

The Artificial Intelligence in VET

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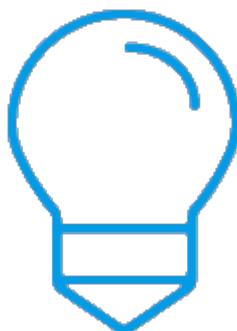
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Step A - What is AI?

Entry level learning path



What is Artificial Intelligence?

Step A/01

Artificial Intelligence (AI) can be defined as a system that has been designed to interact with the world in ways we think of as human and intelligent. Ample data, cheap computing and AI algorithms mean technology can learn very quickly. The transformative power of AI cuts across all economic and social sectors, including education. Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems, which includes expert systems, natural language processing, speech recognition, machine vision and other operations programmed on the basis of machine learning, reasoning and self-correction.

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Resources

TEXT: Artificial Intelligence in the policies, processes and practices of vocational education and training (Chapters 1)

Description: Insight into the topic
[ENG]

COURSE: Elements of AI

Description: Free Online course developed in Finland to give citizens a basic understanding of artificial intelligence.
Link: <https://course.elementsofai.com/>
[ENG]

PODCAST: The ai podcast

Description: some of the world's leading experts in AI, deep learning and machine learning explain how it works, how it's evolving and how it intersects with every facet of human endeavor, from art to science. New episodes are released about every other week.
Link: <https://blogs.nvidia.com/ai-podcast/>
[ENG]

The Artificial Intelligence in theoretical terms

Step A/02

Artificial intelligence is not a completely new topic, instead it has been occupying computer science since the early 1950s. The term was first coined during the Dartmouth Workshop on artificial intelligence in 1956. The topic has been particularly high on the agenda in recent years, as recent technological advances push the limits of what machines can do (McKinsey & Company 2018). This is particularly due to the expansion of the Internet, the availability of data and more powerful computing and algorithms. A uniform definition of what artificial intelligence is, however, does not yet exist, since AI combines a multitude of technologies. Artificial intelligence is therefore to be understood as a kind of 'umbrella term' (Southgate et al., 2019, p. 17).

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Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 3.1 – Understanding of the term Artificial Intelligence

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

VIDEO: What is Artificial Intelligence? In 5 minutes

Description: The video gives a context on how to think about AI

Link: <https://www.youtube.com/watch?v=2ePf9rue1Ao>

[ENG]

The different concepts of artificial intelligence

Step A/03

In the European Artificial Intelligence Strategy, the following is given (European Commission, 2018b):

“Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – to achieve specific goals. AI-base systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications).[...].”

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Another classification of AI, which is also more widely used by the public, provides for the following subdivision (Southgate et al., 2019):

Artificial narrow intelligence:

Refers to AI systems that focus on solving concrete application problems, which have been developed and trained specifically for them. In performing the tasks, the system may outperform human performance, but they do not have the general scope of intelligent behaviour that humans have. All systems that exist today fall into this category of weak AI.

Artificial general Intelligence:

Refers to AI systems that have the same intelligence as humans. They would act on their own initiative. These systems exist only in science fiction movies.

Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 3.1 Understanding of the term Artificial Intelligence

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

VIDEO: What is Artificial Intelligence (or Machine Learning)?

Description: The evolution of AI and the differences between reality and science fiction

Link: <https://www.youtube.com/watch?v=mJeNghZXtMo>

[ENG]

The AI technologies in daily life

Step A/04

- **Smart home:** based on the internet of things
- **Smart vacuum cleaners:** now an everyday consumer technology using sensor-based mapping or chaos theory
- **Smart meters for charging for services**
- **Internet search:** search is based on AI
- **Recommender systems:** Netflix, amazon
- **Augmented Reality and Virtual Reality:** used in games and education but also many work based applications
- **Transport as a service:** integrated transport systems
- **Smartphones / communication**
- **Social technology**

Resources

VIDEO: Top 10 Artificial Intelligence Technologies in 2020

Description: Video of Edureka! channel

Link: https://www.youtube.com/watch?v=K_Mh21P9OwA

[ENG]

WEB ARTICLE: Top 15 Hot Artificial Intelligence Technologies

Description: list of AI based technologies for daily life

Link: <https://www.edureka.co/blog/top-15-hot-artificial-intelligence-technologies/#NaturalLanguageGeneration>

[ENG]

