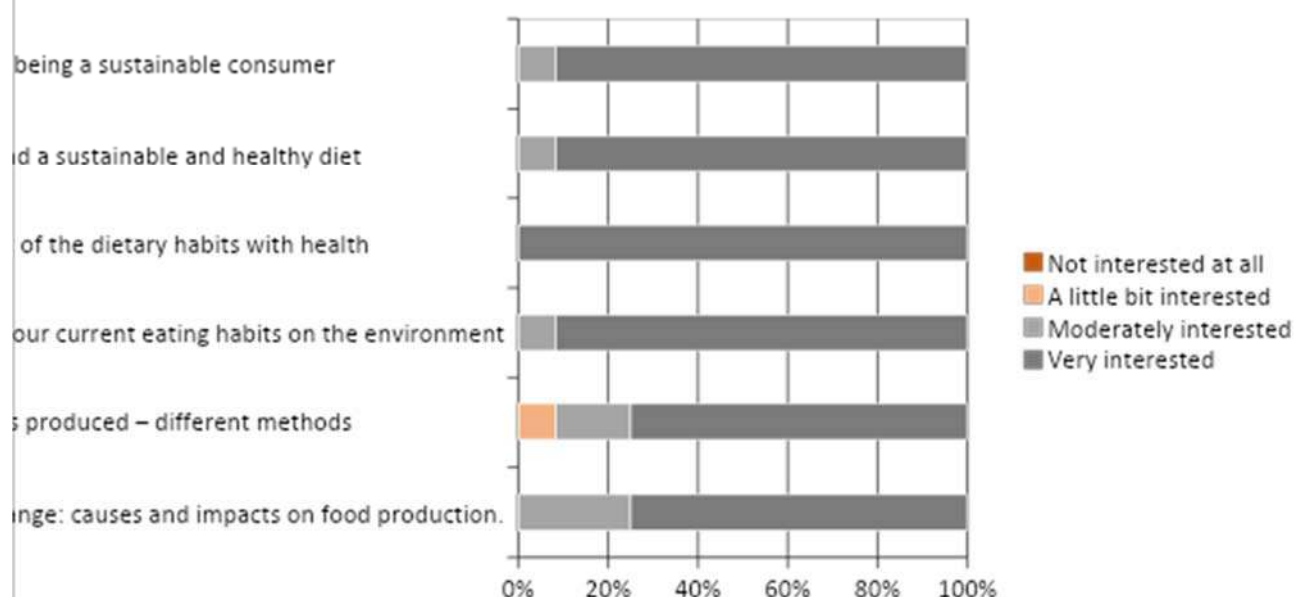
33

Interest in themes - Teachers

- being a sustainable consumer
- d a sustainable and healthy diet
- of the dietary habits with health
- our current eating habits on the environment
- s produced – different methods
- nge: causes and impacts on food production.

Legend:
- Not interested at all
- A little bit interested
- Moderately interested
- Very interested

0% 20% 40% 60% 80% 100%

Interest in methods - Teachers

- e Internet
- d other subjects like IT, PE, Literature and Art.

Legend:
- Not interested at all
- A little bit interested
- Moderately interested
- Very interested

