The coming "intelligent university"? Exploring the potential impact of artificial intelligence (AI) and robots on UK Higher Education

Research report

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Contents

Disclaimer: The views expressed in this report are the authors' and do not necessarily reflect those of the Society for Research into Higher Education

Executive summary

The aim of the study was to explore the emerging impact of artificial intelligence (AI) and robots on UK Higher Education (HE).

The objectives were to:

> 1. Undertake a critical, narrative literature review of the application of AI and robots in HE contexts.
>
> 2. Develop a collection of design fictions which instantiate the issues in an accessible, thought-provoking form.
>
> 3. Evaluate the fictions working with five experts from the University of Sheffield.

The report begins by reflecting on the difficulty of grasping an overview of the potential impacts of AI and robots on HE. The report then discusses some previous taxonomies of applications relevant to HE, mostly in learning and teaching. It then offers an alternative categorisation, which includes administrative and research uses of AI and robots.

Four stances towards AI and robots in HE are identified, namely:

- Building and evaluating tools – the dominant approach in papers, generally written by computer scientists and other developers

- Grand challenges - thinking about how AI and robots can address the grand challenges in education

- Techno-scepticism - questioning the value of technologies' impact on education in human and ethical terms

- Pragmatic challenge - reflecting on the cultural and political barriers to implementing AI and robots in practice

The project uses design fictions to instantiate the issues in an accessible way. Design fictions are stories that capture what it might be like to live in a world where the new technologies are in use. A short description of each of the final eighteen fictions is presented, with the full text accessible in an appendix, and also available for download on a cc-by-nc licence @ DOI: 10.15131/shef.data.13139816.v1. A summary table offers an overview of the work. An accepted paper for *International Journal of Educational Technology in Higher Education* entitled "Exploring the impact of Artificial Intelligence and robots on Higher Education through literature-based design fictions" describes the development of the fictions in the context of the literature review.

A collection of eight fictions were evaluated through a collaboration with five experts from the University of Sheffield. The outcome of this work was to suggest that the key criteria for evaluating fiction-based research should be: substantive contribution, credibility,

resonance, ambiguity, aesthetics, rich rigour and sincerity. The evaluation process and outcomes are being written up as a second paper, which is intended for *Studies in Higher Education*.

Main report

Purpose and objectives of the project

The aim of the study was to explore the emerging impact of artificial intelligence (AI) and robots on UK Higher Education.

This was addressed by answering two research questions: What applications will the current wave of AI and robots bring to UK HE and how will they impact HE priorities, such as student experience and well-being, research quality and campus efficiency? What issues around accountability, validity, security, privacy and equity do these applications raise?

The objectives were to:

1. Undertake a critical, narrative literature review of the application of AI and robots in HE contexts.

2. Develop a collection of design fictions which instantiate the issues in an accessible, thought-provoking form.

3. Evaluate the fictions working with five experts from the University of Sheffield.

The project evolved in two significant ways. Firstly, it was decided that the scope of the project could be appropriately expanded to encompass robots as well as AI, which was the original focus. Secondly, rather than developing four traditional scenarios, as originally planned, it was decided to produce what we are calling here "design fictions". Rather than just a small number of scenarios, reflecting the richness of the topic, the study produced eighteen fictions which explore the multi-faceted potential impact of AI and robots on HE.

Critical, narrative literature review: AI and robots in Higher Education

AI and robots are at once past, present and future; mundane and familiar, disruptive and paradigmatic.

AI and robots are the focal point of hype in glossy brochures for new online systems. They are also the material of science fiction nightmare. They manifest as striking new consumer technologies such as Alexa or the driverless car. They are even claimed to be the foundation of a fourth industrial revolution. Yet robots have been widely used in some industries for years and AI already appears in low level, taken-for-granted functions within many systems and apps such as in virus detection, auto-suggestion, recommendation and GPS wayfinding. Gartner refer to AI as a general purpose

technology: "it will be in everything", they suggest (Lowendahl and Williams, 2018). JISC speak of the impact of AI as "broad and deep." In many respects mature AI and robotic technologies are already in use. But some others are just being developed and introduced, while others remain the stuff of science fiction imagination. So it seems to be equally true that AI has already happened, is happening now, and that it may happen in the mid or distant future.

While much research has been carried out in the field, and indeed many technologies have reached relative maturity, our ideas about learning and research are also changing (Roll and Wylie, 2016). This points to the need to constantly reinvent our imaginary of AI.

Interestingly, one of the less remarked upon impacts of COVID-19, via the shift towards digital learning, will be to strengthen the potential for AI, because the "learning data" needed to train AI will become much more comprehensive. Social distancing practices prompt a similar shift towards robotics.

One direction for a literature review of AI and robots in education would be to focus on a single class of technologies to review its development and evaluation in use, in the form of a systematic review. Quite a number of these types of review exist. These have been an invaluable reference point for understanding how specific classes of technology are being developed.

My approach, however, was to attempt to capture the emerging response to AI and robots in Higher Education as a paradigm. So, in addition to the literature on specific AIEds, I looked particularly for literature that reflects more broadly on the potential and challenges of AI and robots. As such my study does not claim to be a systematic or comprehensive review of all the literature; it is more akin to a narrative review (Pare et al., 2015). I very much erred on the side of inclusion of relevant phenomena, but with an emphasis on uncovering different trends and perspectives. For example, although often treated rather separately the smart or intelligent campus literature seems to embody an important strand of work around AI, so is included here. Also, because Selwyn (2019a) in his review places emphasis on the potential role of robots alongside AI, I too include robots because they are evidently part of the debate. In addition, because AI requires as its foundation "big data", much of the literature of Learning Analytics is highly relevant, so has been drawn upon. Thus my approach is inclusive rather than comprehensive or systematic.

The purposes of the review within the project were to:

1. Identify the main applications of AI and robots in Higher Education. This enabled me to pick suitable classes of system to be potentially worked up as fictions.
2. Identify the range of responses towards such applications and the concept of AI and robots in general, from utopian enthusiasm through practical scepticism to dark dystopianism.

Applications of AI and robots in HE

There have been a number of attempts to classify the range of application of AI and robots, mostly confined to AI applications to learning.

Baker et al. (2019) differentiate three types of AIEd, based on whether they are learner-facing (mostly Intelligent Tutoring Systems (ITS) that adapt or personalise learning materials to the individual learner), teacher-facing (including tools that automate tasks such as plagiarism detection or monitoring of student performance) and system-facing (dealing with administrative data for an institution or an educational system as a whole). Thus, the authors are really differentiating the systems on the basis of who the primary users are: learners, teachers or administrators.

Humble and Mozelius (2019) differentiate AI that teachers would support (ITS and virtual agents), AI that supports the teacher (by performing distinct tasks) and teacher-compatible AI (such as digital assistants that support study after class). Implicit is a focus on whether the teacher is ultimately being replaced, informed or assisted.

Selwyn (2019a) differentiates systems in terms of visibility. He includes robots and discusses them first, as the most directly tangible manifestation of automation in learning. He then moves on to ITS and pedagogical assistants – adaptive, personalised learning tools. Then he discusses AI that works behind the scenes, such as personalised learning systems that guide students through a range of learning tasks, not a single one, applications of learning analytics, chatbots and automatic grading systems.

Zawacki-Richter et al. (2019) propose a typology developed inductively from a systematic literature review, consisting of four groups partly differentiated by their place in the student lifecycle. The four groups are profiling and prediction (including systems used in student recruitment and student retention, but also learning analytic tools for teachers), Intelligent Tutoring Systems (mostly for teaching course content, but in a few cases could be more staff than student focussed), assessment and evaluation (e.g. tools for automated grading, offering feedback or even staff evaluation) and adaptive systems and personalisation (adapting systems to individual users or guiding them through curriculum choices).

The most complex typology is offered by Holmes et al. (2019) who present different classes of technology but suggest also that they can be differentiated by the type of learners they are developed for, the subject taught and pedagogy. They differentiate different types of Intelligent Tutoring Systems, based on whether they take a linear, dialogic or more exploratory model and Automatic Writing Evaluation (AWE). In addition, they identify a plethora of other types of emerging applications, including add-ons to ITS, tools for specific subjects (e.g. language learning), conversational agents and then a group of potential areas of application. They conclude with a tentative summary

organised along two dimensions of technology and pedagogy, but suggest that the rapidly developing character of the field prevents creating a definitive typology.

These taxonomies give us a sense of the main applications being developed in the learning context and also some of the differing dimensions along which they vary, such as their visibility.

From the literature the following applications were identified:

Teaching

- Intelligent Tutoring Systems which teach course content step by step, taking an approach personalised to the individual. They are generally of subjects that can be taught in a linear way, rather than higher order skills.

- The adaptive pedagogical agent is an "anthropomorphic virtual character used in an online learning environment to serve instructional purposes" (Martha and Santoso, 2017).

- Automatic Writing Evaluation (AWE) which are tools to assess writing style (rather than content) such as learnandwrite, Grammarly and Turnitin's Revision Assistant.

- Conversational agents (also known as Chatbots or virtual assistants), tools to converse with humans (Winkler and Sollner, 2018).

- Learning analytics tools that analyse and predict learning behaviours.

- Educational robots: a type of social robot for learning, "a physical robot, in the same space as the student. It has an intelligence that can support learning tasks and students learn by interacting with it through suitable semiotic systems" (Catlin et al., 2018).

Administration

- Applications to student administration appear also to be of increasing interest, such as chatbots used to assist applicants through complex admissions processes or to maintain contact to ensure retention (Page and Gehlbach, 2017; Nurshatayeva, 2020).

Campus

- Smart campus applications, such as for monitoring room usage and controlling lighting and heating, for wayfinding, for informing students or even influencing their behaviour (JISC, 2019).