The existing AI-based work technologies

Step A/05

- **Machine translation:** machine language translation has greatly advanced and through Natural Language Processing is deeply embed in many AI applications for work and for learning
- **Self-driving cars:** use sensors and machine learning or neural networks
- **Audio technologies:** we are moving from the written word towards more natural audio and speech as basis for interacting with machines e,g, Siri, Alexi, amazon transcribe
- **Chatbots:** increasingly used in e-commerce and services and now also in education
- **Autopilots for planes**
- **Cloud robotics:** allows robots to learn from each other over the cloud
- **Logistics:** AI is increasingly used for logistics
- **Routine tasks:** AI is fast being used for routine tasks – sometimes in conjunction with automation and robotics

Resources

WEB ARTICLE: Artificial Intelligence In The Workplace: How AI Is Transforming Your Employee Experience

Description: Forbes Web article

Link: <https://www.forbes.com/sites/bernardmarr/2019/05/29/artificial-intelligence-in-the-workplace-how-ai-is-transforming-your-employee-experience/#47b0179053ce>

[ENG]

WEB ARTICLE: How Artificial Intelligence is Changing the Workplace

Description: BBC web article

Link: <http://www.bbc.com/storyworks/specials/how-artificial-intelligence-is-changing-the-workplace/>

[ENG]

WEB ARTICLE: 19 Artificial Intelligence Technologies To Look For In 2019

Description: List of AI based technologies

Link: <https://blog.adext.com/artificial-intelligence-technologies-2019/>

[ENG]

The role of data in AI: Data science, Big data and Data mining

Step A/06

Data Science pursues the goal to gain knowledge from data. Data Science covers the entire “data value chain”: from collection and processing to modelling.

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Big Data is characterized by the following five features:

- the magnitude of data to be processed is very large (volume)
- the diversity of data types and sources (variety),
- the speed at which they occur (velocity)
- the valuable data must be filtered out (value)
- the uncertainty regarding the quality of the data (veracity).

Data Mining: Use of statistical or machine learning methods to detect new relationships and patterns in a data set. The aim is, for example, to make recommendations for decisions or make predictions.

Resources

WEBSITE: Lernende Systeme

Description: German Platform for Artificial intelligence

Link: <https://www.plattform-lernende-systeme.de/glossar.html>

[DE] [ENG]

WEBSITE: Information about Big Data from the European Commission

Description: General Information about Big Data, Research Projects and Events

Link: <https://ec.europa.eu/digital-single-market/en/big-data>

[ENG]

LEARNING ACTIVITY: Data bias in AI

Description: Idea for a lesson about data bias in AI

Link: <https://www.digitaltechnologieshub.edu.au/teachers/lesson-ideas/ai-lesson-plans/data-bias-in-ai/>

[ENG]

WEBSITE + VIDEO: Big Data and AI

Description: Information about Big Data and AI in general and the relevance for development cooperation.

Video-link: <https://www.youtube.com/watch?v=4hSGvAzs-iQ>

[DE] [SUB ENG]

Website-link: <https://toolkit-digitalisierung.de/en/practice/smart-development-approaches-en/bigdata-und-ki/>

[DE] [ENG]

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WEB ARTICLE: What is Big Data and What Artificial Intelligence Can Do?

Link: <https://towardsdatascience.com/what-is-big-data-and-what-artificial-intelligence-can-do-d3f1d14b84ce>

[ENG]

WEB ARTICLE: What is data management and why is it important?

Link: <https://searchdatamanagement.techtarget.com/definition/data-management>

[ENG]

Educational-training areas of development thanks to AI

Step A/07

Use of AI for:

- Registration
- Administration
- Timetabling
- Lesson planning
- Learner engagement
- Learner support
- Assessing
- Marking
- Continuous professional development

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Resources

BOOK: Artificial Intelligence for Learning. How to use AI to support employee development, Donald Clark, 2020, Kogan Page BLOG: Donald Clark Plan B

Description: The Donald Clark blog

Link: <https://donaldclarkplanb.blogspot.com/>

[ENG]

WEBSITE: M&L news

Description: news portal about technologies and education

Link: <https://news.media-and-learning.eu/>

[ENG]

AI for the provision of education and training

Step A/08

Learner engagement and recruitment Engaging with potential students is an issue for vocational education and training organisations in many countries. Higher education has greater prestige whilst careers advisers may not have an in-depth knowledge of different occupations and vocational education opportunities. AI can be used, for instance in chatbot applications, to provide information about the labour market, about jobs and occupations, about qualification requirements and about courses and work experience opportunities. This provides much greater opportunities for in depth engagement than is possible for organisations to currently provide face to face.

