Section 2

Reimagining Higher Education: AI Integration in Teaching, Design, and Assessment

Chapter 4

Working *with* AI: An Integrated, Process-Based Framework for Posthumanist Teaching in Higher Education

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Preface

This chapter explores the potential of integrated learning tasks in view of AI (artificial intelligence) in HE (higher education). AI has democratised content production, but it also poses challenges in distinguishing work done by AI from that done by humans. It suggests that integrated learning tasks can help mitigate these challenges by emphasising the process of writing with AI and focusing on the task rather than the learner. The chapter describes a case study in which students were asked to generate a research topic for themselves and then use ChatGPT (chat generative pre-trained transformer) – a language model AI – to generate prompts for their literature survey. The students then used a spreadsheet to organise their research and a branching tree diagram to form the outline of their literature survey. They used mail merge to extract relevant quotations from their spreadsheets and then used a chatbot to assist them in assembling the final literature survey. We compared the work done by the students in the case study to a group of fifth-year students who did not follow the process and found that the students who used the integrated learning approach had developed an insight in the responsible and ethical use of AI. They also had a much clearer understanding of the research process. In contrast, the fifth-year group simply asked the AI to write the literature survey, resulting in a well-written but vacuous piece of work filled with falsehoods, hallucinations, and fake references. The chapter concludes by pointing out that constructivist learning tasks can help students develop a good understanding of the value of a good prompt and use a step-by-step approach to generate the final project. It suggests that in future, the emphasis should be placed on the process of writing *with* AI, whereas in a posthuman sense, the focus should not be on the student, but on the task.

- In this chapter, you will learn about the potential of integrated process-based learning tasks in the context of AI in HE.
- You will discover how AI has democratised content production, but also poses challenges in distinguishing work done by AI from that done by humans.
- You will explore how constructivist learning can help mitigate these challenges by emphasising the process of writing with AI and focusing on the task rather than the learner.
- You will read about a case study in which students used ChatGPT – a language model AI – to generate prompts for their literature survey, and how they used a step-by-step approach to generate the final project.

Introduction

ChatGPT's launch on 30 November 2022 is probably the biggest disruption of HE since the World Wide Web. Where the Web democratised the acquisition of content, ChatGPT has democratised the production of content. Suddenly, using the same simple text entry box as Google, ChatGPT has allowed anybody to become a writer, a poet, an artist, or even a researcher. The problem driving this research lies in the difficulty to distinguish work that was done by AI from that which is done by humans, and how it affects the way we teach, learn, assess, and do research.

The chapter aims to explore the potential of constructivist learning tasks with a posthumanist approach to AI in HE. Two question drive this study: 1) What are the tenets of posthumanism related to AI in HE? and 2) How does constructivist learning exploit the advantages and mitigate the disadvantages of AI for HE?

Before ChatGPT, there were already many other platforms available that could analyse text, generate graphics, music, and even videos. It is just that the simplicity of ChatGPT made everybody sit upright and take notice of it. Almost immediately schools and universities realised that they had to revisit their policies and task teams, while advisory committees were set up everywhere, conferences and symposia erupted, and experts emerged rapidly with much debate and arguments for and against AI (Baidoo-Anu & Owusu Ansah 2023; Crompton & Burke 2023; Rudolph, Tan, & Tan 2023). Some of these, together with their implications are contained in Table 4.1.

As was the case with the introduction of calculators and later spreadsheets in mathematics and accounting, the initial call was for a total ban, followed by a grudging allowing with conditions, to productive use. This chapter argues for a shift in our thinking about teaching and learning to accommodate the radical change that has been brought about by the rise of AI.

Table 4.1 indicates that the main areas of concern centre around educator autonomy and role redefinition, enhanced teaching and learning, automated grading and feedback, access to vast knowledge resources, research and writing, accessibility and equity, ethical considerations, and a lack of transparency.

AI's main advantages in HE are situated in the redefinition of educator roles to focus on higher-order cognitive skills and human interaction, providing new tools and resources for educators to enhance instruction. It also allows for tailored instruction to individual needs and preferences, enhanced engagement and motivation, timely and efficient feedback, objective and consistent evaluation, 24/7 access to information and resources, personalised recommendations, and content curation, facilitating access to a wider range of information and resources. Additionally, AI enables real-time translation and communication across languages, improved global collaboration and understanding, assistance with writing tasks, brainstorming new ideas, and exploring creative possibilities. It also assists with literature reviews and analyses, data summarisation and interpretation, hypothesis generation, and testing. Moreover, AI

