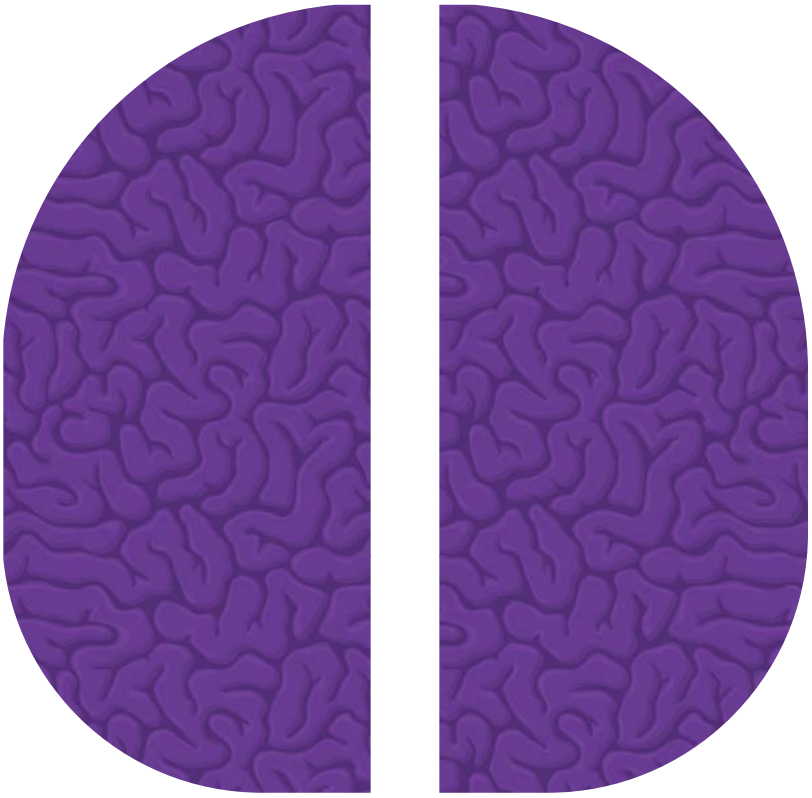
OrganKits
for STEAM

Co-funded by
the European Union



EDUCATIONAL GUIDE
to implement **OrganKits**

MENTALHEALTH &MINDFULNESS

organkitsproject.eu

MENTALHEALTH&MINDFULNESS

TABLE OF CONTENTS

"The brain has no wrinkles: if it continues to work hard, it is constantly renewed, even after 80 years and, unlike other organs, it can even improve"

Mrs. Rita Levi Montalcini

Awarded of the Nobel Prize in Physiology or Medecine 1986
Prize Motivation: For her discoveries of growth factors.

Mentalhealth & Mindfulness:
How much and how do we need to protect and reinforce our mentalhealth and mindfulness?

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PROJECT

- [ ] SPORT-HEALTH
- [x] MENTAL-HEALTH
- [ ] NUTRI-HEALTH
- [ ] NEUMO-HEALTH
- [ ] CARDIO-HEALTH
- [ ] REPRO-HEALTH

LEARN-STEM MODEL

- [x] Complex
- [x] Progress-oriented
- [x] Holistic
- [x] Practical
- [x] Social

KEY COMPETENCES OF THE PROJECT

- [x] Literacy
- [ ] Multilingual
- [x] Mathematics, Science, Technology & Engineering
- [x] Personal, social and learning to learn
- [ ] Citizenship
- [ ] Entrepreneurship
- [ ] Cultural awareness

SUSTAINABLE DEVELOPMENT GOALS OF THE PROJECT

- [ ] No poverty
- [ ] Zero Hunger
- [x] Good Health and Well-being
- [x] Quality Education
- [ ] Gender Equality
- [ ] Clean water and Sanitation
- [ ] Affordable and Clean Energy
- [ ] Decent Work and Economic Growth
- [ ] Industry, Innovation and Infrastructure
- [ ] Reduced Inequality
- [ ] Sustainable Cities and Communities
- [ ] Responsible Consumption and Production
- [ ] Climate Action
- [ ] Life Below Water
- [ ] Life on Land
- [ ] Peace and Justice Strong Institutions
- [x] Partnerships to achieve the Goal

SUBJECTS OF THE CURRICULA worked in this project:

- [x] Mathematics
- [x] Language
- [ ] History
- [x] Biology
- [x] Physical Education
- [x] Art
- [x] Technology
- [x] Physics
- [x] Didactic Metodologies

GENERAL DESCRIPTION OF THE PROJECT:

The project aims to start from the observation and analysis of the plastinated organ assigned to recognize the various components and introduce the fundamental concepts of anatomy.

