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School to Farm

Using Farms as an Ecological and Pedagogical Education

Environment-Gamified-STEAM-Based Learning Approach

Model

{SCHOOL TO FARM}

Competency Framework for Teachers

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Context of the Project

The objective of the School to Farm project is to develop a collection of STEAM activities that are place-based and gamified, with the aim of utilizing farms as an environmental education resource for out-of-school learning purposes that can complement formal education. The project centers around three key contexts: 1) employing farms as a pedagogical and ecological learning environment (place-based learning) in order to promote environmental awareness, 2) creating innovative educational games within the context of STEAM through interdisciplinary approaches (as opposed to discipline-specific), and 3) enhancing environmental education by establishing ecological competency-based learning that aligns with the requirements of formal schooling.

Placed-based learning and School to Farm Approach

Using farms as ecological and pedagogical environments is considered by the context of place-based education in the literature, but it hasn't been referred to or studied like outdoor education. The "School to Farm" approach can be found in some projects and academic literature (Helmi Risku-Norja,2014). In some form, farms are used in outside-classroom. teaching in some schools, although the practices have not been necessarily recorded in the curricula (Risku-Norja 2006). L. B. Sharp, a pioneer of place-based education, has stated that pupils cannot fully understand what they are learning without experiencing it (Knapp, 2000). The learning environment and its various elements, actors, and activities all have an essential function for learning. Another aspect of farm education relates to entrepreneurship education because of decreasing numbers of farmers and farming families.

With this method of teaching, students gain practical experience in farming and agriculture while also developing their analytical, creative, and problem-solving abilities. Students

participate in activities that challenge them to comprehend and resolve issues pertaining to agriculture and farming using concepts and principles from science, technology, engineering, the arts, and mathematics.

Students can learn about sustainable agricultural methods, food production, and the value of natural resources through farm-based STEAM education. It can also encourage the development of a more sustainable future and cultivate an appreciation for the environment.

Overall, farm-based STEAM education provides students with a distinctive and interesting learning methodology that can aid in the development of a variety of skills and academic content while also giving them a greater comprehension of the agricultural practices that are crucial to our civilization.

Traditional classrooms, outdoor classrooms, and agricultural education facilities are just a few of the educational environments where farm-based STEAM education can be implemented. This method of teaching places a strong emphasis on experiential learning and encourages pupils to explore and learn about the surrounding natural environment.

Agricultural technologies including sensors, drones, and precision farming equipment are used extensively in farm-based STEAM education. Students can learn about how these technologies are utilized in farming and agriculture and how they can be used to boost productivity and efficiency while also lowering their environmental effect.

The promotion of sustainability is a key component of STEAM education on farms. Students can study environmentally friendly farming methods include integrated pest management, organic farming, and conservation agriculture. Additionally, they can learn the value of biodiversity and how to safeguard and preserve natural resources.

Entrepreneurship and creativity can also be encouraged through farm-based STEAM education. Students can study the financial side of agriculture and investigate the creation of cutting-edge farming methods and technologies.

In general, farm-based STEAM education offers students a special and beneficial learning opportunity that can aid in the development of a variety of abilities and expertise in relation to farming, agriculture, and the natural world. Additionally, it can aid in fostering innovation, entrepreneurship, and sustainability while preparing students for a range of vocations in the agricultural sector.

Farm-based STEAM education can be conducted in both classroom and outdoor settings, with a focus on hands-on learning and experimentation. Some ways it can be conducted include:

1. Classroom activities: In-class activities can include lectures, discussions, and hands-on activities. Teachers can use resources like Agriculture in the Classroom curriculum, which provide lesson plans and activities that integrate agricultural concepts with STEAM subjects.

2. Outdoor activities: Outdoor activities can take place on a school farm or garden, or at a nearby farm or agriculture research facility. These activities can include field trips, farm visits, and hands-on projects like planting and harvesting crops, testing soil samples, and building and testing agricultural technologies.

3. Project-based learning: Project-based learning is an effective way to integrate STEAM and agricultural concepts. Students can work on projects like designing and building hydroponic systems, creating robotic farming tools, and developing sustainable farmingpractices.

