ERF:
SCIENCE AND TECHNOLOGY

Project Partner Name

DIMITRA Education & Consulting

Duration: 8 hours

Project Consortium

Coordinator:

MMC Mediterranean Management Centre

Partners:

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

SCIENCE AND TECHNOLOGY

Training Aim

The aim of this training is to provide learners with a foundational understanding of science and technology's role in shaping society and the economy, emphasizing how these fields drive progress in areas like healthcare, communication, education, and sustainability. Through exploring both the benefits and challenges associated with technological advancements, including ethical considerations like data privacy and fairness, learners will gain essential knowledge, practical skills, and a sense of responsibility to approach science and technology in a socially conscious and impactful way.

SCIENCE AND TECHNOLOGY

Learning Outcomes

EMSA

In terms of **knowledge**:

- ✓ *Learners will understand the fundamental scientific and technological concepts and recognize their relevance in addressing societal challenges.*
- ✓ *Understand the principles and applications of the scientific method and technological tools in problem-solving and decision-making processes.*
- ✓ *Recognize the impact of science and technology on individual empowerment and societal advancement*

In terms of **skills:**

- ✓ *Demonstrate the ability to use basic technological tools responsibly and analyze the social and ethical implications of science and technology in society.*
- ✓ *Apply scientific methods and technological tools to identify problems, formulate hypotheses and support data-informed decision-making.*
- ✓ *Apply strategies to overcome technology-related anxiety and build confidence in technology use*

In terms of **competences:**

- ✓ *Develop curiosity and ethical behavior on technology use, including data privacy and social equity.*
- ✓ *Demonstrate responsibility and ethical awareness when applying technological solutions*
- ✓ *Take initiative in setting personal goals for technology skill development and maintain a positive approach*

EMSA

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 *(Competence Level)*

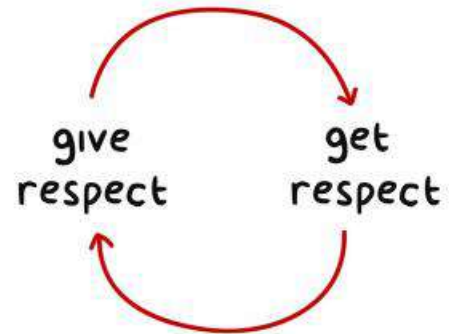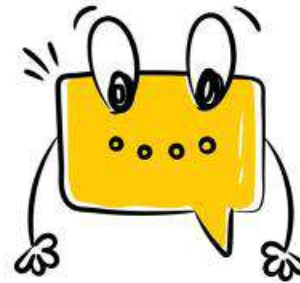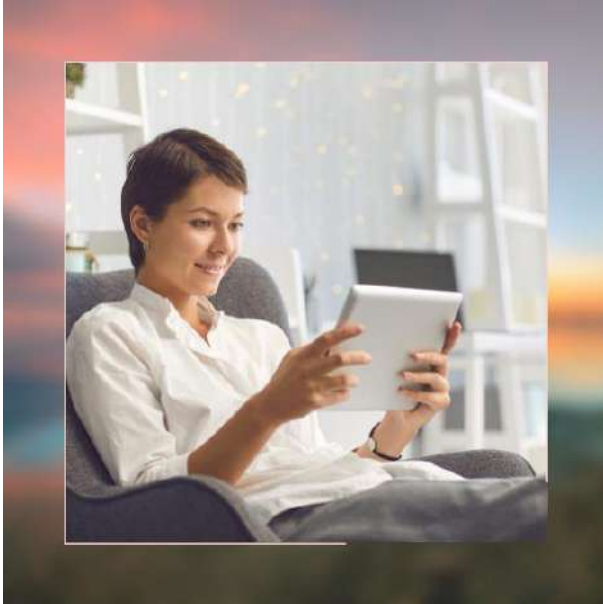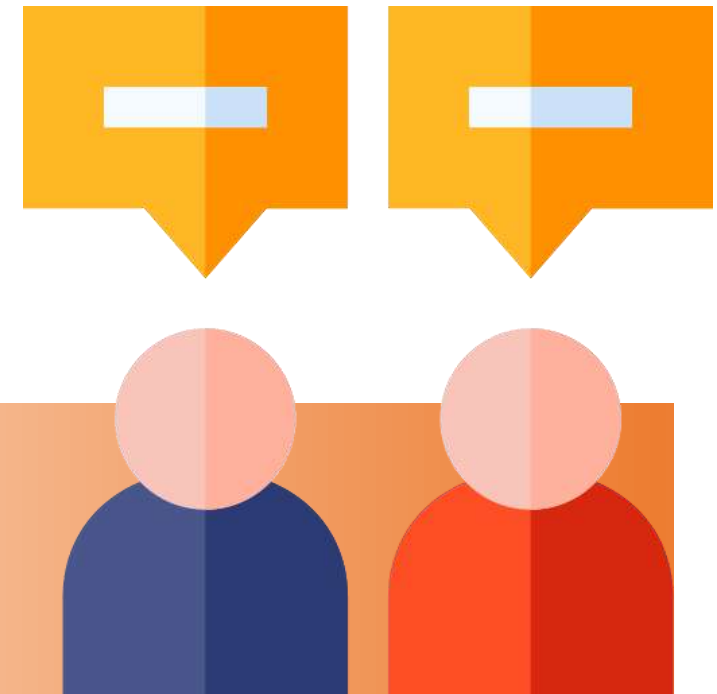| Science and Technology use in Society	→	Developing Technological and Scientific Skills in society context	→	Integrating Technology in Contemporary Life

