ERF:
3. SCIENCE AND TECHNOLOGY

DIMITRA Education & Consulting

Duration: 8 hours

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Project Consortium

Coordinator:

MMC Mediterranean Management Centre

Partners:

Cyprus Certification Company

DIMITRA educational organization

haveta dream

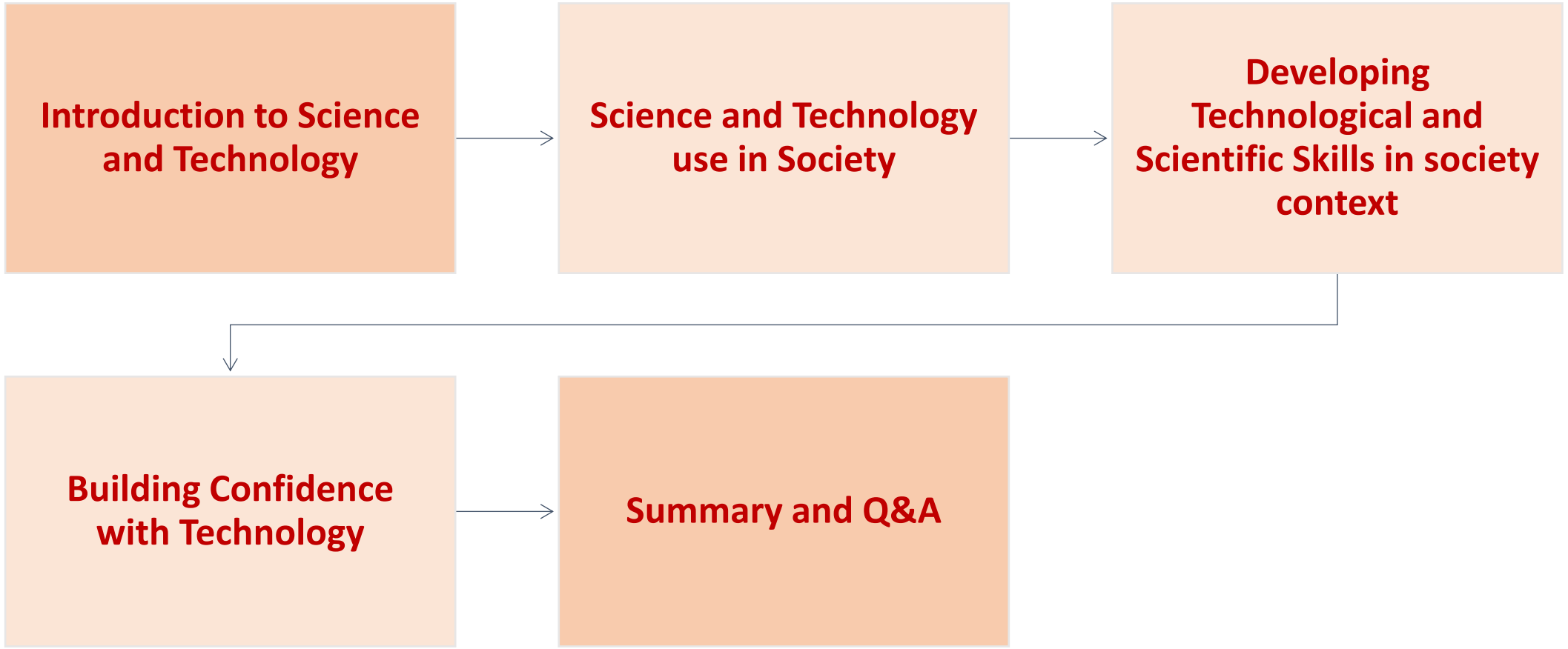
Arab College of Applied Sciences

Jordan Youth Innovation Forum
المـلتقى الأردنـي للإبـداع الشـبابي

Project Details

Title: **“Joint Development, Piloting, and Validation of Entrepreneurial Mindset and Key Skills Curricula and Training Materials for Third Countries”**
Acronym: **EMSA** (Entrepreneurial Mindset and Skills for All)
Agreement Number: 101092477 – EMSA – ERASMUS-EDU-2022-CB-VET
Programme: Erasmus+ Capacity Building in the Field of Vocational Education and Training (VET)
Call for Proposals: ERASMUS-EDU-2022-CB-VET
Start Date: 01.01.2023
End Date: 31.12.2025