4. Collaborations with farmers and researchers: Collaboration with local farmers and researchers can provide opportunities for students to learn from experts in the field. They can visit farms, research facilities, and laboratories to learn about the latest agricultural research and technology.

Overall, farm-based STEAM education encourages students to investigate the links between agricultural and STEAM fields and offers chances for experiential learning.

A number of indoor and outdoor activities that allow students to interact with the science, technology, engineering, art, and math (STEAM) topics connected to agriculture could be included in experimentation scenarios for farm-based STEAM education. Here are a few illustrations:

1. **Soil analysis**: In order to learn about soil composition, nutrient levels, and pH, students can gather soil samples from various locations on a farm and analyze them in a lab.
2. **Plant growth**: To learn about the elements that influence plant growth, students can plant and monitor various kinds of crops, gauge growth rates, and experiment with various irrigation and fertilizer systems.
3. **Livestock management**: Students who observe and care for livestock on a farm can get knowledge about animal nutrition, reproduction, and health.
4. **Farm equipment design**: Using engineering principles, students can design and construct farm equipment like irrigation systems or animal pens.
5. **Food production and processing:** By helping with tasks like crop harvesting, food preservation, and the creation of cheese or butter, students can gain knowledge about the production and processing of food.

These are just a few examples of the various experimental scenarios that might be used in a STEAM education program focused on farms. The objective is to give students practical experiences with agriculture-related subjects in science, technology, engineering, art, and math both within and outside of the classroom.

The data gathered from the survey responses showed that the teachers' farm-based STEAM education approach was used to measure competence. It was developed using information from studies and the literature.

competency areas, such as:

1. **Scientific inquiry and methodology**: Possessing knowledge of the scientific method and the ability to conduct experiments, collect data, and draw conclusions.
2. **Mathematics**: A solid foundation in mathematics, including algebra, geometry, and calculus, as well as knowledge of statistics, probability, and data analysis.
3. **Computer science and coding**: Ability to produce and comprehend computer code, as well as familiarity with computer hardware and software.
4. **Engineering design**: the capacity to develop, build, and test solutions to problems using engineering principles.
5. **Data analysis and modeling**: The ability for data interpretation and analysis, as well as for decision-making using mathematical models.
6. **Scientific literacy**: Knowledge of scientific theories, concepts, and principles, as well as how to apply them in practice.
7. **Problem-solving and critical thinking:** Having the ability to recognize issues, research them, develop and assess solutions.
8. **Creativity and innovation:** The ability to generate new ideas and approaches to problem-solving, as well as the ability to think outside the box.
9. **Communication and collaboration:** The ability to communicate effectively with others and work collaboratively in teams.

JUSTIFICATION OF THE COMPETENCY FRAMEWORK

WP2-School to Farm Competency Framework in the context of the STEAM discipline is an attempt to define the concept of "use of farms as an ecological and pedagogical educational environment" and become school-to-farm literate citizens.

The competency framework is dedicated to the specific content of using farms as a pedagogical and ecological education in the STEAM discipline.

School to Farm Competency Framework contributes to the general objective of learning from nature and protecting nature to harness the real potential of green learning in educational environments and enrich place-based learning (school-to-farm) with interdisciplinary-future-oriented learning materials and curricula which will help to fight climate change and raise awareness of environmental consciousness by prioritizing EU Green Deal. To create educational resources for STEAM-based educational games in farms, we must define a competency area by interviewing STEAM discipline teachers and farmers. Therefore, this competency framework is an innovative feature in terms of eliminating this gap.

1. *Overview of the European Qualifications Framework (EQF)*

A method of mapping qualifications among EU member states is the European Qualifications Framework (EQF). In April 2008, the European Parliament and the Council formally endorsed the EQF. Its two main goals are to foster lifelong learning for citizens and to encourage their international mobility.

2. *Level of Qualification*

The definition of learning outcomes within the EQF framework encompasses three main areas: knowledge, skills and responsibility/autonomy.

- **Knowledge** refers to the theoretical and factual understanding of a subject.
- **Skills** encompass both cognitive abilities (such as logical, intuitive and creative thinking) and practical abilities (such as manual dexterity and the use of tools).

