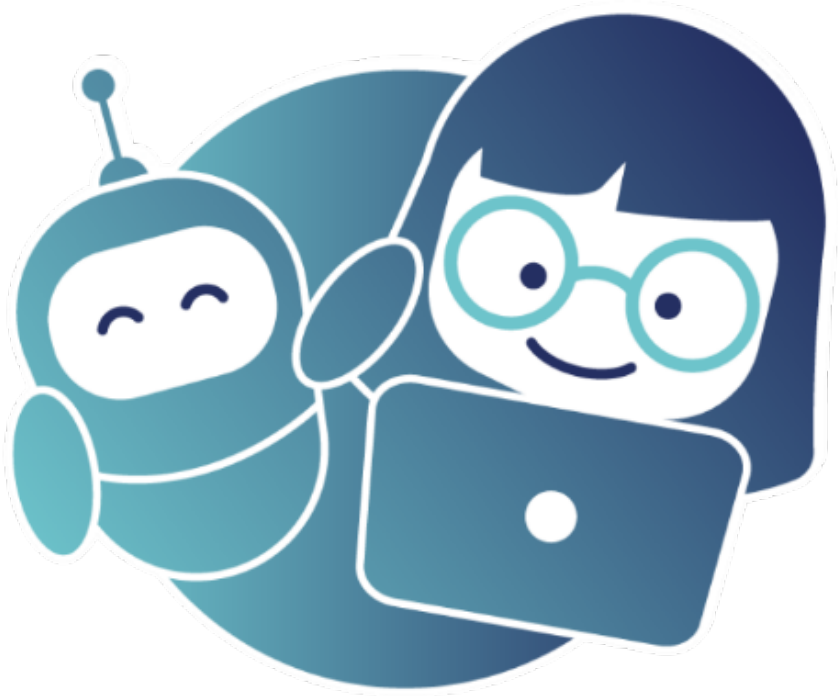
Let's get started!

Toolbox 1: Introduction



I'M NOT A ROBOT

Working with Artificial Intelligence
in Early Childhood Education

KLAX

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VYTAUTAS MAGNUS UNIVERSITY
MCMXXII

Børneinstitution Holluf Pile - Tingkær

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What's it about?

It's about robots & artificial intelligence, about you as educational professionals and your everyday work in your kindergarten!
Get inspired by the contents and the learning game ideas in the project and be sure to read this introduction first.

Let's get started!

Content Toolbox No. 1

- Give it a try!
- About the project: I'm not a robot!
- Artificial Intelligence
- What are toolboxes for?
- Which skills are strengthened?
- Media pedagogical and didactic considerations
- Tips for more in-depth work

Objectives

Pedagogues

- can see their everyday pedagogical work from a new perspective and perform typical activities of kindergarten children in a new context.
- recognise the sense of working with robots as an introduction to understanding digitalisation and AI in kindergartens.
- know how to use terms like AI, robotics, deep learning, etc. in relation to their pedagogical work.
- can plan their digital and AI-related educational activities.
- can assess the children's stage of development and decide for which children it makes sense to work with the boxes (interest, understanding, etc.).
- can justify their educational work with digital media/AI and explain it to parents, for example.

Give it a try!

In teams:

How digital is our daily life?

- Pick up your smartphone and take pictures of everything that is digital in your everyday life.
- Print out the pictures and take them to the team meeting.
- Sort them into categories: digital/with AI/without AI.
- Explain to each other what AI is and whether or how you use AI in your everyday life.

On the homepage:

How digital is our daily life?

https://www.im-not-a-robot.eu/
Site is still under construction!

- Take a look at the photo collection.
- Sort into: Digital - With AI - Without AI.
- Have you discovered everything that uses AI? Look at the solution.