Table 4.1: Advantages and disadvantages of AI in HE

Category	Advantages	Disadvantages	Implications
Teacher autonomy and role redefinition	Redefinition of educator roles to focus on higher-order cognitive skills and human interaction.	May potentially diminish the role of educators and reduce their autonomy in the classroom	Support for educators in adapting to new roles and responsibilities
Enhanced teaching and learning	Provide new tools and resources for educators to enhance instruction. Tailored instruction to individual needs and preferences. Enhanced engagement and motivation.	May require significant time and effort for educators to adapt to and integrate LLMs (large language models) effectively. Potential for bias and discrimination if not carefully designed and implemented. Requires sophisticated algorithms and data collection.	Professional development and support for educators in LLM integration. Careful consideration of equity and inclusion in LLM implementation.
Automated grading and feedback	Timely and efficient feedback. Objective and consistent evaluation.	May not capture the nuances of human judgement. Over-reliance on automated feedback could hinder critical thinking. May diminish the importance of human interaction and nuanced feedback.	Careful integration of LLMs with human educator expertise.
Access to vast knowledge resources	24/7 access to information and resources. Personalised recommendations and content curation. Facilitate access to a wider range of information and resources.	Potential for information overload and misinformation. Requires careful curation and evaluation of resources. May lead to overreliance on LLMs and a decline in critical thinking skills.	Emphasis on developing critical thinking skills alongside LLM use.

Category	Advantages	Disadvantages	Implications
Research and writing	Real-time translation and communication across languages. Improved global collaboration and understanding. Assistance with writing tasks, such as summarising text, generating different creative text formats, and translating languages. Brainstorming new ideas and exploring creative possibilities. Literature review and analysis assistance. Data summarisation and interpretation. Hypothesis generation and testing.	Potential for inaccuracies and misinterpretations. May not capture the full richness and context of human language. Potential for plagiarism and a lack of originality. May not replace human creativity and critical thinking. Ethical considerations regarding data privacy and intellectual property. May reflect and perpetuate biases present in training data.	Develop clear guidelines for the use of LLMs in research and writing. Careful curation of training data and ongoing monitoring for bias. Development of methods to identify and mitigate bias in LLM outputs.
Accessibility and equity	Can provide support for students with diverse learning needs. Can expand access to education for underserved populations.	Ensure equitable access to LLM technology and training.	Bridge the digital divide and address potential inequities in LLM usage.
Ethical considerations and a lack of transparency	Forces us to develop clear ethical guidelines and transparent LLM algorithms.	Raise concerns about data privacy, intellectual property, and accountability.	Public discourse and policy discussions on LLM ethics.

can provide support for students with diverse learning needs and expand access to education for underserved populations. Lastly, it forces us to develop clear ethical guidelines and transparent LLM algorithms.

The key disadvantages of AI in HE are that it may potentially diminish the role of educators and reduce their autonomy in the classroom. It may also require significant time and effort for educators to adapt to and integrate LLMs effectively. There is a potential for bias and discrimination if not carefully designed and implemented, requiring sophisticated algorithms and data collection. Additionally, AI may not capture the nuances of human judgement, while an over-reliance on automated feedback could hinder critical thinking, diminishing the importance of human interaction and nuanced feedback. There is also the potential for information overload and misinformation, necessitating a careful curation and evaluation of resources. Moreover, there is a concern that an overreliance on LLMs could cause a decline in critical thinking skills, resulting in inaccuracies and misinterpretations. LLMs may not fully capture the richness and context of human language and there is a risk of plagiarism and a lack of originality. It is important to address ethical considerations regarding data privacy and intellectual property, as well as to ensure equitable access to LLM technology and training. These concerns also raise questions about data privacy, intellectual property, and accountability.

The key issues around AI in HE are the need to support educators in adapting to new roles and responsibilities, as well as professional development and support for educators in LLM integration. Careful consideration of equity and inclusion is crucial in LLM implementation, along with the careful integration of LLMs with human educator expertise. It is important to emphasise the development of critical thinking skills alongside LLM use. Clear guidelines should be developed for using LLMs in writing and research, while the training data should be carefully curated as ongoing monitoring for bias should be conducted. Methods to identify and mitigate bias in LLM outputs should also be developed. It is essential to bridge the digital divide and address potential inequities in LLM usage. Public discourse and policy discussions on LLM ethics are necessary to ensure responsible implementation.

Learning 3.0

The challenge lies in finding a model that deals with these issues. On his blog on 16 November 2021 Steve Wheeler (2012) presents a compelling argument for a whole new way of learning, based on the technologies of the then near future. He calls it Learning 3.0 (Table 4.2).