0% 20% 40% 60% 80% 100%

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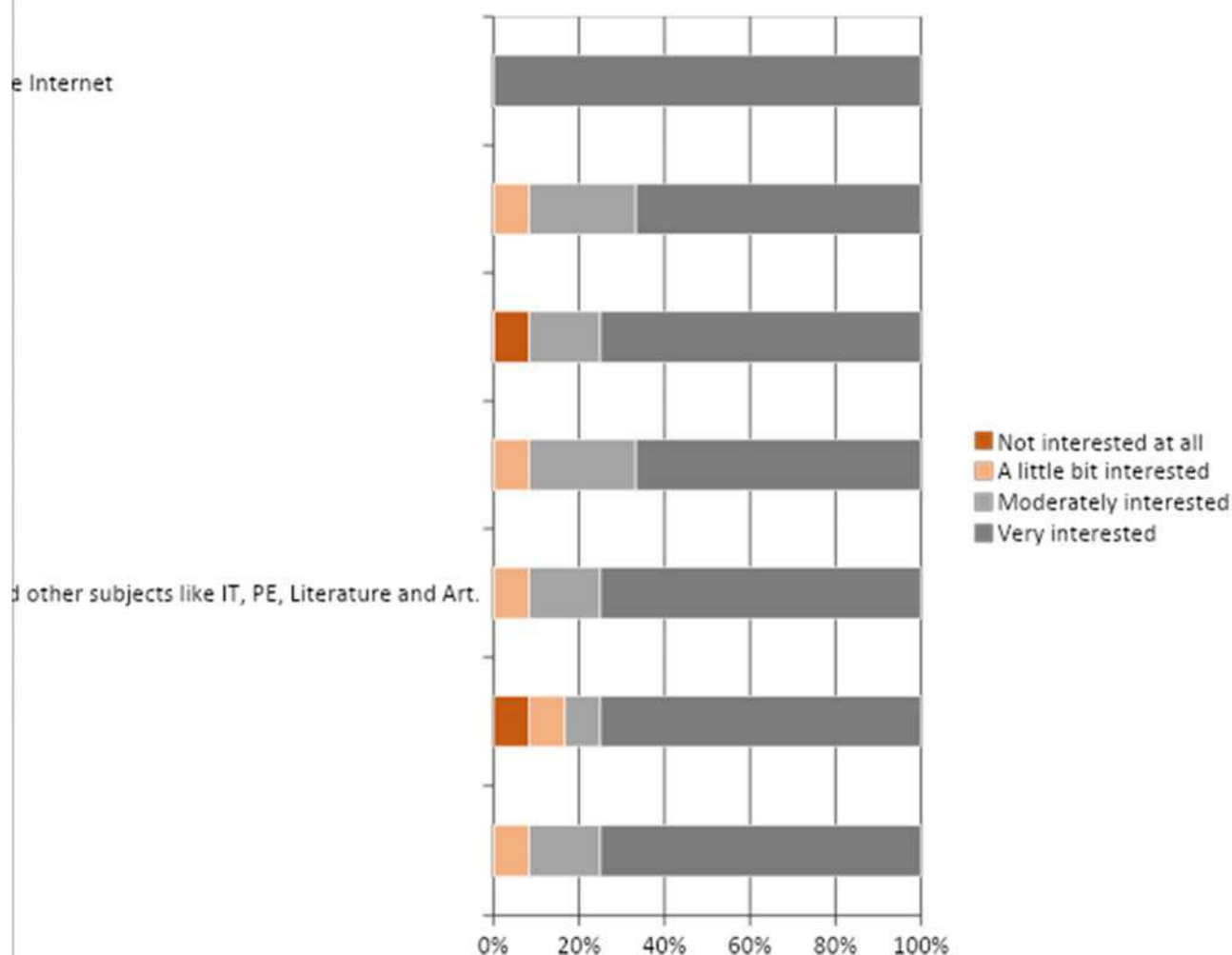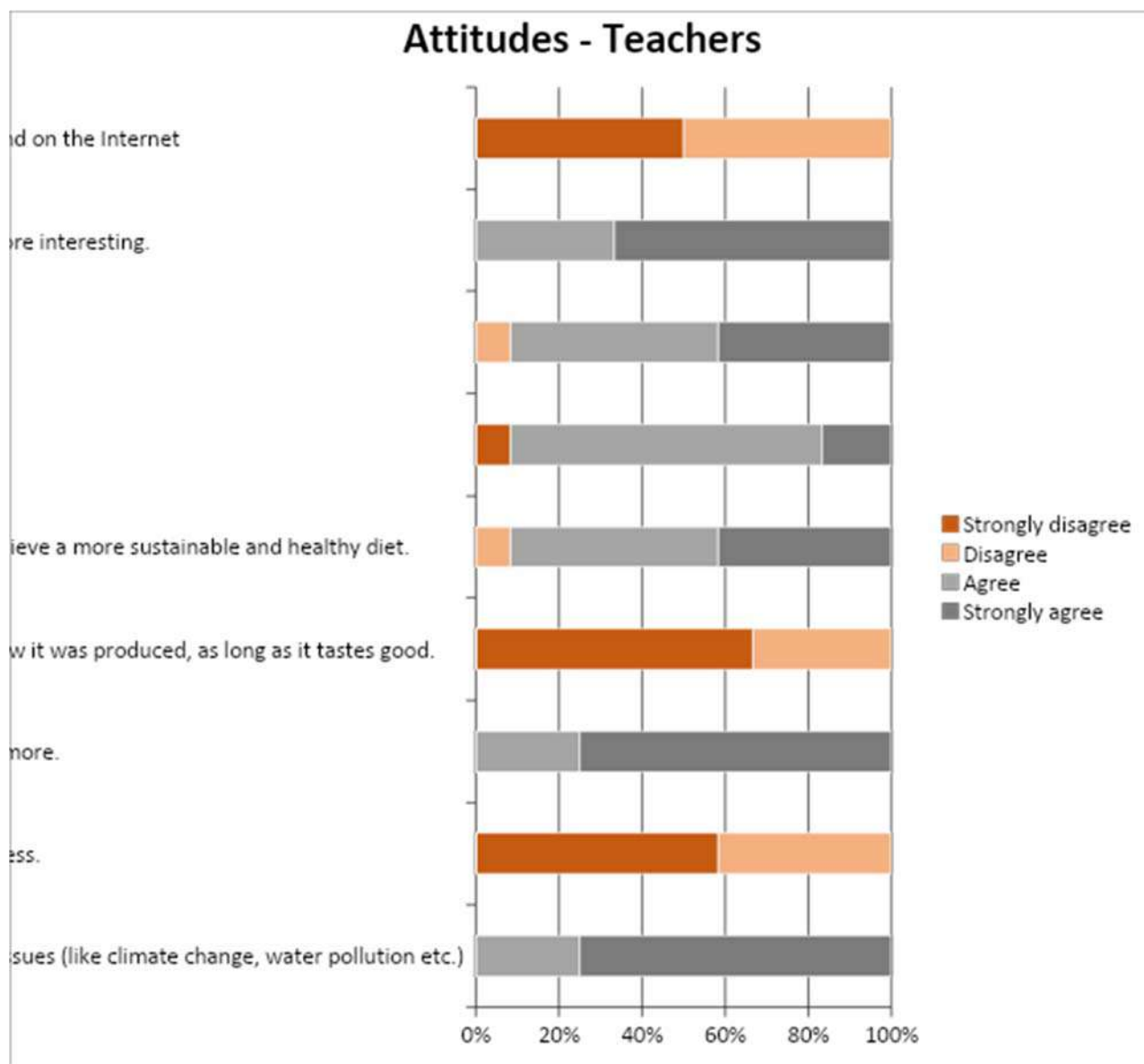
Teachers demonstrate very positive attitudes towards the importance of the environmental issues and the protection of the environment. They also show a positive stance in relation to following a sustainable and healthy diet, working as a member of a team, and using technology in their teaching work at school. It should be noted that, as presented in the following chart, not all teachers have positive attitudes towards parts of the proposed methodology, i.e. working as a member of a team, using mobile devises or willing to change their lifestyles towards a more sustainable and healthy diet.

