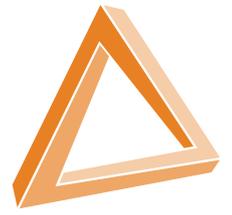


AI Readiness Diagnostic Findings



Step 1: Ready Recommendations

educate
enthus
excite

Step 1 Overview

To find out how **you** can benefit from examining your institution through a 'data and AI lens', contact our AI & Data Science team at hello@educateventures.com

- The **first step** of the 7-step AI Readiness Framework is about **educating, enthusing, and exciting your team and colleagues** so that you can view yourselves and your organisation through a 'data and AI lens'
- You will develop an 'AI mindset' that allows you to view the challenges in your educational setting as those which may be solvable using AI. That allows you to see your **rich, complex data** as not just siloed, unconnected, impenetrable repositories of spotty information, but connective tissue that unites the commonalities at school, such as issues around

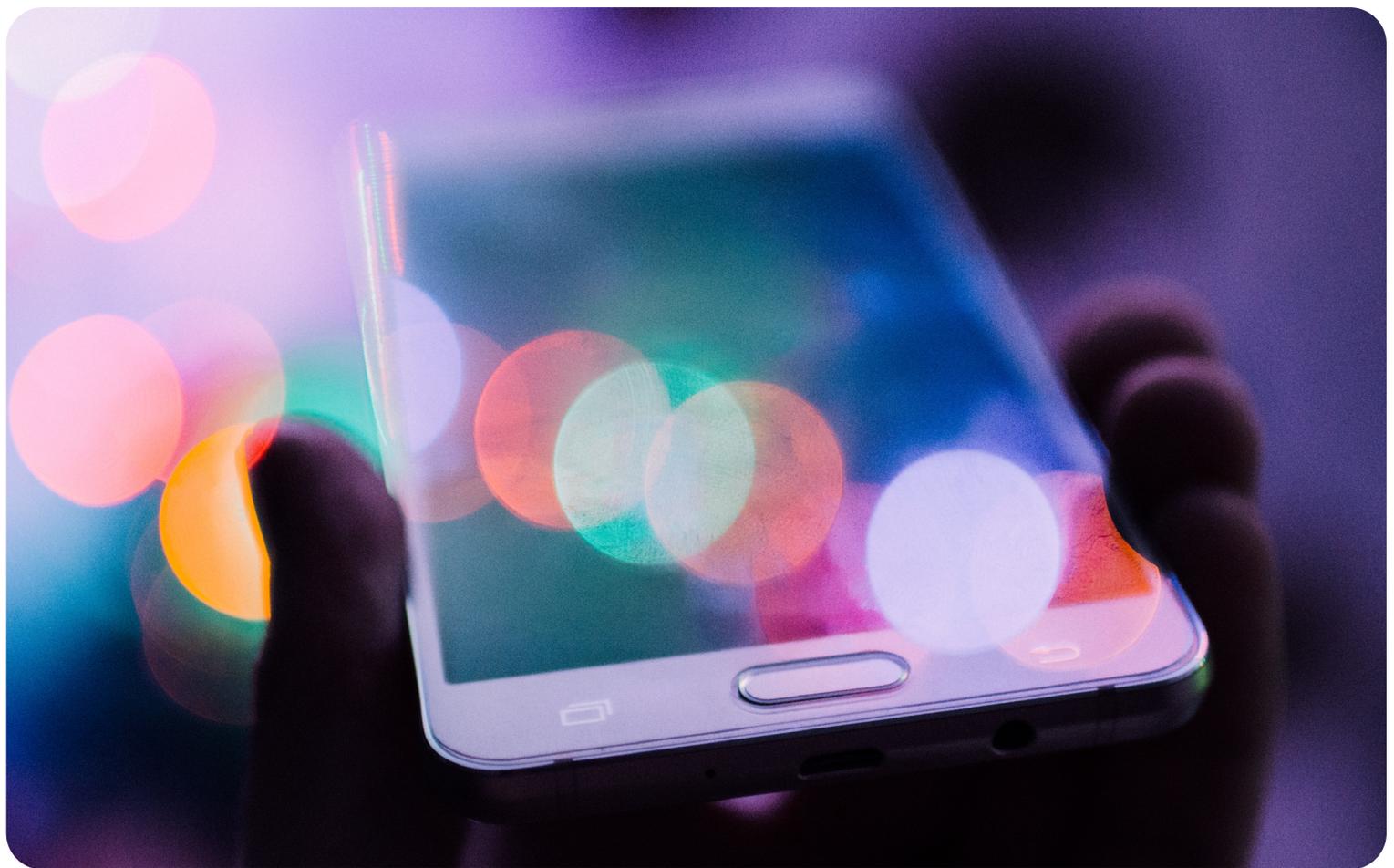
attendance, attainment gaps, budgets, behavioural interventions, essay grading, homework, recruitment and more