Table 4.2: Learning 1.0, 2.0, and 3.0 (Wheeler 2012)

	Learning 1.0	**Learning 3.0**	**Learning 3.0**
Learning Modes	Passive, individual	Active, social, collaborative	Participatory, social, community
Content Organisation	Hierarchy, top down	Hierarchy, bottom up	Networked, multi-nodal, multi-directional
Classification Mode	Taxonomy	Folksonomy	Rhizonomy
Content Provenance	Expert generated content	User generated content	User and machine generated content
Dominant Interfaces	Keyboard, mouse	Keyboard/ mouse, touch screen, voice/ gesture	Voice/gesture, direct implants, biometrics, content aware systems
Construct	Content is king	Context is king	Community is the curriculum
Theories	Behaviourist, cognitivist	Social constructivist	Connectivist, rhizomatic
Data Capture	1D barcodes	2D quick response tags, marker technology	3D holographics, extended marker technologies

Learning 1.0 is a traditional learning model in which students are passive recipients of information from an expert instructor (Wheeler 2012). Content is typically organised in a hierarchical

fashion, with students progressing from simple to complex topics. Knowledge is classified in a taxonomy, with clear distinctions between different subject areas. Content is generated by experts while students are expected to master this content before moving on to the next topic. The dominant interface in Learning 1.0 is the lecture, with students typically using textbooks and notebooks to take notes. The construct of Learning 1.0 is knowledge acquisition, and the educational theories that underpin it include behaviourism and cognitivism. Data capture in Learning 1.0 is typically limited to assessments such as exams and quizzes.

Learning 2.0 is a more social and interactive learning model where learners participate actively in the learning process. Content is typically organised in a less hierarchical fashion, with students able to choose their own learning paths. Knowledge is classified in a folksonomy, with tags and keywords used to describe content. Content is generated by both experts and students while students are encouraged to collaborate with each other and share their knowledge. The dominant interface in Learning 2.0 is the online learning platform, with students using a variety of tools such as discussion forums, wikis, and blogs to interact with each other and with the content. The construct of Learning 2.0 is knowledge construction, and the educational theories that underpin it include social constructivism and connectivism. Data capture in Learning 2.0 is more comprehensive than in Learning 1.0, with data collected from a variety of sources such as online learning platforms, social media, and learning games (Wheeler 2012).

Learning 3.0 is the most recent learning model, and it is characterised by its focus on personalisation, community, and technology. Content is typically organised in a networked fashion, with students able to access and create content from a variety of sources. Knowledge is classified in a rhizomic fashion, with multiple connections between different concepts. Content is generated by experts, students, and machines while students are encouraged to curate and personalise their own learning experiences. The dominant interface in Learning 3.0 is the mobile device, with students using a variety of apps and tools to access and create content, collaborate with others, and learn on the go. The construct of Learning 3.0 is community-based learning, and the educational theories that underpin it include connectivism and rhizomatic learning. Data capture in Learning 3.0 is the most comprehensive of all three learning models, with data collected from a variety of sources such as mobile devices, wearable devices, and the internet of things (Wheeler 2012).

Posthuman Learning

This chapter focuses on the shift towards Learning 3.0 and in particular in content provenance from expert-generated content, through user-generated content, to user and machine-generated content. The combination of humans and machines is known as a cyborg and forms the basis of the discourse on posthumanism. Essentially posthumanism questions the primacy of humans in the world and calls for the integration of humans and non-humans. Non-humans would include all of nature and the human-made environment.

Rosi Braidotti (2019) presents a useful theoretical framework for the critical posthumanities. She draws on Spinoza's concept of 'monism' that argues that the world operates as an interconnected whole without distinct categories and that everything is interrelated.

Another key aspect is transversal convergence, which calls for a synthesis across various points of view, including postcolonial, anti-racist, feminist, queer, and earth studies to generate novel solutions. Braidotti moves from apparent contradictions to integrations. Central to her philosophy is affirmative ethics, drawing inspiration from Spinoza's 'ethics of joy.' She argues that our focus should be on the positive dimensions of human and non-human relationships. Critically, she challenges the notion of human exceptionalism, urging a move beyond the idea that humans hold superior importance without entirely dismissing it. Braidotti calls for an interdisciplinary and postdisciplinary approach, urging the exploration of diverse fields to discover novel solutions and pushing beyond conventional disciplinary boundaries (Braidotti 2006). For Braidotti we are all nomads. We are constantly arriving somewhere, and at the same time we are departing from somewhere. She emphasises embodied and embedded perspectives, encouraging a grounded understanding derived from lived experiences and a discouraging reliance on overarching theories, stressing the importance of embedding posthumanist values within educational institutions. She argues that we should integrate posthumanist thinking and values into educational practices.

In such a fluid environment we need to question our love of binary opposites. One such binary opposition lies in the division between behaviourism and constructivism as learning theories shown in Table 4.3.