Our digital daily life – further information

https://www.meinalltag.digital/
https://www.migesplus.ch/publikationen/geschichten-aus-dem-digitalen-alltag

Our digital daily life – in kindergarten

Antje Bostelmann: Kinder der Zukunft – Der Kindergarten in der digitalen Welt. Die Geschichte vom Internet, in: kindergartenpaedagogik.de https://www.kindergarten-paedagogik.de/fachartikel/bildungsbereiche-erziehungsfelder/medienerziehung-informationstechnische-bildung/kinder-der-zukunft-der-kindergarten-in-der-digitalen-welt-die-geschichte-vom-internet

Lena Grüber: KiTa digital? Kleinkinder und Technik – Vortrag, https://19.re-publica.com/en/session/kita-digital-kleinkinder-technik

Digital skills for pedagogues

https://joint-research-centre.ec.europa.eu/digcompedu_en
➔ Test your digital literacy here: https://educators-go-digital.jrc.ec.europa.eu/

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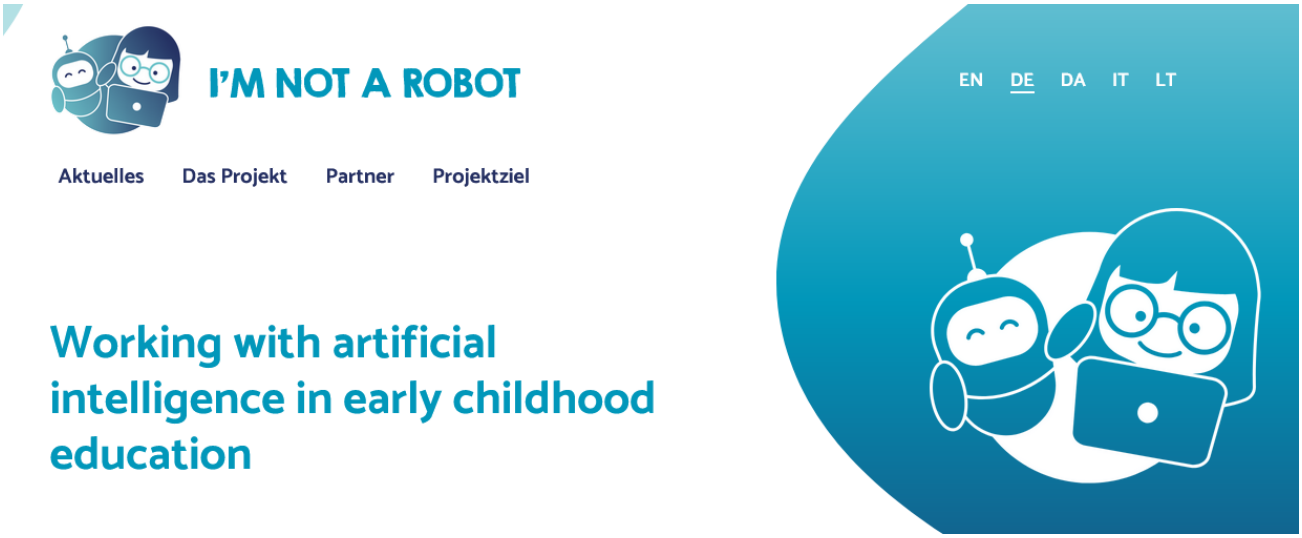
About the project: I'm not a robot!



Artificial intelligence (AI) technology presents people with new challenges. AI forms a new lifeworld reality that has a direct impact on the socialisation processes of children as well as on intrafamilial communication behaviour.

The project "I'm not a robot – working with artificial intelligence in early childhood education" deals with the pedagogical challenges associated with these social and familial changes.

Only a few publications describe the relevance of the topic of AI for pedagogical work. Additionally, pedagogical principles for the use and handling of AI in kindergarten education are currently very limited. AI's growing presence in everyday life is a new challenge for kindergarten educational institutions. Implications arising from the interaction between humans and AI in everyday life should also be fundamentally understood by educational professionals in order to be able to derive pedagogical principles for action.

Europe-wide cooperation

In the "I'm not a robot" project, four European project partners from Berlin/Germany, South Tyrol/Italy, Vilnius/Lithuania and Odense/Denmark are developing pedagogical principles which they will integrate into their respective national curricula after successful testing.