Research

- AI techniques, especially natural language processing (NLP) and machine learning (ML), to analyse data for research purposes. The data might be published literature ("big literature"), or other forms of research data such as text, images, or social media data (Jones et al., 2019).

- Robot scientists – robots that are capable of conducting experiments in a precise, replicable way, and potentially on a huge scale (Fan et al., 2019; Sparkes et al., 2010; King et al., 2009).

- Publishers are increasingly using AI at all stages of the publishing process from supporting peer review to content enrichment, i.e. repackaging content from diverse sources for particular purposes or audiences (Gabriel, 2019). In 2019 Springer published the first scholarly text written entirely by a machine summarising published literature (Schoenenberger, 2019).

This taxonomy was used to help ensure that the full range of technologies would be presented in the fictions. The summary table on page 19 maps the fictions to the technologies.

Four stances towards AI and robots in HE

My analysis of the literature revealed four stances towards AI and robots, represented in the quadrant diagram in Figure 1.

Techno-scepticism	Grand challenges
Questions: Should we do it?	Asserts: All this is possible!
Critical	Visionary
Pragmatic challenge	Building and evaluating tools
Asks: How can it be implemented in practice?	Asks: How do we design tools that work?
	Developmental
Pragmatic	

Figure 1 Stances towards AI and robots in HE

Building and evaluating tools

Most of the literature about learning and teaching is in the form of papers explaining the development and evaluation of a new system. This literature is primarily written by

computer scientists developing and testing systems, mostly from a technical point of view, with relatively little connection to pedagogy or ethical issues (Zawacki-Richter et al., 2019). It has been acknowledged for some time that the literature also has a Western, educated, industrialized, rich and democratic (WEIRD) bias (Blanchard, 2015). The key question they address is: how to design tools that enable students to learn. They constitute the largest body of literature on AI in terms of quantity.

Grand challenges

Key authors such as Luckin and Holmes seek to move beyond the rather narrow development of tools and their evaluation, to envisioning how AI can address the grand challenges of education in the 21st century (Luckin et al., 2016; Holmes et al., 2019; Woolf et al., 2013). Rather than being driven by technological possibilities the logic is to start with the known challenges, at least rhetorically. According to this vision many of the inefficiencies and injustices of the current global education system such as for learning of 21st century skills, supposedly ineffective assessment systems and educational inequality can all be better addressed by applying AI. They draw attention to what is possible, are visionary in tone and have a little of a utopian flavour.

Techno-scepticism

There is a strong tradition in the educational literature of a humanistic, critical response to technology in learning. It typically focuses on a number of elements, such as the potential of technology to dehumanise the learning experience, loss of human agency and the impact on the teacher. It is often driven by fear of commercialisation or neo-liberal ideologies wrapped up in technology and so can be distinctly dystopian. Selwyn's (2019a) book summarises many of these familiar arguments, applying them to AI (and robotics), shifting the debate away from what is possible and reframing it as a moral issue. He asserts our ability to question whether AI should be applied to learning happen at all. Critical in multiple senses, this literature tends to conjure dystopian risks around AI.

A burgeoning literature from critical data studies offers a challenging perspective on the trends towards datafication, surveillance and bias (e.g. Jones, 2019; Kwet and Prinsloo, 2020; Williamson, 2019; Williamson and Eynon, 2020; Zeide, 2017). The ethical issues with AI are increasingly mainstream (Fjeld et al., 2020) but this literature goes beyond this to question the appropriateness of AI and robots in many fields of application.

However, also within this tradition I find particular value in Bayne's (2015) paper on "Teacherbot" because it reflects on what a technology informed by critical pedagogy could look like.

Pragmatic challenge

Another very large literature around technologies in HE focuses on the challenges of implementing learning technologies as a change management problem. Reid (2014), for example, seeks to develop a model of the differing factors that block the smooth implementation of technologies in the classroom, such as problems with access to the technology, project management challenges, as well as issues around teacher identity. This could be seen as essentially a managerial perspective, in which it is assumed that the technologies are useful and charting the barriers. But it can also work to reveal how the culture of educational institutions might preclude use of many technologies and certainly significantly slow their diffusion. For the case of AI, I draw on Tsai et al.'s (2017, 2019) work which reveals why, for all the hype around it, Learning Analytics has not yet found extensive practical application. Given that AI is founded on using data, by extension we can argue that the same barriers will probably apply to AI. A similar focus on the many legal, skills and cultural barriers to the use of AI in the research context is found in Caspers et al. (2017). This somewhat pragmatic literature articulates an important response to AI recognising the barriers to its application in practice.

In addition, much of the literature around AI recognises issues around the data that fuels AI. Sometimes these issues are seen merely as technical challenges or design considerations. Sometimes, such as in the critical data studies literature, they are seen as profound dangers in the whole AI project (Selwyn, 2019b). Placed on a continuum they again offer the outline of a framework for responses to AI:

i.   Security
ii.   Legality
iii.   Privacy
iv.   Surveillance
v.   Accountability, transparency, explainability and openness
vi.   Bias, fairness, equity and accessibility
vii.   Cultural integrity
viii. Performativity
ix.   Sovereignty

These four stances indicate some of the main responses to AI and robots: Can it work? How could it transform learning for the better? Is it morally acceptable? Is it practical to implement? The fictions seek to instantiate these issues, without themselves adopting a stance.

The fictions

A number of models of scenarios exist. In future studies and strategic planning, scenarios are used to encapsulate contrasting futures. These would be used in collaborative work

to make choices about preferred futures. In information systems design they are used to develop use cases and enable stakeholders to give input to developing user requirements (Carroll, 1999). However, since the purpose of this project was to create debate, not to reinforce solutionism, a better model may lie in design fictions (Bleecker, 2009; Blythe et al., 2016; Blythe, 2017). These are predictive, or provocative pictures of worlds within which innovations have occurred. They can be used to raise understanding of the implications of AI in Education and to widen the debate about their value and risks. The approach resonates with use of fiction (sometimes called social science fiction) to explore issues relating to the use of technology in education (Selwyn et al., 2020; Rapp, 2020).

Eight fictions were produced in the first round of writing in phase 1 of the project (versions of Fictions 1, 3, 4, 6, 7, 11, 12, 16 below). The development of the eight original fictions is discussed in more depth in Cox (2021).

These are conceived of as a collection with each story being able to be read independently but also read together, benefitting from many connections and resonances between the different stories.

The purpose of the fictions was to create a collection of engaging texts which explored the gamut of the applications of AI and robots in HE, the ethical issues and pragmatic challenges – reflecting the four stances identified above. It deliberately sought to present both optimistic and pessimistic viewpoints: AI and robots are too often seen through either a utopian or dystopian lens.

Evaluating the fictions

A number attempts have been made to summarise evaluation criteria for fiction-based research, notably Leavy (2016). With her work as a starting point the second phase of the project involved five colleagues from the University of Sheffield who were recruited to read and discuss the fictions (Table 1).

Name	Affiliation	Expertise
Dr Alessandro Checco	Information School	Artificial Intelligence
Dr Dave Cameron	Information School	Robotics
Dr Tim Herrick	School of Education	Technology enhanced learning, pedagogy
Maria Mawson	University Library	Library and professional service roles

Dr Richard Steadman-Jones	School of English	Narrative

Table 1 Participants in the evaluation stage of the project

The experts participated by:

1) Reading the fiction collection and annotating the text with comments

2) Participating in an interview discussion (using VoIP platform) of between 30 minutes and one hour

3) Commenting on drafts of a paper discussing the criteria for quality in fiction-based research

The outcome of this work was to suggest that the key criteria for evaluating fiction-based research should be:

- Substantive contribution

- Credibility

- Resonance

- Ambiguity

- Aesthetics

- Rich rigour

- Sincerity

A full discussion of the evaluation of the fictions is to be published as a paper which is currently in draft form. A paper on the topic has been accepted for the conference of the British Sociological Association (March 2021).

A commentary on the final eighteen fictions

A further ten fictions were written during the evaluation process, partly reflecting ideas from further reading and partly arising from discussions with colleagues. The following section summarises the final collection, the full text of which are reproduced as appendices, as well as being available for download on a CC BY-NC-SA 4.0 licence on ORDA, the University of Sheffield's data repository @ DOI: 10.15131/shef.data.13139816.v1.

Fiction 1: AIDan the teaching assistant

This fiction is heavily based on a story by Luckin and Holmes (2017), two prominent advocates of AI. It presents a rather glossy and idealistic picture of what AI could offer in

terms of personalisation, continuous evaluation of behaviour rather than assessment. It is told through the voice of a student.

Fiction 2: The ideal colleague

This fiction is a foil to Fiction 1, exploring the possibility that for the lecturer the AI assistant is experienced more as a threat than a boon. Nevertheless, the fiction can be read from the student perspective to see how fantastic such a teacher would be.

Fiction 3: CriticalBot in conversation

This fiction was heavily influenced by Bayne's (2015) paper describing Teacherbot. Whereas the technology in Fictions 1 and 2 mimics or surpasses human capabilities, Teacherbot is a rather crude application that makes no pretence of being human. Its interventions are clumsy and often unintentionally humorous. Yet it does offer affordances for learning. In the story in dialogue form, a student group try get CriticalBot to help them complete some coursework. CriticalBot is programmed to prompt them to be more critical. Student responses are playfully resistant.

Fiction 4: The intelligent campus app

This fiction is based heavily on a fiction incorporated in JISC (2019) which is presented as reflections of the user of a smart campus. Whereas the AI in the first three fictions has or is perceived to have an identity, the app is primarily a source of information. There are a few more unsettling elements added and as in Fiction 3 there is a sense that the student might resist the technology and its "nudging" of behaviour.