This analysis is the premise for making interdisciplinary correlations based on the links between the brain and well-being.

These connections will be articulated by the teachers of the disciplines indicated, paying particular attention to the brain areas linked to the reception of visual and language stimuli, as well as to the role of motor activity aimed at psycho-physical well-being. What makes this project so unique is the presence of the plastinated organs. The impact on students as well as on teachers is going to be very effective to increase motivation and cultural curiosity.

Moreover the PBL methodology fosters the active participation of all the students responsible for a concrete construction of a learning process.

SPECIFIC STUDENTS' COMPETENCES TO DEVELOP (LEARNING OUTCOMES)

Observing

Creating guide questions

Developing Team Job skills

Solving Problems

Identifying connections and relationships

Acquiring and interpreting data

Learning how to communicate

Learning to design routes

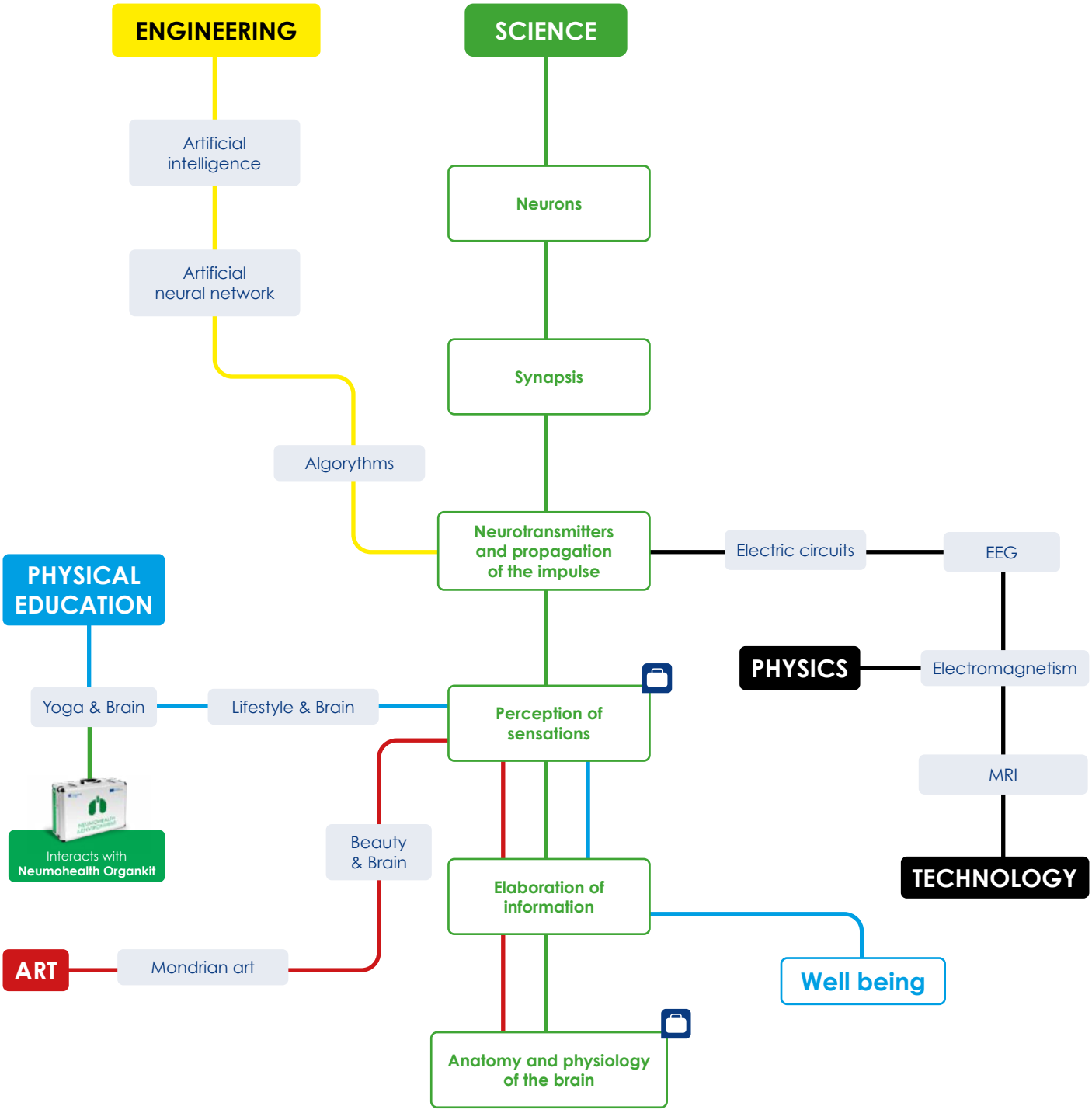
Discussing relevant arguments

Respecting deadlines and tasks' instructions

Debating

Self assessing

PROJECT MAP



* This activity uses the OrganKits case.

SCIENCE

LEARNING UNIT 1: ***THE CENTRAL NERVOUS SYSTEM***

TARGET GROUP

16-17 years old students

PREREQUISITES

Basic knowledge: cell and cell structures; cell membrane; animal tissues

FINAL OUTCOME

Making of a video or a multimedia presentation

KEY COMPETENCES

Planning, identifying connections and relationships, communicating, acquiring and interpreting information.

COMPETENCE ACHIEVEMENTS

Making appropriate use of material resources (plastinated organs, optical microscopes, histological preparations) and acquired knowledge to make the final product, showing logical skills, organizational skills and executive accuracy.

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- The nervous system units: neurons and glial cells.
- The neurotrophic factors.
- Brain structure and function.
- The cavities and coverings of the Central Nervous System.
- Cerebral cortex areas and their functions.

SUBJECT OBJECTIVES

To relate neurotrophic factors with the development of neurons and the increase in synaptic connections.
To be able to identify the different parts of the brain in the plastinated organ
To describe the brain organization with its functions.
To relate different areas of the cerebral cortex to signal decoding.

IMPLEMENTATION AND TIME

February – March / 8hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Plastinated organs, optical microscope, educational video, histological preparations, supplementary multimedia material, textbooks, Network resources

EVALUATION

Formative and summative

LEARNING UNIT 2: ***THE PERIPHERAL NERVOUS SYSTEM***

TARGET GROUP

16-17 years old students

PREREQUISITES