Table 4.3. Elements of behaviourist and constructivist instructional design (Ertmer & Newby 2013; Qiu 2020)

Category	**Behaviourist**	**Constructivist**
Process	Linear and sequential	Recursive, non-linear, sometimes chaotic
Planning	Systematic, top down	Organic, developmental, reflective, and collaborative
Instructors	Subject matter experts	Facilitators of learning processes
Objectives	Pre-stated and clearly formulated	Outcomes emerge as the process unfolds
Goal	Automaticity of sub-skills	Deep contextual learning
Data	Mainly objective	Often subjective
Evaluation	Summative	Formative

Table 4.3 portrays the characteristics of the two dimensions and indicate that they are mutually exclusive. However, this model cannot leverage the advantages of one dimension to offset the drawbacks of the other. Scholars suggest cognitivism as a middle ground between the dimensions (Ertmer & Newby 2013). Nevertheless, there is a debate among researchers about whether these approaches should be diametrically opposed (Rohlíková 2024; Ahmad, Sultana, & Jamil 2020; Hassad 2011; Rieber

1992; Shabo 1997; Zlatkova-Doncheva 2020). In keeping with Braidotti's concept of transversal convergence and her call for a synthesis across fields (Braidotti 2019), I argue that behaviourism and constructivism are not opposites but distinct philosophical approaches and I suggest an integration by plotting them as orthogonal dimensions, treating them as complementary (Cronjé 2000, 2006).

This integration forms a matrix with four quadrants that I call construction, integration, immersion, and injection. Construction is low in behaviourism and high in constructivism. It fosters students' ability to construct their own meaning. This domain resonates with what Seymor Papert called *constructionism* (Harel & Papert 1991) – a form of learning where students are given a task to construct something, and then once they have constructed it, know they have learnt all the skills required in doing so. Integration blends constructivist exploration with direct instruction, occurring rapidly and seemingly simultaneously, representing the domain of automaticity and expert learning (Bloom 1986). Immersion indicates that one is thrown into the deep end (Cronjé 2019:5 of 19). Injection involves this deep-end immersion. It is the domain of serendipitous learning as well as trial and error. Injection is characterised by high behaviourist elements, resembling classic and operant conditioning with a desire to 'inject' knowledge directly into the brain.

The four quadrants of learning are not mutually exclusive, and effective learning often involves a combination of different approaches. For example, a teacher might use a behaviourist approach to teach students the basic mechanics of a new language, but then use a constructivist approach to help students develop their fluency in using the language in real-world contexts.

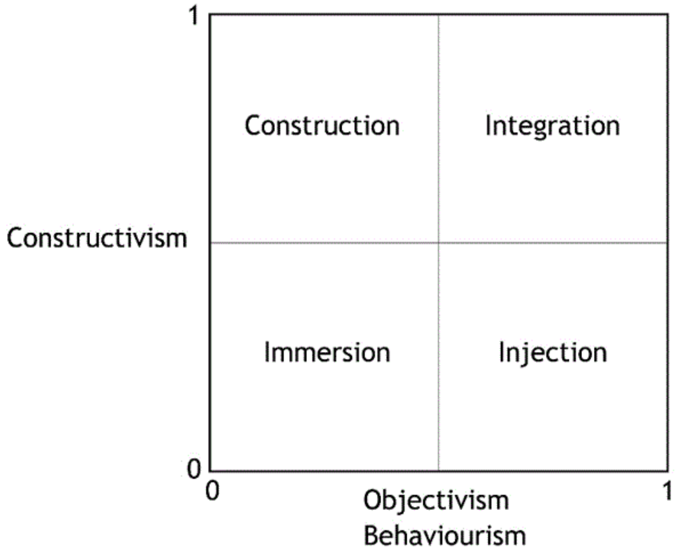

Figure 4.1: Integrating behaviourism and constructivism (Source: Cronjé 2000, 2006)

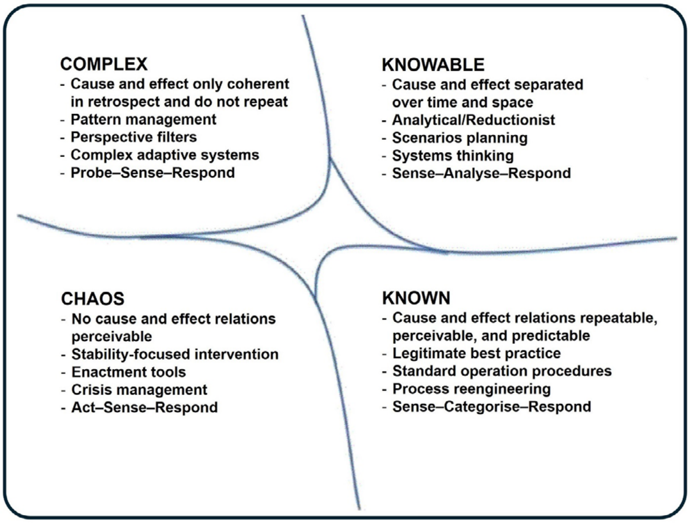

Figure 4.2: The Cynefin framework (Source: Adapted from Kurtz & Snowden 2003)