The project is funded by the Erasmus+ programme from 01/03/2021 – 30/06/2023 with funds from the European Commission.

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Artificial intelligence

Artificial intelligence (AI) – a term that's both fascinating and potentially intimidating. Knowledge about AI and views on its future and further development differ widely.
Attitudes vary between great confidence *"AI will make our lives easier"* and great fear *"AI will replace us humans"*.
The key question remains: what opportunities does artificial intelligence actually offer humans and what challenges does it bring with it?

Why is this topic important for kindergarten children?

Children come into contact with the topic of artificial intelligence in their everyday lives, e.g. through voice assistants on their parents' smartphones, through smart toys, smart home systems or in (science fiction) films and books about AI. Search engines or streaming services also use AI systems. AI is therefore present in some form for many children in their living environment.
It is therefore important that children and young people understand what artificial intelligence means, how it works and, above all, what potential it offers and what challenges need to be solved. The further development of AI will accompany adolescents throughout their lives.

Why is this topic important for educational professionals?

AI and digitalisation are topics for pedagogical professionals because these are topics children deal with in their reality of life. Their task is to prepare children for their future lives. It's not important to understand all the technical details of AI and digitalisation, but to be open-minded towards this range of topics. The 12 toolboxes offer you the opportunity to get to grips with the topic and integrate AI into your everyday work. In the first toolbox "Let's start", you'll find reflections and suggestions from educational research and pedagogical practice to critically engage with the significance of digitalisation and AI in our world. The aim is to question one's own attitude to this topic and become aware of one's own reservations as well as one's own enthusiasm.

Our notion of AI in the project (André Timm)

Our understanding of artificial intelligence (AI) is shaped by our impressions of autonomously acting robots from literature and films. In the project, however, we are guided by an IT-based conceptualisation.

Weak & Strong AI

AI can be divided into two categories, weak AI and strong AI. Weak AI aims to solve a single task that would otherwise have been done by a human or that would be too complex for a human. Each task must be clearly defined, and a different specialised AI must be developed for each task. The best-known applications of weak AI are voice-controlled digital assistants (e.g., Alexa, Siri – see image), recommendation systems, search engines (e.g., Google), chatbots, automated vehicles and face and image recognition. Strong AI aims to mimic human behaviour and display intelligence in all possible contexts. Strong AI could, for example, collaborate with humans on the same level, understand tasks and develop solutions. But this strong AI does not (yet) exist in our everyday lives.

Machine learning

The most important subcategory of AI is machine learning, which uses statistical methods to analyse input data, develop algorithms and make predictions. A typical task for AI is to recognise the content of images, audio or texts. Just as a child learns a language for the first time, an AI analyses its rhythm and pronunciation. The only difference is that an AI performs very complex calculations and processes a huge amount of data in a short amount of time to find these patterns.

Self-optimising AI

The mathematical concept for building a self-optimising AI is called "artificial neural networks". Analogously to the human brain, many mathematical units – called neurons – process their input data by adjusting their parameters and generate output data.

The recognition of images and speech requires networks with a neural network and millions of computations and parametric adjustments to achieve reasonable accuracy. Very fast computers or even computer networks and a lot of input data are needed to train these networks. The optimisation process can take up to weeks, but once the perfect calculation is set, it can be executed very quickly – for example, when you talk to Alexa and get an immediate answer.