The nervous tissue: neurons and glial cells. Membrane transport.

FINAL OUTCOME

Making of a video or a multimedia presentation

KEY COMPETENCES

To be able to acquire and interpret information, identifying links and relationships, to be able to plan and collaborate

COMPETENCE ACHIEVEMENTS

To make appropriate use of the material resources and knowledge acquired to make the final product, showing operational skills, organisational skills and accuracy.

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- Communication between neurons: synapses
- The neurotransmitters
- The nerve signal propagation
- Anatomy of the peripheral nervous system

SUBJECT OBJECTIVES

- To explain how the nerve impulse is transmitted along the axon.
- To describe synapses and classify them by mechanism of action
- To explain the functions of various neurotransmitters
- To know how to describe the structure and functions of the peripheral nervous system components, using 3D models, histological preparations and/or iconographic material.

IMPLEMENTATION AND TIME

March – April /8 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Organ models, optical microscope, educational video, histological preparations , integrative multimedia material, textbooks, Network resource.s

EVALUATION

Formative and summative

LEARNING UNIT 3: ***SENSORY PERCEPTION***

TARGET GROUP

16-17 years old students

PREREQUISITES

The central and peripheral nervous system

FINAL OUTCOME

Making a multimedia product.

KEY COMPETENCES

To be able to acquire and interpret information, identifying links and relationships, to be able to plan and collaborate

COMPETENCE ACHIEVEMENTS

To make appropriate use of material resources (plastinated organs, optical microscopes, histological preparations) and acquired knowledge to produce the final product, showing logical skills, organizational skills and executive accuracy.

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

Sensory receptors, their classification and their mode of action

SUBJECT OBJECTIVES

- To describe specific characteristics and structure of different receptors.
- To connect different sensory stimuli to specific areas of the cerebral cortex

IMPLEMENTATION AND TIME

April / 6 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Organ models, plastinated organs, optical microscope, educational video, histological preparations, integrative multimedia material, textbook, Network resources

EVALUATION

Formative and summative

TECHNOLOGY

LEARNING UNIT 4: ***MAGNETIC RESONANCE (FMRI)***

TARGET GROUP

16-17 years old students

PREREQUISITES

Nervous tissue : neurons and glial cells
Membrane transports

FINAL OUTCOME

Making a Podcast or a multimedial presentation

KEY COMPETENCES

Planning, identifying connections and relationships, communicating, acquiring and interpreting information.