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Resources

VIDEO: Artificial Intelligence in Recruiting

Description: How artificial intelligence in recruiting works

Link: https://www.youtube.com/watch?v=f_UW1FwJXTY

[ENG]

AI-enhanced learning and teaching processes

StepA/09

Intelligent tutoring systems

An Intelligent Tutoring System (ITS) is defined as an IT tool capable of helping a student in the same way (or almost) as a human tutor. Specifically, the functions it should perform are the following:

- presenting learning contents;
- evaluating the efficacy of student learning process (what and if the learner is learning);
- promoting learner motivation;
- helping learners to cope with difficulties, to bridge learning gaps by getting examples and extra explanations.

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Smart classrooms

A smart classroom is a physical learning room equipped with sensor technology. The data collected via sensors, e.g. with microphones or cameras, are used by humans or AI systems to provide learning assistants, tools or strategies for the learners (Southgate et al. 2019). A smart classroom should support the teacher in teaching in order to make learning more effective for the students. **Assessment** One of the biggest short term uses of AI in teaching and learning may be in assessment. Although e-Assessment has been around for some time, the use of AI can greatly enhance the variety of assessment formats. Automatic marking of assessments reduces the load on teachers, allowing a move towards more formative assessments, rather than reliance on manually marked end testing. The Wales government is exploring moving all exams in schools to e-Assessment in the near future.

Resources

TEXT: Artificial Intelligence in the policies, processes and practices of vocational education and training

Chapter 8.1 – Intelligent tutoring systems

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

VIDEO: Intelligent Tutoring system

Description: A brief introduction to what an intelligent teaching system is

Link: <https://www.youtube.com/watch?v=PZQKrLW4xH8>

[ENG]

VIDEO: Educational Game and Intelligent Tutoring System: A Classroom Study and Comparative Design Analysis

Description: Example of ITS implementation

Link: <https://www.youtube.com/watch?v=a1qU9gPFkBW>

[ENG]

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TEXT: Artificial Intelligence in the policies, processes and practices of vocational education and training

Chapter 8.2 – Smart Classroom

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

VIDEO: How China Is Using Artificial Intelligence in Classrooms | WSJ

Description: Example of Smart classroom implementation

Link: <https://www.youtube.com/watch?v=JMLsHI8aV0g>

[ENG]

VIDEO: WOW (Window on the World) Room (IE Business School in Madrid)

Description: AI based virtual Classroom.

Link:

https://www.youtube.com/watch?v=1YEbrbVqbyM&feature=youtu.be&list=PLRmzLREnclo3TCVUjtj85C_YSmAhuLSzYG

[ENG]

TEXT: Artificial Intelligence in the policies, processes and practices of vocational education and training

Chapter 8.4 – Digital Assessment

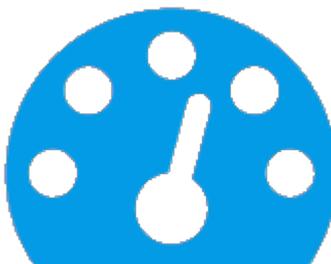
Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TacpleAI_FullReport_IO1.pdf

[ENG]

Step B - Which are the impacts of AI?

Learning path for advanced



The socio-economic implications of AI implementation in industries

Step B/01

Despite alarming forecasts of the occupations and jobs that could disappear as a result of the introduction of AI and automation and counterclaims that the new technologies will lead to the creation of jobs, the reality may be more nuanced. It is likely that AI will have a greater impact in changing the tasks within individual occupations and jobs, with some tasks becoming automated while new tasks emerge. One impact of AI on the working and professional world is the establishment of smart factories. AI facilitates redesigning a production environment into a **smart factory**, excelling in high flexibility and versatility with new organisational structures and processes.

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Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 4 – ARTIFICIAL INTELLIGENCE AND EMPLOYMENT, THE LABOUR MARKET AND SOCIETY

Chapter 4.1 – Will machines complement or replace humans in the workplace?

