

STE (A) MIT INTEGRATED LESSON PLAN

Title

Food Biochemistry

Authors

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Summary

Interdisciplinarity is part of a modern education that aims, at the end of the educational path, an optimal integration of the educated in society, on the labor market and in the family.

A holistic knowledge of the world brings with it a deep understanding of the micro and macrocosm, scientific and moral landmarks, and adaptability to social and economic conditions.

Diversification of students' educational field on the lifestyle adopted with a significant impact on their health, through risky behaviors (alcohol, tobacco, drugs, etc.), eating characteristics, exercise, leisure and stress limitation, behaviors to prevent various diseases - the evaluation of certain types of psycho-social behavior in situational contexts given by the values and attitudes related to health, these influencing the behaviors related to health.

The implementation of this activity aims to inform students about the importance of selecting certain categories of products, in particular juices packaged in plastic bottles which have recently begun to be consumed in much too large quantities, compared to the recommended daily dose, being preferred to water, without taking into account its side effects that will appear after a period of time.

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Subject (s)

STEM Subject 1 - Informatics (ICT)

STEM Subject 2 - Chemistry

STEM Subject 3 - Mathematics

Non-STEM Subject - English language

Real-life questions

Is it important to know the chemistry of the elements in frequently consumed products?

Is it necessary to know the contents listed on the product packaging?

Do excessive consumption of products containing food additives have any influence on health?

Aims of the lesson

By the end of the lesson, students should be able to:

Informatics (ICT)

- use appropriate software for reading barcodes, applications for calculating the nutritional value of product packaging, applications for calculating glycemic index
- apply video editing - WeVideo, Video Editor to promote healthy habits
- create collages with Canva
- identify words that contain names of minerals from the puzzle created in EducaPlay

Chemistry

- explain the structure of vitamins and minerals from body
- relate the properties / chemical elements of minerals that help the body
- know the connection between chemistry and mathematics
- calculate the atomic mass

Mathematics

- explain the difference between calories and kilocalories,
- apply the percentage calculation

Science learning must be done methodically, algorithmically. At the same time, transdisciplinarity involves a combination of methods and procedures specific to the disciplines of the curricular area of mathematics and science and technology. In this lesson we proposed activities based on the knowledge acquired in mathematics, chemistry and ICT, based on solving problems specific to the real world, from the perspective of mathematics and science. In this lesson students investigate methods of analyzing foods and learn more about the colors, additives and preservatives that are designed to make our food attractive and give it a long shelf-life.

The aim of the lesson is to put the chemistry into a context that students can easily relate

Connection to STEM careers

- Biochemist: studying the influence of different factors that influence nutrition
- Food biochemistry expert
- Mathematician and statistician
- Sciences teacher

By implementing the activities described in this lesson plan in the classroom, students will acquire skills in:

- Communication in foreign languages, initiative and entrepreneurship, mathematics by applying knowledge in problem solving, in the use of digital tools.
- The students can be oriented towards professions in the field of chemistry: biochemist in medicine, biochemist in food, computer scientist, video game programmer.



- Mathematical modeling of various problematic contexts, by integrating knowledge in different fields,
- Using algorithms and mathematical concepts for local or global characterization of a concrete situation,
- Experimental and theoretical scientific investigation,

Age of students

11-14

Time

Preparation time: 1 hour

Teaching time: 5 hours

- Preparation: 1 hour
- STEM Subject 1: Informatics: 1 hour
- STEM Subject 2: Chemistry: 1 hour
- STEM Subject 3: Mathematics: 1 hour
- non-STEM subject: Languages: 1 hour

Teaching resources (material & online tools)

Materials:

- Tablets or PCs with the Internet connection
- <https://www.youtube.com/watch?v=URcDTN8dcQY&list=PLRoD4fBs2EVPZEpk1HY7XbNiU92mrSNH9>
- https://www.youtube.com/watch?v=xraFmK_n1WY
- <https://www.youtube.com/watch?v=NZKBQ23VONA>
- <https://youtu.be/YimuIdEZSNY>
- <https://youtu.be/0KbA8pFW3tg>
- <https://youtu.be/0KbA8pFW3tg>

Online resources :

<http://platon.ea.gr/content/3d-interdisciplinary-map-science-ideas>

<http://vishub.org/>

Online tools:

[Lessons on the platform Graasp](#)



- <https://cloud.graasp.eu/ro/pages/5b3a0fa236fcba175ddfe36c/subpages/5ea5ee6e06e9b92048500667?previewing=true>
- <https://cloud.graasp.eu/ro/pages/596864794acfb4c31450989>
- <https://kahoot.it/>
- https://www.educaplay.com/learning-resources/5566960-raspunde_la_intrebari.html
- <https://ro.padlet.com/lidiaristea2004/5dvd9onl9211>
- <https://mm.tt/1708059518?t=ErBbGPIrSo>
- <https://mm.tt/1708057607?t=JK6uqSGiHs>