COMPETENCE ACHIEVEMENTS

To make the student proficient in the basic principles of MRI and technical procedures for reading images.

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- Physical principles of Magnetic Resonance, applied to diagnostic imaging.
- Dynamic or functional image techniques.
- Contrast in MRI images.

SUBJECT OBJECTIVES

To explain how fMRI does not directly measure neural events but rather metabolic changes related to neural activity.

IMPLEMENTATION AND TIME

March -April / 4 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Educational videos , supplementary multimedia material, textbooks, Internet resources.

EVALUATION

Formative and summative

ENGINEERING

LEARNING UNIT 5: ***ALGORITHMS***

TARGET GROUP

15-16 years old students

PREREQUISITES

Basic elements of computer science, language analysis, simple geometric figures

FINAL OUTCOME

Implementation of an algorithm for selecting an assigned element from a set

KEY COMPETENCES

To design, identify links and relationships; to collaborate and participate, to communicate, acquire and interpret information

COMPETENCE ACHIEVEMENTS

- To understand the essentials of programming languages.
- Choose appropriate procedures for defining an algorithm.
- Development of logical thinking and critical thinking.
- Use IT tools and technologies

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- The Algorithms
- The commands
- The" if then else"condition
- The condition "for"
- The "when" condition

SUBJECT OBJECTIVES

To know how to define a simple algorithm

IMPLEMENTATION AND TIME

March -April / 8 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Educational videos , supplementary multimedia material, textbooks, Internet resources.

EVALUATION

Formative and summative

LEARNING UNIT 6: ***ARTIFICIAL NEURAL NETWORK (ANN)***

TARGET GROUP

16-17 years old students

PREREQUISITES

- Basic elements of computer science
- Algorithms
- Combinatorial calculus
- Simple functions

FINAL OUTCOME

Implementation of an artificial neural network for the selection of an assigned element from a set

KEY COMPETENCES

To design, identify links and relationships; to collaborate and participate, to communicate, acquire and interpret information

COMPETENCE ACHIEVEMENTS

To know the elements that make up a neural network. To choose suitable tools for the definition of a neural network. Development of logical thinking and critical thinking. To use IT tools and technologies.

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- The neural network
- The knots
- Weight functions
- The layers
- Structure and functioning of the network

SUBJECT OBJECTIVES

To know how to define an artificial neural network at 1 hidden level.

IMPLEMENTATION AND TIME

April /5 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Educational videos , supplementary multimedia material, textbooks, Internet resources.

EVALUATION

Formative and summative

LEARNING UNIT 7: ***ARTIFICIAL INTELLIGENCE (AI)***

TARGET GROUP

16-17 years old students

PREREQUISITES

- Basic elements of computer science
- Programming languages
- Foundations of ethics and logic

FINAL OUTCOME

Use of ChatGPT to solve simple tasks

KEY COMPETENCES

Identify links and relationships; to collaborate and participate, to communicate, acquire and interpret information.

COMPETENCE ACHIEVEMENTS

- To know the elements that make up an artificial intelligence.
- To know the limits and potential of AI
- Development of logical thinking and critical thinking.
- To reflect on the value of AI in our society

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- Development of critical sense in the use of AI
- Ability to discern between a bot response and a reasoned response.

SUBJECT OBJECTIVES

- Artificial Intelligence Networks
- AI for graphic purposes
- AI for research purposes
- Use of AI for solving simple tasks

IMPLEMENTATION AND TIME

November /10 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Educational videos , supplementary multimedia material, textbooks, Internet resources.

EVALUATION

Formative and summative

ARTS

LEARNING UNIT 8: ***BEAUTY AND BRAIN ACTIVITY***

THROUGH THE ANALYSIS OF PIET MONDRIAN'S WORKS

Description and methodological premise

Art education must be understood as a transversal discipline since the image itself is a natural and "primitive" mediation of knowledge: the theories of neuroscience and the psychology of vision have focused on the possibilities inherent in the use of images for the enhancement of functions connected to memory, placing image thinking as a central element of cognitive science.