Chapter 4.2 The role of AI in the Industry 4.0 and its socio-economic implications

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TacpleAI_FullReport_IO1.pdf

[ENG]

VIDEO: How to Turn a Regular Factory into a Smart Factory

Description: TED talk about smart factories

Link: https://www.youtube.com/watch?v=p-SLDuMW_6k

[ENG]

WEB ARTICLE: Workers' rights: negotiating and co-governing digital systems at work

Description: AI as a new front line for unions as well as a challenge to workers' rights to autonomy

Link: <https://www.socialeurope.eu/workers-rights-negotiating-and-co-governing-digital-systems-at-work>

[ENG]

Changes brought by AI in the productive sectors

Step B/02

Research literature identifies a range of implications of AI for skills needs (McKinsey, 2018):

- Demand for advanced technological skills such as programming will grow rapidly. There is also a lack of sufficient understanding of technologies to lead the organization through the adoption of automation and AI.
- Increasing demand for key skills and competencies: social, emotional, and higher cognitive skills, such as creativity, critical thinking, and complex information processing, basic digital skills.
- Demand for physical and manual skills will decline but it still will remain the single largest category of workforce skills in 2030 in many countries.
- There are expected declines in the need for basic cognitive skills, particularly the basic data input and processing skills used by data entry clerks and typists and in a range of back-office functions.

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Resources

VIDEO: Bill Gates on the impact of AI on the job market

Description: FOX Business Network interview

Link: <https://www.youtube.com/watch?v=sl5ggAJidVQ>

[ENG]

VIDEO: The future of work: is your job safe?

Description: A report by “The Economist”

Link: https://www.youtube.com/watch?v=B5I_vNEcFWg

[ENG]

PODCAST: The role of technology in the future of work.

Description: Emerald podcast [ENG]

Link: <https://soundcloud.com/user-163454702-828217667/fow-podcast-ep3-the-role-of>

[ENG]

VIDEO: The Future of Your Job in the Age of AI | Robots & Us

Description: A report by “WIRED”

Link: <https://www.youtube.com/watch?v=MMIsbl3DIL8>

[ENG]

Changes of occupational profiles due to the introduction of AI

Step B/03

The literature on the implications of AI for work and employment distinguish between the replacement of human workers and the use of AI to assist human performance. Some scenarios provided by the authors follow:

- AI will transform work tasks, but will not make human activity completely obsolete.
- At the *level of operations*, the AI augments and complements human work by increasing the efficiency and effectiveness of current ways of doing things. At the *level of actions*, AI replaces, substitutes, and automates actions that were previously done by humans, whereas at the *level of activity*, AI transforms the system of motives, making current activities and specializations redundant and obsolete. Occupations made up of physical activities in highly structured environments or in data processing or collection will see declines. Growing occupations will include those with difficult to automate activities such as managers, and those in unpredictable physical environments such as plumbers.
- Demand for physical and manual skills and for basic data input and processing will decline, while growth will be strong in demand for interpersonal skills, creativity, and empathy. Advanced IT skills and programming alongside complex information processing skills will also see a surge in demand. In highly automated plants, the software is the interface for all technical solutions.

Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 4.1 – Will machines complement or replace humans in the workplace?

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

REPORT: Creative Disruption: The impact of emerging technologies on the creative economy

Description: Report by World Economic Forum

Link: http://www3.weforum.org/docs/39655_CREATIVE-DISRUPTION.pdf

[ENG]

WEB ARTICLE: Preparing Workers for Anything: Human + Machine

Description: Allison Salisbury writes about three critical career pillars to develop to face the uncertain future of work

Link: [Educause review](#)

[ENG]

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WEB ARTICLE: AI and automation of the workplace

Links: <https://www.electropages.com/blog/2020/03/ai-and-automation-workplace>

[ENG]

VIDEO: 3 myths about the future of work (and why they're not true) | Daniel Susskind

Description: TED talk of Daniel Susskind on the implications of automation and AI for the future of work and jobs

Link: <https://www.youtube.com/watch?v=2j00U6IUC-c&list=PLmmg4kHZRIt-n8yecYPHjU1P1GZ2h50ar&index=539>

[ENG]

VIDEO: Daniel Susskind, Author of "A World Without Work"

Description: Interview with Daniel Susskind on the implications of automation and AI for the future of work and jobs

Link: <https://www.youtube.com/watch?v=J0d2Dhv1C34>

[ENG]

PODCAST: The role of technology in the future of work. Emerald podcast

Description: Experts talk about the role of the worker in the future of work

Links: <https://soundcloud.com/user-163454702-828217667/fow-podcast-ep3-the-role-of>

[ENG]

PODCAST: Training And Developing The Workforce. Emerald podcast

Description: Emerald podcast

Link: <https://soundcloud.com/user-163454702-828217667/fow-podcast-ep2-training-and>

[ENG]

VIDEO: Digital Workforce and Automation

Description: Example of Digital workers hub portal

Links: <https://www.automationanywhere.com/rpa/digital-workforce>

[ENG]

Possible work scenarios: interactions between workers and the workplace and required skills

Step B/04

Some scenarios provided by the authors follow.