Attitudes - Teachers

d on the Internet

re interesting.

ieve a more sustainable and healthy diet.

w it was produced, as long as it tastes good.

nore.

ess.

sues (like climate change, water pollution etc.)

Legend:
- Strongly disagree
- Disagree
- Agree
- Strongly agree

0%   20%   40%   60%   80%   100%

Finally, the last question focuses on whether the teachers' personal interests or hobbies relate to the project theme, by examining the frequency of doing a related set of activities. Most of the teachers stated they cook very often, they personally select the food to buy, check the origin of food as well as the nutritional value or additives/preservatives on the packaging. Additionally, most teachers often select organic food to eat and search for the effects of a particular food on health. On the contrary, most teachers do not usually use an application to calculate food's nutritional value or environmental impact.

Overall, most of the teachers seem to have a good level of awareness on being sustainable consumers and leading a sustainable and healthy diet, as evident from their personal life choices.
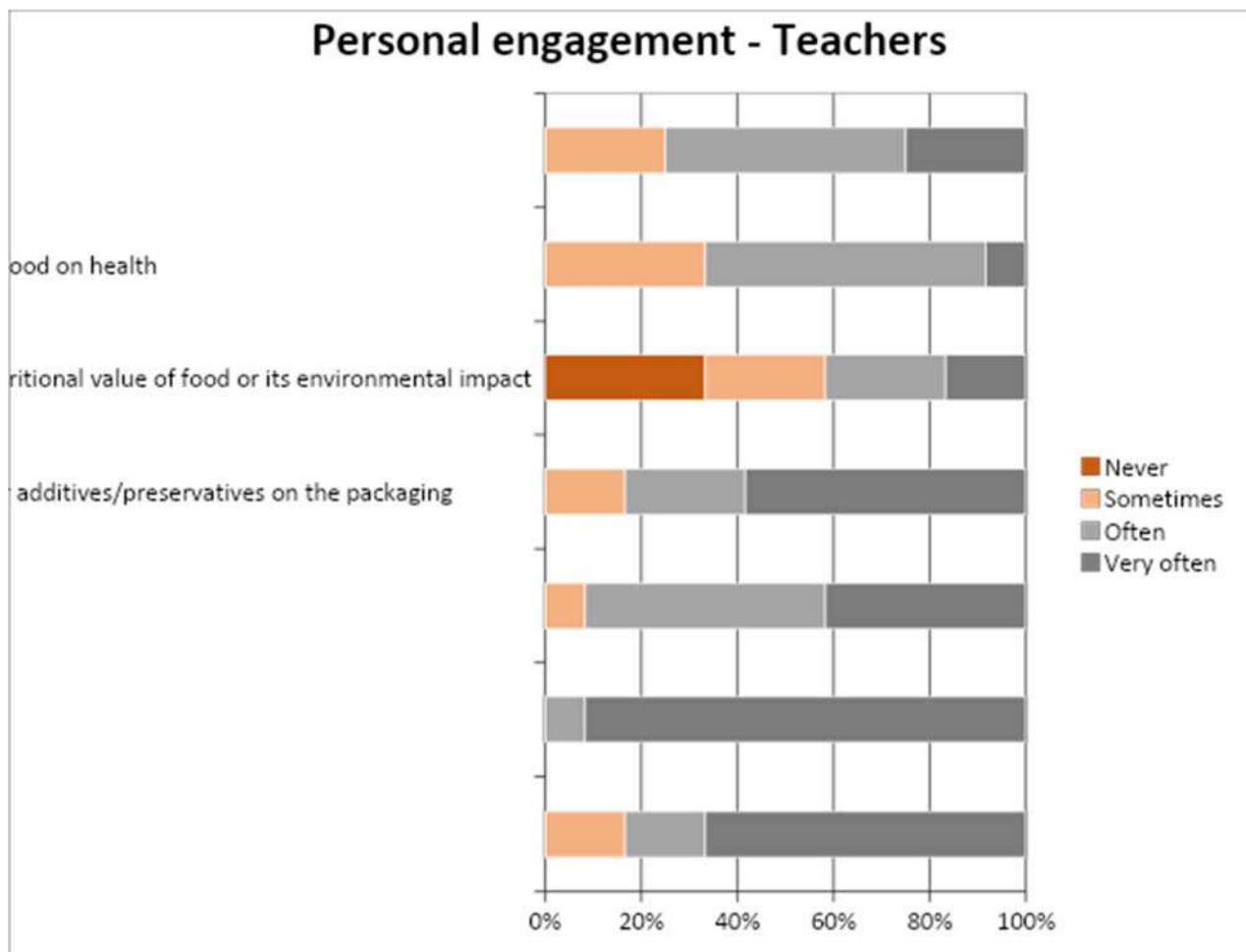
Conclusion

The survey findings in general reflect the experience of both students and teachers, having implemented learning activities focusing mainly on healthy diet, rather than sustainable food production and consumption.

The findings presented above draw a set of conclusions regarding the knowledge, skills, interests and attitudes of the participating students and teachers of the 1st General Lyceum of Rafina, that are summarized below.