21st century skills

This lesson plan will enhance among the students the following skills, defined as 21st century skills:

- Critical thinking - thinking of who to eat healthy in everyday life
- Problem solving - making experiments on food biochemistry- the content of fats, salt and sugar in the most consumed products
 - calculations: body mass index, basal energy consumption, calorie consumption / day
- Creativity - Creativity - making the difference between natural and synthetic vitamins and minerals.
- Collaboration - students work in teams and each group realize a PowerPoint presentation
- Initiative - making their own presentation about healthy food & fast food - the difference between natural and synthetic vitamins and minerals
- Investigate - how many kcal should be consume per day
- Computational thinking and digital literacy - students seek solutions to problems by using different apps and online tools

Lesson Plan

The implementation of integrated STEM teaching and learning is facilitated by the use of specific pedagogical approaches (PBL, IBL, etc). In order to facilitate the research done by the teachers and the design of activities by teachers, a selection of such approaches is presented in Annex 1. Maintaining Annex 1 in the Learning Scenario and citing where necessary is mandatory.

Name of activity	Procedure	Time
1st Lesson		
Brainstorming and discussion	The teachers will introduce students to the goals of the lessons. The activities related to the topic are carried out during 3-4 hours, following the coherent and efficient approach of the texts that through	30 min



	<p>their formalization involve notions and mathematical concepts and / or notions and concepts of the living world and / or notions and concepts of chemistry, mathematics and ICT.) and / or notions and concepts at interdisciplinary level.</p> <ul style="list-style-type: none"> making reports on the evolution of the principles of a debate - coherence, assertiveness, logical argument - in relation to practical-everyday problems "open", in order to formulate answers / solve them and taking into account the optimization of resources involved in the proposed solution. 	
<p>Discussion and preparation for the next lesson</p>	<p>The teachers will provide the main information about the role of chemistry in promoting a healthy lifestyle and share the materials using Google Classroom.</p> <p>Students work in small groups by using tablets and PCs.</p>	<p>20 min</p>
<p>2nd Lesson - Informatics</p>		
<p>STEM Subject 1 Discussion / questions</p>	<p>During the Informatics lesson students will be introduced to the use of the Android and others applications.</p> <p>Phone applications for identifying the fat contents of the most consumed products, making captures using images taken from captures on application pages.</p> <ul style="list-style-type: none"> Students will create a summary of scientific terms in the STEM field using the StoryJumper application; Scientific texts will be translated from the literal wording into scientific language and vice versa using Puzzle- EducaPlay They will make posters, posters, documentaries using Canva, and they will be uploaded to the Padlet. 	<p>15 min</p>
<p>STEM Subject 1 Investigation and conclusions</p>	<p>They will investigate:</p> <p>Modalities of curricular integration about food biochemistry</p> <ul style="list-style-type: none"> Reading contents - identification of substances specified on product packaging <p>Foods rich in omega 3 complex</p> <p>Foods rich in Ca, Mg, Fe, Zn, K,</p> <p>Calculations related to 100 g / product</p> <ul style="list-style-type: none"> Energy value; 	<p>35 min</p>



	<ul style="list-style-type: none"> - Fat content, of which saturated fats; - Carbohydrate and sugar content; - protein; - salt. <p>- With Viva Video will be created a presentation with images from the activities in which each team worked. The final product will consist of a creation of a diet guide "From A to Z", which will contain information about vegetables and fruits rich in vitamins and minerals, kcal content in food, in the application "StoryJumper", which will also contain a puzzle created in the EducaPlay application, and the video will be presented by each team in a festive setting.</p>	
Learning products	<p>The learning products will consist of the students':</p> <p>worksheets,</p> <p>EducaPlay - Quiz</p> <p>Padlet- uploading the materials created</p> <p>Power Point presentations</p> <p>Documentary movie in Wevideo</p>	
3rd Lesson - Chemistry		
STEM Subject 2 Discussion / questions	<p>In the Chemistry lesson, students will be introduced to the:</p> <ul style="list-style-type: none"> ● Knowledge and understanding of the notions of energetic nutrition (proteins, carbohydrates, lipids) and non-energetic nutrition respectively (fibers); ● Understanding the importance of these nutrients for the health and harmonious development of the human body; ● Understanding the importance of the trei daily meals; ● Knowledge of the dangers to which they are exposed by consuming fast food products and excess sweets; <p>Discussion: Students will have to answer the following questions:</p> <ul style="list-style-type: none"> ● Do we know the essential elements and chemicals in the human body to have good health? ● Food Pyramid - What foods / fruits should be at the base of the pyramid? ● What soft drinks and foods are frequently consumed? 	15 min
STEM Subject 2 Group work Investigation and conclusions	<p>Students find information about: biochemical transformations that occur in the most consumed products: chips, pizza, fast food.</p> <p>Experiments with students / Laboratories: using laboratories on the Go-Lab platform, investigating, analyzing and interpreting results.</p>	35 min