How reliable this statement is, it is demonstrated by Temple Grandin in the book "Thinking in images and other testimonies of my autistic life", which offers a different vision of the approach to autism, based on the visual abilities and color perception of the subjects whose experiences it narrates; also the American TEACH method for the same pathology is based on the visual abilities and colour perception of autistic subjects. Knowing how to speak and knowing how to observe are the two cornerstones of knowledge, as Mayer argues with the cognitive theory of multimedia learning: up to now the first learning channel has been privileged, underestimating the second. According to cognitive theory, we learn best through the use of the auditory and visual channels.

Classroom experience with the aid of IT tools demonstrates that the process, following this method, is able to make even students with inactive behaviour active. Simultaneous representation through the oral verbal channel and the visual one allows to enhance memorisation, activating the process of transfer and retention of the concept.

The teacher's mediation consists, in the first place, in placing word and image on the same level; the intrinsic difficulty in the material shown must be resolved through a deployment of signs, a capacity for analysis, selection and organisation of the same which requires the activation of several brain areas of the pupil and which must be developed in class in an accurate preparatory phase.

The methodology adopted follows the teaching lines of ANISA (Italian art historians teachers association).

BEAUTY AND BRAIN ACTIVITY:
THROUGH THE ANALYSIS OF PIET MONDRIAN'S WORKS

1. TEACHER

Content and course selection, check compatibility with curricular programming.
Comparison of disciplinary contents relating to the disciplines involved (Art, Science, Mathematics).
Objectives setting :

OBJECTIVES

To observe and recognise; to identify visual and morphological elements; to estimate linear quantities; to search for geometric modules; to put in relation; to decode and encode different languages; to analyse and rework creatively.

2. TWO-HOUR LESSON

Brain storming: pupils will be asked the question "what is beauty?". The answers will be included in conceptual sets and subsets.

Circle time: in this setup, in the first phase, there will be the return of what emerged from the brain storming; in a second phase, the image of a painting by Mondrian will be presented: Composition with red, yellow and blue, asking what is the immediate perception of this Opera. The circle time foresees that the answers are given by the students following a clockwise direction and allowing only those who have already answered to be able to intervene again on the considerations of a classmate. The observations must be analyzed and extrapolated according to conceptual sets by the teacher. They will be resubmitted at the end of the module.

3. THREE-HOUR LESSON

Class viewing of Mondrian's works and texture analysis exercises: analysis of shapes and colors **(IWB).** Synchronic and diachronic analysis of Mondrian's work **(video).** Relationship between colour and visual perception: from Goethe's colour theory to Gestalt visual perception.

Video

4. ONE-HOUR LESSON

Correspondence between shapes, colors and auditory sensations: Mondrian and music.

Video

5. TWO-HOUR LESSON IN CO-PRESENCE (ART AND SCIENCE)

Observation of the median prefrontal cortex **(plastinate)** and observation of correspondence in MRI.Vision of the effects of viewing abstract artworks on the cerebral cortex (Semir Zeki video); the activation of brain areas in relation to simultaneous visual and auditory perceptions.

Semir Zeki Video

5. TWO-HOUR LESSON IN CO-PRESENCE (ART AND MATHEMATICS)

Maths game with Mondrian's scheme: can you solve the puzzle of Mondrian squares?

Video

5. TWO-HOUR LESSON (RETURN OF WHAT YOU HAVE LEARNT)

Circle time: in this setting, according to the scheme already exposed, the question will be asked again: "What is beauty?"

6. TWO-HOUR TEST

Digital elaborations with use of words, images and sounds.

MATHS

LEARNING UNIT 9: ***ELECTRICAL CIRCUITS***

PREREQUISITES

Classification of materials in relation to electrical properties. Potential difference, electromotive force, current, electrical resistance, electrical power.

FINAL OUTCOME

Making of a video or a multimedia presentation

KEY COMPETENCES

Planning, identifying connections and relationships, communicating, acquiring and interpreting information.

COMPETENCE ACHIEVEMENTS

- To comprehend, interpret and analyze and solve simple patterns of electricity networks.
- To use specific tools and technologies in compliance with safety regulations

LEARNING OBJECTIVES

- Observation
- Interpretation
- Experimentation
- Communication

CONTENTS

- The Charging
- The electric charges
- The electrostatic induction
- The electric current
- The current and the Joule effect
- The laws of Ohm
- The electrical circuits

SUBJECT OBJECTIVES

- To identify the functional electrical characteristics of the RLC circuits in sinusoidal mode.
- To compare electrical circuits and brain electricity.
- To perform tests and measurements in a laboratory.