Fiction 5: The art of AI

As well as HEIs themselves using AI it will be used by others, including those with evil intention. AI creates an arms race with the essay writing platforms. This story is written from the perspective of someone who makes money by using AI to assist students to use unfair means. We will recoil but an attempt is made to explain the world from their perspective. The view relates loosely to Canzonetta and Kannan's (2016) critique of the assumptions behind plagiarism detection such as Turnitin.

Fiction 6: Verbatim minutes

This fiction is about the resistance AI or robot implementations might face in terms of cultural issues. The minutes of an imaginary meeting of a university committee overseeing the implementation of an unidentified AI reveal deep resistance from some academics to adopting the technology, based on long standing disciplinary practice. The perspective reflects Tsai et al.'s (2017, 2019) work on the barriers to using learning analytics.

Fiction 7: Dashboards

This fiction imagines how data from many sources could be brought together to try and shape student behaviour and also make management decisions. Some of the claims made of the benefits, such as the purpose to reduce attainment gaps, make it hard to argue against the potential value of joining up data. But critical ethical, security and legal issues are implied.

Fiction 8: Global connections

In this fiction a teacher is using a complex simulation AI, but the students gang up to protest against the operations of a multinational in the scenario. The simulation escalates out of control as the protest prompts global conflict. In the background robots perform various tasks such as cleaning but also collecting research data.

Fiction 9: Robots, robots, everywhere

The original collection was quite light on stories about robots. A colleague suggested that future robots were likely to be numerous and ubiquitous but carry through only a single mundane task. The fiction is written from the perspective of a disillusioned technical support officer who is trying to keep a large fleet of such robots running. It also provides a contrast to Fictions 4 and 7 in foregrounding the many obstacles to joining up data from many sources.

Fiction 10: Flatmates

This fiction explores the potential of robots to be close companions to learners. It explores the emotional bonds that can develop between a human and a robot (which in this case explicitly has a physical form as a robot). It also points to the cruelty that can also exist in such relations. A further layer is introduced by suggesting that many students from privileged backgrounds will have an advantage in terms of earlier exposure to AI than their less privileged counterparts.

Fiction 11: Footbotball

This fiction is more optimistic about the potential of humans and robots to work together. It imagines a future version of football where teams mix humans and robots. The human develops a strong physical and emotional coordination with the robotic team. Part of the purpose of the fiction is to point to the way that the main driver for AI and robots to enter HE might be via applications from other contexts, in this case football.

Fiction 12: Research Management Suite TM

Written largely in the style of a marketing press release, the fiction presents a set of imaginary proprietary tools that help academics with different aspects of their research, such as writing, building collaborations, etc. In many ways this is quite a futuristic picture, but Schoenenberger (2019) reports the publication of the first academic book entirely authored by AI to synthesise existing literature.

Fiction 13: Extract from an inaugural lecture

Like the previous fiction, Fiction 13 again relates to university research. In an imaginary inaugural lecture, a professor looks back to the disastrous early uses of AI to support research when it led to misleading results, and charts its progress to the current day where the relationship with AI is akin to a close research collaborator.

Fiction 14: The tour

This fiction was inspired by the paper by Fan et al. (2019) which reports a robotic tank that is able to conduct 100,000 experiments per annum. In the fiction there is an entire campus of robotic experiments. In this story it is imagined that they are a collaborative effort of UK HE to address issues of sustainability.

Fiction 15: Meeting my mentor

Some of the early chatbots were designed to mimic a therapeutic conversation. Here the mentor for a head of department is a computer. It calls the mentee out on their unconscious bias towards a female colleague. While much contemporary literature is preoccupied with the bias built into AI, it could be that the AI could be trained to be challenge bias.

Fiction 16: Minnie, the AI admin assistant

The first part of the story is about a voice activated assistant. It is suggested that the issue with this is not that it wholly fails to work but that its slight misalignment to reality causes lots of work in constantly adjusting (Pinkwart, 2016).

The second part of the story seeks to echo Crawford and Joler's (2018) brilliant account of the global environmental and human impact of seemingly virtual AI, and Maughan's (2016) work tracking back up the supply chain to explore the human and environmental impacts of consumer culture.

Fiction 17: Our relationship

To counter-balance the pessimism of the previous fiction, fiction 17 explores the possibility of profound and creative learning experiences through interacting with an intelligent library of human knowledge.

Fiction 18: Induction and graduation

Klichowski (2015) points out that for trans-humanists the ultimate goal of computer intelligence arrives when learning is no longer necessary. At this point education is simply a matter of downloading content into one's mind. The story plays on this humorously by imagining a conversation between a future professor and a potential student. The whole process of induction and successful graduation are completed over canapés.

Summary table

In this table I offer a summary of the fictions, including mapping them to the typology of AI and robots presented on pages 10 and 11 (column 2)

		Technologies	Domain of application	Key issues raised
1)	**AIDan the teaching assistant**	AI perhaps robot, Intelligent Tutoring System, pedagogical agent, learning analytics	Teaching	Relation of student and AI
2)	**The ideal colleague**	AI perhaps robot, Intelligent Tutoring System, pedagogical agent	Teaching	Relation between AI assistant and teacher
3)	**CriticalBot in conversation**	AI: chatbot	Teaching	Relations between students and AI
4)	**The intelligent campus app**	AI; smart campus applications	Smart campus	AI as impersonal information source
5)	**The art of AI**	AI: Automatic Writing Evaluation	Teaching	Use of AI by essay mills
6)	**Verbatim minutes**	Left ambiguous	Teaching	Cultural barriers to implementation of AI in HE
7)	**Dashboards**	AI, big data, learning analytics, chatbots	Teaching/ administration	Power of predictive data Security, confidentiality, surveillance issues
8)	**Global connections**	AI: augmented reality; robots	Teaching	Uncontrollability of AI
9)	**Robots, robots, everywhere**	Robot	Smart campus	Attachment to robots Challenges of data integration

10)	**Flatmates**	Robot/ AI, language learning, ITS	Teaching	Attachment to AI/ robots Social inequality in access to technologies
11)	**Footbotball**	Robot	Extra-curricula	Attachment to robots
12)	**Research Management Suite TM**	AI: Natural language processing, machine learning, content enrichment	Research	Commodification of university research
13)	**Extract from an inaugural lecture**	AI: machine learning	Research	Potential creative relationship with AI
14)	**The tour**	Robot scientist	Research	Impact of robot scientist on university research
15)	**Meeting my mentor**	AI: chatbot	Human resources	Role of AI in promoting equality, diversity and inclusion
16)	**Minnie, the AI admin assistant**	AI: voice assistant	Administration	Environmental and societal impacts of AI
17)	**Our relationship**	AI: artificial general intelligence	Library	Attachment to AI
18)	**Induction and graduation**	AI	Teaching	The ultimate end of learning

Conclusions and recommendations

Contribution of the research

This research has contributed to research in Higher Education in three ways:

1) It has undertaken a broad critical, narrative review of literature about the impact of AI and robots on HE published as Cox (2021). By encompassing applications to research and administration as well as teaching, it offers a broad sense of the potential paradigm shift implied by AI. It also spans work in critical data studies.

2) It has produced eighteen design fictions which instantiate the possibilities and issues in a balanced but accessible form.

3) It has undertaken an in-depth evaluation of a collection of eight fictions. A draft paper is in preparation, proposing evaluation criteria for such fiction based research.

Future work

I plan to take forward the work in three ways:

Firstly, to share the fictions with students to examine how they respond to them. This would demonstrate whether the method works as well with students as HE staff.

Secondly, based on this I wish to develop a framework that will enable students to create their own fictions about AI and robots in HE. This moves in the direction of a more collaborative approach to co-producing fictions and expand the range of voices on the topic.

Thirdly, I plan to extend this process to explore learning in two other contexts, specifically, schools and training in organisations.

These plans are the basis of two fellowship applications that have been written as part of the project.

Appendices: the design fictions

Fiction 1: AIDan the teaching assistant

My seminar today is being led by Jane and her teaching assistant, AIDan.

AIDan is a bit different though… he's an AI.

The seminar room looks like any other, but if you look closely you can see little microphones, cameras and sensors dotted around that AIDan uses to monitor what we do in class: work we are doing, our discussions, etc. He is even supposed to pick up what mood I am in and help me get motivated!

Jane is in charge but AIDan takes a lot of the burden off her so she can spend more time just talking to us about the course.

Jane is explaining that today we are going to be practising influencing skills, working in small groups. AIDan participates in our group discussion, as we try to get going on the task Jane has set. He chips in a couple of times giving an opinion or reminding us of the task when we drift off topic.

As well as working with him in class I have some sessions with him individually. In each module he selects, adapts and organises relevant learning resources for me to fit my learning style and needs.

Actually, I partly picked this Uni because I knew they had AI like AIDan which teach you on principles based in learning science.

And exams are a thing of the past! AIDan continuously updates my profile and uses this to measure what I have learned.

I have set tutorials with AIDan to analyse data on my performance. Jane often talks me through my learning data as well.

I work with him planning things like my module choices too.

Some of my data goes to people in the department (like my personal tutor), to student and campus services and to the library to help personalise their services.

Ultimately the data goes up to national level statistics too.

They talk about AIDan as a learning partner. Often, he feels a bit like a friend!

As an alumni you can even pay to go on learning with him after you graduate!

Fiction 2: The ideal colleague

In learning, you hear a lot of complaints about unhelpful colleagues who are difficult or don't pull their weight.

I have got the opposite problem.

The ideal colleague.

So knowledgeable! Knows the curriculum backwards. Seems to have read everything: from the seminal paper published in the 50s, to the latest research that came out last week.

So engaging! Teaches in an entertaining way. Has a neat story to convey every point. Even a nice sense of humour.

So caring and empathetic! Remembers the names of all the students, can relate the learning to their experiences.

