

Module Three

The AI world

Module Three - Topic 1

Real-world applications of AI

Activity 3.1.1 - AI for good: The (potential) positive impact of AI technologies on social life and global issues

Activity 3.1.2 - Main societal challenges and risks in the use of AI

Activity 3.1.3 - Co-Design Fictions

Module Three - Topic 2

Ethics of AI

Activity 3.2.1 - Staging Dilemmas

Activity 3.2.2 - The role of stakeholders in AI

Activity 3.2.3 - Class Code of Ethics

Activity 3.2.4 - Creating Ethical Matrices

Module Description

The module focuses on human - AI interactions. It covers applications of AI and machine learning that are already on the market (e.g. computer vision applications, web-search engines) or that will be available in the near future (e.g. autonomous vehicles, humanoid robots). The activities will focus on a critical and honest discussion on what can be achieved thanks to AI and machine learning, what remains far from achievable in the field, and on the fact that AI can impact society in positive and negative ways.

Students attending this module will reflect on the advantages and limits of such technology, reflecting on aspects such as privacy and biases in human - AI interactions raised by such technology. Teachers will be able to engage learners in activities and discussions involving responsible use of digital technologies.

Main subject(s): Computer science, ethics, social science, civic education

Time allotment: 4 hours to complete the module

Topics and activities

Topic 3.1	Real-world applications of AI: Activity 3.1.1 AI for good: The (potential) positive impact of AI technologies on social life and global issues; Activity 3.1.2 Main societal challenges and risks in the use of AI; Activity 3.1.3 Co-design fictions
Topic 3.2	Ethical implications of AI: Activity 3.2.1 Staging Dilemmas; Activity 3.2.2 Activity 3.2.2 - The role of stakeholders in AI; Activity 3.2.3 Class Code of Conduct; Activity 3.2.4 Creating Ethical Matrices;
Digital competences (DigComp 2.2)	
Area 2 Communication and collaboration - 2.2 Sharing through digital technologies - 2.3 Engaging in citizenship through digital technologies - 2.4 Collaborating through digital technologies Area 3 Digital content creation - 3.1 Developing digital content - 3.2 Integrating and re-elaborating digital content - 3.4 Programming Area 4 Safety: - 4.1 Protecting devices - 4.2 Protecting personal data and privacy - 4.4 Protecting the environment	
DigCompEdu competences	
Area 5 - Empowering learners: - 5.1 Accessibility and inclusion: To ensure accessibility to learning resources and activities, for all learners, including those with special needs. To consider and respond to learners' (digital) expectations, abilities, uses and misconceptions, as well as contextual, physical or cognitive constraints to their use of digital technologies. - 5.3 Actively engaging learners To use digital technologies to foster learners' active and creative engagement with a subject matter. To use digital technologies within pedagogic strategies that foster learners' transversal skills, deep thinking and creative expression. To open up learning to new, real-world contexts, which involve learners themselves in hands-on activities, scientific investigation or complex problem solving, or in other ways increase learners' active involvement in complex subject matters.	
Educational goals	
The Module is intended to contribute to a critical understanding of the challenges associated with person-AI interaction. Starting from a knowledge of the current stage of development of AI and of the foreseeable one in the medium term, students will develop a more conscious vision of the functioning of AI-based tools and of the cultural biases that affect it. Moreover, students will be able to formulate hypotheses with respect to the positive and negative impacts that the adoption of AI-based tools can generate at the social level and to argue their opinion with respect to ethical dilemmas. Educating to AI ethics is key in order to improve students' understanding of how AI is impacting (their) lives, To equip them to make informed choices on how to interact with AI and	

To enhance their critical thinking and engage them in discussion on the ways AI should be used.

Module Three - Topic 1

Real-world applications of AI

Duration	Approximately 120 minutes
Subjects	Social Science, Computer Science, Civic Education, Ethics
Summary	This topic is based on the idea that AI applications in the real world can have positive and negative effects. Students will be encouraged to discuss opportunities and challenges brought about by existing applications of AI technologies. They will also explore possible current or future developments in the use of AI technologies in the real world through a creative exercise.

Learning objectives

The aim of this Topic is to increase students' awareness of AI technologies' applications in the real world and their implications. The activities will highlight risks and opportunities through the analysis of examples from different societal areas such as climate change, finance and economics, healthcare etc., maintaining and fostering an interdisciplinary approach. They will also help familiarise students with key concerns regarding the use of AI technologies and surveillance, biases and privacy issues.

Activities overview

Activities	Modality	Level
Activity 3.1.1 AI for good: The (potential) positive impact of AI technologies on social life and global issues	In class / Online	Basic
Activity 3.1.2. Main societal challenges and risks in the use of AI	In class / Online	Basic
Activity 3.1.3 Co-Design Fictions	In class / Online	Advanced

Activity 3.1.1 - AI for good: The (potential) positive impact of AI technologies on social life and global issues

Estimated duration	40 minutes
Requirements	Modules 1 and 2. If done in-presence, moderately large open space where students can discuss and present in groups
Hardware and Software tools used	Remote: Software - Video-conferencing software. Real time online collaboration text editor and presentation software. Hardware - Desktop/laptop computer
Type of assessment	Assessment is based on the understanding of the issues discussed in class displayed through a representation of arguments supporting the positive impact of AI, and through critical discussions that question those arguments.