- The integration of intelligent machines and software into the workplace, workflows and workspaces will continue to evolve to enable humans and machines to work together.
- Artificial Intelligence creates completely new spaces for interaction between machines.
- Increase in active labour in the field of complex maintenance processes in heavily digitalized production environments.

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Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 4.2 – The role of AI in the Industry 4.0 and it's socio-economic implications

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

Required competences to use AI in the workplace

Step B/05

Research literature identifies a range of implications of AI for skills needs (McKinsey, 2018):

- Demand for advanced technological skills such as programming will grow rapidly. There is also a lack of sufficient understanding of technologies to lead the organization through the adoption of automation and AI.
- Increasing demand for key skills and competencies: social, emotional, and higher cognitive skills, such as creativity, critical thinking, and complex information processing, basic digital skills.
- Demand for physical and manual skills will decline but it still will remain the single largest category of workforce skills in 2030 in many countries.
- There are expected declines in the need for basic cognitive skills, particularly the basic data input and processing skills used by data entry clerks and typists and in a range of back-office functions.

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Resources

TEXT: Artificial Intelligence in the policies, processes and practices of vocational education and training

Chapter 5 – The skills and competences needed in the age of artificial intelligence

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

Ethical implications for AI

Step B/06

- Ethical concerns include:
- Surveillance
- Bias
- Data security
- Transparency
- Anonymity
- Face recognition
- Unreliable data
- Explainability
- Accountability

But see Stephen Downes Commenting on Mind the Ethics Gap – <https://ammienoot.com/brain-fluff/mind-the-ethics-gap/> And saying “Those arguing for ethics in educational operation (and I am one) have to respond to a wide array of ethical challenges, such as accessibility and inclusion, and not merely more narrow concerns about commodification, market forces and privacy (which, if I may say perhaps a bit boldly, are very much first-world problems).”

Resources

VIDEO and PRESENTATION: Ethical Codes and Learning Analytics – Stephen Downes

Description: Presentation at EDEN 2020 Conference

Link: <https://www.downes.ca/presentation/523>

[ENG]

WEB ARTICLE: The UK Examination Debacle August 2020 – Graham Attwell

Link: <https://www.pontydysgu.org/2020/08/ai-and-algorithms-the-uk-examination-debacle/>

[ENG]

WEB ARTICLE: New York Times When Algorithms Give Real Students Imaginary Grades – Meredith Broussard

Description: Ms. Broussard is an artificial intelligence researcher at New York University.

Link: <https://www.nytimes.com/2020/09/08/opinion/international-baccalaureate-algorithm-grades.html>

[ENG]

WEB ARTICLES: 12 unexpected ways algorithms control your life

Description: Mashable's series [Algorithms](#) explores the mysterious lines of code that increasingly control our lives — and our futures.

Link: <https://mashable.com/article/how-algorithms-control-your-life/?europe=true>

[ENG]

WEB ARTICLE: When Algorithms Give Real Students Imaginary Grades

Description: In-person final exams were canceled for thousands of students this spring, so computers stepped in — to disastrous effect. New York Times article

Links: <https://www.nytimes.com/2020/09/08/opinion/international-baccalaureate-algorithm-grades.html>

[ENG]

VIDEO: Algorithmic Bias Explained

Description: algorithms risk magnifying human bias and error on an unprecedented scale. Rachel Statham explains how they work and why we have to ensure they don't perpetuate historic forms of discrimination

Links:

https://www.youtube.com/watch?time_continue=7&v=tia5OHE98F4&feature=emb_logo

[ENG]

WEB ARTICLE: AI is Changing the world – who will change AI

Description: Artificial Intelligence (AI) technology is changing our world, but the workforces behind the cutting-edge systems produced are inconceivably male-dominated. This is not simply an issue because of the lost talent of capable women; it is also a much wider problem of future technology being shaped by a small section of society with a singular worldview. If AI systems only reflect white, male programmers, will AI systems actually be useful for our diverse world?

Link: <https://www.nesta.org.uk/blog/ai-changing-world-who-will-change-ai/>

[ENG]

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BOOK: Artificial Unintelligence

Description: How Computers Misunderstand the World, By Meredith Broussard

Link: <https://mitpress.mit.edu/books/artificial-unintelligence>

[ENG]

VIDEO: Why is ethics crucial in the development of AI?