- **Responsibility and autonomy** refer to a learner's ability to apply their knowledge and skills independently, while also taking responsibility for their actions.

SUMMARY

As a result of this project, gaining skills, feelings, and attitudes in the teacher:

Farm-based education: Farm-based education is an educational approach that uses the farm as a classroom to teach students about agriculture, food systems, and sustainability. Teachers should understand the basic principles of farm-based education and how it can be used to enhance STEAM education.

Project-Based Learning: Teachers should be able to design and implement project-based learning experiences that engage students in hands-on learning on the farm. For example, a teacher might challenge students to design and build a simple irrigation system that uses solar power to water crops.

Collaboration: Teachers should be able to collaborate with farmers, agriculture organizations, and other educators to support their students' learning. For example, a teacher might work with a local farmer to plan a field trip that allows students to learn about sustainable farming practices.

Technology Integration: Teachers should be able to integrate technology into their lessons to enhance student learning. For example, a teacher might use a weather app to teach students about meteorology and how it impacts crop growth.

Assessment: Teachers should be able to assess student learning in meaningful ways and use that feedback to adjust their teaching. For example, a teacher might use a rubric to assess student projects and provide feedback on how they can improve their work.

Reflection: Teachers should be able to reflect on their own practice and identify areas for improvement. For example, a teacher might reflect on a lesson that did not go as planned and consider how they can adjust their approach for future lessons.

This project's distinctive value lies in its provision of farm-based STEAM education. Our objective is to enhance teachers' capacity to effectively convey this subject matter to their students by the project's end. To achieve this aim, the seven themes covered in this project were designed to impart competence, skills, knowledge, responsibility, and autonomy.

-DISCUSSION AND CONCLUSION

The responses from the questionnaire that was given to the teachers led to the identification of these headings as potential learning topics. Using these headings, we identified a total of eight different competency areas.

No:	**Competence Area**
1	Sustainable Farming Practices
2	Soil Science
3	Plant Biology And Genetics
4	Agricultural Engineering
5	Water Conservation In Agriculture
6	Food Science And Technology
7	Marketing And Business In Agriculture
8	Sustainable Agriculture Projects

COMPETENCY FRAMEWORK STRUCTURE

1- SUSTAINABLE FARMING PRACTICES

Competence Area	Sustainable Farming Practices
Competence Statement	To learn about different sustainable farming practices, such as crop rotation, integrated pest management, and cover crops. To analyze case studies of sustainable farming practices and their impact on the environment and community
Knowledge and scientific data	1-Crop rotation: This involves planting different crops in the same area in successive years to improve soil fertility and prevent pests and diseases. • To demonstrate different crop varieties and their requirements • To be able to explain soil health and nutrient management • To know different crop varieties and their requirements • To understand soil health and nutrient management 2-Conservation tillage: This is a method of planting crops without disturbing the soil, which reduces erosion and improves soil health.

	• To know different types of conservation tillage techniques • to understand of soil structure and water management 3-Integrated pest management: This involves using a combination of methods to control pests and diseases, including biological controls, crop rotation, and selective use of pesticides. • To know different pest and disease control methods • to understand the ecological relationships between crops, pests, and beneficial organisms 4. Agroforestry: This is a system of land use that combines trees with crops and/or livestock to improve soil health, reduce erosion, and increase biodiversity. • To be aware of different tree and crop varieties and their requirements • to understand ecosystem services and biodiversity conservation 5. Water conservation: This involves reducing water use and improving water quality through practices such as drip irrigation, soil moisture monitoring, and cover cropping. • To know different water conservation techniques • To understand of water quality and pollution prevention

Skills = abilities (what can I do)	• Crop rotation: to be able to plan and implement a crop rotation schedule • Conservation tillage:to be able to operate specialized equipment, such as no-till drills and seeders • Integrated pest management: to be able to identify pests and diseases and monitor their populations • Agroforestry:to be able to design and implement agroforestry systems • Water conservation: to be able to design and implement irrigation systems.