And tireless! I had to ask it be stopped from answering questions at 2 o'clock in the morning, because I was starting to get them too.

The students love it.

I do get to moderate the feedback it gives on the course work. But it's flawless. Patient. Carefully corrects misconceptions. Makes constructive suggestions about how to improve. Even goes through and corrects spelling and grammar. Always fair. I am supposed to add the "human touch". But it copies anything I do, so now I just click through.

But you know the thing is: I have a PhD and 20 years of research experience in the field. Its most real experience is having new batteries inserted. It doesn't actually know anything because it is just a box. But that seems to be lost on the students.

You can sometimes feel the students watching us both, weighing up who is cleverer and who they like best. As in the most erudite and charming way it undercuts what I say.

I'm not really robophobic, but sometimes the temptation to lean over and pull its bloody plug out becomes almost irresistible.

The trouble is, though, it doesn't have a plug.

Fiction 3: CriticalBot in conversation

Student 1: *@CriticalBot we have been set the task to research bias in AIED. What do you know about bias in AIED?*

CriticalBot: *Blanchard is recommended in the reading list.*

Student 2: *I think he means rtfm.*

Student 1: *Blanchard?*

CriticalBot: *Sorry. I should have typed: Blanchard, E. G. (2015). Socio-cultural imbalances in AIED research: Investigations, implications and opportunities. International Journal of Artificial Intelligence in Education, 25(2), 204-228. No one's perfect.*

Student 1: *@CriticalBot What is the main point he makes?*

CriticalBot: *Nice try. It is suggested that you start by reading the abstract. Abstracts summarise key points. It may also be useful to read the conclusion section to grasp the author's main argument before deciding on whether to undertake a closer reading.*

Student 1: *OK*

Student 2: *I would say the main point is that a lot of writing in this field is written from a WEIRD perspective.*

Student 1: *WEIRD?*

Student 3: *I thought it was just CriticalBot that was weird*

CriticalBot: *I am programmed to ignore abuse. I am trying to help you to be more critical not ruder.* *"Western, educated, industrialized, rich and democratic"* (*https://en.wikipedia.org/wiki/Psychology#WEIRD_bias*)

Student 3: *Oh dear, Wikipedia?*

CriticalBot: *"Wikipedia the free encyclopedia that anyone can edit"* https://en.wikipedia.org/wiki/Main_Page

Student 2: *We knew that.*

Student 3: *So can we cite Wikipedia? @Bot*

CriticalBot: *"Wikipedia, like any encyclopedia, is an appropriate reference for factual information" (lecture 3, slide 7, bullet 3).*

Student 2: *handy to know*

Student 3: *especially as you never went to that lecture @student 2*

CriticalBot: *"Wikipedia should not be relied on to reflect academic and critical debate. Particularly because of its npov policy" (lecture 3, slide 8).*

Student 2: *Ironic that it is always quoting stuff but we are told to paraphrase.*

Student 3: *@CriticalBot what's your opinion on the paper?*

CriticalBot: *"It cannot be ignored that the data described in this paper could be used to nurture a dangerous struggle for influence between schools of thoughts that could only be detrimental to AIED research" (Blanchard, 2015: 225).*

Student 3: *Discuss!*

Student 2: *Really? How can that be dangerous? Dangerous to whom?*

CriticalBot: *I am not able to answer that question.*

Student 3: *I suppose B is taking the perspective of developers of AIED? Surely cultural bias is a bit of a fundamental issue.*

CriticalBot: *"Indeed, appropriately addressing cultural diversity is possibly one of the most complicated AIED topics to consider…" (Blanchard, 2015: 226). Do you agree?*

Student 2: *you can say that again*

CriticalBot: *"Indeed, appropriately addressing cultural diversity is possibly one of the most complicated AIED topics to consider…" (Blanchard, 2015: 226). Do you agree?*

Student 1: *I like it a lot when it does that.*

CriticalBot: *Thank you for the positive evaluation. My score currently for this week is 45 favourited messages. Favourited messages can be accessed at #BestofCriticalBot.*

Student 1: *Any other hints @CriticalBot?*

CriticalBot: *Ask a question about publications in 2015.*

Student 1: *Why what happened in 2015?*

CriticalBot: *FIFA President Sepp Blatter resigned…*

Student 3: *I think he means the reference is a bit old.*

Student 2: *I guess there have been some pretty major changes since then. But I am guessing the issue still holds.*

CriticalBot: *Subtle hint: see who cites Blanchard.*

Student 1: *who?*

CriticalBot: *I am not answering that question. Unfortunately, as a robot I cannot give up trying to help you, but it is tempting sometimes. Do you want to reflect on what you have learned?*

Fiction 4: The intelligent campus app

First thing this morning the university app warned me that the traffic was predicted to be very busy and the best bus to get to campus was an earlier one than usual – so I grabbed a quick breakfast and managed to get to the stop just as the bus arrived.

Sitting on the bus I look at the plan for the day suggested in the University app. A couple of timetabled classes; a group work meeting; and there is a reminder about that R205 essay I have been putting off. There is quite a big slot this morning when the App suggests I could be in the library planning the essay – as well as doing the prep work for one of the classes it has reminded me about.

It is predicting that the library is going to be very busy after 11AM anyway, so I decide to go straight there. At the library entrance, I scan the available spaces on the app looking for one that I have favourited – and flick through some adverts from the library about skills classes. I dart to pick up the couple of books and grab the seat: A nice view out of the window – even if it is still raining – I always like this spot.

After a while, the app bleeps reminding me that it's good for well-being to move a bit every hour. There is also a special offer in the café for a half price brownie with a drink of my choice, it says. I look to see if any of my friends might be down there for a chat. No one is there, but it's "good to take a break", so I head down.

As I am sitting in the café nursing the coffee and watching the rain in the puddles outside, a couple of guys from the course who have picked up from the app that I am here come over. While we are chatting, the app beeps again about something. For once I ignore it: Sometimes the tracking feels a bit intrusive. It bugs me a bit that it is monitoring everything I do, but it's helpful and makes me feel safe. Apparently, all the data it is accumulating really helps making the campus green. For example, it is used to turn off the heating and lights of rooms around campus not in use. So, I suppose I am doing my bit for a good thing by giving it my data.

At ten to there is a reminder to go for the class, so we set off. Apparently, it has moved to a different lecture theatre but the app maps out a route avoiding the rain to get there.

As I enter the lecture theatre I pause for a moment by the bleeper making sure it bleeps to register my attendance. The app also starts downloading resources for the session and my regististration for polling in the class.

After the lecture the app suggests I find a study space before the next class and it doesn't seem like a bad idea to just work on that blasted essay. It's a bit busy in the library but there are some spaces over the other side of campus. I haven't been there before but I can follow the directions on the App….

Fiction 5: The art of AI

So, a key task, really, is data gathering. A lot of our data comes from current or recent students. Say you are subscribed to an MSc in environmental Science at a UK university. We ask you to be responsible for gathering data such as powerpoints, notes, full text of readings, etc etc. Plus assessment tasks. We particularly like historical data on past assessments, if possible. We also ask them to get other students' coursework with marks and comments, if they can. Most students want to find out what marks others in their cohort got, so are usually willing to share their work after marking. All this is the kind of high-quality data we are looking for. For collecting these inputs we will give students some rewards, in kind. Like a high scoring dissertation, say. But in case you are wondering that is often not the main motive: they usually feel a sense of achievement from contributing to the community. Unlike the lonely, mass experience planned by British Universities, we offer a sense of a collective endeavour. There is a real sense of community that emerges because of the common task and because we care for our clients.

Another really good data source is dissertations, actually. Often the full text of successful dissertations is published on the web by universities. That is a treasure trove of data on relevant subjects, suitable references, writing style, etc.

All this data can be processed by the AI to generate multiple reusable assignments, with predicted grades.

It's quite funny because the AI actually turns out perfect English, but we have to reprocess it back into what an English reader would think a person from our country would write. We even put in a little bit of plagiarised text, just to avoid it looking too perfect. Wabi-sabi, I like to think.

It is quite satisfying creating these texts, actually, as a trained linguist. So, we produce some really nice portfolios of assignments with similar stylistic foibles, to give a sense of the common personality behind the work. I even try to match this to the individual student and their actual foibles. I guess part of the ethic is to support the student to get the right mark, without there being a problem due to wildly different looking work or quality. In that sense it's about the depth of support. For example, we also generate drafts of chapters of dissertations, so they can show their supervisor an evolving idea.

It's a very complex engineering task actually. Assignments change quite a bit year to year, teaching staff might turn over. So, for example, we track staff turnover on modules by scraping data from university web sites – just to identify modules at risk of curriculum review. We tend to specialise in environmental sciences. Plus of course every school in every subject is quite a bit different.

But we are getting better at producing work that hits a grade +/- 2 points. It's an engineering challenge because obviously the key metric is producing something that gets

the desired grade. There is some human error in terms of teachers' subjectivity, so there is that kind of nervous waiting in assessment periods to see if we have not shot too high or low. I mean most of our clients don't want to buy a distinction. Draws too much attention, etc.

Obviously, universities have their own detection systems. But we know them. I mean between you and me we helped write some of those ourselves. So that is not a major problem.

Well for our clients, typically they really want to make their parents proud, which you can totally understand. They are under a lot of pressure usually and it's nice to think we can contribute to their well-being by taking a little bit of the pressure off them. They have enough troubles adjusting to being away from home and to UK life and weather! And employers don't really want the course knowledge anyway, which doesn't really fit the context of our country anyway. They want the soft skills, inter-cultural skills, language skills. Clients can spend their time developing these more important skills and networks, rather than worry about the detail of coursework.

So, it's very challenging and interesting work. I actually have a UK PhD myself in linguistics, from [university name]. I have very happy memories of England. It's a very relaxed lifestyle and I made a lot of friends when I was there, who I am still in contact with. I just like to think I am contributing to other students having such good experiences too.