Training Rules

"In one word, how would you describe yourself as a technology user?"

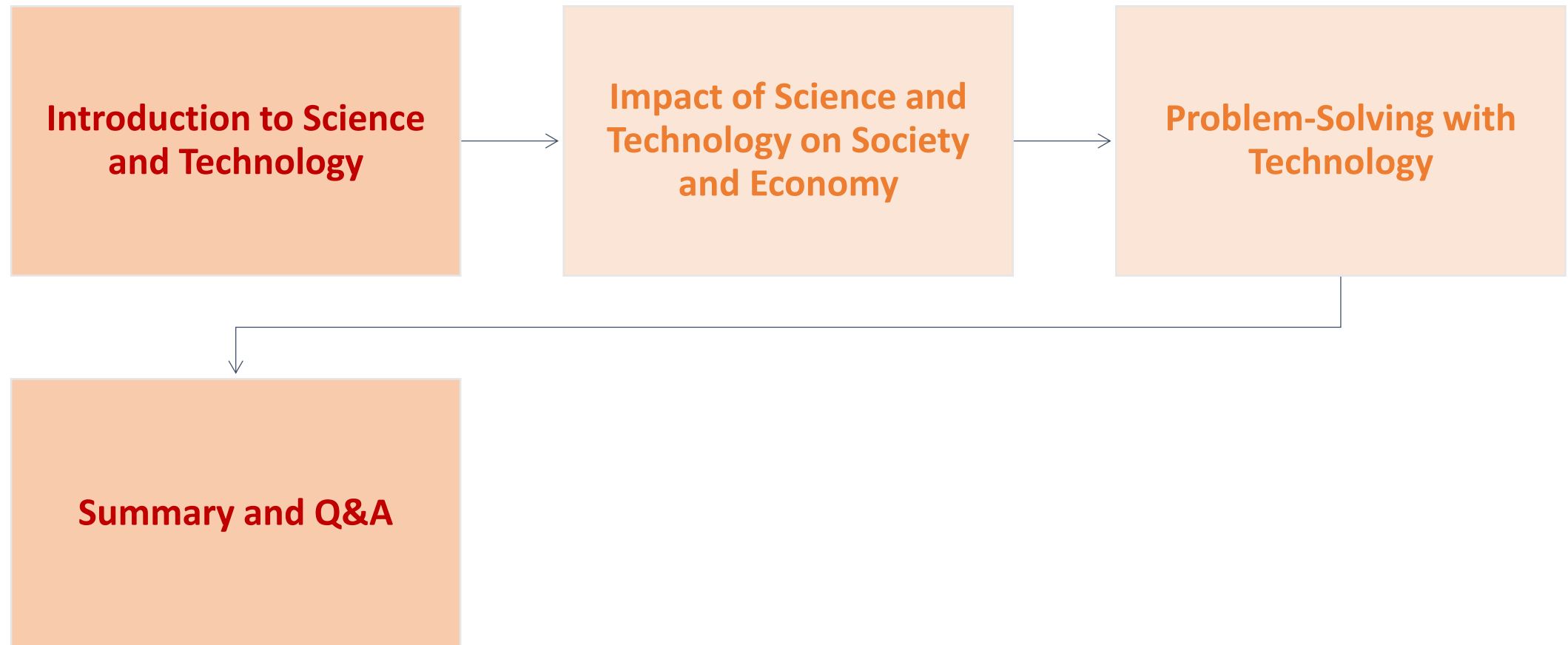# Ice-breaking Activity – Snapshots

Introductions

Let's get to know each other!

"Science is not only a disciple of reason but also one of romance and passion."— Stephen Hawking

Introduction to Science and Technology

Introduction to Science and Technology

Definition of Science

- **Science** is a structured method of investigating the natural world, rooted in systematic observation, measurement, and experimentation.

Science seeks to understand fundamental truths about the universe, from the behavior of tiny particles to the vastness of space, as well as biological, chemical, and physical phenomena on Earth.

The scientific method involves forming hypotheses, conducting controlled experiments, gathering data, and reaching conclusions that can be tested and verified.
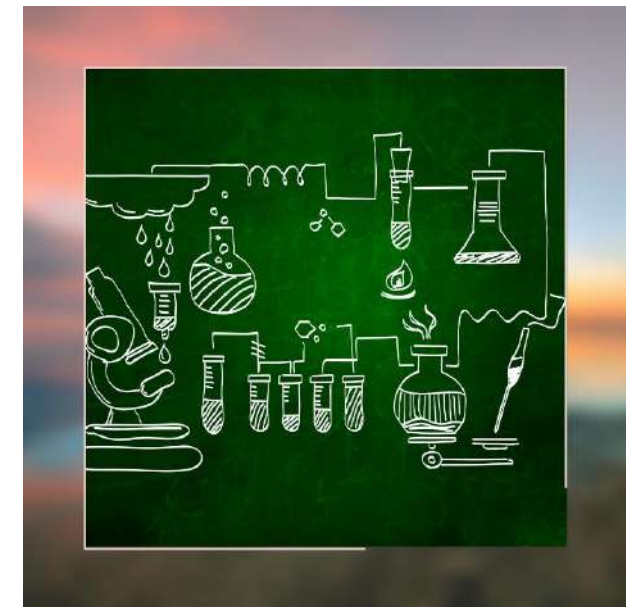
Introduction to Science and Technology

Definition of Technology

- Technology is the practical application of scientific knowledge to create tools, systems, or methods that solve real-world problems or enhance our capabilities.

Purpose: Technology serves to make life more efficient, comfortable, and productive by addressing specific human needs, from improving communication to developing sustainable solutions.

Types of Technology: This includes everything from simple tools like the wheel to complex systems like computers, medical devices, and renewable energy solutions

Introduction to Science and Technology

Science example: Astronomy studies celestial objects, biology explores living organisms, and chemistry examines substances and their interactions.

Technology examples: Smartphones enable instant communication, medical equipment like MRI scanners aids in healthcare, and renewable energy technologies help reduce our carbon footprint.

Introduction to Science and Technology

Importance in Society

Science and technology have a profound impact on almost every aspect of human life, reshaping our social structures, economies, and daily routines.

- **Key Areas of Impact**: **Healthcare**: Advances in medical research and technology have led to better diagnostic tools, treatments, and even cures for diseases that were once fatal.

- **Education**: Digital tools and online platforms make learning accessible to more people, enabling lifelong education.

- **Communication**: The internet and mobile technology allow instant global communication, connecting people and ideas worldwide.

- **Environment**: Scientific research drives environmental awareness, while technologies like renewable energy and waste management promote sustainability.

Introduction to Science and Technology

Challenges and Responsibilities

With these advancements come societal responsibilities to address ethical considerations, such as data privacy, accessibility, environmental impact, and ethical implications of scientific discoveries.