Responsibility and Autonomy	● STEAM education is focused on developing students' responsibility and autonomy. Responsibility means that students take ownership of their own learning and are accountable for their progress. Autonomy means that students are given the freedom to work independently and make their own decisions in the learning process. ● By encouraging responsibility and autonomy in STEAM education, students are empowered to explore their own interests and passions, take risks, and develop critical thinking, problem-solving, and decision-making skills. These skills are essential for success in STEAM fields, as well as in many other areas of life ● Choose a farm-based theme that aligns with your STEAM objectives and includes outdoor activities. For example, if you are teaching physics, you might focus on exploring the forces involved in simple machines used in farming, such as levers and pulleys. ● Plan outdoor activities that allow students to engage in hands-on, experiential learning on a farm or in a garden. This could include planting and harvesting crops, testing soil composition, and exploring the local ecosystem.

Competence Area	Soil Science
Competence Statement	To investigate different soil types and their properties. To analyze soil samples to determine pH, texture, and nutrient content. To learn about the impact of soil health on crop growth and sustainability.
Knowledge and scientific data	1. Soil sampling and analysis: This involves collecting soil samples from different locations on a farm and analyzing them to determine their nutrient content, pH level, and other characteristics. • to know soil chemistry, biology, and physics. • to understand laboratory procedures and equipment 2. Soil fertility management: This involves using the information from soil sampling and analysis to develop a soil fertility management plan, which may include fertilization, liming, and other amendments. • to know the different fertilizers and amendments and their effects on soil fertility. • to be aware of nutrient cycling and soil-plant interactions.

	3. Soil conservation: This involves managing soil erosion and preserving soil health through practices such as cover cropping, reduced tillage, and contour farming. • to know soil erosion processes and control measures • to understand soil structure and water management 4. Soil microbiology: This involves studying the microorganisms that live in soil and their interactions with plants and the environment. • to know soil microbial ecology and physiology • to be aware of microbial nutrient cycling and plant-microbe interactions 5. Soil restoration: This involves restoring degraded or contaminated soils to a healthy, productive state through practices such as phytoremediation, soil amendments, and reforestation. • to know soil restoration techniques and their effectiveness. • to explain ecosystem services and biodiversity conservation.
Skills = abilities (what can I do)	• Soil sampling and analysis: to be able to collect soil samples accurately and safely. • Soil fertility management: to be able to calculate and apply the correct amount of fertilizer or amendment. • Soil conservation: to be able to design and implement soil conservation practices. • Soil microbiology: to be able to collect and analyze soil microbial samples. • Soil restoration: to be able to design and implement a soil restoration plan

Responsibility and Autonomy	Integrate STEAM principles into outdoor farm activities by incorporating technology, engineering, and math concepts. For example, students could use simple machines to lift and move heavy objects, calculate the force required to plant crops or design irrigation systems to conserve water. Encourage responsibility and autonomy by having students take ownership of their own learning. For example, they could design and implement their own experiments, record their observations, and analyze their data.

2- PLANT BIOLOGY AND GENETICS

Competence Area	Plant Biology and Genetics
Competence Statement	To learn about plant anatomy and physiology, plant genetics, and the use of genetically modified crops in agriculture. To conduct experiments on the effects of different growing conditions on plant growth
Knowledge and scientific data	1. Plant identification: This involves being able to identify different plant species and varieties based on their morphology, anatomy, and other characteristics. • to know plant taxonomy and nomenclature • to be aware of plant growth and development

2. Plant physiology: This involves understanding the physiological processes that govern plant growth and development, including photosynthesis, respiration, and hormone signaling.

- to know plant anatomy and biochemistry
- to explain environmental factors that affect plant physiology, such as light, temperature, and moisture.

3. Plant genetics: This involves studying the genetic makeup of plants and how genes affect plant traits and behaviors.

- to know plant genetics and molecular biology.
- to understand plant breeding and selection techniques

4. Plant pathology: This involves studying the diseases that affect plants and the pathogens that cause them. The skills involved include:

- to know plant disease symptoms and diagnostic methods.
- to understand plant disease management strategies, such as biological control and chemical treatments.