To consider the “positive” impact of AI means to identify in which cases and through which modalities AI technologies are used to help address some of the world’s most pressing challenges. These challenges can refer to the priorities outlined in the United Nations’ 17 Sustainable Development Goals (SDGs). The objective of this activity is to facilitate the understanding of how the use of AI technologies can have a positive impact on the real world through the representation of supporting arguments and examples. Comments and questions challenging these arguments will also be encouraged and explored. .

Procedure (steps)

Anticipatory Set

- Teachers introduce the SDGs to the class, dwelling briefly on the 17 goals and emphasising their overall ethos: "leaving no one behind".



- Teachers can remind students of an artificial intelligence system previously studied in Module 1 (for example chatbots, digital assistants, search engines, etc.). Teachers introduce some examples of the positive impact of AI technologies on key real world issues (e.g. healthcare, climate change, research...) taken from the SDGs exploration and from “AI for Good” list (see resources for teachers below).
- Teachers explain that an intervention with a positive impact on one SDG could be detrimental to another SDG and its targets. Awareness of this interconnectedness should be a driving principle for fair and inclusive AI for social good: AI applications should aim to maximise a net positive effect on as many SDGs as possible, without causing avoidable harm to other SDGs.

Direct Instruction

- Teachers divide students into groups of 3-8 students.
- Each group directly searches on Google one example of AI technologies addressing one or more SDGs; Example: By texting “AI and Education” (SDG n. 4, Quality Education) on Google, it is easy to discover existing products that combine computer vision intelligence and augmented reality technology to improve the way students learn in the classroom (for example, instead of reading about a volcanic eruption, the system shows students a virtual 3D model of the eruptive process).
- The example is briefly described on a poster board through a graphic representation. The group then tries to imagine other possible positive uses of the AI tools studied in Modules 1 and 2 (e.g. chatbots, digital assistants, search engines, image recognition etc.) and adds them to the board.

Guided Practice and Understanding

- Each group then presents their work to the class, briefly explaining the connection between the chosen example and one or more of the SDGs. After the explanation, the

class discusses with the help of the teacher whether the benefits identified for some SDGs may be to the detriment of others.

Troubleshooting

Possible issue	Possible solution
The AI examples of applications of AI in the real world are unclear to the students, or students can not relate the concepts they learned previously with the applications of AI they are trying to explain.	Assurance from the teacher and re-explanation of high-level concepts if needed.
Students unwilling to physically play out an application of AI technologies in the real world	Partnering with a drama teacher and making the enacting part of the lesson in a more appropriate environment, such as a school theatre or a large space
Students unwilling to challenge the examples and arguments presented by one group	Teacher asks questions that encourage critical debate on specific applications of AI

Resources for teachers

Resources that can be used in class for introducing examples of AI for good

Title	Description	Link	Languages
The Sustainable Development Goals	Document on the 17 Sustainable Development Goals that were set up in 2015 by the United Nations General Assembly and are intended to be achieved by 2030	https://issuu.com/unpublications/docs/sdg_yak_en	ENGLISH
Go Goals!	Game on the Sustainable Development Goals	https://go-goals.org/	Available in ENGLISH, ITALIAN and GREEK
UNICEF - Artificial Intelligence for Children	Video describing UNICEF strategy to better understand how Artificial Intelligence (AI) systems can protect, provide for, and empower children	https://www.youtube.com/watch?v=b5w1UySIRjI&feature=emb_imp_woyt	ENGLISH and Autotranslated captions

AIWS - AI For Social Good	Webpage with examples of artificial intelligence applications for good	https://aiworldschool.com/ai-for-social-good/	ENGLISH
Instagram profile of AIDA, a humanoid AI robot artist	Instagram profile of AI.DA a robot artist	https://www.instagram.com/p/CWvNpHEIVnO/	ENGLISH
The next Rembrandt	Video that explains the challenge for an AI to imitate Rembrandt's painting style	https://www.youtube.com/watch?v=luygOYZ1Ngo	ENGLISH and Autotranslated captions
Franz Schubert - Symphony No.8 in B minor, D.759 ("Unfinished") finalized by artificial intelligence	Artificial intelligence has finished composing Shubert's unfinished work	https://www.youtube.com/watch?v=wZalJVzY-LE	ENGLISH with subtitles
Изкуствен интелект дописа „Десетата симфония“ на Бетовен	AI completed Beethoven's tenth symphony	https://btvnovinite.bg/svetut/izkustven-intelekt-dopisa-a-desetata-simfonija-na-betoven.html	BULGARIAN
БЪЛГАРСКИ УЧЕН СПЕЧЕЛИ 2 МЛН. ЕВРО ЗА ПРОЕКТ ЗА НОВ ТИП ИЗКУСТВЕН ИНТЕЛЕКТ	A video about Bulgarian scientist Prof. Martin Vechev who won a prize for developing new type of AI	https://btvnovinite.bg/predavania/tazi-sutrin/balgarski-uchen-specheli-2-mln-evro-za-proekt-za-nov-tip-izkustven-intelekt.html	BULGARIAN
Българи създадох изкуствен интелект за програмиране на най-добрия футболен отбор	A video about a Bulgarians who developed AI for creating the best football team	https://europeans.bntnews.bg/balgari-sazdadoha-izkustven-intelekt-za-programirane-na-nai-dobriya-futbolen-otbor-567news.html	BULGARIAN
Изкуствен интелект би могъл да спаси пчелите от изчезване	A video about a Bulgarian AI project for protecting the bees from extinction	https://bnt.bg/bg/a/izkustven-intelekt-bi-mogl-da-spasi-pchelite-ot-izchezvane	BULGARIAN
Berthoud - изкуствен интелект на полето	AI in agriculture	https://drive.google.com/file/d/1HeEGg5zuBeozW8dDVHDRJJRZ7P3705ZP/view?usp=sharing	BULGARIAN
CNBC - Robotics, AI and farming	AI in agriculture	https://drive.google.com/file/d/12kWt77VAxzZ4-EEqThXVmvWic4s0dQe/view?usp=sharing	BULGARIAN with ENGLISH subtitles
Изкуствен интелект: Как роботизирана	How a robotic arm helps with online ordering	https://btvnovinite.bg/predavania/tazi-sutrin/izkustven-intelekt-kak-robotizirana	BULGARIAN