Learning Activity

- MT2.1_1 Reflect on the most important scientific and technological inventions— **Telephone,** and **TV.**

Learning Activity

- **Telephone,** and **TV - The following inventios are considered Science or Technology development examples ?**

- **Share your perspectives on why do you consider this?**

1. Impact of Science and Technology on Society and Economy

Science and Technology in Society and Economy

Science, through systematic research and discovery, uncovers new knowledge that expands human understanding, while **technology** applies this knowledge in practical ways that directly affect daily life.

Together, they drive economic growth, improve societal well-being, and enhance global competitiveness.

This symbiotic relationship between science and technology fuels progress, enabling societies to address pressing challenges, from healthcare to climate change, while shaping a globally competitive landscape.

Definition and Importance of Science

Science is not merely a body of knowledge; it's a process that seeks to answer questions about the universe, develop explanations, and make predictions. Its importance lies in its ability to generate new insights that drive innovation and solve societal problems.

Science underpins technological advancements and equips societies with the knowledge needed to make informed decisions, making it indispensable for sustainable progress.

Definition and Importance of Technology

Technology transforms abstract scientific concepts into tangible tools that improve everyday life.

Technology is essential for enhancing efficiency, productivity, and overall quality of life. It plays a crucial role in various fields, such as communication, where smartphones and the internet enable instant global connectivity, and sustainability, where renewable energy sources like solar and wind power are helping to reduce environmental impact.

Impact on Society – Positive Aspects

Science and technology have improved various facets of societal life, particularly in healthcare, communication, and education.

These positive impacts have collectively improved the quality of life, making education, healthcare, and information more accessible.
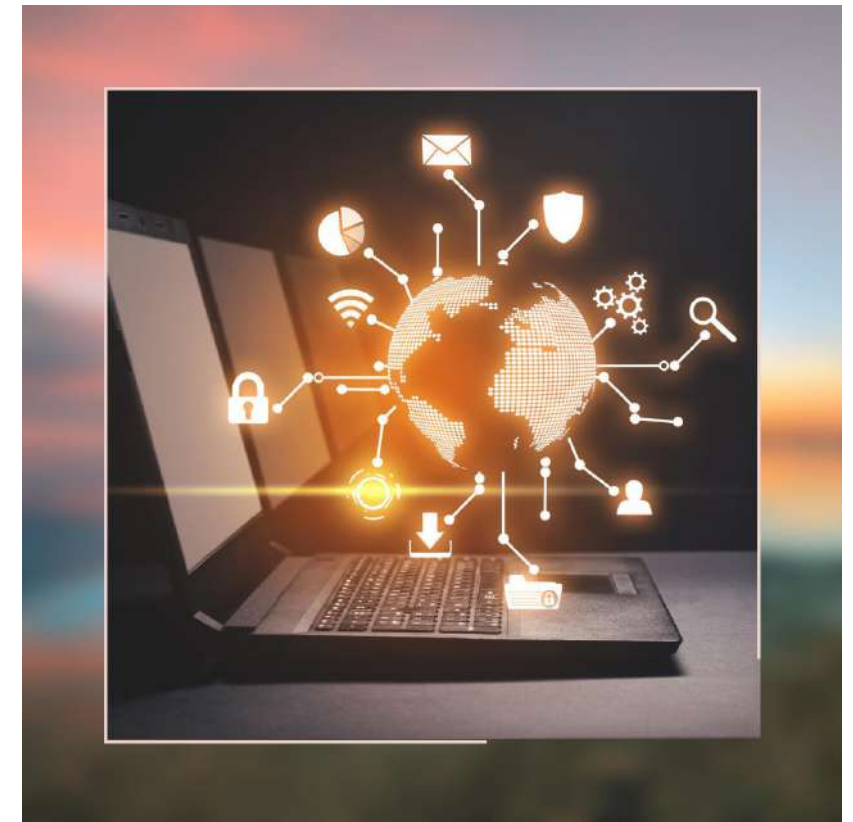
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Impact on Society – Positive Aspects

- Medical technology advancements have led to better treatments, diagnostic tools, and even preventive healthcare solutions, resulting in longer and healthier lives.

- In terms of social connectivity, the internet and social media have transformed how people interact, breaking down geographical barriers and creating a more interconnected world.