Applications of AI

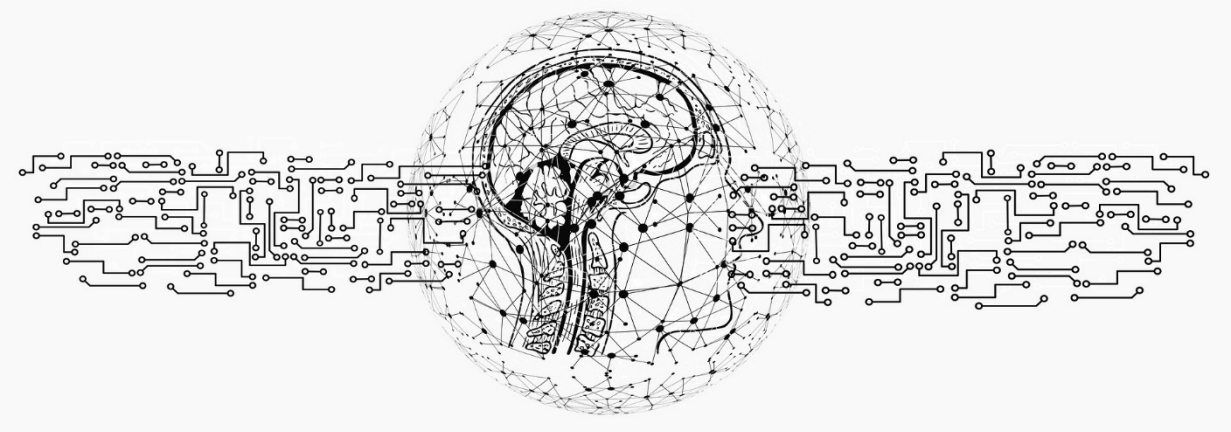
AI can help us in our everyday lives as well as in solving global challenges. For example, it can help us translate ancient texts written in unknown languages. AI can paint paintings, compose music and write poems in the style of other artists – just by analyzing the statistical algorithms behind them. At the same time, the intelligence to "understand" language is constantly growing.

The scientific sector also benefits from AI. Artificial intelligence can help diagnose diseases at very early stages, develop new drugs or even new material compounds by analysing thousands of data and providing them as input.

Risks

At the same time, the progress of AI also brings risks. Since AI needs a lot of data to deliver good results, this could also be the reason why the most advanced AI developer companies are Google, Microsoft, Amazon, Facebook, Apple, Tesla and IBM. Therefore, it'll be very important in the future to pay attention to the protection of private data.
Another risk is that wrong, manipulated or outdated data will be used as input, which may lead to wrong predictions. It will be a challenge for future generations to deal with disinformation and propaganda through personalised messages or even political speeches imitated by deepfake avatars that mimic human behaviour.
It's also necessary to ask what human creativity means in times of computer-generated art, which will be increasingly difficult to distinguish.

Humanisation (anthropomorphism) of AI



Human development of AI is progressing at an immense rate. Many robots in everyday life and the workplace are already made up of AI and the impact on our future will grow steadily. Therefore, the best thing that can be done for future generations is to provide a broad knowledge of AI from a technological and ethical point of view in order to be able to explore it and contribute to its development.

A perfect AI, an AI that permanently analyses its entire environment, reacts to it and can ensure its survival, does not yet exist. The questions of whether or when there will be a time when machines and robots can optimise themselves cannot be answered.

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https://www.spiegel.de/netzwelt/gadgets/kuenstliche-intelligenz-turing-test-chatbots-neuronale-netzwerke-a-1126718.html?sara_ecid=soci_upd_KsBF0AFjflf0DZCxpPYDCQgO1dEMph
https://www.economist.com/interactive/briefing/2022/06/11/huge-foundation-models-are-turbo-charging-ai-progress
https://app.pearup.de/material/teachingSequence/vqQ4FbCRgvwCEwMRC
https://www.craiyon.com/?prompt=Heat%20wave%20making%20penguins%20dance%20on%20ice
https://www.technologyreview.com/2022/07/12/1055817/inside-a-radical-new-project-to-democratize-ai/

Why are the image of robots and the term robot used?

Robots fascinate children and adults. (Almost) every child and every adult can imagine something about a robot. They think of technology and the future, but also of friendship and help. We use this fascination and imagination in our project. Robots as an image stand for digital and AI-supported devices, i.e., we don't stop at a description of a robot but aim to pick up on current technical developments. After all, robots are also being developed further and our idea of robots and artificial intelligence is changing with it.

Usually, a distinction is made between play and learning robots for children. We don't make this distinction, because learning takes place in play and learning can be playful.