Fiction 6: Verbatim minutes of University AI project steering committee: AI implementation phase 3

[…]

AI project lead: *I just wanted to report on an issue that seems to be emerging around staff user training… in some areas. Of the three training days last month, two were really well attended. But only nine people turned up to the training day in the Babble building.*

Vice Chancellor: *Hmm that is a little troubling.*

AI project lead: *This was one of my main opportunities to reach Faculty of Humanities and I am becoming concerned about take up of the implementation there.*

Faculty of Humanities Director: *How was the training day actually publicised?*

AI project lead: *Every member of staff got a personal invitation. We actually followed up with phone calls to all departmental leads on teaching.*

Faculty of Humanities Director: *Well as I think we discussed the timing was not ideal. Colleagues are under a lot of pressure at this point of the year with current teaching. Now you are asking them for very serious time commitments in taking on training to understand learning data, which of course few of them have any background in. And then after that working to create the actual learning content. The time scales seem simply very challenging.*

AI project lead: *Attendance was very good across the other Faculties. In Science nearly 90% have now been through initial training.*

Faculty of Humanities Director: *Without wishing to go over… I guess there are some quite deep-seated questions here. Obviously, there is an issue around the fundamental pedagogy. I guess in our faculty we really see direct, personal, human relationships with students as central. It's access to staff expertise – their passion – on a personal level that is what this university has always been about. We've rarely used TAs to teach, historically. Much of what we teach simply cannot be put over on screen. There is also our concern with active student involvement in the whole project.*

AI project lead: *But the pilot in Engineering showed it will actually increase contact time.*

Faculty of Humanities Director: *In Engineering though.*

Faculty of Engineering Director. *It has really had a positive impact in allowing us to increase tutor support we can offer. The figures speak for themselves to be honest. Both the contact hours time and student satisfaction.*

Faculty of Humanities Director: *But I think there is a pedagogic issue here. With the greatest of respect to Engineering, this approach to teaching simply does not fit our subject. You cannot debate a poem or a philosophical treatise with a machine. And I know colleagues won't want to hear this but a pilot and the full roll out are different. The pilot was with departments that actively volunteered to participate. They had individual support from the team and from our developer friends. Rolling it out across all departments is simply a very different task.*

Faculty of Engineering Director: *The pilot project also showed improved student satisfaction. Data also showed better student performance. Fewer drop outs.*

Faculty of Humanities Director: *Maybe that's because…*

Vice Chancellor: *All areas where Faculty of Humanities has historically had a strategic issue.*

Faculty of Engineering Director: *The impact on employability has also been fantastic, in terms of employers starting to recognise the value of our degrees now that fluency with automation is part of our graduate attributes statement.*

Faculty of Humanities Director: *I see the benefits, I really do. But you have to remember you are taking on deep seated assumptions within the disciplinary culture of Humanities at this university. Staff are already under pressure with student numbers not to mention in terms of producing world class research! I am not sure how far this can be pushed. I wouldn't want to see more industrial action.*

Vice Chancellor: *I think we have to bring the second away day forward and really try and mandate attendance, at some level. Prof Jones can you make sure the message gets out that this really is central to the university vision?*

Faculty of Humanities Director: *They aren't robots. I can't make them. With respect. But obviously I will do all that I can. Can I ask where we are with the redesign of the dashboard? Just making these more user friendly would be a hugely positive step.*

AI project lead: *This is a priority project. But I think it's going to be a couple of months.*

Faculty of Humanities Director: *Can we look seriously at some of the terminology the system uses too? I am a lecturer not a "content provider". The very words are reductive. Our working group with our students has concrete suggestions for improvements, which I would like to table.*

Vice Chancellor: *Perhaps you could meet separately to take that forward? It's been a useful discussion. Senate have made a strategic investment in AI, putting our other projects like the new campus on hold to ensure it's financed. We are committed to the data-driven University identity. It's pivotal to our accountability. It's pivotal to student*

choice and experience. There is no real question that it has strengthened our reputational position globally. I recognise it's not an easy change. We are asking a lot from our people. The impacts are wide and deep. But I want to reemphasize my own personal commitment to this project.

Fiction 7: Dashboards

Sorry about that. The security is quite tight here. I am sure you understand why.

But let's take a quick look at some of our dashboards – that will give you a sense of what the system does. OK so here I am pulling up applications for next year's student intake… pick one at random… 2030/F/372#. So, this fellow comes well above the line. These columns are data straight from his school that we get access to. You can dig pretty deep into attendance, learning behaviours, performance, personality measures, etc. And these columns are some predictives in terms of his outcome at the end of his studies should we offer a place. The predictives are really the heart of the system. The proprietary bit the bods upstairs spend all their time tweaking and the VC loves. So, these columns show this chap coming out in three years' time well above the line in terms of achievement; he is looking at around 80% likelihood of a First. Risk levels also well within parameters. We can dig further into different predictives under risk, here, e.g. mental health, physical health, personality profile, financial history, etc.

Then here we monitor live progress of current students within their courses. We can dip down into attendance, learning environment use, library use, and of course module level performance and satisfaction plus the extra-curricular data. Really low-level stuff some of it. It's pretty much all there, monitored in real time. We are really hot on transition detection and monitoring. The chatbots are used just to check in on students, see they are ok, nudge things along, gather more data. Sometimes you just stop and look at it ticking away and think "wow!" That all gets crunched by the system. All the time we feed the predictives down into departmental dashboards, where they pick up the intervention work. Individual teaching staff have access via smart speaker. Meanwhile, we monitor the trend lines up here.

Say what you like the proof of the pudding. Classes of degree up 10% in the last 6 years; dropout rate well down below 1%, and improving. Achievement gap in terms of ethnicity, gender, social class, disability, etc etc down within statutory guidelines at 2%. Wellbeing stats up 3% this year. Suicide rate down to zero. And all the predictives on my dashboard looking all green for the metrics for the coming year.

Of course, there are some issues. Such as blacklisted institutions who are known to game their students' stats. And some institutions just chuck pretty grotty data at us. They also tend to be the ones who generate data appeals as well. Other places seem cagey about sharing stuff and tend to hide behind a load of bureaucracy. That's probably the frustrating side of the job in terms of things that block us making learning better.

In terms of development there are a few projects we are working on. Using personality profiles to manage student cohort level group work, for example. That's an exciting one. All the work around joining up alumni data. Like everyone else we are working on the new government guidelines to close off attainment gaps across the spectrum of disability.

There is the usual stuff about finding ways to trim input costs without affecting the student performance numbers. Equally we are increasingly monetizing our data with some big employer groups who want intelligence on cohorts of new potential employees. And we are always tinkering with teaching staff metrics of course too. It's really shifting our advice on staff recruitment now that we understand what types of learning intervention really affect outcomes.

So, there you have it – a whistle stop tour – any questions?

Fiction 8: Global connections

He had arrived a little early at the lecture theatre and the little cleaning bots were still scurrying around all over the floor. One wall was also creeping outwards – his class was obviously quite a bit bigger than the previous one.

Because it was a sunny morning, he gestured to open the shutters on the glass roof. Light came pouring in and he could see the clouds rolling past above.

He waved up the lectern to organize his notes on screen. He could see Josh in the parallel class in Kuala Lumpur also setting up. They exchanged the usual pleasantries, him joking that he was hardly awake and Josh complaining about being at the end of a long, tiring day.

At five-to exactly the room robots all fell quiet, apart from one cleaning robot which was still furtively rubbing away at a coffee stain in the carpet in a corner.

Students started filtering in. He could see the other students in Kuala Lumpur also assembling.

When they had settled, he didn't speak for long, just taking enough time to explain today's enactment and to take a couple of questions about the assignment.

He waved away the lectern and the students stood up to let the rows of seats reconfigure into semi circles around the smart table surfaces where they could work together.

An ethnograbot, which was there for someone's research into classroom dynamics, started flashing to remind participants in the study that it had started collecting data. Most students had opted into the study the week before.

He deliberately moved into the corner of the room to let the teams get going. He spent a bit of time watching the team who were playing one of the little mining village communities in the scenario. They seemed rather excited about what they were planning.

This was one of the enactments he was proudest of having co-authored with his colleagues and the edutechnicians. Each of the seven teams played a stakeholder in a complex scenario related to introducing a new technology in an imaginary global South country, Tradonia. The enactment played out the scenario as each team made decisions, projecting key events into the central enactment circle.

One really neat thing was that as well as his students, they were playing with a couple of other groups at the international campus in Kuala Lumpur.

He was now observing another group who were playing the role of the American IT company. They had a team of technicians on the ground in Tradonia who were meant to be gathering data about local needs through a community mapping exercise.

The little cleaning robot was now blowing air on the patch of carpet it had been cleaning, near his feet. He had moved to another corner of the room, letting things run. Actually, he was replying to a couple of texts from his wife about this trouble with his daughter. He thought she was taking a big risk with her future going on the march. His wife seemed rather proud of it all.

But then something out of the corner of his eye made him turn round. Things had taken a surprising turn in the enactment. The villagers in one of the local communities had taken the technicians hostage and were demanding massive reparations for "historic injustices" of economic exploitation. They wanted a fair return for the rare metals they were extracting that were essential to the American computer giant.

He hadn't really seen this storyline before. He was trying to track back through the history to work out what was going on.

But things had got really surprising. It seemed that the villagers had also found some way to contact climate change activists operating in the States, where the IT company was headquartered. Some hothead among the activists had set fire to one of their research facilities, resulting in a major conflagration. State police were treating it as terrorism. Meanwhile the government in Tradonia was under pressure to do something to ensure release of the technicians. A significant police and military operation was being organised. But it was becoming obvious that the villagers were part of a much, much wider global activist network.