- An AI mindset allows you to be open to the possibility that actually, if your data was studied, it might reveal something unexpected that challenged your preconceptions about what otherwise seemed like an **obvious dilemma** at school that you just hadn't got around to **investigating**
- **Key Takeaway:**
 - Talk to your colleagues about **data**. AI is often a nebulous term with broad connotations that either **scares** or is **too vague** to be of meaning to people, but **collecting and connecting** all that disparate **data** in your school could help you and your colleagues immeasurably in the long run

Recommendation: Ask questions

SUMMARY: a good place to start is to think about the AI you use in your work and play already

- You might use **speech to text**, for example to record a message on WhatsApp. That uses AI in terms of **natural language processing**. Or perhaps you have a **smart home device** that helps you to monitor and manage your **heating and lighting**. Maybe you use a **voice-activated personal assistant**, such as Siri, Alexa, or Google Home
- Is **shopping** a favourite activity? You've probably used lots of online apps to do that. Maybe **fitness tracking**, or **navigation apps**. Maybe you use AI through a **multimedia server** to watch television, or you use a search engine
- When it comes to **education and training**, we can also think of AI being used, perhaps for **grading assignments**, or for helping us to identify students to know whether they have been **attending** a particular course on campus, or visiting a particular department. Maybe we're using **plagiarism-checking software**
- If you are thinking about introducing AI, one of the really important **questions** you need to ask is:
 - **How do you know that it's the right AI for you and for your organisation?**
 - And you also need to ask yourself:
 - **How do you know whether what you're spending is giving you value for money?**
 - You need to be **careful** as there's no such thing as a **free lunch**. If you're being offered an AI application for free, you need to be aware that your **data** can often be the price that you're paying; this is not always the case, but it does happen often. For organisations, such as schools, colleges, universities, and training organisations, **the use of student data as a means of paying for something** is extremely problematic, because the organisation is **responsible** for that data, and must ensure the **privacy** of students' data is maintained
 - What do you really need the AI that you're going to buy to do for you? You need to ask:
 - **What challenges do you want the AI to help you to address?**
 - **What kind of AI could help you tackle those challenges? How do you know that the use of AI for such a challenge is likely to work?**



Recommendation: Learn about the history of AI

SUMMARY: *try to immerse yourself in some of the rich history of AI's development. It will help contextualise some of its modern features*