Training Route Map



Science & Technology

Training Aim

To equip participants with essential technological and scientific skills, focusing on problem-solving, decision-making, and effective use of technology. This unit will emphasize the practical application of scientific methods and technological tools to improve business processes, foster innovation, and enhance decision making processes.

Descriptor

Learning Outcomes

In terms of **knowledge**:

- ✓ Understand the principles and applications of the scientific method and technological tools in problem-solving and decision-making processes

In terms of **skills**:

- ✓ Apply scientific methods and technological tools to identify problems, formulate hypotheses, and conduct experiments, developing practical solutions that enhance business efficiency and support data-informed decision-making.

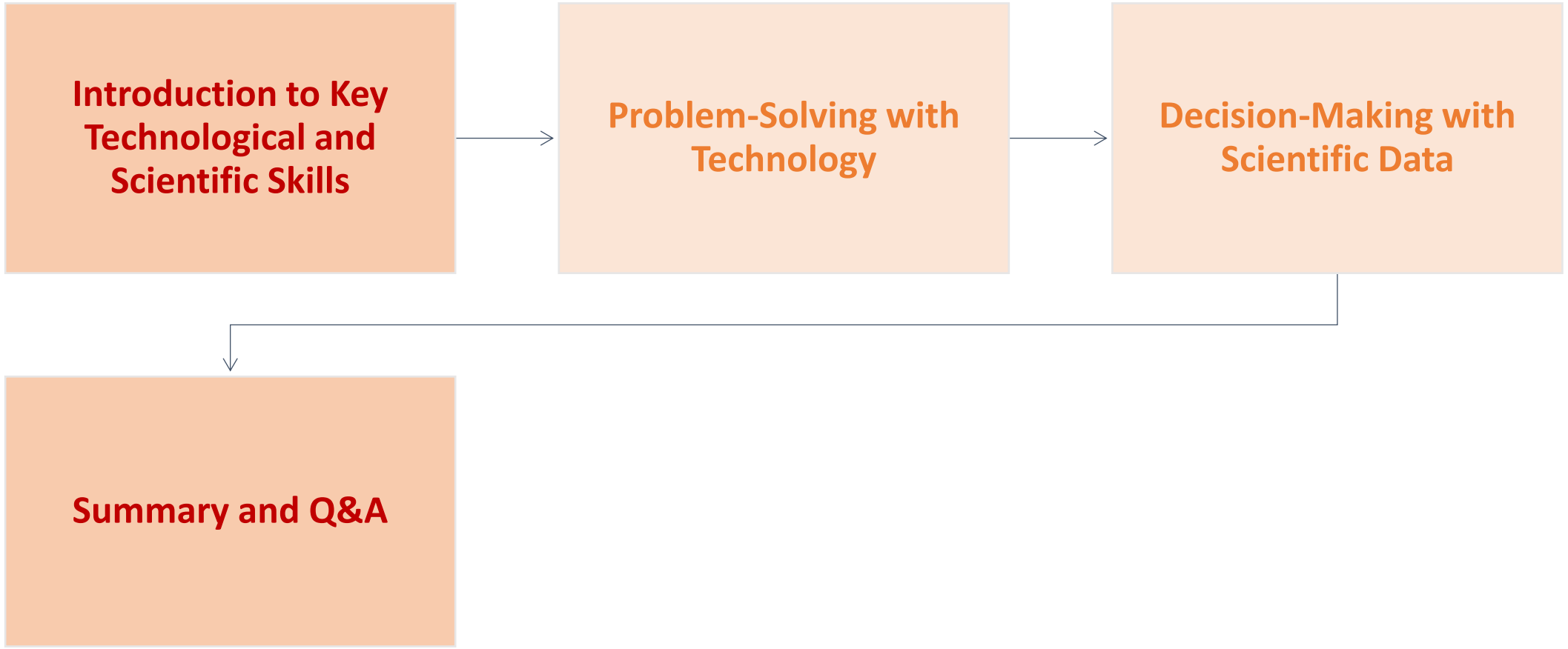
In terms of **attitudes**:

- ✓ Demonstrate responsibility and ethical awareness when applying technological solutions, making informed decisions that consider both social impacts and regulatory compliance,

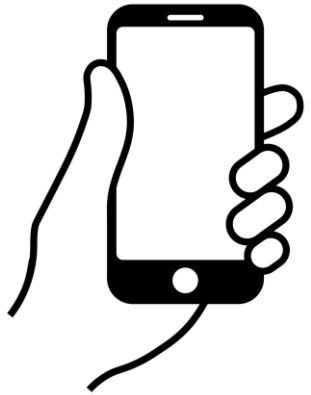
The competence in Science and Technology involves understanding the basic principles, methods, and applications of scientific knowledge and technological innovation, and recognizing their impact on society. It also includes an awareness of the ethical, and social implications of technological advancements, encouraging responsible and informed decision-making.

What ERF competence is our training about?

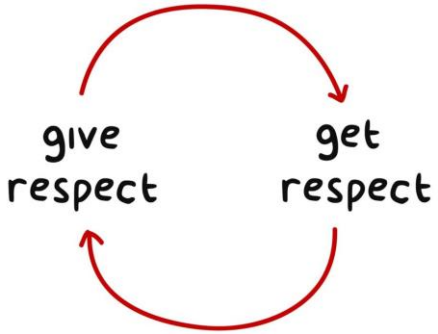
Training Route Map

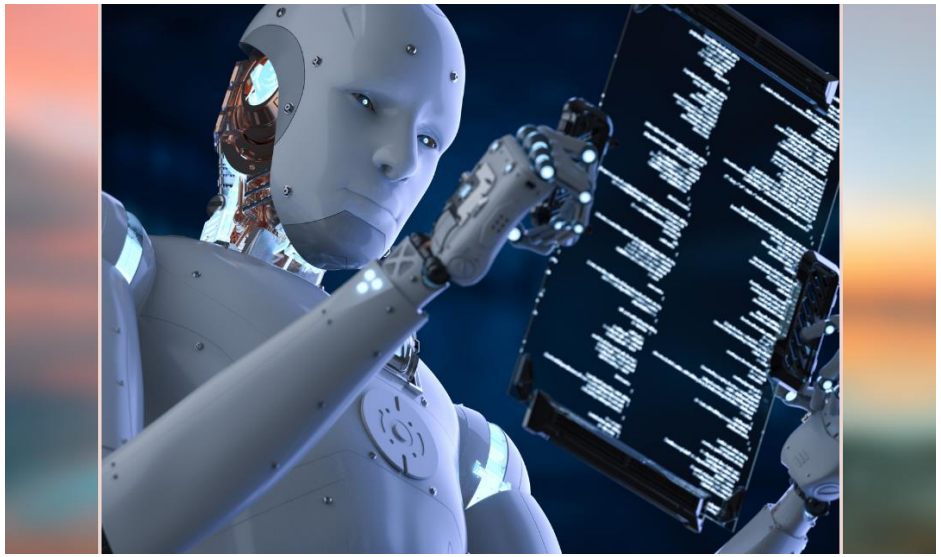


Training Rules



Participation



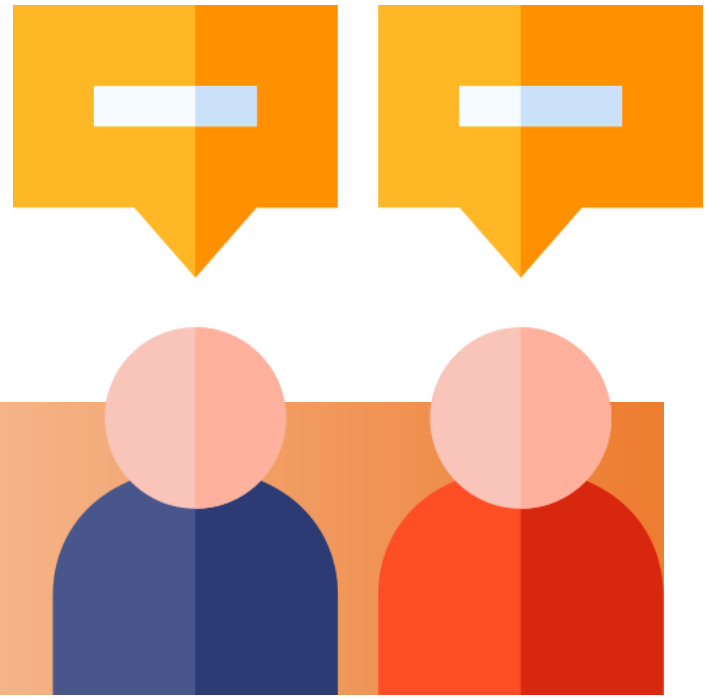


MT2.2_1 Reflect on core value of Science & Technology—**Artificial Intelligence.**
Share your perspectives on how do you consider Artificial Intelligence will affect our society. Positive or Negative? Or both?

Ice-breaking Activity

Introductions

Let’s get to know each other!



"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."— Louis Pasteur

Introduction to Key Technological and Scientific Skills

What Are Technological and Scientific Skills?

Technological Skills:

These refer to the knowledge and abilities needed to work with various types of technology. This can include understanding and using tools, software, machines, and digital platforms that improve efficiency and productivity. Examples include programming, engineering, data analysis, and equipment handling.

What Are Technological and Scientific Skills?

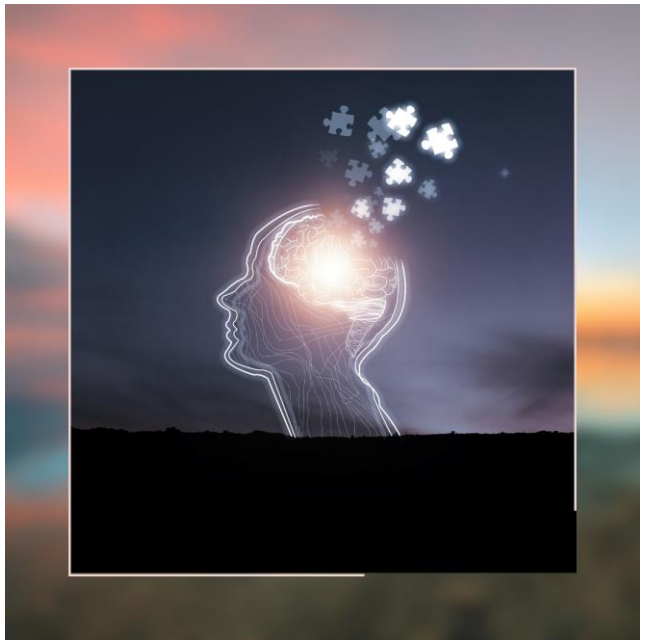
Scientific Skills:

These skills involve applying scientific principles and methodologies to investigate phenomena, conduct experiments, and analyze results. Scientific skills include logical reasoning, critical thinking, research methodologies, and knowledge of the scientific method. They are essential in fields like healthcare, environmental science, and engineering

What Are Technological and Scientific Skills?

Importance of These Skills in Driving Innovation and Solving Complex Problems

Driving Innovation: Technological and scientific skills are crucial for creating new solutions to modern challenges. For instance, advances in AI, biotechnology, and renewable energy arise from strong foundational skills in these areas. Innovation often leads to improved quality of life, new industries, and more efficient processes in existing ones.



What Are Technological and Scientific Skills?