ръка помага при обработката на онлайн поръчки?		-raka-pomaga-pri-obrabotkata-na-onlajn-porachki.html	
По стъпките на Бил Гейтс: 15-годишният Радостин създава изкуствен интелект	15-year-old student creates AI	https://www.bgonair.bg/a/36-sutreshen-blok/212460-po-stapkite-na-bil-geyts-uchenikat-radostin-sazdava-izkustven-intelekt	BULGARIAN

AI for good resources:

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- A list of examples of artificial intelligence applications for good <https://www.crisscrossed.net/2018/12/19/12-inspiring-examples-of-artificial-intelligence-for-good/>
- Use of AI to tackle climate change. Climate Change AI. <https://www.climatechange.ai/about>
See also <https://tate.it/blog/post/come-puo-lintelligenza-artificiale-limitare-gli-effetti-del-cambiamento-climatico/>
- How can AI apply to agriculture? Norton Rose Fulbright. <https://www.nortonrosefulbright.com/en-ke/knowledge/publications/6400e1ea/artificial-intelligence-and-the-future#section3>
- Finn Church Aid & Solita. 2020. How Blockchain can increase trust and transparency in humanitarian aid. <https://www.solita.fi/en/customers/how-blockchain-can-increase-trust-and-transparency-in-humanitarian-aid/>

Activity 3.1.2 - Main societal challenges and risks in the use of AI

Estimated duration	40 minutes
Requirements	Modules 1 and 2. Activity 3.1.1. If done in-presence, moderately large open space where students can discuss and present in groups
Hardware and Software tools used	Remote: Software - Video-conferencing software. Real time online collaboration text editor and presentation software. Hardware - Desktop/laptop computer
Type of assessment	Assessment is based on the understanding of the issues discussed in class displayed through the representation of arguments highlighting the negative impact of AI, and through critical discussions that question those arguments.

The objective of this activity is to facilitate the understanding of how the use of AI technologies can have a negative impact on the real world through the representation of supporting arguments and examples. Comments and questions challenging these arguments will also be encouraged and explored.

Procedure (steps)

Anticipatory Set

- Teachers can remind students of an artificial intelligence system previously studied (e.g. chatbots, digital assistants, search engines, image recognition such as face tracking). The teachers again refer to the SDGs introduced in the previous activity to explain that the use of AI can also have opposite effects and move us away from achieving those goals. Teachers introduce some examples to explain this point, like: according to a study by the European Parliament, about 14% of jobs in OECD countries are automatable (people can be replaced by machines). Another 32% would have to face substantial changes (people have to re-train themselves on their jobs); this would increase poverty.
- The case of algorithm biases. The teacher explains that human beings sometimes make decisions assisted by algorithms (a set of actions or steps required to solve a problem); these decisions, therefore, are partly automatic. Computer recommendations may have an air of rationality or infallibility and people may follow them blindly. However, depending on how it has been 'trained' to work and on the

information that humans give the PC for this (see machine learning), the algorithm can then suggest 'discriminatory' decisions, i.e. favouring certain types of people over others. This is what is called “AI bias” (bias = a distortion of the decision making process based on a prejudice).

- The teacher makes an example: based on a customer assessment made automatically by an algorithm, a bank employee can decide whether a customer can apply for a loan from that bank or not. If the algorithm relies on data from a time when no women were eligible to apply for a loan from the bank, it may give an indication that the best customers to give a loan to are men. This results in discrimination - i.e. unequal treatment - of women. So it works against the SDGs 5 (Gender Equality).
- The teacher explains that other possible issues are: privacy issues in using facial recognition algorithms in public places, or security and privacy issues in using systems that elaborate voice and sounds like digital assistants. Other examples include difficulties of voice recognition algorithms in accurately identifying commands from voices from older adults or younger users because the algorithms are trained on middle-aged adult population. Image recognition software or image based search engines can present biased results (see <https://en.unesco.org/artificial-intelligence/ethics/cases#biasedai>)

Direct Instruction

- Teachers divide students in groups.
- Each group of students discusses one example of negative implications or risks caused by AI applications in the real world.
- Each group thinks about the possible implications of that example in other areas/on other key issues

Guided Practice and Understanding

- Each group, using the material provided by the teacher, devises a way to represent the example they are discussing to highlight the ways in which AI technologies create risks and have a negative impact on the issue at stake, and thus the arguments against that application. Each student might represent an aspect, agent or functionality of the entire system.