The main point of connection in terms of content is the field of robotics, because robotics for children is an important component of STEM education (educational processes in the fields of mathematics, computer science, natural sciences and technology). With robotics, children learn to program, design and build their own robot. In this way, they acquire important skills that will shape their future.

Why toolboxes?

Education in the digital world

The "I'm not a robot" package of toolboxes refers to the **Education in the Digital World** (2016) strategy adopted by the Standing Conference of the Ministers of Education and Cultural Affairs of the states in the Federal Republic of Germany (Kultusministerkonferenz) and takes up the competency framework described there for responsible, self-determined participation in digital society.

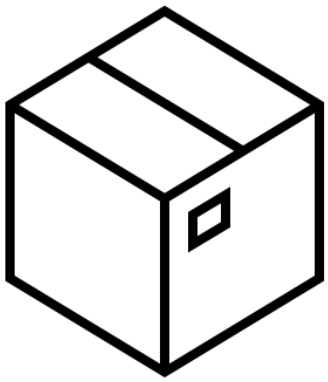
The methods, materials and media in the 12 toolboxes are designed so that they can be used in everyday kindergarten life. For this purpose, everyday play and learning activities of kindergarten children are deliberately integrated. It shows which areas the materials and media already available in preschools can be linked to the topic of AI. Firstly, the toolboxes are intended for use in an overall context so that the learners get a comprehensive view of the topic of artificial intelligence when working through all the media. And secondly, the toolboxes can also be used independently of each other to illustrate individual aspects of dealing with and understanding AI. Included are mainly elements for everyday preschool life itself, but also ideas for home and suggestions for communication with parents.

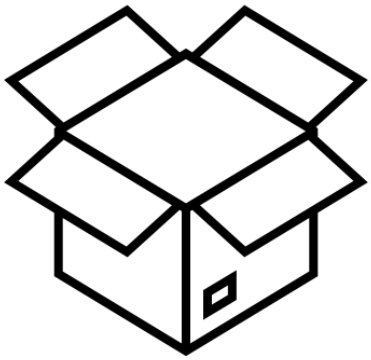
12 Toolboxes

The "I'm not a robot" package consists of 12 toolboxes based on the children's questions about AI, symbolised by robots:

1. Let's get started!
2. Who knows a robot/AI?
3. Let's play robots!
4. How does a robot think?
5. How clever is a robot?
6. What does a robot eat?
7. How does a robot talk?
8. Does a robot have feelings?
9. Can a robot be my friend?
10. How can a robot help me?
11. Where does a robot come from?
12. Let's create a robot!

Box 1 introduces the project and should be read and, if possible, discussed in the preschool team before using the other boxes. All boxes (2-12) can be used independently of each other. So, it's possible to start the topic with any of the boxes.





Toolbox systematics

All toolboxes are structured according to the system of an index card collection. The title page names the topic and the target group. At first glance, it's obvious what the box is about and what goal is being pursued. Further cards describe methods and materials in detail and are complemented by pictures and examples from everyday kindergarten work. On separate pages, the theoretical background to the topic of the toolbox is explained from a pedagogical and didactic point of view, as well as using explanations from the subject area of AI.

The first toolbox is aimed at educational professionals who want to deal with the question of what AI and digitalisation actually mean in kindergartens and how the topic can be used in kindergartens. This box is available in print and online on the "I'm not a robot" homepage (www.im-not-a-robot.eu) and is constantly updated there.
Toolboxes 2 to 12 are designed for educational use in kindergartens. The suggestions in the toolboxes can be implemented with little effort, as the play and learning materials used are already available in most kindergartens. Or materials are used to reinterpret old and used materials in the manner of upcycling and are made to be usable.
Therefore, the media package can be used in everyday kindergarten life with little or no prior knowledge of the topic and also allow us to go deeper into the topic of AI with each box if the level of knowledge is advanced.
The complete "I'm not a robot" toolboxes package can be implemented with all age groups in kindergarten. This is because the underlying activities of the children correspond to the developmental stage and developmental tasks of kindergarten age. However, neither the children nor the kindergarten teachers are trained to be experts in digitisation or AI. The aim of each toolbox and thus of all the toolboxes is to understand digitalisation and digitisation and AI as a possibility and as part of our life and way of life.