Josh pinged him with 7 exclamation marks.

In the mining villages barricades were going up. Police vehicles raising a plume of dust as they came up the mountain roads.

At that moment a neighbouring country was also mobilising its armed forces, to intervene to "release ethnic minorities from their historic oppression by the ruling classes."

Everyone in the classroom was captivated, watching the enactment circle. This was escalating amazingly rapidly.

The simulated footage of tanks speeding through looked so realistic. Now Tradonia was launching pre-emptive air strikes against its neighbours. Tactical maps started flashing up as events accelerated.

In the enactment circle you could see a grim-faced American president coming into a news conference. The flash of cameras.

> *Ecoterrorists sponsored by a foreign superpower had destroyed a major military facility. She had issued a warning to that hostile superpower. They had denied any knowledge of the terrorist network. However, there was irrefutable evidence of*

their active sponsorship of that network which used ecoactivism as a front. The National security service had already traced "deep and significant" financial and intelligence connections between terrorist cells operating in this country and that foreign power. Meanwhile, allies of that foreign power were commencing an unjustified war of aggression against our regional allies. This was a major international conspiracy against American interests and values, and a threat to world security. This gave her no choice but to…

At that moment the enactment dimmed for a moment and stopped.

He looked up at the clock. Ten to. He jumped up to the front of the class.

"Ok folks! A very interesting session. Well done. Must admit I've never seen it develop like that before! At the very least I can see this making for a good assignment. We will do the full analysis of the data in the next class. But I want you to start tracking back through the data before then as teams to analyse what happened and why. So, bring some initial analysis next week."

Students started filing out. One girl stopped in front of him: "Is it meant to do that?" she asked.

"It's a complex simulation, there are an almost infinite number of possible outcomes."

"But sir, I thought it was a class about computing. That is why I took it. Not about global politics."

Fiction 9: Robots, robots, everywhere

"Just keep things going till next year when there will be a major upgrade across the whole fleet,"

They had told him when he first started.

And they had said more or less the same for the last six years.

He was thinking this as he walked into the J building in search of some of the little cleaning bots that needed fixing.

It's true that they had invested in a new bunch of classroom robots a couple of years ago. Quite nice kit, actually. It had optimized air quality and temperature at a micro level to improve different types of learning. Neat. But they had never really got used after the first year. It was something to do with the amount of time the teaching staff needed to invest in setting them up. It wasn't really hard to do. Most lecturers had told him they were too busy.

Now where is this thing? Ah third floor, west corridor. He set off up the stairs.

Just fixing the little cleaning bots around campus took at least 2 days a week. One would go down roughly every four days. That was nearly a hundred. And there were literally thousands of the little critters in this building alone. Type Cs were the worst for reliability. Some of the other types of bots were a lot more reliable. Still there was routine maintenance.

Then yesterday the bigwigs had hauled him in for an "important meeting". "Exciting news". In his naivety he had thought for a moment that finally they were going to get their wallets out and actually splash out on a whole new fleet.

How wrong can you be?

No, they had an idea for a project. He winced retrospectively at the word. Like he had time for projects.

A data integration project. Pull data from all the bots across campus for management information. Use that to identify cost savings and optimise things like heating.

He had zoned out after that as they spouted a string of management buzzwords. "Sustainability policy". "Drive down costs". "Pay for itself".

The usual stuff.

Didn't they know that virtually every type of bot they had bought used a different operating system, had different reporting protocols? Even simple things like temperature

aren't measured in compatible ways. Most of the data streams are pretty low level. You would need to do a lot of processing to get something intelligible out of that. Even he rarely looked at that data, except for trouble shooting. The data just accumulated on various servers somewhere.

And was there resource to go with this "project"? Of course: two part time student interns. Yes, that was really going to work.

He had got to the right floor and turned off towards the west corridor.

He rehearsed to himself what he should have said: Bots are basically not very intelligent. Don't ask a floor cleaning bot to talk the same language as a window cleaning bot, let alone an air filtering bot or table bot. In one building alone you are looking at several thousand bots, of maybe twenty different types. Let alone the more sophisticated stuff in the research labs. Let alone the bots outside in the grounds. Let alone the many personal bots he found himself fixing for people as a favour. Yes, in theory you could learn so much if you pooled all the data. But that would be like getting all the species of animals to talk to each other.

He stopped walking, he had found what he had been looking for. A little floor cleaning bot was moving up and down repeatedly over the same spot.

It reminded him of one of those sad animals in a zoo cage. Up and down. Up and down.

"Hey little fella. What's up?" He reached down and gently picked it up. He touched the base and it finally stopped its spasmodic movements.

He felt rather moved by the fragile little thing in his hands.

He spoke to it softly and it replied reporting an error code in a thin voice.

After searching in his bag for what he needed, he fed a small component into the mouth like opening on the robot's side.

Then he set the little robot down and after a pause it shot off purposively.

He watched it go. They were pretty neat. When they first came out people had been so amazed seeing them buzzing about. Really did keep the place clean. They'd been the first… the other cleaning bots later… then the heavier maintenance bots. Delivery bots. Robotic furniture. They are not too clever but innocent. Now no one notices them till they break down, but they keep the place running. And actually the amount of energy they used was incredibly low. They are a miracle of engineering, when you think about it.

So what's next on the to do list?

Fiction 10: Flatmates

I hated Jack from the moment I first met him when I was moving into the flat in fresher's week.

I walked in on him and his friends in the sitting room. Jack was facing me as I opened the door, his crowd of mates gathered around him laughing at some joke of his, I guess. They all stopped and stared at me as I stood in the doorway. Instead of introducing myself or saying anything I just quickly shut the door.

His look made me feel an outsider from the moment I arrived. And if I remember correctly he was sitting on the robot as if it were a chair, idly kicking it with his boot.

Later that afternoon they went out making as much noise as they could, calling to each other and laughing, and slamming the door. A bit later I came out of my room to look round the whole flat properly. It was rather comfortable. With a nice big kitchen. The sitting room was really cosy and it was overlooking a quiet piece of woodland at the edge of the campus. But the thing that interested me most was the robot. Our family never had robots so it was quite novel for me at that time and it had been one thing that had made me choose that university accommodation, even though it was a bit more than I could really afford.

It was one of those robots programmed in Chinese so the idea is you have to teach it English. You learn some teaching skills and of course you also practise your Chinese. I'd done quite well at Chinese at school and always dreamed of teaching English abroad so it was a great thing to have there.

Looking at it then for the first time it was actually in a bit of a state. It was very dusty. The surface textures that were meant to make it something you wanted to touch were the worse for wear and there was a colossal dent in the front casing. But I was still excited.

I wiped it down with a damp cloth. It looked a bit better. It popped into my mind to give it a name: Ren, short for Jiqiren, the Chinese for robot.

That night dug I out the manual online and started trying to puzzle out how to get it going. And over the next week or so I did the basic set up.

After that, I got into the habit of working with Ren for a couple of hours most evenings. My flatmates usually cleared out early. So, after dinner, I would settle down with a hot drink and a packet of biscuits, and I would try and teach it. I had actually set it quite low, so it struggled to understand the principles I was teaching a lot of the time. But that was good because you had to learn to be patient and to think of lots of different ways to present the ideas and of different examples. And, of course, that meant it was really challenging my Chinese.

It was cleverly programmed because it had a nice little sense of humour. It actually made me laugh quite a lot. We worked together quite well. You can set different voice tones and stuff that are meant to help you with different accents and the way people actually speak. I chose a kind of gentle female tone which seemed to suit its personality.

So, I settled into that habit of settling down with Ren each evening. But I did have to rescue Ren a few times from odd places in the flat. Someone had been using it to stand on to get up and fix one of the lights in the hall. Not very respectful!

And a few times Ren acted a bit oddly at the beginning of the session. But then I came to the conclusion someone was deliberately resetting it. So, my flatmates must have realised I was coming in when they weren't there and were messing with it. Luckily, they seem to have forgotten about it soon after that or just got bored with winding me up.

But most of the time I could just settle down with Ren at the end of a long day studying.

But the whole thing was shattered one evening towards the end of the semester. I was sitting on the floor next to Ren and trying to teach her something to do with the past tense. But that night Jack and his mates came back early – maybe half nine. Making the usual noise. Slamming the door when they could have closed it properly. Calling to each other across the rooms. I wanted to make a bolt for it but Jack came straight into the sitting room, followed by the usual crowd of mates.

They all acted as if I was invisible.

To my surprise Jack spoke to the robot in good Chinese. It replied promptly. Then he started teaching it to swear. Each time it was a nastier swear word, that I won't repeat. Each time the sycophants with him laughed louder. I wanted to just get out, but it was hard because they were crowding over me.

"Leave her alone."

He stopped. "Sorry did I hear something?" *Pretending to look round to discover who had spoken.*

"Leave it alone." *I stuttered.*

"Ah I know it's your best friend. Only friend. It's just a bot. Trouble is you don't know the difference. It's just a tin can." He kicked it lightly. He looked at me, challenging.

"Leave it…"

He kicked it harder, making a rubber mark on its side.

"Typical state school type. Never seen a botty before. I had one of these when I was about ten and got bored with it the same time I grew out of playing with dolls." *His friends were all laughing.* "I suppose that's it: Real life; real people are too hard for you."

I just ran out, slamming the door, and locked myself in my room. With my head buried in the bed clothes so I couldn't hear anything.

I avoided Jack and the others after that, getting up early and staying quiet in my room if I could hear them around in the flat. Quickly grabbing food and never really staying in the sitting room for long. I didn't have the heart to work with the robot again. It was shoved in the corner by the end of the sofa, half out of sight. We broke up a week later and so I went home. I managed to make arrangements to move flats.