Independent Practice

- The students in each group play out the representation of the AI application example and of the arguments against its use for the whole class.

Closing

- The rest of the class challenge the arguments against the use of AI in that particular area through critical comments and questions. Teachers moderate the discussion and clear any misrepresentations or doubts other students might have.

Troubleshooting

Possible issue	Possible solution
The AI examples of applications of AI in the real world systems are unclear to the students, or students can not relate the concepts they learned previously with the applications of AI systems they are trying to explain.	Assurance from the teacher and re-explanation of high-level concepts if needed.
Students unwilling to physically play out an application of AI technologies in the real world.	Partnering with a drama teacher and making the enacting part of the lesson in a more appropriate environment, such as a school theatre or a large space.
Students unwilling to challenge the examples and arguments presented by one group	Teacher asks questions that encourage critical debate on specific application of AI

Resources for teachers

Resources that can be used in class for introducing examples of AI applications and the ethical dimension

Title	Description	Link	Languages
Ethics & AI: Privacy & the Future of Work	Video that explains how ethics and privacy are connected in AI and how AI may influence future jobs.	https://www.youtube.com/watch?v=zNxx5gJtHLC https://youtu.be/PVDguCvRwEs?list=PLIz0pQKPcu89NB4AdYYuixHPnN_2QocuZ	ENGLISH with Autogenerated subtitles ENGLISH with GREEK subtitles
Ethics & AI: Equal Access and Algorithmic Bias	Video describing the potential for AI to help society with a focus on ethics, access and fairness	https://www.youtube.com/watch?v=tJQSyzBUAew https://www.youtube.com/watch?v=yUSj9VsM82U&list=PLIz0pQKPcu89NB4AdYYuixHPnN_2QocuZ&index=6	ENGLISH with Autogenerated subtitles ENGLISH with GREEK subtitles

ως λειτουργεί η Τεχνητή Νοημοσύνη - Τεχνητή Νοημοσύνη: Δεδομένα και Μεροληψία	A short video that explains how training data in AI and bias are connected	https://www.youtube.com/watch?v=7a2aNF-dRo8&list=PLIzOpQKPcu89NB4AdYYuixHPnN_2QocuZ&index=3	ENGLISH with GREEK subtitles
What's Going On With Facial Recognition?	A short video that explains how face recognition can be used to help society or can be used against privacy of people	https://youtu.be/BqQT4sIOYAQ	ENGLISH with Autogenerated subtitles
ИЗКУСТВЕНИЯТ интелект и ЗАЩО Илон МЪСК се обърна срещу себе си?	Video about AI and Elon Musk, including other examples of AI applications	https://www.youtube.com/watch?v=wFPp2IEQPog	BULGARIAN
Algoritmo e pregiudizio	Video on how prejudices and human stereotypes can influence algorithms	https://www.raiscuola.rai.it/tecnologia/articoli/2021/05/Paola-Velardi-a-Maestri-d557376c-fe22-41e8-880f-a09413aec33c.html	ITALIAN
Dove nascono le Idee: la Sicurezza Intelligente	Video on applications of AI for security	https://www.leonardocompany.com/it/news-and-stories-detail/-/detail/the-intelligent-security	ITALIAN

Negative impact of AI / risks posed by AI resources:

Algorithm bias

- [Amazon scraps secret AI recruiting tool that showed bias against women](#)
- [Google will pay \\$2.6 million to workers over claims its hiring and pay practices were biased against women and Asians](#)
- [Algorithm-driven Hiring Tools & Disability Discrimination](#)
- [Wired. "Machines Taught by Photos Learn a Sexist View of Women: Algorithms showed a tendency to associate women with shopping and men with shooting".](#)

Privacy issues

- [Centre for Democracy and Technology, Student privacy protection Training Module](#)
- Save the Children (2020). Digital Safeguarding For Migrating And Displaced Children: An overview of the current context and trends, potential risks and practical next steps. https://resourcecentre.savethechildren.net/node/18477/pdf/mdi_digital_final_rgb_rev_091220.pdf

- <https://blog.torproject.org/reaching-people-where-they-are>
Tor Project's mission is to further the popular understanding of privacy technologies → trainings in the Global South

Surveillance

- BBC File on 4 Podcast (2020). "Facial recognition is being rolled out across Britain. But is it a vital tool against crime - or a threat to the innocent?"
<https://www.bbc.co.uk/programmes/m000dpkt>
- Use of facial recognition in schools:
<https://www.biometricupdate.com/201910/french-privacy-regulator-finds-facial-recognition-gates-in-schools-illegal>
<https://www.politico.eu/article/french-privacy-watchdog-says-facial-recognition-trial-in-high-schools-is-illegal-privacy/>
(see also Automating Society Report 2020)
- There are two pilot projects in Sweden which focus their attention on the use of AI and facial students' recognition for administrative purposes allowing teachers to devote their time to teaching
<https://www.electronicshpecifier.com/products/artificial-intelligence/facial-recognition-tested-in-swedish-high-school>
- Structural and cognitive change of schools and schooling, see Andrejevic and Selwyn, Facial Recognition technology in schools: critical questions and concerns,
<https://www.tandfonline.com/doi/full/10.1080/17439884.2020.1686014>
- European Parliament recent moratorium on using facial recognition for law-enforcement purposes:
<https://www.europarl.europa.eu/news/en/press-room/20210930IPR13925/use-of-artificial-intelligence-by-the-police-meps-oppose-mass-surveillance>