Description: How can an autonomous car take moral decisions? Do we want to bring a robot in a court of law to help make decisions, if we don't know how it reaches its conclusions? Dafna Feinholz, Chief of the Bioethics and Ethics of Science Section of UNESCO, talks about the importance of ethics when it comes to AI, and introduces UNESCO's work toward the first legal and global instrument on the ethics of AI.

Links: <https://www.youtube.com/watch?v=HzYG56HLxbl>

[ENG] [FR] [SP]

Future trends and scenarios due to the coming of AI

Step B/07

Despite alarming forecasts of the occupations and jobs that could disappear as a result of the introduction of AI and automation, and counter claims that the new technologies will lead to the creation of jobs, the reality may be more nuanced. It is likely that AI will have a greater impact in changing the tasks within individual occupations and jobs, with some tasks becoming automated while new tasks emerge. This is already being seen in occupations within the legal and retail sectors and in engineering. Digital technologies are also leading to the emergence of new companies acting as intermediaries between producers and consumers of goods and services (Stanev, 2020), leading to what is popularly known as the ‘gig economy’. Stanev says: “Globalisation of the economy has drastically increased competition and caused the number of atypical labour forms to grow. The expansion of these new forms of employment entails the creation of new kinds of contracts, and in many cases the circumvention of employment law, as workers are turned into ‘entrepreneurs’.”

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Resource

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 4.2 – The role of AI in the Industry 4.0 and it’s socio-economic implications

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TacpleAI_FullReport_IO1.pdf

[ENG]

WEB ARTICLE: The Future of AI: Toward Truly Intelligent Artificial Intelligence

Description: reflections about artificial intelligence (AI)

Link: <https://www.bbvaopenmind.com/en/articles/the-future-of-ai-toward-truly-intelligent-artificial-intelligences/>

[ENG]

WEB ARTICLE: Beyond the AI hype cycle: Trust and the future of AI

Description: Issues about AI

Link: <https://www.technologyreview.com/2020/07/06/1004823/beyond-the-ai-hype-cycle-trust-and-the-future-of-ai/>

[ENG]

WEBSITE: Airtrends

Description: List of articles and research about the Future of AI

Link: <https://www.aitrends.com/research-the-future-of-ai/>

[ENG]

Possible evolution of work due to the coming of AI

Step B/08

Possible scenarios for the future development of work in the context of digitalization:

- spread of intellectual skills and theoretical understanding of the developing and new work processes together;
- growth of the complexity of work;
- increasing automation of work;
- Work polarization by erosion of the middle level occupations;
- work flexibilization and delimitation.

These and other scenarios are outlined in the [TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training](#)

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Resources

TEXT: TACCLE-AI – Artificial Intelligence in the Policies, Processes and Practices of Vocational Education and Training

Chapter 4.3 – Trends and scenarios of the future development of work

Description: Insight into the topic

Link: http://taccleai.eu/wp-content/uploads/2020/07/TaccleAI_FullReport_IO1.pdf

[ENG]

WEB ARTICLE: An executive primer on Artificial General Intelligence

Description: While human-like artificial general intelligence may not be imminent, substantial advances may be possible in the coming years. Executives can prepare by recognizing the early signs of progress.

Link: <https://www.mckinsey.com/business-functions/operations/our-insights/an-executive-primer-on-artificial-general-intelligence>

[ENG]

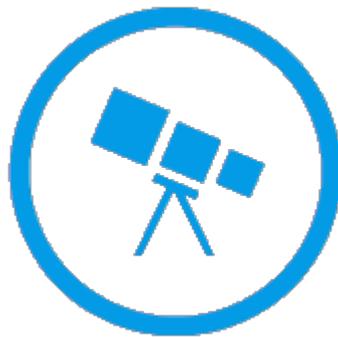
REPORT: AI 2020 UPDATE: The global state of intelligent enterprise

Description: A cross-industry study of the opportunities, trends and challenges that will reshape enterprise over the next two years

Link: https://drive.google.com/file/d/1tOuRLxY-KaCZiKYyoYTQ_nGAe2Y5IVi6/view

[ENG]