- In 1964, a system called **ELIZA**, a computer programme that played the role of a psychotherapist, was devised
- A potential patient was asked to type in their symptoms and ELIZA searched for **keywords**, and returned stock phrases to progress the conversation
- This approach was called **production rule-based pattern matching**, and although ELIZA's operation sounds primitive, several systems evolved from this approach became sophisticated enough to accomplish **advanced activities**, such as diagnosis and treatment recommendations from a set of symptoms
- The pinnacle of this pattern-matching approach was IBM's **Deep Blue**, a computer system that beat Grandmaster Gary Kasparov in several games of **chess** in 1997. It did this by analysing its gigantic **library** of possible moves that it could make, all of which had been **preprogrammed** by its development team
- This need to have an **exhaustive** amount of information preprogrammed is precisely the problem with what is known as **Good Old-Fashioned AI (GOFAI)**
- In chess, there are **thousands** of ways a game could look just **two moves** ahead. If you need to predict what the board looks like **twenty moves** ahead, the number of possible configurations stretches into the **quadrillions**
- There is a severe **limit** to the intelligence this style of AI can achieve. Once the knowledge is written into the computer program code, the system cannot be updated without going back and **changing the code**. No matter how many disease cases they diagnosed, or gas pipe fractures they identified, or games of chess they played, **GOFAI systems couldn't improve**
- One of the big **advantages** of these types of systems, however, is that because they're **symbolic**, they have **rules** written in language that **you and I** can understand. What happens inside them is **transparent**. It's much easier to explain the decision made by a production rule-based Good Old Fashioned AI system, such as one that's diagnosing an illness, than it is to explain the decision made by one of the modern **machine learning systems** that you might come across, because the **steps** that have been taken to fire that rule can be explained to a **human**
- There are many disadvantages to old fashioned AI techniques, but they do still have one **significant** advantage over modern systems



Recommendation: Identify the differences between AI and HI

SUMMARY: examine the differences between artificial intelligence and human intelligence, and ask why those differences matter

- What do we mean by **human intelligence** and what kinds of things does human intelligence **enable** us to do? It's much more than just being able to learn **knowledge and skills**
 - It includes **academic intelligence**: the sorts of things that we learn at school, and as our knowledge resources and problems of the world increase and become more **complex**, that academic intelligence needs to be **interdisciplinary**, because very few of the problems we face can be solved through a deep knowledge and understanding of one discipline **alone**
 - We need to at least understand how that discipline about which we have a **deep knowledge** relates to **other disciplines**, so that we're able to work with other experts from those other disciplines
 - We then need to think about **meta-knowing intelligence**, and this isn't metacognition, it's **epistemology and personal epistemic cognition**: the ability to understand what knowledge **is**, and **where** knowledge comes from. The ability to understand what **evidence** is and what **kind of evidence** we should demand in order for us to believe something to be true, or not, as the case may be
 - This is increasingly important in a world where we have a lot of fake information around us. **Social interventions** are fundamental to being able to work together with other people to solve many of the complex problems that we face today
 - With regard to medicine, think about how much has been gained because of the **combination of understanding** of human bodies, human processes, physiology, anatomy, medical understanding, and then physics and nuclear medicine. That's been a huge advantage for cancer **diagnosis** and **treatment**. But it requires those people who have that medical expertise to be able to **work** with people who have an understanding of physics. So we must develop those **social intelligence** skills
- There are a series of other **meta-intelligences**. In addition to meta-knowing, we have **meta-cognitive intelligence**, which is about **understanding** our thinking processes, and being able to **regulate** those processes. So that, for example, if I'm learning something and my focus is **distracted** by something else, I'm **aware** that the distraction is happening, and I'm able to **refocus**
 - There is **meta-subjective intelligence**, and this is not just about developing emotional intelligence, it's about understanding the **development** or **lack of development** of emotional intelligence, and the **extent** to which the people with whom we're **interacting** are emotionally intelligent, or developing that emotional intelligence
 - There is **meta-contextual intelligence**, which is the intelligence that we **underestimate** the most. As a human. I know that I interact with multiple **environments**, different **people**, different **tools**, and **information**, even if I've never **seen** any of these places, people or tools before. I can get on an airplane, fly to a country that I've never been to before and although I might find the language and signage confusing, I'm sure that I'll be able to get about and meet people and eat. This ability to move seamlessly between different **locations**, and interact with different **people** and **tasks**, is incredibly complex and **far beyond anything that AI can do**
 - If we really are developing a whole complex human intelligence – all of these different sorts of intelligent activity – then we've become very good at being accurately **self-effective**. We can have excellent **perception** of our own self-efficacy, which means that we can set appropriate goals for **activities** we know, whether we do or don't know the right information to be able to achieve that goal. We know what evidence we've used to make a **decision** about whether we **know enough** or not. If we **don't know enough**, we know **how to find out**. We know how to **learn**, we know who can **help**. We know what we need to **take into account**, where we might need to go, how well we'll be able to **cope** in that place, even if we've never been before