- Information is now more accessible than ever, as technology democratizes knowledge, allowing individuals from all backgrounds to learn, grow, and make informed decisions.

Impact on Society – Challenges and Risks

Despite its benefits, technology presents several challenges and risks that impact society in significant ways.

One of the primary issues is the digital divide, which refers to the unequal access to technology and the internet among different social and economic groups. This disparity limits opportunities for certain individuals and communities, reinforcing inequalities.

Impact on Society – Challenges and Risks

Privacy and security concerns are also prevalent in a digital age where personal data is frequently shared and stored online.

Issues such as data breaches and cyber attacks pose risks to individual privacy and national security.
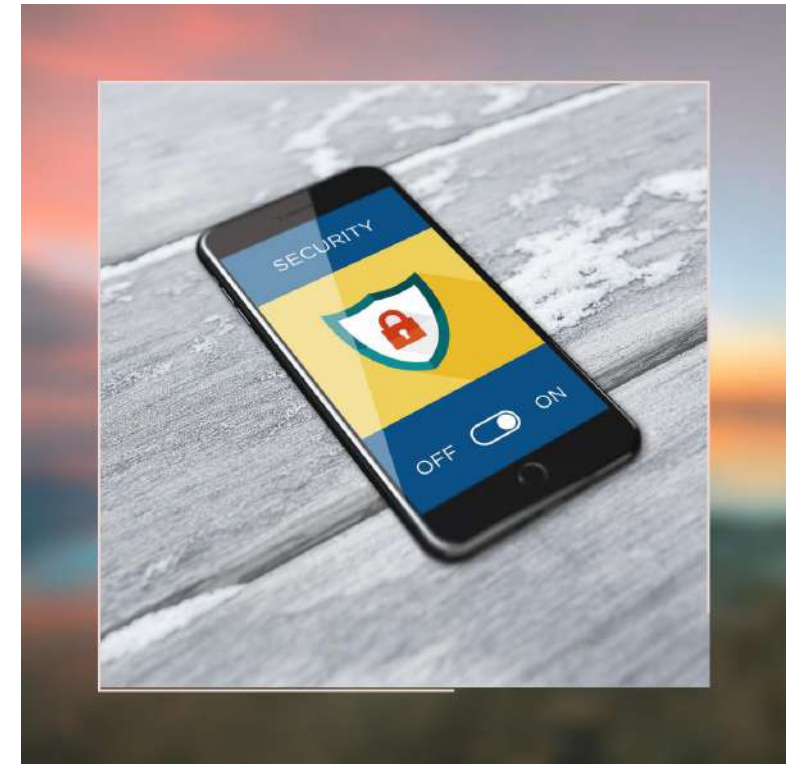
Impact on Society – Challenges and Risks

Furthermore, the rise of automation and AI has social implications, such as job displacement, where traditional jobs may become obsolete, leading to potential economic and mental health challenges.

As technology continues to evolve, addressing these challenges is essential to ensure that its benefits are distributed equitably and responsibly.

Comparative Analysis - EU and Third Countries

EU's Approach

The EU places a strong emphasis on research and development (R&D), sustainability, and digital innovation. Programs like Horizon Europe fund scientific research and technological innovation across various fields, such as artificial intelligence, renewable energy, and biotechnology.

These initiatives not only drive scientific breakthroughs but also prioritize ethical considerations, sustainability, and inclusivity.

This focus on sustainable development and digital transformation positions the EU as a leader in balancing technological growth with social responsibility.

Comparative Analysis - EU and Third Countries

Challenges in Third Countries

In contrast, many third countries face significant challenges that limit their scientific and technological advancements.

Limited access to resources, such as funding for R&D, skilled personnel, and modern infrastructure, constrains these nations from keeping up with rapid technological changes.

For many third countries, technological progress is often dependent on partnerships with more developed countries, international aid, or adapting more accessible, traditional technologies instead of cutting-edge solutions.

Comparative Analysis - EU and Third Countries

Challenges in Third Countries

Infrastructure gaps—such as unreliable internet connectivity, limited access to electricity, and inadequate transportation systems—pose additional barriers.

Furthermore, the digital divide remains a pressing issue, where access to technology is unevenly distributed, often favoring urban centers while rural areas lag behind. This gap restricts opportunities for education, business, and innovation, deepening existing inequalities.