Step C - Instruments for VET teachers



Introduction

Step C/01

AI and automation is a particularly important topic for vocational education and training as it promises profound changes in employment and work tasks ([link to the report for more information](#)). In addition to changed professional competencies (knowledge of new technologies, AI etc.), social competence, personal and methodological skills are increasingly necessary: creative thinking, independent work, teamwork, self-directed learning, socio ethical issues like personal data protection etc. This raises the question of how vocational training courses, projects and modules can respond to this requirement? On the one hand, topics such as AI and digital technologies for smart production can be dealt with in vocational school. In order to also promote social, methodological and personal skills, tasks in vocational school should be as action-oriented as possible. So-called Learning and Working Tasks (LWT) can be one way of making teaching more action-oriented, combining theory and practice and thus promoting the development of learners' skills. LWT are characterized by project-based, process- and task-oriented learning, which make use of problematic situations of professional reality. In the following we provide:

- examples of (AI)projects/ working and learning tasks in VET schools
- a guideline for the creation of learning and working tasks.
- a tool for the self-evaluation of a completed learning and work task.
- practical tips from teachers for teachers on how to implement AI projects/ Learning and working tasks in vocational schools.
- practical tips from teachers for teachers on which competencies are necessary for the implementation of AI projects in vocational schools.

AI oriented projects in Vocational Education and Training

Step C/02

Useful cases

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Bolton College Chatbot: a personal digital assistant for every student

As part of the AI and vocational education and training project funded through the EU Erasmus plus project we are producing a series of case studies of the use of AI in VET in five European countries. Here is ... [Continue reading](#)

Deep Reinforcement Learning-Project in a german VET School

The topic of the project was Deep Reinforcement Learning – preparation of the topic “artificial intelligence” and implementation of an agent in the game “Sonic the Hedgehog”. Sonic is a computer game series of the Japanese publisher Sega. The classic ... [Continue reading](#)

Work and learning tasks/projects design and implementation

Step C/03

Development of a learning and work task/ Project

Step 1 – Analysis of the prerequisites and general conditions *Personnel requirements*

- I thought about the size of the learning group in advance. Or to which size of learning group the project must be tailored.
- I have thought about the composition of the learning group in advance. Or how it should be composed.
- I have thought about which competences and previous experience are necessary or already exist in the group.
- I thought about which teachers, trainers or other actors should be involved.

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Organizational and institutional requirements

- I defined the time frame of the project.
- I have thought about the equipment and resources that are generally necessary for the project (classrooms, laboratories, etc.).

Step 2 – Description of a scenario

- I have specified which product is to be produced or which service is to be provided in the context of the project.
- I have specified who the (fictitious) client is.
- I have specified what expectations are placed on the result of the work.
- I have specified which general conditions resulting from the learning and working environment must be taken into account.

Step 3 – Definition of action steps, goals and contents

- All decisions must (1) be made with the scenario in mind, (2) be based on the curricular requirements and (3) take into account the findings of the condition analysis.
- The chosen project is a real work process initiated by an order.
- For each phase of the work process, action steps were defined which the learners have to complete.

- It was determined which technical, social and personal competencies are to be acquired.
- It was determined which contents the learners will be confronted with during the processing of the task.
- It was determined how the intended goals should be met.

Step 4 – Determination of the subtasks

- I derived subtasks from the overall project.
- The subtasks each have action steps, goals and specific contents.
- I have considered which teaching methods can be used to implement the subtasks.
- I considered which media preparation is needed to support the subtasks.
- I determined how the intended goals should be achieved.

Step 5 – Design of a time and work plan I have created a complete overview of the project (including subtasks, involved resources etc.)

AI-based projects evaluation criteria

Step C/04

(Self-) evaluation of learning and work tasks

Context

Automation and artificial intelligence are already changing the world of work today and will continue to do so in the future. Tasks within professions are changing because certain activities can be performed by machines. The mainly technically induced changes in the world of work and professions make it necessary to prepare young people for this new world of work now. This requires not only changed professional skills (via new technologies such as AI) but also increasingly social competence, personnel and methodological skills: creative thinking, working on one's own responsibility, teamwork, self-directed learning, etc.

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How can vocational action competence be promoted in vocational school and in-company training in the age of AI?

So-called learning and work tasks (LWT) can be a way of making teaching action-oriented, combining theory and practice and thus promoting the competence development of learners. LWT are characterised by project-based, process- and task-oriented learning, which make use of problematic situations of the professional reality. In this way learning and working are to be linked.

The ideal typical realisation of LWT includes the following four steps:

1. Development of LWT
2. Implementation of LWT
3. Evaluation of LWT
4. Self-evaluation LWT

In this part of the toolkit we will go into more detail about the last step (d): self-evaluation.

Brief summary

What are the benefits of the self-evaluation tool? With the help of the self-evaluation tool, teachers and trainers can test whether tasks are suitable in the form in which they were carried out, whether there is room for improvement and whether the task was effective for the learning process. This tool is intended to provide guidance and can be adapted to different contexts.