<u>Knowledge</u>

The main findings with regard to knowledge are as follows:

- Good level of knowledge regarding foods that relate to the Mediterranean Diet, although the survey results also highlighted misconceptions that need to be tackled – for example, white cereal and red meat are connected to the MD by a proportion of the students, while white meat is ranked low by both students and teachers in terms of connection to the MD. The misconception that MD is a variation of a pescatarian diet should be tackled effectively.
- Gaps of knowledge were identified on issues related to the theme of sustainable food consumption, like the importance of low waste, low production cost, limiting packaging and developing new sources of food.
- Views differ between both students and teachers regarding the importance of vegan/vegetarian diet to a healthy diet, which means there is a lack of knowledge on this issue. Also, the importance of consuming food locally produced and typical in own cuisine, as well as eating in moderate servings, is underestimated by students.
- The importance of affordability and the hedonic aspect of food for a sustainable diet is not thoroughly recognized by the students.
- Gaps of knowledge identified mainly in the themes connected to the sustainable food production theme of the project, e.g. sustainable farming, food chains, as well as diseases associated with dietary/lifestyle habits and eating disorders.
- An important proportion of the students are not familiar to key tems like "Carbon footprint", "Ecological footprint", "Biodiversity", "Antioxidants" and "Virtual water". These terms should be thoroughly explained.
- The methodology should highlight the relation of most of the school subjects to the themes of the project – this connection must first be demonstrated to the teachers themselves. Not all subjects are expected to carry equal weight, however the point is to encourage collaboration and cross-fertilisation between disciplines to offer a rich learning experience. The relation of school subjects to central project themes, as seen by both students and teachers, stands as follows:
    - o Biology is seen as relevant to all 3 themes (i.e. sustainable production, sustainable consumption, healthy diet).
    - o Chemistry is seen as relevant mainly to sustainable production.
    - o Physical Education is seen as relevant mainly to healthy diet.

- o Geography and Economics are seen as mostly relevant to sustainable production and consumption
- o History is highlighted as an all-round subject, relevant equally to all 3 themes.
- o The role of IT and English (foreign language) is underestimated, and should be stressed effectively in the learning methodology.
- o Math and Art are barely seen as relevant to the 3 project themes; their role in the learning methodology should be highlighted.
- ● The survey findings strongly indicate the need for supporting schools and teachers in applying STEAM, in two ways:

  - o Foreseeing the teachers' training in the STEAM learning approach in order to prepare them sufficiently for implementing STEAM at school, and

  - o Offering them a learning methodology that includes a clear and practical collaboration framework, and takes into account the limitations of a strict school programme that leaves no time for additional learning activities, and therefore is flexible and practical.

Skills

The main findings with regard to skills are presented below:

- ● The students may not be familiar with using Art to communicate ideas, as Art is not integrated in the school curriculum.
- ● Although the majority of the students seem to possess the necessary skills to carry out activities foreseen, an important proportion of the students (40% - 50%) have very limited or no experience at all. The proposed learning methodology should take this into account and not assume that students already possess the skills necessary to carry out the proposed learning activity; instead, practical examples, guidance by the teachers, and practice in class should be used to assist the students in feeling more comfortable with carrying out the learning activities.
- ● The online/mobile applications proposed as learning tools should be simple and user friendly, and any necessary guidance should be offered to students and to teachers for their use within the GOODFOOD Methodology.
- ● The lack of experience of teachers of various disciplines in collaborating together in one project course should be taken into account, putting forward a clear and practical collaboration framework.

Interests – attitudes

- ● Both students and teachers declare strong interest in learning about the project themes and carrying out key activities foreseen in the learning approach proposed.
- ● The students' recorded hesitation in involving their friends and family in their school project may link to their lack of experience in involving their families and friends in any of their school work, since such initiatives are rare in the national educational curriculum. The involvement of family and friends, foreseen in the learning approach

proposed, should be smooth and not putting too much weight on the students' shoulders.

- Overall, participating students and teachers revealed very positive attitudes towards the project themes and learning approaches. However, a relatively high proportion of the participating students, ranging between 20-30%, does not share their fellow students' awareness and positive attitudes towards environmental issues.
- A clear framework and training should help in changing the negative attitudes of some of the teachers who are skeptical regarding certain aspects of the methodology like the use of applications and collaboration with colleagues of other disciplines.
- The GOODFOOD Methodology (STEAM and IBL approaches) is expected to improve the current negative attitudes of students with regard to Math, Science, Art, by making them more relevant to their own lives and taking students away from the strict school curriculum and traditional classroom teaching.
- The encouraging findings regarding students' personal engagement with regard to project themes (e.g. most of them cook often) should be taken into account in the design of the learning methodology.