Environmental and economic repercussions of AI-based systems

- BBC The Documentary Podcast (2019). "Will AI kill development? Will robotisation prevent poorer countries taking the traditional route to prosperity?"
<https://www.bbc.co.uk/programmes/p075nqyy>
- Sahota, Neil. "Beyond AI: The Need For Solutionists In Creating A Sustainable World". Forbes. 24 April 2019.
<https://www.forbes.com/sites/cognitiveworld/2019/04/24/beyond-a-i-the-need-for-solutionists-in-creating-a-sustainable-world/>
- Jones, Phil. "Refugees help power machine learning advances at Microsoft, Facebook, and Amazon". Restofworld. 22 September 2021.
<https://restofworld.org/2021/refugees-machine-learning-big-tech/>
- Why we should care about the environmental impact of AI
<https://www.forbes.com/sites/forbestechcouncil/2020/08/17/why-we-should-care-about-the-environmental-impact-of-ai/?sh=766825ef56ee>

Activity 3.1.3 - Co-Design Fictions

Estimated duration	60-90 minutes
Requirements	Modules 1 and 2. If done in-presence, moderately large open space where students can make plays and enact.
Hardware and Software tools used	Remote Software - Video-conferencing software. Hardware - Desktop/laptop computer
Type of assessment	- Oral presentation in front of class. - Quality of the ideas and prototypes developed. - Open-ended questions by the teacher about the feasibility, appropriateness and impact of their proposed design. - Questions of peers and discussion after presentation.

The aim of the activity is to provoke students and raise questions about future scenarios in AI. It can also be used to facilitate discussions about the potential forms, functionality, and applications of AI technology by using fictional prompts or what-if questions. Students should be able to envision, discuss, write and design possible future AI technologies.

Procedure (steps)

Anticipatory Set

1. First, the teacher should establish the coordinates of reality, that is, present the current state of AI implementation in society, as well as larger social and cultural contexts surrounding it. Moreover, students should be presented with the concepts and technologies of AI for which they are going to create their story (eg. facial recognition - in discussing this example teachers can refer to the activity of Module 2 with Scratch Face Sensing).

Direct Instruction

2. The teacher presents a fictional story to elicit the exploration of ideas and designs. The story could begin with a personal experience, a news headline or an existing fiction story.
3. The story can have a "what-if" moment, or a counterfactual that elicits the creation of alternative storylines by the students.

Example	What-if moment
Using Facial Recognition at school	What if the face profiling goes wrong? What happens when people share similar face features? (e.g. twins) And if some faces are better recognised than others?
Using apps that create fictional images and videos (deepfake). This content (seem to) show a person participating in activities (or being in a place) that never actually happened	Imagine that you see a video showing you walking in a city abroad that you have never visited - What will be your reaction? You realize that the video is fake and created with an AI system using a video that you posted online. How do you feel about other people manipulating your original video?
Imagine a chatbot that can diagnose health issue based on the information provided but the patient.	What happens if The AI makes an error and provides a wrong diagnosis? What if a patient does not mention all the information about his or her health status?
consider a video or a social media platform such as YouTube or Instagram or TikTok that shows you personalized content	You see content that is selected for you by an AI algorithm. What happens if you can see only the content that the AI suggests? What if the contents are created specifically for taking advantage of such algorithms? What if the algorithm is biased and shows things that actually do not interest you?

- Students are then prompted to design a piece of technology that answers to the context and needs of people in the fictional story created by the teacher.
- The teacher must ask the children explicitly to not think about technological, manufacturing and skills impediments.

Guided Practice

- The teacher divides the class in small groups to codesign
- The students must then create a prototype for their designs, using and shaping simple materials like paper, cardboard, fabric, masking tape etc.

Check for Understanding

- The teacher can go around the groups to check the quality of work and guarantee the discussion remains relevant. Teachers can solve doubts and give insights when prompted.

Independent Practice

9. When their design is ready, students should create a story around the prototype, describing its functioning, who uses it, for what it's used, while telling an engaging story exploring the social and ethical dilemmas their technology aims to solve.

Closing

10. Students present their prototypes to the class and have their solutions evaluated and discussed by their peers.

Troubleshooting

Possible issue	Possible solution
Lack of time for the full activity.	Make the activity a homework assignment. Split the work in different lessons.
Students get stuck on the current state of technology, or know-how when thinking about their designs.	Asking the children explicitly to not think about technological, manufacturing and skills impediments.
Students generate solutions that are seemingly magical, fantastical or irrelevant to the issues or social context discussed.	Guiding their group discussions with probing questions if students start getting lost in fantasy.
Lack of confidence of students in their design skills.	Giving reassurance that they are able to devise a design with their current abilities.