IMPLEMENTATION AND TIME

February – March / 8 hours

TEACHING METHOD

Active learning, Project based learning, interactive lesson, debate.

RESOURCES

Educational videos , supplementary multimedia material, textbooks, Internet resources.

EVALUATION

Formative and summative

PHYSICAL EDUCATION

LEARNING UNIT 10: ***THE BENEFITS OF A HEALTHY LIFESTYLE ON THE BRAIN***

PREREQUISITES

The locomotor system, the cardiovascular system, the nervous system and the food principles.

FINAL OUTCOME

Realisation of a demo video of a work out path.

KEY COMPETENCES

To act autonomously and responsibly, to identify links and relationships; to collaborate and participate, to communicate, capture and interpret information.

COMPETENCE ACHIEVEMENTS

- To be aware of the benefits induced by motor activity.
- To use non-verbal messages consciously by decoding your own bodily messages and those of others.
- To acquire a healthy and active lifestyle.
- To achieve balanced psycho-physical well-being.

LEARNING OBJECTIVES

- Health and well-being, prevention and safety.
- Perception of the self and the completion of the functional development of motor and expressive skills.

CONTENTS

- The long-term motor activity-induced benefits.
- How motor activity affects serum BDNF levels.
- The beneficial properties of endorphins on anxiety states and symptoms of depression.

SUBJECT OBJECTIVES

- Diet to prevent neuro-vegetative disorders.
- Harmful and useful foods for the proper functioning of the brain.
- The quantity and quality of sleep to enhance cognitive abilities and mood.

IMPLEMENTATION AND TIME

October – January / 24 hours

TEACHING METHOD

Laboratory teaching, Project based learning, face-to-face lesson with audio-visual and paper supports, cooperative learning, guided discovery.

RESOURCES

Instructional videos, integrative multimedia material, textbooks, networked resources, heart rate monitor, small tools.

EVALUATION

- Students will be assessed following the return of an assignment assigned to them.
- They will be asked to develop, divided into groups of 4, a diet plan to enhance brain skills.
- Individual attitudinal tests for coordinating skills: Static and dynamic balance, bilateral coordination, motor fantasy and responsiveness.

LEARNING UNIT 11: ***THE BENEFITS OF HEALTHY YOGA ON THE BRAIN***

PREREQUISITES

The locomotor system, diaphragm, cardiovascular system, nervous system.

FINAL OUTCOME

Realization of a demo video of a routine "ASANA YOGA"

KEY COMPETENCES

Act autonomously and responsibly, identify links and relationships; Collaborate and participate, communicate, acquire and interpret information.

COMPETENCE ACHIEVEMENTS

- Be aware of the benefits induced by motor activity.
- Consciously use non-verbal messages by decoding your own body messages and those of others.
- Acquire a healthy and active lifestyle.
- Achieve a balanced psycho-physical well-being.

LEARNING OBJECTIVES

- Health and well-being, prevention and safety.
- Perception of the self and the completion of the functional development of motor and expressive skills.

CONTENTS

- The long-term benefits of motor activity.
- Use the diaphragm for proper, powerful and beneficial breathing.
- The beneficial properties of endorphins on anxiety states and depression symptoms.

SUBJECT OBJECTIVES

- To identify the functional electrical characteristics of the RLC circuits in sinusoidal mode.
- To compare electrical circuits and brain electricity.
- To perform tests and measurements in a laboratory.

IMPLEMENTATION AND TIME

March-May/10 hours

TEACHING METHOD

Laboratory teaching, Project based learning, frontal lesson with audio-visual and paper supports, cooperative learning, guided discovery.

RESOURCES

Educational videos, supplementary multimedia material, textbooks, resources on the net, cardio-frequency meter, small equipment.