	<p>Through simple experiments, students will recognize the product by appearance, specify the causes of product degradation and indicate possible remedies for product degradation.</p> <p>They specify the name of the tested products and write down the results in a table.</p> <p>At the end, they will comment on why it is important to read the product label.</p>	
Learning products	The learning products will consist of the students' presentations, worksheets, mind maps produced with the MindMeister.	
4th Lesson - Mathematics		
STEM Subject 3 Discussion / questions	<ul style="list-style-type: none"> Guided discussion: Healthy weight control; "What weight should I have?" Guided discussion: "Vitamins, minerals and water - Which vegetables, fruits contain vitamins / minerals and have a high water content?" <i>problem solving math and natural sciences - graphs, percentages,</i> <p>Interactive activity: "What foods contain fat?"; "What lunch do we choose?"; -Preparation of a menu for 1 day from a list of foods, so as to respect the number of kcal / day corresponding to age.</p> <p>Interactive activities: "Eliminating a harmful habit" - action plan</p> <p>Nutrients provided by food</p> <p>Interactive activity: "Recommendations for a healthy diet, Calculations: nutritional value, basal energy consumption</p>	15 min
STEM Subject 3 Group work Investigation and conclusions	<p>Team activities: "Analysis of food labels "and" List of alternatives to sweets ".</p> <ul style="list-style-type: none"> Practical activity: Reading product labels - why do manufacturers add vitamins ?; Questionnaire: Health status; Calculation of body mass index; Diet Evaluation- What does a healthy diet mean ?; Team activity: identifying sources of food allergy by reading labels. Calculation of the percentage of salt, sugar and fat per 100 gram product 	35 min
Learning products	<p><i>If you wish to share more materials that complement the text, please include them in the Annexes section and refer to them in this section as well.</i></p> <p>Geogebra – for graphics on fast food on consumption versus healthy food</p>	

Assessment

In the evaluation I considered:

- the originality of the chosen subject that refers to real life
- creating files with the documentation obtained from direct measurements
- originality and image design (layout of the solar panel)



- creation and editing of presentations with data obtained from the field
- the multimedia presentation project and its impact on the classroom, on the school and on the local community,

Authentic assessment :

Performance appraisal in participating in tasks, experiments;
 Extended topics: achievement and interpretation of the results of the questionnaire on the construction of a solar panel in school, for teachers, parents;

Realization of portfolios.

Initial assessment

The students will receive a quiz with some questions related to vegetables and fruits rich in vitamins and minerals,

We will use Google Forms, which offer the possibility to view statistics on each question.

Students follow the steps of learning through a "learning survey" by designing an experimental procedure. We presented to the students the learning stages in the survey by applying a questionnaire survey on the consumption and type of fruit juices consumed daily, after which we proposed the experiment specified above.

The tasks I proposed at the beginning of the activity were of the following type:

- A. Tasks involving scientific documentation on the nature of the substances listed on the packaging of frequently consumed products,
- b. Tasks with problematic practice: case studies - nutritional value of some products can use the online application
<https://www.calculator-nutritional.ro/>
- c. The work tasks focused on the development of presentations and documentaries that meet the requirements specified in the tasks.
- d. Tasks related to finding solutions and proposing methods of counseling and advertising about the health effects of consuming products containing salt, sugar and fats.

Work tasks to coagulate the work teams, to engage them in carrying out the tasks to work in a team, in preparing the presentation and making the documentary films, posters.

Address where the posted questionnaire:

<https://docs.google.com/document/d/1N53LfaQSYAovD78BQ8oCug0aavkSbVBpvqUkIY95P5U/edit?usp=sharing>

have focused on work looking for information, advice on the content of substances that are added to the juice, recommendations on adverse effects on the health of the body.

The students defined the targets of the experiment, built hypotheses and designed the procedure for implementing the experiment.

They then performed the experiment to test whether they could answer the questions they asked.

At the end, they will improve their procedure for implementing the experiment and present this in an essay, which will be presented to the class.