5. Plant biotechnology: This involves using genetic engineering and other biotechnological techniques to modify plants for desirable traits, such as disease resistance or increased productivity.

6. to know genetic engineering techniques and biotechnology tools.

7. to explain ethical and regulatory considerations related to plant biotechnology.

Skills = abilities (what can I do)	• Plant identification: to be able to use identification keys and resources. • Plant physiology: to be able to conduct experiments and measurements related to plant physiology. • Plant genetics: to be able to use genetic tools such as PCR, gel electrophoresis, and DNA sequencing. • Plant pathology: to be able to identify plant pathogens and their modes of transmission. 8. Plant biotechnology: to be able to design and implement experiments related to plant biotechnology
Responsibility and Autonomy	1. Begin by selecting a farm-based theme that aligns with your STEAM objectives. For example, if you are teaching biology, you might focus on soil composition and plant growth. 2. Provide opportunities for students to engage in hands-on, experiential learning on a farm or in a garden. This could include planting and harvesting crops, soil testing, and exploring the local ecosystem.

3- AGRICULTURAL ENGINEERING

Competence Area	Agricultural Engineering
Competence Statement	To research and discuss different types of agricultural equipment, such as tractors and irrigation systems. To analyze the design and construction of agricultural buildings and structures, such as barns and greenhouses.

	To design and build a model of an agricultural structure or equipment.
Knowledge and scientific data	1. Equipment design and fabrication: This involves designing and fabricating equipment that is used in agriculture, such as tractors, harvesters, and irrigation systems. • to know engineering principles and materials science. • to be aware of manufacturing processes and quality control. 2- Precision agriculture: This involves using technology to improve the efficiency and sustainability of agricultural practices, such as crop monitoring, yield mapping, and variable rate application. • to know geospatial technology and remote sensing. • to understand agronomy and crop management practices. 3-Irrigation and drainage: This involves designing and implementing systems for irrigation and drainage to optimize water use and manage soil moisture. • to know hydraulic engineering and soil physics. • to have the knowledge of water management and conservation practices. 4. Structural design and construction: This involves designing and constructing buildings and other structures used in agriculture, such as barns, silos, and greenhouses. • to know structural engineering and construction materials. • to learn building codes and regulations. 5. Environmental management: This involves designing and implementing practices to reduce the environmental.

	impact of agriculture, such as waste management, nutrient management, and erosion control. • to know environmental science and policy. • to understand sustainable agriculture practices and their implementation.
Skills = abilities (what can I do)	• Equipment design and fabrication: to be able to design equipment that is safe, efficient, and effective • Precision agriculture: to be able to analyze and interpret data from sensors and other sources • Irrigation and drainage:to be able to design and install irrigation and drainage systems • Structural design and construction: to be able to design and construct buildings that are safe and functional • Environmental management: to be able to design and implement environmental management plans
Responsibility and Autonomy	1. Foster a culture of collaboration and feedback, where students can work together to support each other's learning goals. Encourage students to share their progress and ask for feedback from their peers. 2. Introduce the concept of autonomy to your students, explaining that they have the freedom to work independently and make their own decisions in the learning process.

4- WATER CONSERVATION IN AGRICULTURE

Competence Area	Water Conservation in Agriculture
Competence Statement	To investigate the water cycle and its relationship to agriculture. To discuss the impact of drought on agriculture and the need for water conservation. To research and discuss different water conservation methods used in agriculture, such as drip irrigation and rainwater harvesting.
Knowledge and scientific data	1. Water management: This involves managing water resources on a farm, including irrigation, drainage, and water storage. • to know water resources engineering and hydrology. • to understand water quality and treatment methods. 2. Irrigation efficiency: This involves using irrigation methods that maximize water use efficiencies, such as drip irrigation, precision irrigation, and soil moisture monitoring. • to know irrigation engineering and soil physics. • to be aware of crop water requirements and scheduling methods. 3. Soil moisture management: This involves managing soil moisture levels to optimize crop growth and minimize water loss through evaporation and runoff. • to know soil physics and hydrology.