National Curricula for kindergardens

Italy/German-speaking kindergartens in South Tyrol
https://www.provinz.bz.it/bildung-sprache/kindergarten/paedagogische-fachkraefte/rahmenrichtlinien-deutschsprachiger-kindergarten.asp?publ_action=300&publ_image_id=412732

Germany
The link to national curricula which represents the principles of the educational and upbringing work of the day-care facilities for children and is specified, filled out and expanded by the educational plans at state level. Within the common framework, all states follow their own paths of differentiation and implementation which are appropriate to the respective situations. Educational plans are orientation frameworks which are binding in each state and on the basis of which the child day-care facilities draw up agency or facility-specific concepts, taking into account local circumstances. (JFMK/KMK 2022, P. 4):
https://www.bildungsserver.de/onlineressource.html?onlineressourcen_id=25908

Lithuania
Kindergarten programme https://smsm.lrv.lt/web/lt/smm-svietimas/svietimas-priesmokyklinis-ugdymas/priesmokyklinio-ugdymo-programa?lang=lt

Denmark
https://www.uvm.dk/dagtilbud/paedagogiske-redskaber-og-rammer/den-styrkede-paedagogiske-laereplan

Skill development with the toolboxes

By using the toolboxes, not only are the digital skills of the children and the pedagogical staff promoted, but the focus is on a promoting skills in a holistic way. The media pedagogical approach and didactic considerations are explained in more detail in the following section.

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Overview 12 Toolboxes

No.	Title	What is it about?	Fits well with box No.	Goal	Target & age group	Content
1	**Let's get started!**	Introduction to the project idea and the contents of the toolboxes	**to all boxes**	Thoughts on digital media and Artificial Intelligence (AI) in everyday life.	Pedagogical staff	It's about robots and artificial intelligence, about you as educational professionals and your daily work in the kindergarten. Be surprised by the content and the learning game ideas in the project and **read this introduction first**.
2	**Who knows a robot?**	Differences between humans and robots	**3, 4 & 8**	Recognise AI-controlled devices in everyday life and reflect on the differences between robots/AI-controlled devices and humans.	Children, all ages & educational professionals	Game ideas for recognising, classifying and discovering robots/AI in one's own environment (kindergarten) and for understanding the basic functionalities of a robot.
3	**We play robots!**	Children turn into robots and play robots	**2 & 4**	First insight into programming robots; understanding that robots need to be controlled by humans.	Children, all ages & educational professionals	It is a playful way to experience what it is like to be controlled. One child is the robot and another child “controls” it.
4	**How does a robot think?**	'Thinking' of the robots is explained	**2 & 3**	Basic principles of programming and coding.	Children, from approx. 4 years & educational professionals	Game ideas where the children become programmers and control other children who turn into a robot.
5	**How smart is a robot?**	Big data, machine learning and speech recognition are introduced	**6**	Insights into what and how a robot/ AI learns.	Children, from approx. 3 years & educational professionals	Game ideas where children can understand how robots/AI can recognise colours, patterns and faces.
6	**What does a robot eat?**	Energy and information as 'food' for a robot	**5**	Robots need a different diet than humans to function, the theme is energy and information as 'food' for a robot/AI.	Children, from approx. 4 years & educational professionals	Game ideas dealing with structured planning and energy production.