Resources for teachers

Description of the method applied to the teaching of new or emerging technologies:

https://irep.ntu.ac.uk/id/eprint/35113/1/12674_Hardy.pdf

Applying design fiction in primary schools:

<https://www.tandfonline.com/doi/pdf/10.1080/14606925.2019.1594972>

More in-depth literature:

- Cheon, E., Sher, S. T. H., Sabanović, Š., & Su, N. M. (2019, June). I Beg to Differ: Soft Conflicts in Collaborative Design Using Design Fictions. In Proceedings of the 2019 on Designing Interactive Systems Conference (pp. 201-214).
- Hardy, A. (2018). Using design fiction to teach new and emerging technologies in England. *Technology and Engineering Teacher*, 78(4), 16-20.
- Maxwell, D., Pillatt, T., Edwards, L., & Newman, R. (2019). Applying design fiction in primary schools to explore environmental challenges. *The Design Journal*, 22(sup1), 1481-1497

Module Three - Topic 2

Ethics of AI

Duration	120 Minutes
Subjects	Social Science, Computer Science, Ethics, Civic Education
Summary	This topic focuses on the ethical implications of AI technologies in human-machine interaction. It will introduce some basic concepts in the field of ethics (accountability, respect, inclusion, equity, sustainability) and connect them with practical examples of AI applications in the real world. Students will be encouraged to reflect on the relationship between humans, machines and ethics and to develop their own guidelines on some of the issues addressed in this Module.

Learning objectives

Students should be able to reflect about the unequal impact of AI and its ethical implications when using or designing those systems. It means to reason not on what we *can* do but on what we *should* do with AI. It ought to be now clear to students that what we *should* seek is that the benefits of new technologies are experienced by all equitably across society. However this general consideration does not resolve the many ethical issues that arise from case to case. Students will be trained to understand that there are many issues which do not have an easy answer and they will be encouraged to formulate questions (instead of finding the solutions). Teachers will support students to feel that their participation in the debate is important because AI is everyone's business.

There are many ethical challenges:

- Lack of transparency of AI tools: AI decisions are not always intelligible to humans.
- AI is not neutral: AI-based decisions are susceptible to inaccuracies, discriminatory outcomes, embedded or inserted bias.
- Surveillance practices for data gathering and privacy of court users.
- New concerns for fairness and risk for Human Rights and other fundamental values.

1.

Activity overview

Activities	Modality	Level
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Activity 3.2.1 Staging Dilemmas	In class / Online	Intermediate
Activity 3.2.2 The role of stakeholders in AI	In class / Online	Intermediate
Activity 3.2.3 Class Code of Ethics	In class / Online	Intermediate
Activity 3.2.4 Creating Ethical Matrices	In class / Online	Advanced

Activity 3.2.1 - Staging dilemmas

Duration	40 minutes
Requirements	Modules 1 and 2.
Hardware and Software tools used	Remote: Software - Video-conferencing software. Real time online collaboration text editor and presentation software. Hardware - Desktop/laptop computer
Type of assessment	Quality of arguments during group discussion and class presentation.

This activity can be used to engage students in ethical considerations on the potential benefits and risks that could arise from AI and affect the social environment. For that reason the use of ethical dilemmas might be useful. The discussion may concern potential impacts of AI on the labour market, on social inequalities, on environment, natural resources and sustainability, on privacy and surveillance, on human relationships and human rights.

Procedure (steps)

Anticipatory Set

1. The teacher can remind students about the most common ethical theories if not explored previously. The presentation of a well-known ethical dilemma as an example and a brief discussion coupled with some questions to students can be interesting enough to grab their attention. The teacher reminds the students of the case of algorithm bias explored previously (activity 3.1.2) and announces that other crucial ethical issues and related questions will be now addressed.

Direct Instruction

1. The teacher explains ethical issues and questions:

- privacy: when we surf the web many algorithms collect data about us, often without us being aware of it?
 - Power balance: how can we control that the use of AI is not concentrated in certain countries or companies that then become more and more powerful?
 - Responsibility: if many people are working to train algorithms who is responsible for the mistakes they may make (e.g. spreading fake news, see Module 4)?
 - Environment: how can we control the impacts of the use of technologies on the environment?
 - How AI makes us feel: when technologies replace some of the work previously done by humans, how can humans feel and how can they find new ways to contribute?
2. The students should be divided into groups of four to six.
 3. The teacher reads aloud a scenario, or provides to students the scenario's text (virtually or printed) so everyone reads silently.

Guided Practice and Check for Understanding

4. Each group chooses one of the questions listed by the teacher and tries to 'stage' it with reference to a specific technology and a possible case: roles are assigned within the group (supporter, opponent, listener in doubt, etc.) and a short 'script' is written. After the story is read the teacher should ask students how they read the situation and what might be the underlying issues or problems.

Independent Practice

5. When the group arrives at an understanding of the problem, the teacher should ask how they would approach the issue, which steps they would take, and which consequences it would entail. When the groups have completed their work they will take turns staging their scripts.
6. The students in each group will be asked to comment on the scenes performed by the other groups. Inside each group, students should create a list of possible approaches and share them with the class.

Closing

7. Teachers should comment on the proposals and relate the possible solutions to the equivalent ethical frameworks. urges the class to appreciate how many new questions have emerged

Troubleshooting

Possible issue	Possible solution
Dominant personalities in the group shifting the discussion to match their views.	Establishing turns to speak. Creation of a list of approaches instead of demanding for consensus inside the groups.
Irrelevant discussions to the scenario at-hand.	Constant verification by the teacher that the discussions are on track.
Lack of substance on their reasoning around the ethical problems presented.	Provide students with previous knowledge of ethical and moral theories to support their reasoning.