Case Study

MT2.1_2

This case study highlights the European Union's role in empowering developing nations like Kenya through sustainable energy projects, infrastructure support, and skills training to bridge technological and digital divides.

Case Study

The European Union partnered with Kenya to implement a solar energy project in rural areas. The project involved:

- **Infrastructure Support**: Installing solar panels and creating a reliable electricity grid in remote villages.

- **Skills Training**: Training local technicians to maintain the solar panels and manage the energy grid.

- **Education**: Providing digital tools and internet access to schools powered by the solar energy system.

This initiative not only supplied renewable energy to rural areas but also improved education, created jobs, and helped bridge the digital divide between urban and rural regions.

Case Study

Questions

- How did the EU's solar energy project in Kenya address both infrastructure challenges and the digital divide in rural areas?

- In what ways can skills training and local capacity building contribute to the sustainability of EU-supported projects in developing nations?

2. Ethical Use of Technology and Science

Data Privacy and Security

In today's digital world, data privacy and security are at the forefront of ethical technology use.

As more aspects of our lives move online, personal data—such as browsing habits, purchasing history, health information, and even location data—are collected, stored, and used by various organizations.

This collection of personal information brings substantial benefits, such as personalized services and targeted recommendations. However, it also raises significant ethical responsibilities regarding how this data is handled and protected.

Learning Activity

MT2.1_3

"What is the first thing you usually share when creating a social media profile?"

"Which of these pieces of information do you think are the riskiest to share? Why?"

Best Practices for Data Protection

To protect users' personal information, organizations need to adopt robust data protection practices.

This includes:

- encrypting sensitive data

- securing networks

- using multi-factor authentication

- and regularly updating software to prevent vulnerabilities.

For individuals, understanding these practices can be empowering, as it allows them to make informed decisions about sharing their data and engaging with digital services.

The Importance of User Consent

One of the key ethical principles in data privacy is **user consent**. Individuals should be informed about what data is being collected, how it will be used, and with whom it will be shared.

Consent should be **freely given**, informed, and specific, allowing users to make choices about their data.

For instance, many websites and applications now ask users to accept cookies or agree to terms before proceeding. However, this should not be a mere formality; users should genuinely understand what they're agreeing to.

Challenges of Data Collection

Despite these principles, there are challenges in data collection and potential misuse.

Companies may collect more data than necessary or use it for unintended purposes, leading to a lack of transparency and accountability.

Additionally, data breaches are a constant risk, where sensitive information can be exposed or stolen, potentially harming individuals financially and emotionally.

Individual Rights and Transparency

In response to these challenges, privacy regulations like the **General Data Protection Regulation (GDPR)** in the EU have strengthened individual rights over personal data.

Under GDPR, individuals have the right to access, correct, or delete their data and to be informed about how it's used.

Adults learning about data privacy can benefit from understanding their rights under these regulations and how to exercise them.

Video Analysis

MT2.1_4 Video Activity

The video provides an in-depth look at the General Data Protection Regulation (GDPR) introduced by the EU, which fundamentally changes how personal data is managed and protected. It explains that GDPR grants individuals greater control over their data, with companies now required to obtain explicit consent to store personal information.

Video Analysis

Questions

1. When did the General Data Protection Regulation (GDPR) come into effect?

A) January 1, 2016
B) May 25, 2018
C) July 15, 2020
D) December 31, 2019

2. Which of the following is NOT considered personal data under GDPR?

A) Email addresses
B) Location data
C) Anonymous survey responses
D) Health records

Video Analysis

Questions

3. What must organizations do if a data breach affects individuals' rights and freedoms?

A) Inform the data subjects immediately, regardless of the breach's impact

B) Report the breach to the relevant authority within 72 hours

C) Wait until the breach is resolved before notifying the data subjects

D) Anonymize the data retroactively to mitigate the breach

Video Analysis

Questions

4. Which of the following rights does GDPR grant to data subjects?A) Inform the data subjects immediately, regardless of the breach's impact

A) The right to unrestricted data retention
B) The right to data portability and erasure
C) The right to automated decision-making without oversight
D) The right to deny organizations lawful data processing

Fairness in AI and Automation

As artificial intelligence (AI) and automated systems become more integrated into society, ethical concerns about bias and fairness have emerged.