This four-quadrant model can be mapped directly onto the Cynefin framework (Figure 4.2 above) of decision-making (Kurtz & Snowden 2003). 'Cynefin' is a Welsh term that can be translated with *the place where we belong*, or *habitat*, and was designed to give decision-makers a sense of space in their problem-solving. At the centre of the framework we find the domain of disorder where no sense can be made. From there, depending on the structure of knowledge one moves into one of four domains: Chaos, complex, knowable, or known. The Cynefin framework, developed by Dave Snowden and Cynthia Kurtz, consists of five domains: Disorder, chaos, complex, knowable, and known. The domain of disorder represents a state where you do not know the type of causality that exists. It is a state of confusion where people will not make decisions that take them out of their comfort zones. It is the domain where it is unclear which of the other four domains apply.

In the *known* domain, challenges or problems are well understood, and solutions are evident. It is the domain of best practices, where addressing challenges requires minimal expertise. Issues addressed by help desks often fall into this category. The approach involves sensing the challenge, analysing it, applying expert knowledge, and executing the plan. The *knowable* domain involves challenges where the cause and effect relation requires analysis or investigation. It is the domain of good practices. It requires a greater level of expertise compared to the known domain. The relation between cause and effect in the complex domain is only perceivable retrospectively, not in advance. It is the domain of emergent solutions. The approach involves probing, sensing, and responding, allowing for the emergence of new practices. The *chaos* domain represents situations where, at systems level, no relation is visible between cause and effect. It is the domain of novel solutions. There is an act, sense, and respond approach that allows for the discovery of novel practices. The *chaos* domain represents situations where there is no relation between cause and effect at a systems level. It is the domain of novel solutions. The approach is to act, sense, and respond, allowing for the discovery of novel practices.

The four quadrants can be mapped directly onto the Cynefin framework. Table 4 indicates that in the *known* quadrant, direct instruction suits knowledge with clear cause-and-effect relations. It aligns with the *injection* quadrant, introducing instructor-known material systematically to all students, aiming for standardised understanding and efficient batch processing of learning. In the absence of clear cause-and-effect, the *immersion* quadrant promotes discovery learning, despite seemingly being chaotic. Experiential and incidental learning, apprenticeships, walking and talking, occur here, emphasising apprenticeships, field trips, and incidental learning. The *construction* quadrant, rooted in constructivism, involves students tackling complex tasks to construct solutions, aligning with Papert's 'constructionism.' It encompasses robotics, spreadsheets, and real-world experiences, encouraging pattern recognition by means of group work and reflection. The *integration* quadrant blends drill and practice efficiency with understanding. Educators choose the right mix of instruction and construction for fluency and comprehension of knowable outcomes.

Table 4.4: Mapping the views of Kurtz & Snowden onto Cronjé's paradigms (Aylward & Cronjé 2022:509)

Instructional Design Paradigm	Cynefin Framework	Implications
Injection Direct instruction of known cause and effect relations. High levels of standardisation and regulation of best practice. Drill and practice, standardised tests. Algorithms and recipes. Automaticity, automation.	**Known** Cause and effect relations repeatable, perceivable, and predictable. Legitimate best practice. Standard operating procedures. Process reengineering. Sense-categorise-respond.	This quadrant is where material known to the instructor but not to the student is introduced programmatically through a systematic approach, such as Gagne's events of instruction. The idea is to bring all students to the same standard before progressing.

Instructional Design Paradigm	Cynefin Framework	Implications
Immersion No direct instruction or constructivist scaffolding of relations. Student develops own stability. Iterative cycles. Thrown in at the deep end, trial-and-error, incidental learning.	**Chaos** No perceivable cause and effect relations. Stability-focused intervention. Enactment tools. Crisis management. Act-sense-respond.	Although it may seem that no learning can take place as there is no assistance for learners to make sense of the chaos, much of our experiential learning takes place in this quadrant, such as learning to walk and to talk.
Construction Emphasis on reflection, iterative processes and complex tasks. Fail-safe experimentation. Schema is valued. Group work for multiple perspectives. Complex tasks with multiple solutions. Cognitive scaffolding to support probing, sensing, and responding.	**Complex** Cause and effect are only coherent in retrospect and do not repeat. Pattern management. Perspective filters. Complex adaptive systems. Probe-sense-respond.	This is the quadrant that is high in constructivism and low in behaviourism where students are given complex tasks to construct solutions to learning problems. This is the area of robotics, spreadsheets, and even real experiments. The aim is for students to recognise patterns through reflection and group work.
Integration Systematic learning tasks with increasing levels of complexity. Analysis of learning goals to reduce cognitive load. Students are given clear instruction and then allowed to explore and construct.	**Knowable** Cause and effect separated over time and space. Analytical/ Reductionist. Systems thinking. Sense-analyse-respond.	This is the quadrant that integrates the efficiency of drill and practice with the effectiveness of understanding what you are doing; instructional designers will select the most appropriate blend of instruction and construction to ensure both fluency and understanding.