We also applied the "Group Questionnaires" to the students to detect what they think and their degree of interest in demonstrating through experiments what should be done and known, so that they get to know and show a high degree of interest in their own account about health.

Link

<https://docs.google.com/document/d/1MGetMGaJ2tuWB3DRTiw8lvxXEPCMNm85cbEJMSr4s/edit?usp=sharing>



Formative evaluation

During each subject lesson, several formative assessments will take place in the form of a quizzes and surveys.

Analyzing the students' answers on Padlet.

Formative assessment :

The aim is to obtain feedback at each stage of the activity through the materials made at a given time and through their intermediate evaluation. Students are challenged to self-evaluate at each level of work.

All these are tracked on the basis of the worksheets or materials made up to that moment; the progress of the working groups will be monitored. Additional additions and clarifications will be provided if necessary.

Final assessment

- Portfolios
- Products created, individually or in groups;
- Individual or group performances;
- Individual and group behavior;
- Test worksheets;
- Documentation, articles, posters, posters, films
- Powtoon, PowerPoint presentation, presentations made by students in front of their colleagues, parents and teachers in the school;
- questionnaire addressed to students;
- Summary test

Creating the page on the Google Docs platform

Attitude and effort put into project execution

During the summative evaluation, certain test sheets are used, the evaluation of the knowledge, the way of solving the difficulties, the skills in the realization of the materials ; how to communicate with those in the work team; participation in the presentation and in the final debate, the opinion of the others but also the self-assessment about the degree of involvement of each member of the team in the realization of the project.

Student feedback

It will be oriented on *solving some work tasks*, using mainly the method of learning and training skills by *solving a wide range of practical applications* and focusing on *achieving with accuracy and timeliness of workload requirements*. The realization of the projects within the practical activities will follow the development of the team work skills.

The place where the training normally takes place is in the computer laboratory where - in order to optimize the didactic approach - it is necessary to have a minimum endowment

that supposes a number of computers equal to the number of students in the class, connected in network and with access to all services.

INTERNET. The configuration of the computers must allow the running of the applications through which the specific competencies will be formed.



Teachers will choose the most suitable applications depending on the specialty.

There must also be a printer and peripheral and external storage devices in the laboratory. The presence of a video projector will improve interactive training.

The specifics of the discipline require interactive teaching methods, especially recommending individual practical applications, the method of discovery, demonstration, heuristic conversation.

The dynamics of this field, extremely fast, determines the permanent updating of software products by presenting the latest versions, so that it is easier for graduates to adapt to subsequent developments in productive activity

Teacher feedback

Collaborative work platforms can be used to create the materials (for example: Graasp, Moodle, Google Docs, Live @ Edu, Edmodo, Slide share).

The evaluation must focus on the creative interpretation of information and the ability to solve a situation - problem with the help of a computer. It is recommended that students learn to create their own portfolio with the products made.

Using conceptual maps in summative evaluation, create with the application Coggle

Annexes

A thorough and complete list of all the materials used will be asked from all teachers. Those materials will be cited as Annexes and they can be further cited in the learning scenario.

Anexa 1

Rubric for PowerPoint evaluation

<https://docs.google.com/document/d/100bGVOKqDO9JOpxsU275gKxHdW1xOLvslmUfJJcMKkw/edit?usp=sharing>

Anexa 2

Biochemistry of food

https://docs.google.com/forms/d/e/1FAIpQLScmm_CpTUUBZVp5eKuCIYQDL3KiMN-P4JZmQSI9VvMCz_P-nw/viewform

Anexa 3

Lesson Plan

https://drive.google.com/file/d/1j40TAPQurLhpOT_owp1HeBpz1RXs3jEY/view?usp=sharing

Anexa 4



Evaluation grids

<https://drive.google.com/file/d/1UjPiT12F5Q5dHCXQ7gSvbsLpHwvfpof4/view?usp=sharing>

Anexa 5

Theoretical information

<https://drive.google.com/file/d/1SRBF6fzDgbF5arudfUu0qQYyWBGd8319/view?usp=sharing>

Anexa 6

Theoretical information - Healthy lifestyle- PowerPoint presentation

<https://drive.google.com/file/d/1HpEsbguMDtF6bauN2Xp27Hf6gC5QP4TH/view?usp=sharing>

Anexa 7

Healthy education - Questionnaire

https://docs.google.com/document/d/1k_gfpmEtMFMNCBFALFMei08C24KIDuWnc0naz4rVTz44/edit?usp=sharing

Anexa 8

Final product evaluation form after completing the work task

<https://drive.google.com/file/d/1Qn8WZNRkIWDbMjDpT1K-D5jvaH9ZFtYN/view?usp=sharing>