AI systems are designed to make decisions or provide recommendations based on vast amounts of data. However, the data fed into these systems often reflects societal biases, and if not carefully monitored, AI can amplify these biases, leading to unfair outcomes.

This is particularly relevant in sensitive areas such as hiring, criminal justice, healthcare, and education.

Accountability and Transparency in Algorithm

Accountability in AI means that developers and organizations take responsibility for the ethical design, deployment, and outcomes of AI systems.

This includes ensuring transparency, addressing biases, and aligning systems with societal values and legal frameworks.

By monitoring performance, engaging with stakeholders, and providing clear explanations for AI decisions, accountability fosters trust and ensures that AI systems contribute positively while minimizing harm and unintended consequences.

Accountability and Transparency in Algorithm

Developers should be transparent about how their AI models work, the data sources they use, and the decision-making processes within the algorithms.

For example, in high-stakes situations like determining loan eligibility, it is essential to know why the algorithm accepted or rejected an applicant.

Ensuring Fairness and Ethical Standards

Organizations using AI and automation must align their practices with **ethical standards** that promote fairness.

This can include guidelines on designing unbiased systems, testing AI models for fairness, and adopting ethical frameworks such as **AI ethics codes** or **principles of responsible AI**.

Learning Activity

MT2.1_5

Read the following scenarios:

- A friend posts photos of an event and tags people without their consent.

- A social media influencer promotes a product but doesn't disclose it's a paid ad.

- Someone shares misinformation about a trending topic without checking the source.

"Is this fair? Why or why not?"

"What could the person have done differently to ensure fairness?"

Ensuring Fairness and Ethical Standards

Moreover, government and industry bodies are increasingly developing regulations to enforce fairness in AI, ensuring that automated systems do not discriminate.
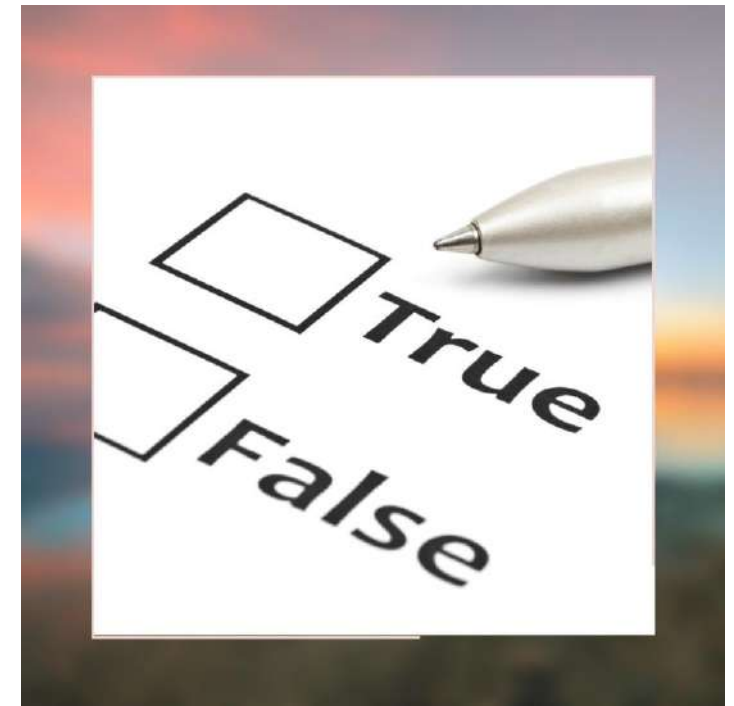
By learning about these ethical standards and regulations, adults can better understand the mechanisms in place to uphold fairness and the ongoing work needed to make AI equitable.

True or False Questions

MT2.1_5

Answer the True or False Questions Based on What You've Learned Throughout the 2 topics.

True or False Questions

1. The European Union emphasizes ethical considerations, sustainability, and inclusivity in its scientific research and technological innovation programs.

2. One of the societal responsibilities in technological advancements includes addressing issues like data privacy and environmental impact.