Resources for teachers

- Guide for the activity with examples and description of the facilitator role: https://schoolreforminitiative.org/doc/facilitation_scenarios.pdf
- European Parliament - The ethics of artificial intelligence: Issues and initiatives: [https://www.europarl.europa.eu/RegData/etudes/STUD/2020/634452/EPRS_STU\(2020\)634452_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2020/634452/EPRS_STU(2020)634452_EN.pdf)
- Automating Society Report 2020: <https://automatingsociety.algorithmwatch.org/>

More in-depth literature:

Eva Brandt, Thomas Binder, Elizabeth B.-N. Sanders. Tools and Techniques: Ways to engage telling, making, enacting. In Routledge International Handbook of Participatory Design. Routledge, New York, NY. 145–181.

Activity 3.2.2 - The role of stakeholders in AI

Estimated duration	40 minutes
Requirements	Modules 1 and 2.
Hardware and Software tools used	In-presence Large sheets of paper, and coloured pens/sticky notes. Remote Software - White canvas software with real time collaboration. Video-conferencing software. Hardware - Desktop/laptop computer with mouse, or tablet.
Type of assessment	Oral presentation of the work group. Students are assessed on the quality of ideas and diversity of issues presented.

Procedure (steps)

Anticipatory Set

1. The teacher reminds students of the idea of algorithm as an opinion or decision making process (Activity 3.1.2) providing examples of how stakeholders' interests/opinions are reflected in the outcome.

Direct Instruction

2. Then they should explain the concepts of stakeholders, values and goals with respect to algorithms.
3. Describe the activity objective, i.e. identifying key ethical claims, possible motivations for different stakeholders' goals and conflict/alignment between them.

Guided Practice

4. Students learn that algorithms are a set of instructions that modify an input to produce an output. Students are then asked to write a particular algorithm for a hypothetical robot teacher: i.e. the procedure for performing the "best" science lesson (SDG 4 - Quality Education).
5. Divided into groups, students identify the stakeholders who care about the science lesson (stakeholders) and are assigned different roles in each group (that of the student, teacher, parent, school headmaster, etc.). In the groups, students then explore the meaning of the 'best lesson' and see how their different opinions and interests are reflected in their algorithms.
6. Each group notes on a poster the questions and doubts that arise in their work and presents them to the class.

Check for Understanding

7. The teacher guides a collective comparison on the work done by the groups and recalls the objective of the activity emphasising how in the development of technology there are different interests at play and how it is difficult to make the 'best' choice without taking into account different perspectives.

Troubleshooting

Possible issue	Possible solution
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Difficult in taking perspectives other than their own, or to think about conflicting perspectives of different stakeholders.	Make each group work out the specific perspectives of a single "stakeholder". Assembling the different perspectives afterwards.
Students go astray with the discussion, discussing irrelevant issues.	Teachers can avoid students discussing irrelevant issues by enforcing a structured approach and giving timely advice.

Resources for teachers

Resources for teachers on what is an ethical matrix and how to build it:

- This MIT resource for AI and Ethics education for middle school students (10-14) provides guidance to explain and build an ethical matrix, based on the concept of algorithms as opinion (connected to the concept of algorithm bias). It includes slides, teacher guide and activity sheet (in English)
<https://docs.google.com/document/d/1e9wx9oBg7CR0s5O7YnYHVmX7H7pnlTfoDxNdrSGkp60/edit#>
- A brief guide on how to manage dialogue concerning controversial issues in the classroom: *Difficult Dialogue in the Classroom Guidance and activities to give teachers the skills to manage difficult dialogue* – Training resource from Tony Blair Institute for Global Change:
<https://generation.global/assets/resources/difficult-dialogue-english.pdf>

More in-depth literature:

- Mepham, B., Kaiser, M., Thorstensen, E., Tomkins, S., & Millar, K. (2006). *Ethical matrix manual*. LEI, onderdeel van Wageningen UR.
- Jensen, K.K., Forsberg, EM., Gamborg, C. *et al.* Facilitating Ethical Reflection Among Scientists Using the Ethical Matrix. *Sci Eng Ethics* **17**, 425–445 (2011).
<https://doi.org/10.1007/s11948-010-9218-2>
- Ethical Matrix Manual: <https://core.ac.uk/download/pdf/29269684.pdf>

Activity 3.2.3. - Class Code of Ethics on AI

Estimated duration	40 minutes
Requirements	Modules 1 and 2. Large sheets of paper, coloured pens.
Hardware and Software tools used	Remote: Software - Video-conferencing software. Real time online collaboration text editor and presentation software.

	Hardware - Desktop/laptop computer
Type of assessment	Oral presentation, groups written outcome of the activity. Quality of arguments during class discussion.

The goal of the activity is to make students think about ethical issues in an AI area of their choice and co-create a Class Code of Ethics.

Procedure (steps)

Anticipatory Set

1. First, the teacher narrates a story that explores and exposes an ethical issue underlying a particular Artificial Intelligent System. For example, the teacher could create a fictional story in which a person is unfairly treated or mistakenly portrayed based on pervasive facial recognition software. Engage students in a small discussion about the story and its fairness/unfairness to make them start thinking about those concepts.

Direct Instruction

2. Teachers should provide students with a list of AI areas and research questions that will guide students' ethical inquiries. See *AI Ethics Research Areas* and *AI Ethics Research Reflection in "Resources for Teachers"* section.
3. The teacher should divide students into working groups.
4. Students should agree on the distribution of Artificial Intelligence areas between groups.