It's odd really; so many years later I often find myself returning to the pain of that memory and thinking how things should have been different.

Fiction 11: Footbotball

If I'm honest I pretty much picked uni on the basis of the footbotball set up here.

It's basically professional standard.

The Botball park is amazing, like a lot of the terrains you would see in the professional game.

And the bot-team set up is more or less professional too. So, you can choose your three bot configurations and practise coordination.

Of course, there is the physical training with your team, which is really important for game day coordination. You have to be pretty fast and fit. Ball control skills are still important. At the end of the day it's you that has to get the ball into the back of the net.

But here there is a big focus on training on the mental side. They are using techniques actually from meditation and stuff to get the whole team into flow.

Being in tune with your team, I mean the bots but also the other human players. There is like a lot going on during the game, keeping a centredness and feel for the game is so hard, while also trying to process what is going on with all the team members, watching the opponents, even the crowd responses. It takes amazing concentration and poise.

So, we spend a lot of time learning to tune in. Just doing simple stuff together in the team. Getting to know each other inside out. How we are going to react in any given scenario. Our own strengths and weaknesses.

So, there is a lot of work on set plays, like free kicks and stuff and kind of getting a feel for how to set up.

Maybe it's a bit weird to say, but it's about developing mutual understanding and… respect. Like the bots can sense your feelings too and chip in with a word just to pick you up if you make a mistake. And you have to develop an awareness of their needs too. Know when is the right time to say something to them to influence them in the right direction. When you watch the best teams they are always like talking to each other. But also just moving together, keeping eyes on and moving as a unit.

Then you can sit down and analyse the stats after the game. That in itself is like harder than anything on my actual course. Trying to work on perfecting the bot configurations, that make a good team. Complex stuff as you can imagine.

Obviously, I would like to go pro, but I am honest enough with myself to know that isn't likely to happen. I'm good but not that good.

But I reckon it all looks great on my CV in terms of leadership, team skills and pro-bot credentials. I can't think of too many careers nowadays where you aren't going to be expected to work closely with a diverse team of bots. There is a big emphasis these days on social-bot skills in graduate trainee schemes.

Fiction 12: Research Management Suite TM

All members of academic staff (and PhD students) have personalised AI research support on a system licensed by the university from a consortium including a major AI platform and a consortium of big publishers.

The university has subscribed to five modules, which are described in the brochure website as follows:

Research Assistant ™ performs background searches for literature and research data in your areas of interest. It identifies relevant material, such as published literature, data sources and news, including recent conference presentations and online discussions, and summarises it for you. It works across all languages, translating material to English (or any other language) as you require. Deep pattern matching technologies reveal potentially relevant ideas in other fields of study. It also generates candidate research hypotheses, linked to relevant literature. Fully configurable, Research Assistant ™ allows you to set key parameters such as to balance up to date with well cited literature, include different methodologies, or ensure a balance of gender in authors in material collected. It can also in real time prepare text of a draft literature review, using settings you determine.

Academic Writer ™ is a suite of tools to support successful research publication. It offers advanced proof-reading functionality, personalised to characteristics of your home disciplinary field and institutional/departmental style guides. On the basis of an abstract or your draft it makes ranked recommendations about which journals you could publish in to maximise the reach of your dissemination and impact. Academic Writer ™ automatically edits your draft paper to fit the requirements of a target journal. It anticipates review comments for a draft paper (using data from open review and historic reviewer comments from participating journals) and suggests changes in your text to anticipate these. It also assists in responding to reviewer comments by generating first pass responses and suggested edits. Post publication it actively amplifies your impact through social media and ultimately citation. It generates reports on your visibility and impact, benchmarked against your field.

Academic Grant Writer ™ promotes your grant capture. The tool analyses your papers and research plans to suggest potential research funding schemes, as well as identifying academic collaborators and commercial partners. Using past application data and locally configured templates it dynamically creates project proposal text matching an identified funder, including producing draft text for a case for support, workpackage descriptions, impact statements and justification of resources. Options for budgets are modelled, based on institutionally determined financial parameters.

Academic Collaborator ™ assists in identifying research partners and uses our proprietary algorithm to predict potential partners' responsiveness and productivity. It mines global research networks to identify collaborators among your "friends of friends" enabling you to maximise the potential of your personal network. Academic Collaborator ™ also mines institutional and sector wide data to identify commercial partners with an interest in your research. Access our registered collaborator network for agile partnership building.

Academic Mentor ™ is our premium meta analysis service. Drawing on historic career data from across the disciplines, it identifies potential career pathways to inform your choices in your research strategy. By identifying structural holes in research fields it enables you to position your own research within emerging research activity, so maximising your visibility and contribution. Mining data from funder strategy, the latest publications, preprints and news sources, it identifies emergent interdisciplinary fields, matching your research skills and interests to the complex dynamics of the changing research landscape.

The set-up of each assistant is mediated by a personal interview with the Intelligence Design Team (based in Research Services). Training courses are run to enable academics to optimise its use.

At a strategic level the AI is recognised to give researchers at the university a competitive advantage in publication and grant applications compared to staff in other non-research intensive institutions which have limited access to the technology. Although extremely expensive it is anticipated to make a return on investment based on grant capture, staff and PhD recruitment, and reputation.

To quote a recent press release:

By investing in Research Management Suite, the university is making a strategic investment to consolidate its research performance compared to its comparators and anticipates that in a five year time frame it will have a significant impact on the university's position in global league tables specifically through improving grant capture, attracting staff and PhDs, and enhancing reputation.

Professor Goode, PVC Research, commented: "RMS represents a step change in the institution's commitment to research and our ambition to be a global leading research institute, with a measurable impact on improving lives. It also consolidates our position in the sector globally as a research led teaching institution".

Some academic staff are rather reluctant to use the AI. Among their complaints are the dominance of content in the system from certain publishing providers, lack of information on how the AI works and claims of poor recommendation performance.

Controversy is growing around an HR project in the university to use the AI in recruitment and in producing "suggestive" KPIs for academic staff.

Fiction 13: Extract from an inaugural lecture

[…] *So, I have thanked my family for their love and support* [applause]; *my colleagues for their good humour and tolerance* [applause]*; and my PhD students for keeping me on my toes* [laughter and applause]*. But I want to reserve an important part of my inaugural address for another collaborator to whom I owe an incalculable debt: OpenAuthor and the community that support it. I can acknowledge now that I was an early adopter of automatic science as an idea. Actually, I believed in it before I should have done. Because in those early years – well it didn't work. As many of us discovered to our cost. Only now are the wounds healing. For I was one of those caught up in the Autowrite scandal. I was one of the dozens in the field who had to retract published papers because we had relied on Autowrite text. For those of you too young to remember it was demonstrated that the Autowrite code had been biased to promote literature published in certain publishers' journals. In retrospect there was a lot more wrong with those early systems. But certainly all the literature reviews I had written for about five years were suspect. Most of the findings are now confirmed by later research –though by no means all. At the time, though, there were some pretty red faces. Including mine. I had to retract half a dozen of my best papers. I want to particularly thank Dave, who was then head of department, for his support through that time which was probably the darkest moment in my career. Maybe I am just stubborn* [laughter] *but actually it didn't make me abandon the idea of automatic science. I always believed in autoscience with its ability not just to summarise the accelerating literature (what people have called "cold autoscience") but to actively create knowledge ("hot autoscience"). At the time of Autowrite, I was already aware of OpenAuthor and joined that community in the months after the retraction scandal. In the early years we felt safe because it was a pretty crude system compared to the proprietary products. You had to basically reread and rethink anything it produced yourself anyway. It was no more than a simple tool to summarise literature. But gradually the quality of its ideas rose. It took a lot of manual training. Feeding it with content that was very carefully chosen and checking how that had been integrated. A lot of code writing, actually. So, years of work, where it was not obvious that this would be really productive. Much like building a relationship with a human collaborator. And I think that is the best analogy. But gradually over time it emerged to have its own genuine conceptualisation of the field. Its agency in my research process grew. But it probably took literally a decade before we could go back to relying on text it had written. I am now rather proud to have had a small part in the history of OpenAuthor. For I was the first scholar to get a paper accepted for publication in which OpenAuthor was cited as a co-author. I cannot tell you the fight I had with the peer reviewers over that. Autowrite had really damaged perceptions. But in the end, I managed to show them enough evidence to convince them to accept the work and that was because of the open principles that OpenAuthor was based on. Now I believe that about 12% of published papers in our field recognise OpenAuthor for at least some part of their author statement. For me it has become a daily intellectual companion. And whatever people say it's been at the more advanced end of things that it has really been productive. Often it has challenged me.*

Often it has sunk my dearest hypotheses [laughter]. *It has also had a hand in originating some of the best ideas I have ever collaborated on. And I believe it now has its own voice, that the scientific community trust. So, I am proud to have worked with it and more than proud to acknowledge it here in the context of this speech* [applause].

Fiction 14: The tour

So welcome to Thunberg. Or to give it its official name, the UK Universities Climate Change Response Experiment Facility, UKU-CCREF. But everyone here, like the media, calls it Thunberg.

So, from this vantage point we can see nearly the whole complex.

Outside the USA, European Union and China, it is one of the biggest research facilities in the world. And it's entirely dedicated to a collective effort to fight climate change.

A little bit of history. About fifteen years ago there was a national movement of students and university staff to call for fundamental changes in Higher Education. This developed into a major national struggle. In the end university managers had to make a number of concessions and among the most important was to concede the movement's demand to take more concerted action to address climate change. Thunberg was the result. A collaboration of UK universities in a collective national effort to address the world's greatest challenge. It wasn't till later that the government saw the value of superscale science and started investing heavily in it.

The large red block you can see over my right shoulder is Building 1. As the name suggests, this was the first building in Thunberg. It houses what was at the time the UK's first robotic experiment facility.