Interdisciplinary Academic Intelligence

Meta-Knowing Intelligence

Social Intelligence

Meta-Cognitive Intelligence

Meta-Subjective Intelligence

Meta-Contextual Intelligence

Perceived Self-Efficacy

- None of the above suggests human intelligences are **separate**. They are different sides of a **complex whole**, all of which are **essential**, and five of which are about meta-intelligence: the ability to **reflect** on our own thinking
- This ability to reflect, however, is something that is **way beyond current AI systems** and it can be argued, way beyond any AI system
- AI systems can be **relatively** good at the **interdisciplinary academic intelligence**. They can have some success with meta-knowing intelligence, because they can look for good evidence to back up something as true or false, and to some extent, AI can at least help us with **social intelligence**, it can **interact** with us as humans and can help us to interact as humans but really, the remaining aspects of our human intelligence are **way beyond AI**
- It's this ability to **reflect** on our own intelligence that sets us aside as humans. The complexity of human intelligence is way more sophisticated than what AI can do at the moment, even if we have AI systems that can be very successful in a particular **narrow area**

Recommendation: Beware the risks

SUMMARY: consider some of the possible risks around the use and development of AI in a school or education and training business

- Imagine a situation in which you're working in a **school** or a **college**. You might have access to a **voice-activated personal assistant**, such as Alexa, and you're helping students learn a language. You think it is appropriate to use Alexa because it could help the students identify if they have pronounced the **words** in their target language **correctly**. If Alexa does not understand the **instruction**, it might tell the students they are not **speaking clearly** in that target language. This sounds like a good use of something like a virtual personal assistant for education
- However, whilst you hope that what you're capturing is the conversation that the student is **attempting** to have with Alexa, when capturing that student audio, you might also be capturing a lot of **outside noise**; perhaps the place where the students are having the conversation is near a busy road, perhaps somebody else is in the room, or perhaps somebody's eating. This is a big problem
- For a start, those noises will **interrupt** and **diminish** the **extent** to which Alexa would be able to understand what the students are saying. That might give students **false feedback** about the **accuracy** of their pronunciation. The students might be using the target language to **structure their commands** perfectly well, but the noise in the environment might prevent Alexa from functioning as it should
- Additionally, the fact that Alexa would tap into all of these extraneous noises means that you can't be sure that you're not capturing audio that reveals **identifiable information** from other students in the environment
- Understanding the risks that come with the **use** and **development** of AI can allow you to **mitigate** them in educational or educational business environments. Such a voice-activated interface could be a useful tool for teachers and learners, but **precautions** would need to be taken in order to maintain **privacy** and perform **appropriate data collection** so that such things as identifiable information is not revealed, and recommendations to use the device in the appropriate setting are emphasised, lest incorrect operation skew **results**



Recommendation: The different types of AI

SUMMARY: not all AI systems are the same, and it's important to **understand** their key differences