The theoretical designer framework has now dealt with integrating direct teaching and problem-based learning, as well as considering the knowledge domain. To complete the pedagogical triangle (Houssaye 1988) of educator, student, and content, student competency must be considered. Aylward (2018) proposes a model that fits a learning curve onto the combined model. This results in a taxonomy of learning competence comprising eight levels, as shown in Table 4.5.

Table 4.5: Aylward's levels of competency (Aylward & Cronjé 2022:514)

Level	Name	Description
0	Unaware	Uninformed, unknowing, uneducated, ignorant, or incompetent.
	Rudimentary knowledge	Being informed with limited understanding, no competence, no confidence or even over confidence (Dunning-Kruger). Inchoate.
	Novice I	Limited experience and confidence. Can follow a recipe with the aid of an instructor. Well defined, simple problem or scenario. Rudimentary.
	Novice II	Can follow a recipe with the aid of an instructor. Well defined, simple problem or scenario. Practical application.
	Intermediate I	Can follow a recipe unaided. Well defined, simple problem or scenario. Practical application. Have a working knowledge, basic competence, and confidence.
	Intermediate II	Can follow a recipe unaided. Well defined, medium complexity problem or scenario. Practical application. Has a well based competence and confidence. Competent level.
	Advanced I	Can devise a recipe or algorithm for a broadly defined complex problem and scenario. Master/ed level.
	Advanced II	Can devise a recipe for poorly or ill define problems or scenarios. Expert level.

Progressing through stages of proficiency, an individual starts as unaware, lacking knowledge of the required skill. Moving to rudimentary knowledge, they grasp the basics but lack competence. They might even be overconfident, not knowing what they do not know – the so-called Dunning-Kruger effect. Progressing to Novice I, they can apply the skill in simple situations with guidance. Advancing to Novice II, their application extends to more complex situations with some support. Reaching Intermediate I, they independently handle the skill in complex situations. Finally, at Intermediate II, they not only navigate complex scenarios but can also impart knowledge, teaching others how to master the skill.

Plotting these levels against time, Aylward shows how a learning curve develops with students first struggling to come to terms with new work, and then progressing quickly as their competence increases (Figure 4.3).

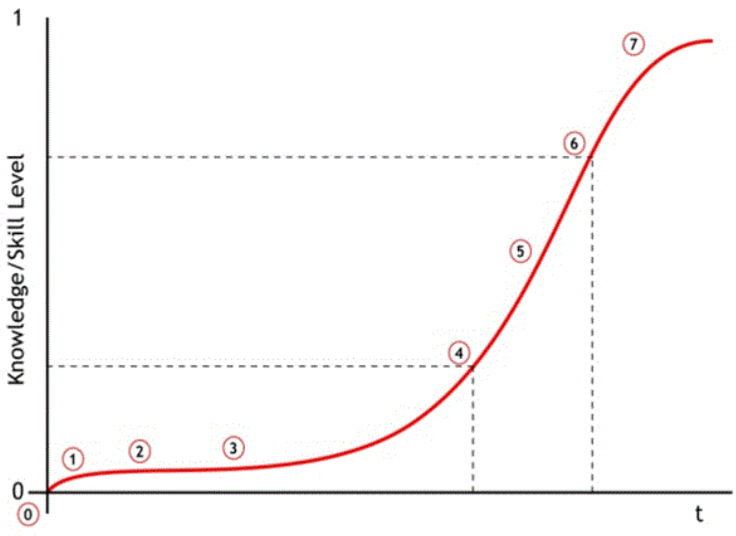

Figure 4.3: Aylward's learning curve (Source: Aylward 2018:1938)

The curve shown above can be turned into a parabola and plotted onto the four-quadrant model.