How to use the self-evaluation tool? The teacher himself/herself can answer the questions. However, trainers and pupils can also be involved. In this case, it must be ensured that there is trust among those involved so that assessments can be freely expressed.

Resources

TEXT: Practice Guide – (Self-) Evaluation of Project-oriented learning and work tasks

- [Download](#)

AI school-projects implementation

Step C/05

By teachers for teachers – Tips during the implementation of AI projects*

A list of advice and preparation steps for those teachers and trainers who can imagine to install and implement AI projects in their vocational training institutions:

Find out the possibilities and limits of the (computer) equipment at the school.

- Are there free and usable capacities in computer rooms?
- Is the required software available?
- Can the required software be procured and installed? (access rights, hardware requirements, license fees)

Find out the knowledge of the school teachers in relation to the chosen project topic.

- Are there colleagues who can support the project professionally?
- Are there colleagues who can support the project with technical problems?
- Are there appropriate training opportunities for colleagues?

Teachers should be able to realistically estimate their own workload.

- How much time will project supervision and support take up?
- Are there common free time slots for students and teachers?
- Are there binding time windows for students and teachers?

The possibilities of relieving the teachers should be examined.

- Are there possibilities of relief (hours, supervision during breaks) for participating colleagues?

The school management should be informed and involved if necessary.

- Inform school management by means of an application/copy of the project application.
- Is the school management interested in implementing the project?
- Are there any support possibilities from the school management? (spatial resources, personnel resources, financial support)
- Have supervisory and liability issues been clarified?

The financial possibilities of the school should be clarified.

- Is there a budget for projects in the school?
- Is there a support association/ circle of friends that provides financial support for projects?
- Are there opportunities for cooperation with the city/the economy or individual businesses?

The corresponding capacities in the specialist rooms must be clarified and ensured.

- Are there available capacities in computer rooms?
- Are there available workstations in the school?
- Are there free capacities in laboratories/specialist rooms/workshops?
- Have the colleagues responsible for rooms/laboratories been contacted?
- Is the approval of the school management necessary/clarified?

The question of time must be clarified by setting clear time targets and agreeing on them.

- Are the start and end of the project (duration) bindingly defined?
- Are working hours and location bindingly fixed?

The students and colleagues of the school are to be informed and involved if necessary.

- Are colleagues who could be addressed by the project teams (students) informed about the scope and purpose of the project?
- If necessary, ask colleagues for assistance.
- Are supervision and liability towards colleagues clarified?

The goals of the project topic must be discussed and agreed upon together with the students.

- Are goals clarified jointly by pupils/project supervisors?
- Is there a binding (written) definition of goals?

Binding milestones should be defined or worked out and scheduled together with the students.

- Is there a binding schedule for reviewing/discussing milestones?
- Are the deadlines met?

Regular monitoring of the project work by the teachers should be ensured.

- Are there binding common times for the project supervisors/project teams?

Resources

DOCUMENT: Virtual conference on AI and education and training

Description: UNESCO / UNEVOC Virtual conference reports

Links:https://unevoc.unesco.org/up/virtualconference_27_background.pdf

https://unevoc.unesco.org/pub/vc_synthesis_27.pdf

[ENG]

NOTES:

*Practical tips from teachers for teachers on how to implement AI projects in vocational schools (collected from the interviews and case studies)

Teachers and trainers competences profile

Step C/06

By teachers for teachers – Which competencies are helpful?*

Self-competence:

- Self-management: Know your own goals and values, set appropriate priorities, delegate work, know your own limits and set yourself apart accordingly.
- Self-discipline: Being able to familiarize yourself with more complicated AI topics.

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Methodological competence:

- Project management: Controlling, planning, implementing and evaluating projects.
- Leadership skills: Guiding and supporting trainees, as well as agreeing on objectives (which should be adapted flexibly).

Social competence:

- Enthusiasm: Being able to inspire the school management and especially the trainees about a project and motivate them to participate.
- Empathy: To be able to empathize with the problems and difficulties of the students* in order to provide support. Patience is particularly important, because this is also a new subject area for the students.
- Ability to work in a team: To work together with students and to cooperate with other people, especially trainers.

Professional competence:

- Have basic knowledge of AI and industrial practice.

NOTE:

*Practical tips from teachers for teachers on how to implement AI projects in vocational schools (collected from the interviews and case studies)

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