3. The definition of technology in the training is limited to simple tools and does not include advanced systems like medical devices or renewable energy solutions.

4. The digital divide refers to the equal distribution of access to technology and the internet across all social and economic groups.

5. According to the training, understanding the ethical and social implications of technological advancements is part of the key competencies in Science and Technology

Revision-Summary and Q&A

✓Science and technology drive advancements in areas like healthcare, communication, and education, improving quality of life and economic growth.

✓Responsible technology use requires considering data privacy, environmental sustainability, and social equity.

✓The EU emphasizes R&D and sustainable innovation, while many third countries face resource and access challenges, highlighting global disparities in technology.

Do you have any questions?
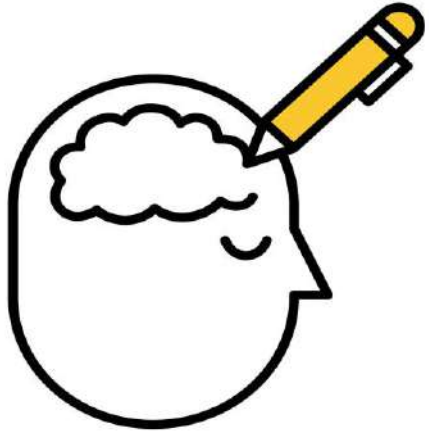
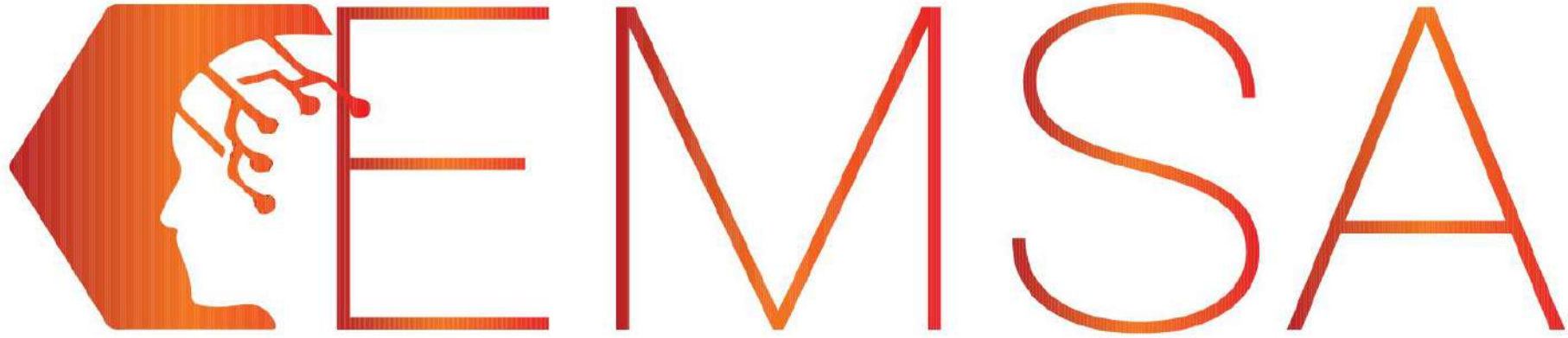What will you keep from today's training?

Training
Evaluation

List of References

- **O'Neil, C. (2016).** *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy.* Crown Publishing Group. …

- **European Union (2018).** *General Data Protection Regulation (GDPR): Regulation (EU) 2016/679*

- **Russell, S., & Norvig, P. (2020).** *Artificial Intelligence: A Modern Approach (4th ed.).* Pearson Education.

- **Jobin, A., Ienca, M., & Vayena, E. (2019).** *The global landscape of AI ethics guidelines. Nature Machine Intelligence, 1*(9), 389-399.

List of Suggested Resources for Self-Directed Learning

- **Future of Privacy Forum (FPF) /** Website: https://fpf.org/

- **AI Now Institute /** Website: https://ainowinstitute.org/

- **The Centre for Data Ethics and Innovation (CDEI) /** Website: https://www.gov.uk/government/organisations/centre-for-data-ethics-and-innovation

- **The Ethics of Artificial Intelligence - Stanford Encyclopedia of Philosophy /** Website: https://plato.stanford.edu/entries/ethics-ai/

Thank you!