No.	Title	What is it about?	Fits well with box No.	Goal	Target & age group	Content
7	**How does a robot speak?**	Language, speech recognition and communication	**8 & 10**	Communication with robots/AI is different from communication between humans.	Children, from approx. 4 years & educational professionals	Game ideas in which children realise that robots can only communicate responsively to a limited extent.
8	**Does a robot have feelings?**	Emotions and body perception of humans in contrast to robots/AI	**2, 7 & 10**	Perception of feelings and body experiences that characterise us as human beings, strengthening emotional competence.	Children, from approx. 4 years & educational professionals	Game ideas in which children learn to recognise and assign feelings. It becomes clear that robots/AI do not have feelings.
9	**Can a robot be my friend?**	Questions about the morality and ethics of technologies, robots and AI	**10**	Moral/ethical aspects of dealing with robots, understanding that robots are not to be considered as people, as friends.	Children, from approx. 3 years & educational professionals	Game ideas to understand the difference between friendships between children and friendships with robots.
10	**How can a robot help me?**	Technical applications of robots and AI; technical progress and everyday life facilitation through robots/AI	**7, 8 & 9**	Understanding of the different forms of technological support for humans and that robots are designed to meet human needs.	Children, from approx. 3 years & educational professionals	Game ideas where the children think about how a robot could help them in their everyday lives.
11	**Where does a robot come from?**	Design and production of robots and AI-controlled devices	**12**	who builds a robot and how it is built; brief insight into the historical development of robots	Children, from approx. 4 years & educational professionals	Game ideas where the children themselves become robot designers and understand that robots/AI have to be developed by humans.
12	**We are building a robot!**	An "own" robot is designed and built from all kinds of materials; creativity, imagination and the joy of playing are the main focus	**11**	Knowledge about robots and Artificial Intelligence is linked to creativity; building a robot themselves strengthens the children's understanding that robots need to be built.	Children, all ages & educational professionals	Game ideas for upcycling robots.

Mediapedagogical & didactic considerations

Mediapedagogical & didactic considerations

Teachers learning about AI with children may encounter sensitive topics and challenges in organising activities. Sensitive topics may arise when touching on ethical issues, such as whether a robot and a human can be friends, or when considering what is an appropriate length of time for children to use devices with displays, etc.
Here are some directions/topics you could/should consider before starting activities with children.

Friendship between humans and artificial intelligence

The development of technologies now allows us to talk about social interaction and communication between humans and robots in roles such as friends, companions and tutors (Neumann, 2020). The concept of social robots has emerged in the last few decades. It's important to note that social robots can help people in various areas of social and everyday life, including but not limited to entertainment, leisure, personal services, cleaning, security and elderly care (Neumann, 2020).
Robots are also used in education, especially for learning languages, providing learning experiences and supporting learning in certain subjects such as biology, chemistry or mathematics, but the attitude of teachers and parents towards robotics in early childhood is more negative than positive. Even though some studies point to negative effects of robots on children's psychological development (e.g., robot nannies who never say no to children), it's important to talk to children about virtues and morals in their behaviour from an early age to raise understanding that robots can contribute significantly to the development of the self. Although AI or robots are not currently the solution to educational problems, they could in the future help teachers in overcrowded classrooms or support students in learning programmes with a high degree of immersive learning. Artificial intelligence can also make a teacher's job easier when a robot becomes a student assistant (Luckin & Holmes, 2017).

The limits of human responsibility in a changing society

The robot does not need to know what makes a behaviour good or bad, because it's enough for the human to have a basic intuition of what virtues and vices are and to be motivated to apply this practical knowledge (Cappuccio et al., 2021). The focus is not on what the robot can or should do for the human but how the human can develop himself and improve his character by interacting with a robot (Cappuccio et al., 2021).

At what age should we start talking about artificial intelligence with children? What is a safe time to use screens?

Nowadays, children often have digital devices in their hands before they even hold a pen for the first time. In everyday life, we're all surrounded by increasingly intelligent tools, objects that need to be controlled and improved, with which to communicate and create an even smarter world (Ponomariovienė, 2020). Screen exposure is not recommended for children under 18 months. Children aged 18−24 months can be introduced to high-quality digital media programming/apps through parent−child co-use, and daily screen time should be limited to one hour for children aged 2−5 years. More than one hour of screen time per day is considered excessive for children aged 2−5 years (COUNCIL ON COMMUNICATIONS AND MEDIA, 2016).