- Good Old-Fashioned Artificial Intelligence (GOFAI) does not **learn**, and is very poor at dealing with **uncertainty**, so what are the alternatives? **Data** and **machine learning**
 - Rather than working out in **advance** what an AI system is **going** to be doing, and what it's **able** to do so that you can write production rules, machine learning systems process data about the **world**. If they are **diagnostic systems** designed to diagnose breast cancer, then their world is the world of breast cancer tumours, **trained** on examples and images of thousands and thousands of tumours and of breast tissue without tumours so that it can learn the **differences**
 - If we go back to our GOFAI system, its code must be changed at the source for its operation to change. It can explain its decisions, it is **transparent**, but it is
- limited in its use. Machine learning on the other hand can reveal unexpected **patterns** in data, even discovering something that its programmers would not think to look for. But this requires **data**
 - The nature of this learning behaviour is the difference between **narrow** AI, which is what most of our AI systems are now, where they handle one task such as chess, diagnosing an illness, driving a car, recognising images, and so on, and what we call **Artificial General Intelligence (AGI)**, which would be a machine that can handle **any** intellectual task, as is the case with human intelligence
 - If we look at the example of a baby, we can reasonably assume that they will grow into an intelligent adult, and even at birth, they already have matters of intelligence. Perhaps this baby will grow up to be as smart as a great scientist like Alan Turing. Can you imagine a general intelligence system like Alan Turing? It is hard to see. We are nowhere near Artificial General Intelligence at the moment



Recommendation: The need for data

SUMMARY: AI feeds on **data**, and it is a hungry beast. What kind of data do you have in your organisation?

- What kind of **data** does your organisation have and what kind of data do you have in your **role** there? How do you **use** data, how does your **organisation** use data, and how do your **colleagues** use it? Do you **collect** data? Do you **access** or **use** any of this data?
- Perhaps you have data about particular **pupils** in a school, perhaps captured from **images** of people. Perhaps it's data about the way that people **travel** into your workplace, perhaps it's data about **the workplace itself**, such as the light, the heat, the energy that's consumed. Perhaps its data about the sorts of **interactions** that happen in that workplace, for example, coaching, evaluations, meetings, or knowledge exchange
- What **kind** of data might be useful to help us understand more about what's happening in a learning environment, such as a school, college or university? Could it be data about:
 - **Particular teachers**
 - **Particular pupils**

- **The classes that are taught**
- **The number of people who are in those classes**
- **The particular subjects that are taught**
- Or could it be data about individuals, and how they're **performing**? Perhaps it might be data about people's **emotional states**: are they feeling anxious or feeling on top of the world, are they feeling emotionally upset, are they feeling unhappy, frightened
 - **How are people feeling?**
 - **How does that affect their interactions?**
 - **How does that affect their learning?**
- Perhaps you have **output data**: test scores, rights and wrongs
- This data may not be collected **nice and neatly** somewhere, or may not be easily **accessible**, but it probably does exist, and processing data is how machine learning systems learn. AI can help us to understand a lot from the data that we have and can find. And if we learn a lot from the data we will make much better use of the AI systems that we choose to use



Autonomy

SUMMARY: the capacity for an artificial agent to operate independent of human guidance

- Autonomy is one of the two **key features** in AI systems, and it's one that enables systems like **self-driving cars** to exist. It's about having an AI system that can complete actions without **constant guidance** from its user, or from its programmer
- When we're thinking about the sort of AI we want to bring into our organisation, we can think about it performing tasks in **complex**

Adaptivity

SUMMARY: the ability to improve performance by learning from experience, and to adapt to the needs of individuals

- **environments** without constantly needing **advice** or **guidance** from us, and we can think about its systems **adapting** to different individuals and their different **needs**
- Before we start to decide about the benefits we want, however, we need to use our AI methods and other data analysis methods to help us understand the **data** that we already have

Recommendation: Ethics

SUMMARY: *regulation is extremely important, but the development and evolution of technology will always outstrip it, so we must prioritise ethical AI*

- Society needs some in the population to understand more about AI, so that we can continue to explore how we **protect** people when engaging with technology and data
- What are the **ethics** of modern AI? How do we do **responsible AI**? AI will continue to evolve and develop, and the ethics work around that evolution will never be completed. It is something that has to grow **in tandem**
- Whilst **regulation** is extremely important, and the sector will continue pushing for safer regulatory frameworks, as AI evolves, regulation alone will **never** be enough because AI innovation will always outstrip it. Education therefore becomes crucial
- The term '4th Industrial Revolution' is in use in education and technology, and it's the time and place we're experiencing currently, with the **workplace** changing due to automation, and AI beginning to alter the nature of the **jobs** that people perform. There have been lots of **reports** that have suggested this number of jobs are likely to disappear, or that particular area will flourish with AI, or those particular skills will be

needed, and as useful as those reports are, **they are asking the wrong question:**