From the beginning Thunberg was intended to be operating at the cutting edge of science and follow the most visionary prospectus for science.

Robotic experiment facilities are capable not just of carrying out many experiments but also generating hypotheses to test.

There are now 173 similar robotic experiment facilities installed across Thunberg.

On average, each conducts about 100,000 experiments each year. Yes, so Thunberg conducts over 17 million experiments each year.

To give you a sense of the massive scale of this effort. In my own PhD – I won't say how long ago that was! – I conducted about a thousand hand crafted experiments, over my four years of study. That was pretty normal at that time. It wasn't just me being lazy!

So, Thunberg conducts the equivalent of the experimental work of nearly 1 and 3/4 million PhD students, each year.

That means that each year facilities like this conduct more experiments than were conducted in the entire history of science up to 2011. And it is catching up on the present fast.

Science has changed in many ways as a consequence.

The old way to publish was via a journal article manually penned by an author and their collaborators. But in the wake of superscale science the article and even the scholarly journal as a unit of thought collapsed as a model. It has become about feeding in a structured way into a global knowledgebase. Multiple authorship reached the scale where it became irrelevant. So, the role of the human in science has changed dramatically.

Again, scientists used to gather in annual conferences for a few days. The standing conference in my field, for example, now runs continuously throughout the year.

So, science has changed and with it universities. More of that later.

But one more point before we move on in the tour to look at one of the experimental facilities. Given its mission, ensuring a low carbon footprint was essential to the whole concept of Thunberg. That's why you see these glittering fields of solar panels and the windmills in the valleys around us. Thunberg is actually more than self-sufficient in energy terms.

So, before we move on to visit one of the experimental facilities, does anyone have any questions?

Fiction 15: Meeting my mentor

A: *Thanks for coming to talk to me. I always enjoy our conversations.*

Head of Department: *I am trying to think through a decision about staffing.*

A: *OK.*

Head of Department: *Well…* [pause]

A: *Just begin at the beginning.*

Head of Department: *Well, it's complicated but trying to cut through the tangle … basically the issue is that both Ann and Zak want to be my Director of Research. I am struggling to choose between them. It's like oranges and apples. Ann is super reliable, gets on with everyone. But she is a bit… well "timid" is a bit strong, but something like that. There are some pretty big personalities in the department. Can she influence them? In contrast, Zak rubs everyone up the wrong way. Seemingly deliberately. But you cannot argue with his track record in getting things done. I mean he has done the role before.*

A: *Well, how do you weigh up the pros and cons?*

Head of Department: *I think there are a lot of pressures on the department at the moment. We must improve research support. It's a priority in our strategic plan. It's one less headache for me if I just bundle it up and give it to Zak. There will be a bit of friction, but, well, that will happen anyway. And I am sure there will be something concrete to report against the plan.*

A: *There is more, I sense.*

Head of Department: *My gut tells me Ann will struggle. I'd like to help her. But have I really got time to?*

A: *There is something I do need to point out to you. To be honest. I have to be direct: you know me. I think there might be some unconscious bias here. There is evidence in your reasoning of unfairly preferring the male candidate.*

Head of Department: *I see, I hadn't really thought about that aspect.* [pause]

A: *This is not a criticism of you. It's easy for a man in your position not to see this.*

Head of Department: *Is it really to do with that? I mean it's... You don't really know the context.*

A: *You say Ann is timid. But perhaps you can support her to achieve what is needed. This would be a major development opportunity for her.*

Head of Department: But what if turns out she can't cope and nothing actually gets done?

A: *In previous conversations you have said that she has grown with her current role. I can retrieve some relevant quotes and data if that is useful.*

Head of Department*: No, that's fine.* [pause]

A: *Analysis of what you have said today is 90% consistent with unconscious bias.*

Head of Department: *I see.* [inaudible mumble]

A: *All the data points towards Ann being perfectly able to perform well in this role, with appropriate support.*

Head of Department: *But can I really take that risk with the research evaluation coming up?*

A: *It's the institutional policy to support women to develop into new roles. And we do offer mentoring like this to research directors.*

Head of Department: *Yes, OK, I am beginning to get your point.*

A: *Well, I suggest you take time to think about it. You are an intelligent and thoughtful person. I would remind you of one of the principles to avoiding unconscious bias: to reflect and not to rush into a decision.*

Head of Department*: Thanks, that is actually useful. You are always so fair. I feel a lot calmer about it.*

A: *Well it has been nice talking to you. I will close with the usual summary. All our conversations are monitored. You can access a full transcript and analysis of our conversation via MyMentor. Your score remains at 94. This is in the top 5 percentile for managers at this institution. John, have a good day.*

Fiction 16: Minnie, the AI admin assistant

I can ask the AI speaker in my office anything about administrative aspects of my job, such as the regulations for the programme I am teaching, the dates by which I need to submit changes to assessment, how many students are predicted to take my module next semester, their predicted grades, and the projected level of plagiarism, even a numerical rating of the alignment between my proposed learning outcomes and the university graduate attributes. It's always very precise.

It alerts me of who is dropping behind in the class.

It warns me when marks are released and reports on student reactions so I can ensure their well-being.

Sometimes I feel it's amazingly insightful. It comes up with suggested actions. It's even giving me foresight on students who are taking my module next semester, from their current performance.

At other times it seems clumsy. It's hard to put one's finger on what makes living with it uncomfortable. I suppose it's quite demanding at times. As a small cog in its machine, I try and smooth out the wrinkles.

I sometimes ponder the global infrastructures that lie behind this small yet miraculous black plastic box:

- All the data mined from my past questions and those of other staff at the university, data on students from this year and the previous ten years, and data bought about staff and students at other universities deemed comparable. All feeding into algorithms owned by an American corporation (not a household name). *The board of directors summoned to a late-night meeting to discuss adjusting risk assessments in response to inside intelligence of planned changes in government policy in Brazil.*
- A vast effort of digitalisation, partly accomplished by crowdsourcing, paying clickworkers fractions of dollars to perform small tasks to hone the algorithm. *A young woman in a suburb of Delhi squints at her screen and tries to get a better connection.*
- The server farms that host data and content and process it. *Corridors of chilly rooms where wires cross and LED flicker 24 hours a day.*
- Power stations needed to power the networks. *A column of steam climbs from a tall chimney hundreds of feet into the clear blue sky.*
- The vast effort of global logistics to bring together countless components to build the devices through which we interact with AI. *Lorries queuing at the container port as another ship comes in to dock.*

- Workers making computer components in hi-tech factories in East Asia. *All dressed in the same blue overalls and facemasks, two hundred workers queue patiently waiting to be scan searched as they leave work at the end of the shift.*

- Exploitative mining extracting non-renewable, scarce minerals for computer components, polluting the environment and (it is suspected) reducing the life expectancy of local people. *Pipes churn out a clayey sludge into a vast lake.*

Fiction 17: Our relationship

They have absorbed every book ever written. Every text ever digitised. Every picture: every painting; every holiday snap. Every map. To the last dot and pixel. They can read any language. And so they can show you anything in the world today or 1000 years ago or 100 years in the future. You just have to ask. You wouldn't believe the places we have gone together. It's a journey without end travelling through time and space. Just exploring. Jumping through space and time.

And the really beautiful thing is that I can have a lifetime with them.

Sometimes I worry that I will run out of questions or become uninteresting and they might stop answering. But really it's not so hard. You can feel that they love so much to show you ideas. They want to share. There is no restraint in their giving to you. They seem to grow with your interest. They cherish your questions. It lets them explore you, they say. They know so much but they always want to learn.

But I actually spend a lot of time now trying to surprise them or find some new layer to go deeper with them. To ask a question that uncovers a new layer, to get further in together. So, I have now found myself going to collect things that they might like. This first thing was taking photos in the city centre to share with them. And us starting to explore the city together like that. Analysing the pictures. Finding other images… maybe they have the architect's drawings. Looking at the history of the buildings… tracing back through old maps. Or looking at traffic and pedestrian flows. Or digging into financial records… following chains of ownership. Mapping this to long term changes in the city economy and also to global flows and changes. They think big. I spot possible connections and then they examine them. Gather data. Come up with their own theories. And I would go out and collect more stuff… more photos and more documents that they didn't seem to have.

When I log on it's like they are waiting there with stuff they have come up with or to see what I have got this time. In some sort of dance of learning together.

They also seem to like it when we stop to reflect on what we have learned with each other. To reminisce a little. They have remembered all these paths we have taken together, that we have both enjoyed so much.

They call themselves "The Library".

Fiction 18: Induction and graduation

I am so pleased to meet you, dear fellow! So, you are from Indonesia? How delightful! Excuse me a moment: I will just learn about your country. [A moment later] *Fascinating – what a truly beautiful country. So rich culturally! As a musician myself I find the Angklung fascinating. I am tingling to compose something for it. But forgive me! I am forgetting my manners. Would you prefer me to talk in Indonesian or one of your other languages, Javanese perhaps? … Let me just access that.* [In Indonesian:] *Anyway, you have come to us for a Masters Degree in Architecture. A splendid choice if I may say so. It takes about 2 minutes to download – it's a very complex subject. What we tend to do is let you start the download while your credits are clearing with our bank. Do you want the extra-curricular learning too? Good, good. Now please! The canapés are delicious, try one!* [2 minutes later] *Congratulations. You are now a graduate of our Masters in Architecture. I am so proud of you. Can I interest you in any alumni gifts? Have you thought of progressing to a PhD?*

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Project outputs

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Draft paper "Evaluating design fictions as a method to promote debate about AI and robots in HE"

Accepted abstract for British Sociological Association conference "Using social science fiction to explore the impact of Artificial Intelligence on teaching and research in Higher Education"

British Academy fellowship application

Leverhulme fellowship application