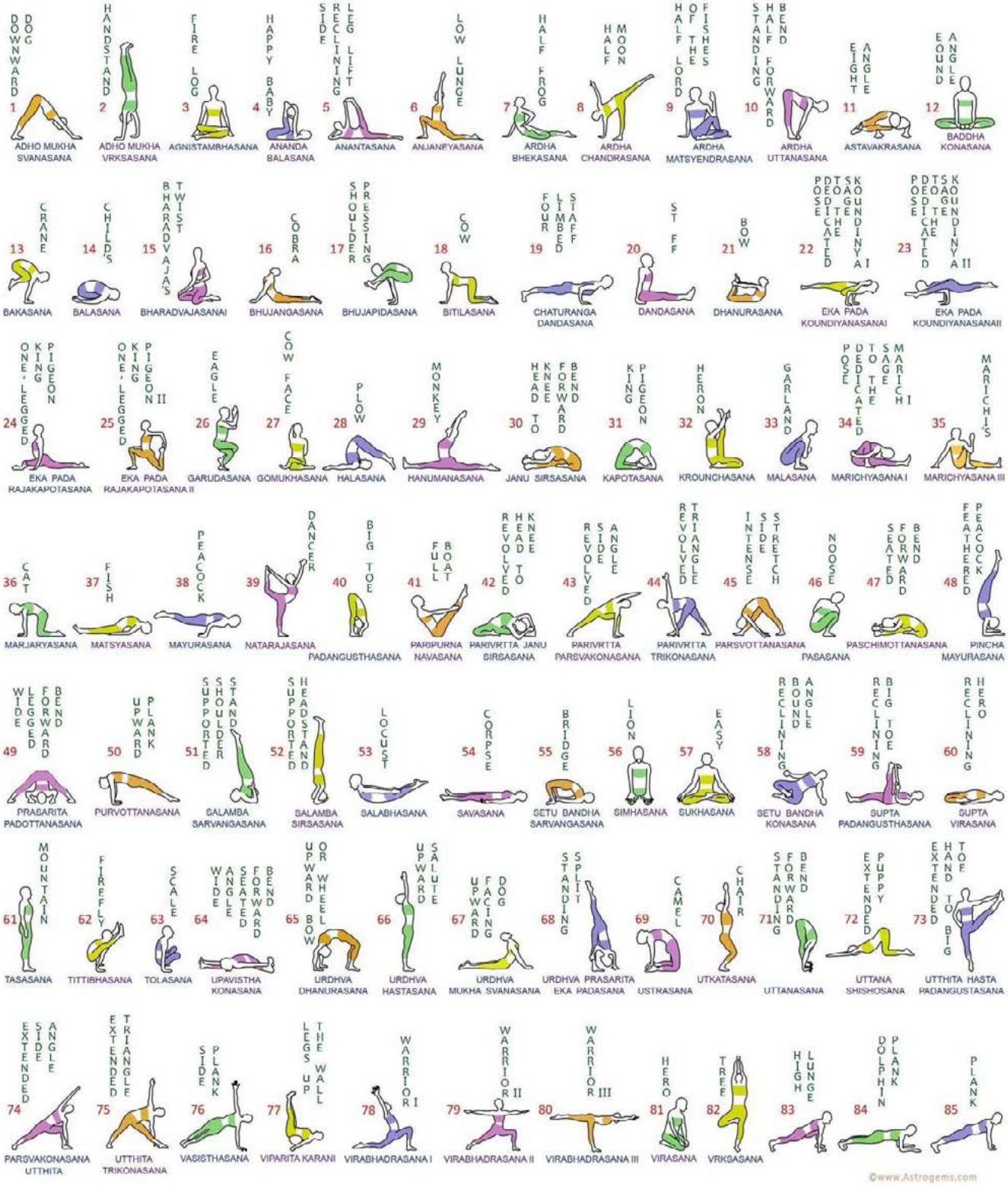
EVALUATION

Systematic observation during the assigned task.

Students will be asked to perform in pairs, for a greater control of the movement and consequent correction, a routine of 10 positions to choose from those taught by the teacher (see image below) "YOGA ASANA" to:

- Reduce stress and emotional tension.
- Promote a state of psycho-physical well-being.
- Develop a deeper connection with yourself.

YOGA ASANAS ABC LEARNING GUIDE



Activities:
- Watching the video twice
- Brainstorming
- Taking Notes
- Debating

Video 1

Are you a body with a mind or a mind with a body?
Maryam Alimardani

Video 2

What yoga does to your body and brain?
Krishna Sudhir

Video 3

How friendship affects your brain
Shannon Odell

Video 4

OrganKits
for STEAM

UNIVERSIDAD DE MURCIA

mdc
I.E.S. MIGUEL DE CERVANTES

ISTITUTO SUPERIORE DA|LG

PLATON SCHOOLS

Bahçeşehir Koleji

DISCOVER-IN
anatomy at your hands

mentortec

N. 2022-1-ES01-KA220-SCH-000089616

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