In the initial phases of learning, the brain processes unfamiliar information within the Cynefin framework's *disorder* domain, represented by the central diamond. Figure 4.4 shows how, depending on the student's knowledge level, from novice to expert, they swiftly move to one of four main domains. Initially, little actual learning occurs as the brain readies itself to assimilate the presented information. Not all learning requires reaching the expert level. Some fields only demand a working knowledge – competence – where one can follow a recipe independently. To achieve this, fundamental knowledge and practice are essential. This occurs in the *injection* domain where an expert instructs the participant primarily through practice, such as explaining steps of the recipe. Certain fields involve applying knowledge and skills practically. Transitioning from the *immersion* domain to the *construction* domain, participants develop their value systems by engaging in discovery and experimentation. Instruction involves a practical application in a fail-safe environment. The highest level of learning occurs in the *integration* domain, where collaboration among peers leads to new knowledge and methods. Instruction involves engaging in debates and projects, pushing boundaries in cross-field integration.

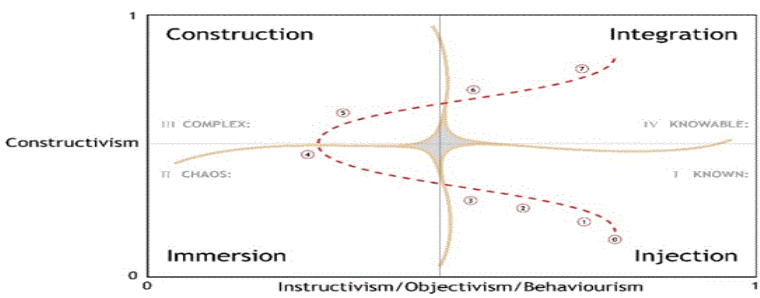

Figure 4.4: The learning curve fitted onto the integrated model (Aylward & Cronjé 2022)

Synthesis

Based on Spinoza's monism we have now created a unified model to integrate teaching, content and the student. In this way we have activated Braidotti's concept of transversal convergence, by creating a synthesis across various points of view, including behaviourism and constructivism, and have moved from apparent contradictions to integrations. Given the nomadic nature of our lives, we must shift from a product-oriented view of learning – where the final outcome is assessed as evidence of learning – to a process-oriented approach that evaluates the entire journey and experience of learning as it unfolds.

The process starts by imparting foundational knowledge to novices. This is most effectively achieved through direct instruction, referred to as injection. Instruction can be provided through formats such as lectures, tutorials, or drills. Lectures may be presented using various methods, including in-person delivery, video recordings, printed books, e-books in PDF format, or other one-way communication channels. While computer-based tutorials enable interactive feedback, similar opportunities can also be included in conventional face-to-face teaching. Students can be encouraged to use AI to simplify complex texts. They could use AI to build tables of comparison between texts, group similar items together, and provide examples and counter examples.

Once students have formed a basic understanding we move into the *immersion* quadrant where they enter the realm of serendipitous learning through experience, encountered in daily life. They can be left to explore various instances of the occurrence that they are studying. This domain aligns with methodologies such as work-integrated learning or field trips. Here students could use AI tools that allow them to explore various activities – tools that build visual representations of knowledge structures.

Intermediate-level students engage with complex knowledge through the approach of construction. This includes engaging in projects, conducting laboratory experiments, and participating in problem-based learning activities designed to match their skill level. This is where students would use Gen-AI (Generative Artificial Intelligence) to do structured tasks in order to construct artefacts that will show that they have mastered the material.

Knowable knowledge falls within the realm of advanced and expert students. Here, an optimal blend of resources essential for effective learning integration is employed. This domain fosters the highest degree of student autonomy, allowing individuals, based on their expertise, to discern and prioritise their learning needs. This is where students will be expected to synthesise all their experiences gained in the process to define their own learning challenge, set their own goals, do their own explorations, construct their own solutions, and perform an evaluation of those solutions. Table 6 provides a synthesis of paradigms, knowledge domains, mastery level, learning tasks and AI platforms that can be used throughout the learning process.

Table 4.6: A framework for designing learning tasks with AI

Paradigm	Knowledge (Kurtz & Snowden)	Mastery Level	Tasks	AI Platform
Injection	Known	0-3 Unaware, rudimentary knowledge	Compare the responses of various AI platforms to the same question. Use AI to simplify complicated texts. Use AI to make tables of comparison. Use AI to group similar items together.	ChatGPT Bard Bing YouChat Perplexity ChatPDF Paper Digest Semantic Scholar
Immersion	Chaos	0-7 All levels, experienced mostly by levels 3 and 4	Determine the leaders in the field. Identify the key debates. Show the relations between elements in the field.	Connected papers Lateral Litmaps Research rabbit

Paradigm	Knowledge (Kurtz & Snowden)	Mastery Level	Tasks	AI Platform
Construction	Complex	4-5 Intermediate	Create a spreadsheet with the key papers in the field. Rank the issues in order of importance to you.	Scispace Elicit
Integration	Knowable	6-7 Advanced	Create a branching tree diagram of your relationship with the field. Write an annotated bibliography of the spreadsheet above. Fill out the branching tree to a fully-fledged paper relating your own experience to what you have learnt.	Voyant Jenni Quillbot Writefull Dall-e Leonardo