Importance of These Skills in Driving Innovation and Solving Complex Problems

Solving Complex Problems: In an interconnected world, challenges like climate change, public health crises, and cybersecurity threats require scientific reasoning and technological intervention. These skills enable people to analyze and address such issues effectively. For example, data analysis helps in predicting environmental changes, while scientific research underpins advancements in healthcare treatments

Topic 1: Problem-Solving with Technology

Using the Scientific Method for Problem-Solving

Steps of the Scientific Method:

Observation: Identify a problem or need by closely observing your environment or situation. It's about recognizing that something isn't optimal or could be improved.

Hypothesis: Based on your observations, you propose a potential solution or explanation. A hypothesis is an educated guess about how to solve the problem, and it should be specific and measurable.

Experimentation: This involves conducting experiments or trials to collect data and observe outcomes.

Analysis: After gathering data, you analyze it to determine whether your hypothesis is supported or if adjustments are needed

Using the Scientific Method for Problem-Solving

4 Steps of the Scientific Method:

1. Observation: Identify a problem or need by closely observing your environment or situation. It's about recognizing that something isn't optimal or could be improved.

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Using the Scientific Method for Problem-Solving

4 Steps of the Scientific Method:

3. Experimentation: This involves conducting experiments or trials to collect data and observe outcomes.

4. Analysis: After gathering data, you analyze it to determine whether your hypothesis is supported or if adjustments are needed

Relevance in Technology

The scientific method provides a structured, logical approach to problem-solving, which is crucial in technology development. In tech fields, using this method helps ensure that solutions are data-driven, tested, and effective. By following these steps, innovators can systematically improve and refine technological solutions.

Observation

This step involves observing your environment or a particular situation to detect a problem or area that could be improved. The goal is to understand the current state and recognize any gaps or issues. Observing thoroughly is critical because it helps you define the problem accurately, ensuring that you don’t waste time addressing symptoms rather than the root cause.

Observation

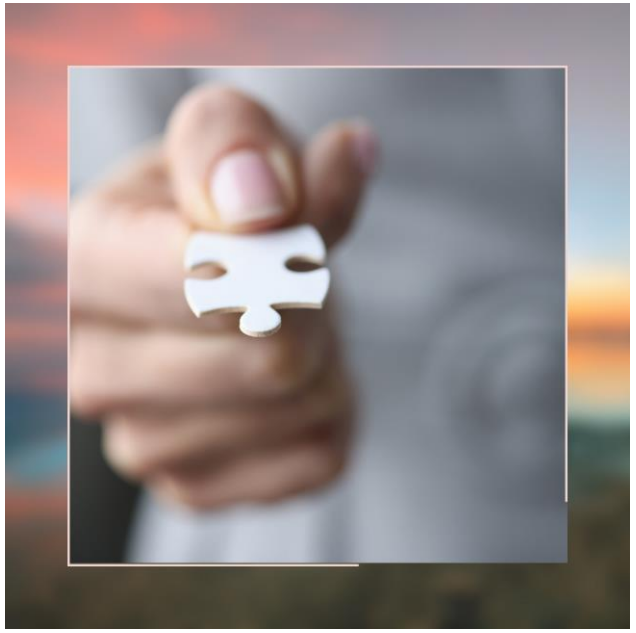
Example: Suppose you're an educator and notice that many students aren’t fully engaged during class. By observing students’ behaviors and perhaps gathering feedback from them, you might find that traditional teaching methods are failing to capture their attention. This observation phase sets the foundation for proposing a solution, as it helps clearly define the problem.

Hypothesis

After identifying a problem in the observation phase, you develop a hypothesis—a possible solution to the problem. The hypothesis should be based on your observations and provide a clear, testable statement about how you intend to solve the issue. Think of it as a tentative answer to the problem that you're going to verify through testing.

Hypothesis

Related to the previous example, instead of a vague hypothesis like "Digital tools might help," a testable hypothesis would be more specific, such as "Implementing interactive digital tools will increase student engagement by 20% in three months."