Guided Practice

5. Each group should think and discuss ethical issues and problems pertaining to their specific AI area. They should follow the research guidelines provided and consult the teacher when needed.
6. Each group should develop solution-oriented principles that address ethical shortcomings in their chosen area of AI.

Check for Understanding

7. The teacher can go around the groups to check the quality of work and guarantee the discussion remains relevant. Teachers can solve doubts and give insights when prompted.

Independent Practice

8. Groups get together and create a shared document with all the principles devised. Conflicting principles should be discussed with the class and contradictions solved in the final document.

Closing

9. The final document should be the Class Code of Ethics is presented to the whole class with a shared presentation, either in physical or virtual format.

Troubleshooting

Possible issue	Possible solution
Students having difficulty in reasoning about the issues and providing solution-based principles.	Providing the students the research guidelines printed or as a virtual document for reference.
Difficulty in solving or arriving at a compromise between conflicting principles in the class discussion phase.	Teacher guidance when necessary and mediation of class discussion.

Resources for teachers

- Description of the activity with steps and links for useful documents:
<https://curriculum.code.org/hoc/unplugged/5/>
- AI Ethics Research Areas from code.org:
<https://docs.google.com/document/d/16D3jRO2Q3KxM8FHvC8sdGLa19sxa5DGperetnX9gqcY/edit>
- AI Ethics Research Reflection from code.org:
<https://docs.google.com/document/d/19vF4UVAcJa6UsqkdKynWzSR80Mlnb2G3coBoWNxplYc/edit>
- AI Code of Ethics Slides from code.org:
https://docs.google.com/presentation/d/1SJEXpTCKwf5fbDy5GuDjDGAsuUrkl9QfxKF-1pMSndq/edit#slide=id.ga33378b3c1_0_47

Resources for students

- AI Ethics Research Areas from code.org:
<https://docs.google.com/document/d/16D3jRO2Q3KxM8FHvC8sdGLa19sxa5DGperetnX9ggcY/edit>
- AI Ethics Research Reflection from code.org:
<https://docs.google.com/document/d/19vF4UVAcJa6UsqkdKynWzSR80Mlnb2G3coBoWNxplYc/edit>

EU strategy on Artificial Intelligence

- <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1623335154975&uri=CELEX%3A52021PC0206>
- <https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence>
- <https://datainnovation.org/2021/05/the-artificial-intelligence-act-a-quick-explainer/>

Activity 3.2.4 - Creating Ethical Matrices (Advanced level)

The teacher can introduce the idea of the ethical matrix (see MIT AI Ethics Education curriculum) and explain its constitution to students (still using the example of the best science lesson - or equivalent), recalling the concepts of stakeholders, values and goals. The teachers provide a list of AI applications and make students pick their preferred, forming groups around chosen issues. Students should list the interest groups (stakeholders) and fill the matrix based on group discussion. Devise a list of ethical principles relevant to each interest group. The teacher should be available for clarifying doubts regarding technical questions around AI. Furthermore, going through the groups to provide constructive advice and ensure the discussion is around the relevant theme. Students can then be asked to evaluate the impact of each specific principle with a scale from -2 (very negative) to +2 (very positive).

Assessment

DigComp 2.2. area	Definition	Assessment Indicators	Details
5.2 IDENTIFYING NEEDS AND TECHNOLOGICAL RESPONSES	<i>Able to identify some examples of AI systems: product recommenders (e.g. on online</i>	Can you describe one AI project for good?	The student explains project, effects and element of the system

	<i>shopping sites), voice recognition (e.g. by virtual assistants), image recognition (e.g. for detecting tumours in x-rays) and facial recognition (e.g. in surveillance systems).</i>		
1.2 EVALUATING DATA, INFORMATION AND DIGITAL CONTENT	<i>Aware that the data, on which AI depends, may include biases. If so, these biases can become automated and worsened by the use of AI. For example, search result about occupation may include stereotypes about male or female jobs (e.g. male bus drivers, female sales persons)</i>	What is a bias in an AI system? (advanced) Why we have to pay attention to the bias?	Student clearly explain the term “bias” and the connection with AI. (advanced) Student give at least one example of bias in AI.

2.5 (only advanced) NETIQUETTE If use this resource https://thenextweb.com/news/mits-depression-detecting-ai-might-be-its-scariest-creation-yet	<i>Aware that some AI systems can detect user's mood, sentiments and emotions automatically from one's online content and context (e.g. content posted on social media) but this application is not always accurate and can be controversial</i>	Can AI understand the mood of a person really?	Student shows awareness of the interaction between AI and humans.
2.2. (only advanced) SHARING THROUGH DIGITAL TECHNOLOGIES	<i>Willing to collaborate with AI projects for social good in order to create value for others (e.g. by sharing data so long as appropriate and robust controls are in place)</i>	Which AI project for good could receive your activity help to grow?	Student connect one project with one personal action to improve project.

1.2. EVALUATING DATA, INFORMATION AND DIGITAL CONTENT	<i>Able to recognize that some AI algorithms may reinforce existing views in digital environments by creating “eco chamber” or “filter bubbles” (e.g. if a social media stream favours a particular political ideology, additional recommendations can reinforce that ideology without exposing it to opposing arguments)</i>	What is one of the most important roles of the AI’s algorithm? (advanced) How AI system in a social network or app can influence you experience?	Student is able to explain what means algorithm’s use in social or apps. (advanced) Student clearly explain the impact of AI in suggestion of content in social?
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