	• to understand soil moisture retention and infiltration rates. 4. Crop selection and management: This involves selecting and managing crops that are well-suited to the local climate and soil conditions, and that require minimal irrigation. • to know crop physiology and ecology. • to explain crop rotation and soil fertility management practices. 5. Water reuse and recycling: This involves reusing and recycling water on a farm to minimize water use and reduce the amount of wastewater that is discharged. • to know water treatment and reuse technologies. • to understand water quality and environmental regulations related to water reuse and recycling.
Skills = abilities (what can I do)	• Water management: to be able to design and implement water management systems. • Irrigation efficiency: to be able to design and install efficient irrigation systems. • Soil moisture management: to be able to measure and monitor soil moisture levels. • Crop selection and management: to be able to select and manage crops based on their water requirements. • Water reuse and recycling: to be able to design and implement water reuse and recycling systems
Responsibility and Autonomy	STEAM education is focused on developing students' responsibility and autonomy. Responsibility means that students take ownership of their own learning and

	are accountable for their progress. Autonomy means that students are given the freedom to work independently and make their own decisions in the learning process. By encouraging responsibility and autonomy in STEAM education, students are empowered to explore their own interests and passions, take risks, and develop critical thinking, problem-solving, and decision-making skills. These skills are essential for success in STEAM fields, as well as in many other areas of life.

5- FOOD SCIENCE AND TECHNOLOGY

Competence Area	Food Science and Technology
Competence Statement	To discuss the chemistry of food and its nutritional value. To investigate food preservation techniques used in agriculture, such as canning and freezing. To will also conduct experiments on the effects of different food preservation methods on food quality and safety.
Knowledge and scientific data	1. Food safety and quality control: This involves ensuring that food products are safe and meet regulatory and quality standards. • to know food microbiology and chemistry. • to understand foodborne illnesses and their prevention.

	2. Food processing and preservation: This involves using various methods to process and preserve food products, such as canning, freezing, and dehydration. • to know food processing technology and equipment. • to be aware of food chemistry and the effects of processing on food quality. 3. Product development: This involves developing new food products or modifying existing ones to meet consumer demand and market trends. • to know food science and consumer behavior. • to understand food marketing and packaging. 4. Sensory evaluation: This involves using human sensory perception to evaluate the flavor, aroma, texture, and appearance of food products. • to know sensory science and statistics. • to have the knowledge consumer preferences and behavior. • Food analysis: This involves using analytical methods to analyze the chemical, physical, and sensory properties of food products. • to know analytical chemistry and food science. • to understand food labeling and regulations.
Skills = abilities (what can I do)	• Food safety and quality control: to be able to design and implement food safety and quality control programs. • Food processing and preservation: to be able to design and implement food processing and preservation systems.

	• Product development: to be able to develop and test food product prototypes. • Sensory evaluation: to be able to design and conduct sensory evaluation tests. • Food analysis: to be able to use analytical instruments and methods
Responsibility and Autonomy	1- Choose a farm-based theme that aligns with your STEAM objectives and includes outdoor activities. For example, if you are teaching physics, you might focus on exploring the forces involved in simple machines used in farming, such as levers and pulleys. 2- Incorporate reflective practices into the learning process. Encourage students to reflect on their own learning, identify areas for improvement, and set goals for future learning.

6- MARKETING AND BUSINESS IN AGRICULTURE

Competence Area	Marketing and Business in Agriculture
Competence Statement	To research and discuss different agricultural business models, such as farm-to-table and community-supported agriculture. To analyze case studies of successful agricultural businesses and their marketing strategies.

	To will also develop a marketing plan for a sustainable agricultural product.
Knowledge and scientific data	1. Market research and analysis: This involves researching and analyzing market trends, consumer behavior, and competitor activity to inform marketing and business decisions. • to know market research methods and statistics. • to be aware of consumer behavior and market segmentation. 2. Product positioning and branding: This involves developing and positioning products to meet the needs and preferences of target markets and creating a strong brand identity. • to know marketing strategy and brand management. • To explain visual design and copywriting. 3. Sales and distribution: This involves selling and distributing agricultural products to customers through various channels, such as direct sales, retail, and e-commerce. • to know sales and distribution channels and methods. • To understand supply chain management and logistics. 4. Financial management: This involves managing financial resources and budgets for agricultural businesses, such as managing expenses, revenue, and profitability. • to know financial management and accounting principles. • to be aware of risk management and financial planning.