Why is it important to learn programming and what should we pay attention to?

According to researchers, programming and robotics can enable all children to achieve their goals and participate effectively in social developments (Monteiro et al., 2021). Creating engaging activities for children where they can apply existing knowledge and acquire new knowledge will build the important skills needed to work with different technologies. For children to develop basic programming skills, they should participate in challenging programming activities that teach kindergarten-appropriate knowledge, such as directional learning. Code learning is a skill that

contributes to children's learning process, helps them to cope with many different situations in their lives and helps them to work better with machines (Garcia-Penalvo et al., 2016). In the learning process, children should not be afraid of making mistakes. They need to be encouraged to try again and in this way try to develop an important personal quality: perseverance. It's also important to explain to the children what to do if they make a mistake while creating an algorithm/sequence and how to correct the mistake. Since the way the robot works is related to the way humans work, the robot's mistake can also be corrected. It's important to teach the children that they can return to a wrong action and correct it. In this way, the children get used to checking the work they have done and making sure that everything is working correctly.

What should be the main method for teaching artificial intelligence?

Children learn through play. During play, they manipulate different objects, model different situations, coordinate their actions with peers and adults, actively act in different contexts, etc. Recently, more and more researchers have found that learning principles based on games or simulations are in many cases more effective than traditional learning methods. According to the researchers, technology should therefore contribute to enriching the learning context, experimenting with content and allowing learners to create their own knowledge in an active and culturally rich environment (Rodrigues & Felicio, 2019).

Becoming a prosumer

The term "prosumer" is a combination of the terms "producer" and "consumer" and describes active users of social web offerings (cf. Grimm/Rhein 2007).
Alternatively, the term "produser", a combination of "producer" and "user", is also used (cf. Bruns 2008).
Being able to shape media messages oneself is one aspect of media literacy that should strengthen social action as a whole.
Active participation in public discourse also from the media language spectrum
This action-oriented approach makes it clear that our school system is still one-sidedly oriented towards teaching reading and writing skills for verbal texts. Visual language or even moving audiovisual texts are neglected at school. Indeed, models for differentiating media competence into a comprehensive multimedia understanding are hardly taught systematically (cf. Doelker 1989, 1997).

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Tips for in-depth study

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Links

Digital and kindergarten

- https://joint-research-centre.ec.europa.eu/digcompedu_en
- https://joint-research-centre.ec.europa.eu/digcompedu/digcompedu-self-reflection-tools_en

Artificial Intelligence (AI)

- Comic/Graphic Novel: https://weneedtotalkai.files.wordpress. com/2019/06/weneedtotalkai_cc.pdf
- https://medienportal.siemens-stiftung.org/en/artificial-intelligence-introduction-perspectives-on-ai-112780

Let's get started!

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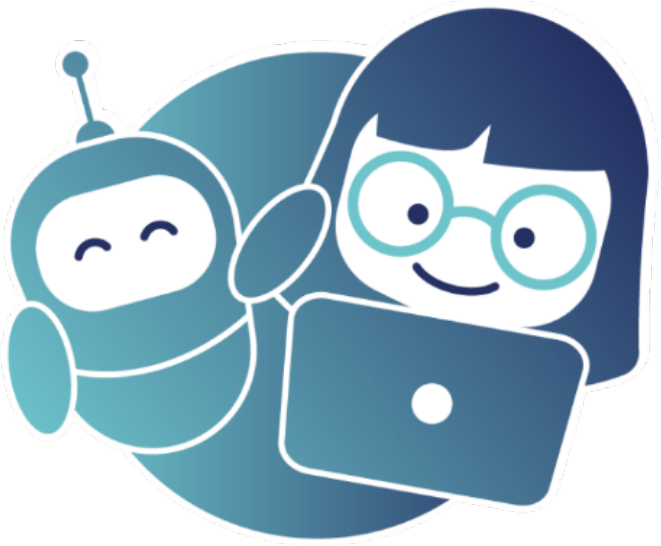

I'M NOT A ROBOT

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