Experimentation

This step involves creating a structured experiment or trial to test your hypothesis. The design should specify what you will do, how long the experiment will last, and how you will measure the results.

A well-designed experiment will have a clear structure that isolates the variable being tested (in this case, the digital interactive tools) and ensures that any changes in engagement are due to this variable.

Experimentation

Related to the previous example, in a classroom setting, you might design an experiment where one group of students uses traditional learning methods, while another group uses interactive digital tools. The two groups should be as similar as possible, so the results are due to the learning method, not other factors.

Analysis

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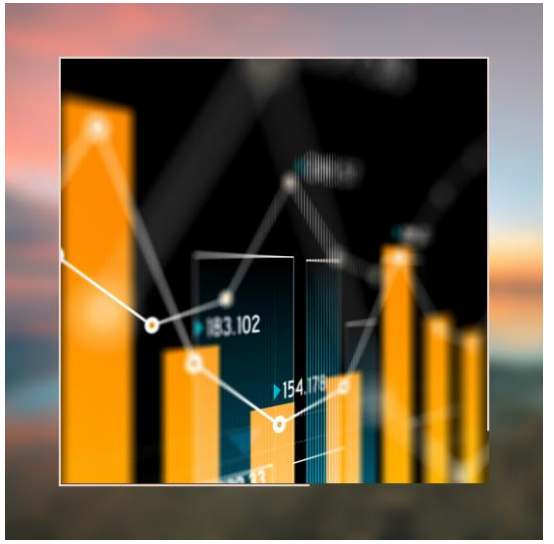
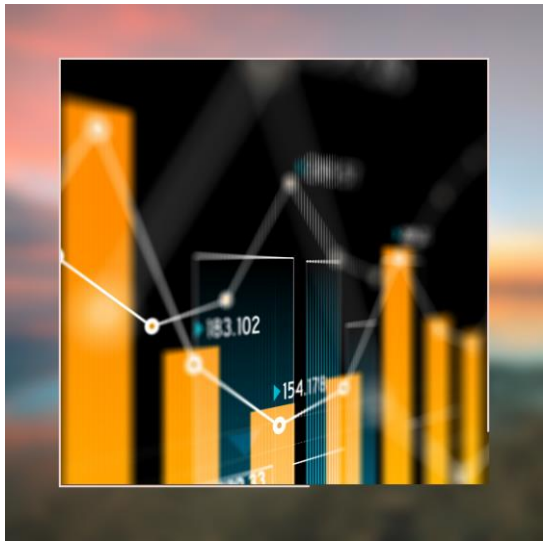


Analysis

Suppose that after conducting the trial with digital interactive tools, you collect data showing a 15% increase in engagement, rather than the 20% you predicted. Analyzing this data helps you see that while the tools had a positive effect, they may need refinement to reach the target increase.



Case Study

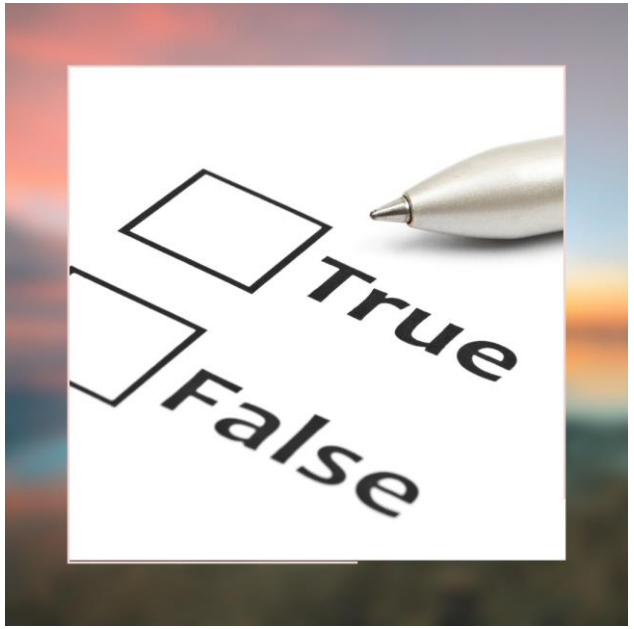
MT2.2_2

Case study on identifying the 4 stages of scientific method for problem solving in real situation problem : observation, hypothesis, experimentation, analysis