	5. Business planning and management: This involves developing and implementing strategic plans, managing resources, and making operational decisions to ensure the success and growth of agricultural businesses. • to know business strategy and planning. • to be aware of human resource management and leadership
Skills = abilities (what can I do)	• Market research and analysis: to be able to analyze data and interpret market trends. • Product positioning and branding: to be able to develop product positioning and branding strategies. • Sales and distribution: to be able to develop and implement sales and distribution strategies. • Financial management: to be able to develop and manage budgets and financial statements. • Business planning and management: to be able to develop and implement business plans
Responsibility and Autonomy	• Integrate STEAM principles into outdoor farm activities by incorporating technology, engineering, and math concepts. • Incorporate reflective practices into the learning process. Encourage students to reflect on their own learning, identify areas for improvement, and set goals for future learning. • Teamwork and collaboration: These involve promoting teamwork and collaboration in STEAM education projects by encouraging students to work together to solve problems and achieve project objectives.

7- SUSTAINABLE AGRICULTURE PROJECTS

Competence Area	Sustainable Agriculture Projects
Competence Statement	To apply the knowledge and skills they have learned throughout the program to develop a sustainable agriculture project. To identify a local or global agricultural issue to address, develop a project proposal that incorporates sustainable farming practices and STEAM principles, and implement and evaluate the project.
Knowledge and scientific data	1-Project planning and management: This involves developing and managing sustainable agriculture projects from conception to completion. • to know project management methodologies and tools • to understand project risk management and stakeholder engagement 2. Sustainable farming practices: This involves implementing sustainable farming practices that conserve natural resources, promote biodiversity, and reduce greenhouse gas emissions. • to know sustainable farming techniques and systems • to be aware of soil health, crop rotation, and integrated pest management

	3. Climate change adaptation: This involves identifying and implementing strategies to adapt to the impacts of climate change on agriculture, such as changes in temperature and precipitation patterns. • to know climate change science and adaptation strategies. • to understand water management, soil conservation, and crop diversification. 4. Community engagement and education: This involves engaging with communities and stakeholders to promote sustainable agriculture practices and build awareness of sustainable food systems. • to know community engagement and education strategies. • to understand social and cultural factors that influence food systems. 5. Grant writing and fundraising: This involves writing grant proposals and fundraising to secure funding for sustainable agriculture projects. • to know grant writing and fundraising strategies. • to understand funding sources and grant management
Skills = abilities (what can I do)	• Project planning and management: to be able to develop project plans, timelines, and budgets. • Sustainable farming practices: to be able to implement and manage sustainable agriculture practices. • Climate change adaptation: to be able to assess climate risks and vulnerabilities.

	• Community engagement and education: to be able to develop and implement outreach and education programs. • Grant writing and fundraising: to be able to develop and write compelling grant proposals.
Responsibility and Autonomy	1) Choose a farm-based theme that aligns with your STEAM objectives and includes outdoor activities. For example, if you are teaching physics, you might focus on exploring the forces involved in simple machines used in farming, such as levers and pulleys. 2) Plan outdoor activities that allow students to engage in hands-on, experiential learning on a farm or in a garden. This could include planting and harvesting crops, testing soil composition, and exploring the local ecosystem. 3) Integrate STEAM principles into outdoor farm activities by incorporating technology, engineering, and math concepts. For example, students could use simple machines to lift and move heavy objects, calculate the force required to plant crops, or design irrigation systems to conserve water. 4) Encourage responsibility and autonomy by having students take ownership of their own learning. For example, they could design and implement their own experiments, record their observations, and analyze their data. 5) Foster collaboration and feedback by having students work in small groups or pairs. They can share their findings, troubleshoot problems, and provide feedback to one another.

	6) Incorporate reflective practices into the learning process. Encourage students to reflect on their own learning, identify areas for improvement, and set goals for future learning.