- We are in a similar state to that of driving along a **road**. We've never driven this long before and a thick fog has descended so that we cannot **see** where we are going
- Having a **map**, which is the equivalent of many of these reports, is not very useful, because **we don't actually know that we can't see where we're going**. Landmarks aren't very useful in this scenario
- Of far more value is the knowledge that we have a **reliable car**: our **steering** works, the **lights** work, as drivers we're not **intoxicated**, we're not under the **influence of drugs**. We are of **sound mind**, have good **eyesight**, we can **hear**
- These are the things that are important in this situation, and actually, in that scenario, they are the equivalent for us in terms of **human intelligence**. AI must complement our rich human intelligence so that **resilience** is built into that uncertain road



Who can help me?

We are specialists in **ethical AI solutions** for schools and education and training businesses - **contact our team for help**

The EDUCATE AI and Data Science team was formed to consult on and co-design ethical AI solutions to complex problems in data-driven technology ventures and schools. Our team of computer scientists, educationalists, and world-renowned experts can take you from zero AI to a comprehensive evidence-led strategy and beyond, with effective, scalable AI-powered teaching and learning solutions.

To find out how you can benefit from examining your institution through a '**data and AI lens**', and leveraging the transformational power of AI to tackle your challenges, contact the **AI and Data Science Team** at EDUCATE Ventures Research at hello@educateventures.com.

Thanks for reading!

- The EDUCATE Ventures Research Team
Summer 2022

Further Reading

Below you can find a selection of resources, books, podcasts, webinars, and research papers appropriate to your stage of AI Readiness. Good luck!

• [AI for School Teachers, Byte-Sized Edition](#)

- An easy-to-read 10-page byte-sized summary of the book of the same name, written by Professors Rose Luckin, Mutlu Cukurova, and Headteacher Karine George, members of the senior team actively developing and using the AI Readiness Framework from which these recommendations derive

• [Is AI Set to Change the Way You Teach?](#)

- A 40 minute podcast from Tes Podagogy where Professor Rose Luckin and Headteacher Karine George discuss AI Readiness in schools and educational institutions

• [Working Well with AI](#)

- A wide-ranging set of podcasts featuring guests from across the worlds of work and education speaking to Professor Rose Luckin about how AI and technology has affected their practice and profession

• AI Readiness: Step 1 Webinar for [Educators/Businesses](#)

- Two separate webinars introducing Step 1 of the AI Readiness Framework, one targeted toward educationalists, and the other target to educational businesses

• [Is AI Intelligent?](#)

- An easy-to-read 2-page summary from the EVR Byte-Sized Library on definitions of AI and intelligence from Dr Carmel Kent

• [AI for School Teachers](#)

- The complete book on the AI Readiness Framework, specifically for teachers and headteachers in schools. It will help teachers and heads understand enough about AI to build a strategy for how it can be used in their school. Though it is pitched to teachers and contains familiar examples, the approach should still be used by education and training businesses working with technology

• [Empowering Educators to be AI Ready](#)

- The research paper proposing the AI Readiness Framework for educators, produced by the AI for School Teachers authors and the AI & Data Science team at EDUCATE Ventures Research. The paper features an example of the framework used in a Higher Education Institution

• [Machine Learning and Human Intelligence](#)

- Professor Rose Luckin's 2018 publication, the book proposes a framework for understanding the complexity of human intelligence. In it, Rose identifies the comparative limitations of AI when analysed with this framework and offers recommendations for how educators can draw on what AI does best to nurture and expand human capabilities