True or False

MT2.2_3

True or False questions testing your knowledge on using the Scientific Method for Problem-Solving



Topic 2: Decision-Making with Scientific Data

Decision-Making with Scientific Data

In today's world, data is at the core of decision-making across industries, including healthcare, finance, environmental science, and government policy. By leveraging data, decision-makers can better predict outcomes, assess risks, and make choices that are objective and measurable.

Data-driven decision-making is crucial because it relies on factual evidence rather than intuition or assumptions, leading to more consistent and reproducible results.

Understanding Analytical Decision-Making

Analytical decision-making is a method that relies on data and structured reasoning to make informed choices. It involves breaking down complex problems into manageable parts and using data to evaluate different options objectively.

Analytical decision-making reduces guesswork, minimizes biases, and provides a framework to make logical, evidence-based decisions. This approach is particularly useful in reducing uncertainty, leading to outcomes that are more consistent, reliable, and justifiable.

Steps in the Analytical Decision-Making Process

There are 6 possible steps in the Analytical decision making Process

1. Define the Problem or Objective
2. Collect and Process Data (Quantitative and Qualitative)
3. Analyze Data
4. Generate Options and Evaluate Possible Outcomes
5. Make the Decision and Implement
6. Review Results and Refine Approach if Necessary

Decision-Making in the EU vs. Third Countries

Decision-Making in the EU

The EU has established strict regulatory frameworks that guide decision-making in areas like environmental standards, data protection (GDPR), and consumer rights. This ensures that decisions made by organizations and governments meet high standards of transparency, accountability, and ethics.

Decision-Making in the EU vs. Third Countries

Decision-Making in the EU

The EU emphasizes **data transparency**, meaning data sources and methodologies must be clear and accessible. This allows the public and stakeholders to understand the basis of decisions.

The EU invests in publicly accessible databases, like Eurostat for statistics or the European Environmental Agency's data, enabling evidence-based policies.

Decision-Making in the EU vs. Third Countries

Decision-Making in Third Countries:

Third countries (non-EU countries) often have varied regulatory, economic, and social frameworks, which affect decision-making processes.

In some third countries, **data accessibility** may be limited due to economic constraints, lack of digital infrastructure, or privacy laws.

Decision-Making in the EU vs. Third Countries

Decision-Making in Third Countries:

Decisions may rely more on personal experience, cultural norms, or situational context rather than on comprehensive, standardized data. This can lead to varied approaches and inconsistencies, especially when compared to the structured data practices common in the EU.

Video Analysis

MT2.2_4

This video introduces Multi-Criteria Decision Analysis (MCDA) as a structured approach to make complex decisions with multiple stakeholders, using the example of a family choosing a home based on various criteria like distance, size, and cost. Review the video and answer to the questions.

AI-Driven Decision-Making

AI-driven decision-making refers to using artificial intelligence (AI) to assist or fully automate decisions in various fields such as finance, healthcare, marketing, and public services.

These AI systems analyze large amounts of data, identify patterns, and generate insights that help inform or even make decisions.

This approach has grown in popularity as AI technologies become more sophisticated, capable of handling complex, data-intensive tasks with speed and accuracy beyond human capabilities.

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AI-Driven Decision-Making

AI-driven decision-making relies heavily on data-driven insights, using vast amounts of data from multiple sources, including historical records, real-time information, and a range of public or private databases.

This capability allows AI to process extensive datasets, identify patterns, and extract actionable insights that serve as the basis for more informed and evidence-backed decisions.

AI-Driven Decision-Making

One of the core strengths of AI in decision-making is its **speed and efficiency**. AI systems can analyze and process data at speeds far surpassing human capabilities, enabling quicker decision-making in crucial, time-sensitive areas such as emergency response, stock trading, and customer service.