After receiving direct instruction of known knowledge, such as watching online videos, novice students can be asked to use AI to assist them with tasks such as comparing responses to the same question, simplifying complicated texts, creating tables of comparison, grouping similar items together. Once they have some grasp of the field, they can be left in the *immersion* quadrant to use AI in determining leaders in the field, identifying key debates, showing the relations between elements in the field. Intermediate students can be asked to use AI in constructing artefacts such as spreadsheets with key papers, ranking issues in order of importance, and creating branching tree diagrams. Advanced students can integrate all their skills and achieve knowable knowledge by using AI in and creating visual representations of the field as it relates to the individual. These technologies can help automate processes, analyse data, and provide insights to support decision-making and learning.

A Worked Example

This case study is a synthesis of various exercises that I have given students over the past year, encouraging them to use AI wherever possible. The case is a fourth-year research methods class for Information Technology students. This is the first time they had to do any research and the aim of the course is to take them through the process of developing a research proposal, executing the research and writing it down. The exercise under discussion was the construction of a literature survey.

Rudimentary, Known, Injection

Students were asked to watch a YouTube video explaining the purpose and process of writing a literature survey. They were then given a multiple-choice test to complete to ensure that they had sufficient knowledge. They could watch the video and do the test as many times as they liked but could only proceed to the next level once they had obtained 75% for the test. Once having reached the 75% grade students were asked to prompt a chatbot of their choice to act as a coach to assist them in finding a suitable research topic for themselves. The topic had to align with their goal with the course they were doing, with their own reality on the ground (their available time, resources, interests, etc.) They had to determine the most opportune field to study, based on their progress in the rest of the course. Finally they had to develop a research plan going forward.

Novice, Chaos, Immersion

Once they had some understanding of the process students were asked to use AI literature search engines to orientate themselves in the field. They had to use two or three different sites, such as Connected Papers, Research Rabbit, and Litmaps to create representations of the field and finally they had to provide the key topics for their own literature outline.

Intermediate, Complex, Construction

Students were asked to use sites such as Scispace and Elicit to make tables that summarise the key elements of concern in their field. They had to make headings such as Title, Abstract, Keywords, Methods, Key Findings, Conclusions, Limitations, and Recommendations for further research. They then had to export these tables to a spreadsheet, cluster the themes according to the graphic representations they had made in the previous phase, and rank them in a logical sequence.

Advanced, Knowable, Integration

The students now had to combine the representations generated in the *immersion* phase with the spreadsheet constructed in the previous phase and generate a branching tree diagram that would form the outline of the literature survey. Having worked with as many as 150 articles they now had a good idea of the structure of a paper, as well as the structure of a literature survey. They were therefore asked to use the tree diagram to develop an outline for their paper, and then to use mail merge to extract relevant quotations from their spreadsheets. Once they had arranged their quotations in a proper sequence, they could decide which they wished to use in inverted commas, and which they wanted to paraphrase and cite. Finally they could use any chatbot of their choice to assist them in assembling the final literature survey. As an appendix to their paper they had to attach a sheet containing every AI that they had used, as well as all the prompts that they put into the AI.

Conclusion

A comparison of the work done by the students in the case study and a group of fifth-year students who did not follow the process showed that they had developed an insight into the responsible and ethical use of AI. They were exposed to many more academic papers than the seniors and had a much clearer understanding of the research process. An analysis of their prompts showed that they had developed a good understanding of the value of a good prompt and used a step-by-step approach to generate the final project. The fifth-year group, on the other hand, simply asked the AI to write the literature survey and the result was invariably a well-written, but vacuous piece of work filled with falsehoods, hallucinations, and fake references.

It is clear that in future the emphasis should be placed on the process of writing with AI. However, in a posthuman sense the focus should not be on the learner, but on the task.

Ethical Use of AI in this Chapter

The following AI platforms were used in producing this chapter: PaperDigest was used for the initial discovery of literature. ChatPDF was used to simplify the highly complex writing style of Braidotti, with the prompt 'Explain this to a high school learner.' Bard was used to combine all the resources on advantages and disadvantages of AI for HE and draw up the table of comparison. You.com, Perplexity, and ChatGPT were used to paraphrase, simplify, and expand certain passages, as well as to produce explanations of tables with prompts such as 'Please rewrite this, grouping similar elements together and putting it in a logical sequence,' or 'Please rewrite this bulleted list as a running paragraph,' or 'Please convert this paragraph into a bulleted list.' The abstract was written by ChatPDF. No AI-generated text was copied and pasted without first having been scrutinised, verified, and edited by the author. The author takes full responsibility for the accuracy of the information provided here.

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