This **efficiency** also extends to handling repetitive or complex analyses, where AI can save valuable time and resources by completing tasks that would typically require a significant human workforce

AI-Driven Decision-Making

AI-driven decision-making also ensures **consistency and objectivity**, as AI systems follow programmed algorithms and models, avoiding the influence of human emotions, biases, or cognitive fatigue.

This adherence to objective parameters enhances fairness, as AI can standardize decisions across similar cases, creating more predictable and reliable outcomes.

By reducing the variability that often accompanies human judgment, AI-driven decision-making enhances trust in systems where consistent results are essential, such as legal assessments or financial approvals.

AI-Driven Decision-Making

Pattern recognition and **predictive capabilities** are other notable strengths of AI in decision-making.

AI's ability to detect and analyze patterns within data allows it to predict future trends or behaviors accurately.

This predictive power enables organizations to make proactive decisions, helping them prepare for likely scenarios and giving them a competitive advantage in adapting to market or environmental changes.

AI-Driven Decision-Making

Adaptability and learning are key characteristics of AI, particularly through machine learning.

This **adaptability** is valuable in dynamic industries, such as e-commerce, where customer preferences continually evolve. Machine learning models can adjust to new patterns, improving their accuracy and relevance over time.

This **flexibility** enables AI systems to stay effective in rapidly changing environments, ensuring that the decisions they support remain current and reflective of the latest trends.

AI-Driven Decision-Making

Scalability is another advantage of AI-driven decision-making. AI systems can manage large-scale operations efficiently, making them suitable for organizations of any size.

This scalability is particularly valuable for businesses with fluctuating or expanding needs, as AI provides a flexible framework that adjusts to various operational levels.

Multiple Choice Questions

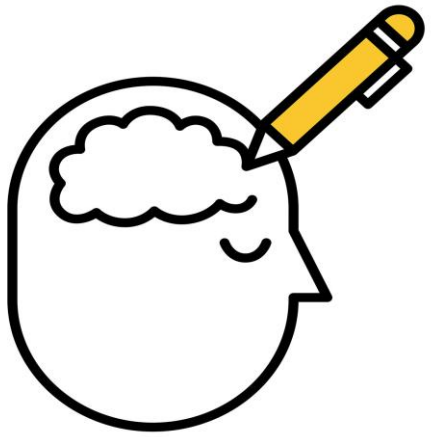
MT2.2_5

Multiple Choice Questions Based on What You've Learned Throughout this Unit Course.

Revision-Summary and Q&A

- ✓By using data and logical processes, analytical decision-making helps minimize guesswork and bias, resulting in more consistent and justified decisions.
- ✓Comparative analysis of decision-making practices between the EU and Third countries provided insights into regional differences.
- ✓AI systems facilitate faster, more consistent, and scalable decision-making by leveraging large datasets, pattern recognition, and machine learning.
- ✓Decision-making practices vary between regions, with the EU prioritizing strict regulations, transparency, and data protection, while third countries often rely on context-based or less formalized practices

Do you have any questions?



What will you keep from today’s training?

Training

Evaluation

List of References

- Kambil, A. (2008). *What is your data strategy?* Harvard Business Review.
- Roser, M., & Ritchie, H. (2021). *Artificial Intelligence.* Our World in Data.
- Provost, F., & Fawcett, T. (2013). *Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking.* O'Reilly Media.
- Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies***.** W. W. Norton & Company.

List of Suggested Resources for Self-Directed Learning

- Harvard Online - *Data Science for Business* - *Harvard Online - Data Science for Business*
- MIT Sloan Management Review - The AI Advantage : MIT Sloan Management Review - The AI Advantage
- European Union's *AI Ethics Guidelines for Trustworthy AI* (European Commission, High-Level Expert Group on AI) - AI Ethics Guidelines for Trustworthy AI

Entrepreneurial Mindset and Key Skills for All

Thank you!

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