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A nexus of systems converging around an interactive principle underpinning education, research and innovation

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A nexus of systems converging around an interactive principle underpinning education, research and innovation

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Abstract
This paper deals with the development of a systemic model which revealed an interactive principle underpinning education, research and innovation. This principle can be observed to operate in diverse contexts, as it deals with commonalities and not the surface operational details. This is because it reveals the need for certain mechanisms to perform essential functions in pedagogy, research and innovation, but does not specify the forms each mechanism should take, which are left up to the stakeholders in different contexts. The principle underpins a systemic model of course design, which the authors have used to produce two AI applications, which we suggest have immediate relevance and use in Higher Education institutions. It is our contention that AI applications should be informed by the judgement and experience of human educators, as these are attributes which AI tools lack, as well as feelings of emotional empathy and care for students. This paper will show how this principle has been applied in a variety of educational interactions since its inception, as well as in two recent applications involving AI tools. The development of this concept took place within a critical realist approach, which explores the nature of reality, looks at the often unperceived mechanisms underpinning structures and events, and uses these conceptual insights to develop practical interventions in social life. We suggest that, if the deep-level structure of the mechanisms which govern social systems such as education can be identified, the systemic models thus formed can be used to gain insight into educational design and evaluation, whether for face-to-face, blended or digital pedagogy. The interactive principle underpinning these conceptual models can be seen to form a nexus of systems underpinning education, research and innovation in terms of showing the deep structure of interactions in these areas. The principle reflects the intuitions of experienced educators and researchers expressed in a myriad of outward practical applications.

Key words: *systemic modelling, mechanisms, principles, practical applications, critical realism, AI tools*

Introduction

This paper deals with the development of a systemic model which revealed an interactive principle underpinning education, research and innovation. Work so far has shown that the principle can be observed to operate in diverse contexts, as it deals with commonalities and not the surface details of each context. It will be suggested that this is because the principle reveals the need for certain mechanisms to perform essential functions in pedagogy, research and innovation, but does not specify the forms each mechanism should take: this is left up to the stakeholders in different contexts. In particular, the principle underpins a systemic model of course design, which the authors have used to produce two AI applications which, we believe, have immediate relevance and use in Higher Education institutions. It is our contention that AI applications, whether simple AI agents or devices created by agentic AI, should be informed by the judgement and experience of human educators, as these are attributes which AI tools lack, as well as feelings of emotional empathy and care for students, which cannot be outsourced to algorithms. The model of course design makes it quite clear that it is human designers, with feedback from

participants, who should decide what the various elements of a course will constitute, and how they will be applied, monitored and evaluated.

This account will show how this principle has been applied in a variety of educational interactions since its inception, as well as in two recent applications involving AI tools. The development of the principle discussed here occurred within a critical realist approach, which explores the nature of reality, and looks at the often unperceived mechanisms underpinning structures and events. However, it uses these conceptual insights to develop practical interventions in social life. It is the contention of this paper that, if the deep-level structure of the mechanisms which govern social systems such as education can be identified, the systemic models thus formed can be used to gain insight into educational design and evaluation, whether for face-to-face, blended or digital pedagogy.

This paper first looks at the nexus of systems and shows how these converge around an interactive principle discovered in doctoral research. The deep conceptual structure thus revealed is shown to underpin various social processes, including in-person pedagogy, eLearning and blended learning approaches. Next, the theory and practice of AI applications is discussed in terms of how the principle assists in categorizing AI tools as mechanisms, designed, produced, applied and monitored by humans for the use of human educators and researchers, and not as autonomous actors. Practical applications designed and developed by the authors are used to illustrate this point, as well as emphasizing the fact that both lecturing and supervision require an ethic of care for students and colleagues, which is something which cannot be suppled (merely mediated) by AI tools.

The Nexus of Systems

An attempt to conceptualise the inchoate mass of deep-structure concepts, and work out how they are interrelated to each other and social structures is shown in Figure 1.

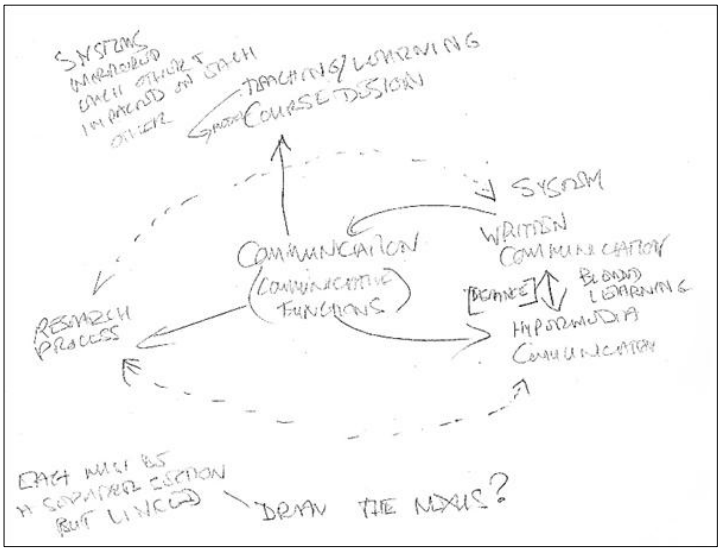

Figure 1. Sketch of the nexus of inter-related systems

The interactive principle is depicted in Figure 2 as being at the centre of the nexus of inter-related systems, underpinning their systemic models. This principle was discovered when it was seen to explain the model of communicative functions, and was originally identified as the system of communicative functions itself (Pratt 2005b: 137-138; 2011a: 145). However, its resonances with the functions needed for teaching/learning and research, as well as other interactive social processes (e.g. art, design, and crafting), meant it was later viewed rather as a deep-structure interactive principle conceptually underpinning the following processes:

- Communication, with subsystems in-person, written, and hypermedia communication;
- Education, with subsystems in-person, virtual and blended pedagogy;
- Research (this is related to the other systems, as communication, learning, and now, hypermedia, are all integral to the research process). (Pratt 2009: 3)

innovation		**Model of course design**		*innovation*
	virtual pedagogy	←[blended learning]→	*in-person pedagogy*	
Model of research process	*inquiry*	**INTERACTIVE PRINCIPLE**	*communication*	**Model of communicative functions**
	virtual communication	[distanced communication]	*writing/reading*	
innovation		**Model of hypermedia communication**		*innovation*

Figure 2 The interactive principle underpinning the inter-related systems

Innovation is situated in all four quadrants to show that, no matter how new or original the innovations are, they serve the ends of the essential functions of all four systemic models, using creative new ways to carry out these functions. Recognition of the interactive principle operating in different areas and contexts means that innovations can be seen as being guided by core principles, and not just surface features of a process (Archer 1998: 196). It must be stressed that the above compilation is not meant to be exhaustive: crafting, artefact design and creative arts can all be seen to show features of being underpinned by the interactive principle (Pratt 2011a: 139).

An advantage of systemic modelling is that it helps to identify the commonalities in social structures. While contextual issues might change, in most social processes there are enduring features, which are realised differently in different contexts. While is it not feasible to demonstrate how the interactive principle underpins all the processes shown in Figure 2, Table 1 illustrates how the principle underpins communication, learning and research (Pratt 2009: 5).

Table 1 The interactive principle underpinning communication, learning and research

System of Functions	INTERACTIVE SOCIAL PROCESSES UNDERPINNED BY A COMMON PRINCIPLE		
	Communication	**Learning**	**Research**
Contextual	… must be contextualised.	…must be contextualised.	…must be contextualised.
Ideational	… needs message content.	…needs knowledge content.	…needs knowledge content.
Interactive	… constructs meaning in interactions.	…constructs knowledge in interactions.	…constructs knowledge in interactions.
Social	… is governed by social mores.	…is governed by academic criteria.	…is governed by research conventions.
Reflexive	… is regulated by feedback.	…is regulated by feedback.	…is regulated by feedback.

Identifying commonalities in social processes when adapting them to fit new contexts is particularly important in education, which is by nature conservative and slow to change (Anderson 2023; Masters 2025). For example, putting well known classroom terms and motifs in early eLearning courses helped students and staff to adapt to the change to a virtual delivery medium (Figure 3). In one blended learning semester course, the online course materials had student photographs as a backdrop, showing students that the virtual course was about *them*, and that they could be as at home on the Internet as they were in the lecture room (Figure 4). The home screen of the CALT Online coursework masters in Language Practice (Figure 5) showed students sitting at computer benches as a 'normal' aspect of master's research, their community of practice being extended after hours by virtue of being able to communicate on LMS tools and take part in related research activities. Such courses were based on the commonalities of the research process but were innovative in terms of the virtual mechanisms used to enhance them.

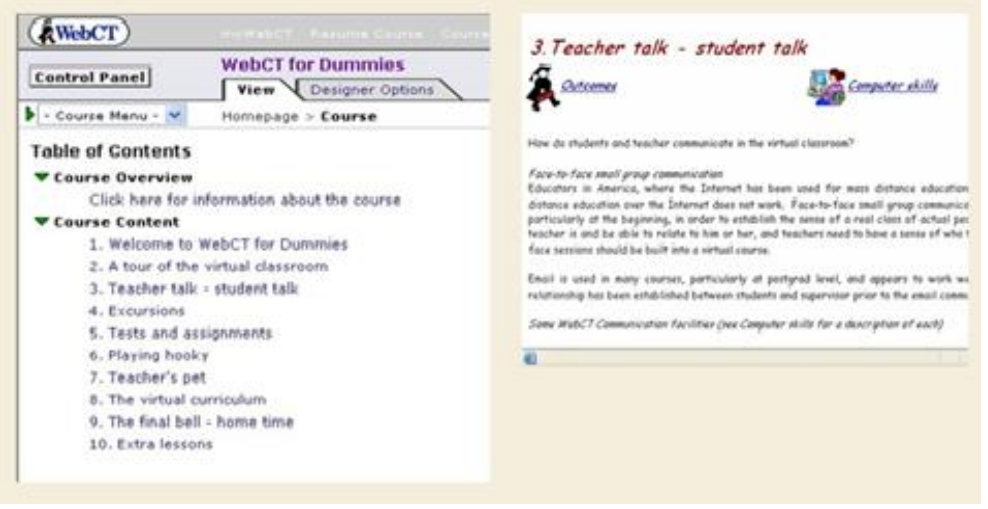

Figure 3 An early online course with familiar classroom terms and motifs

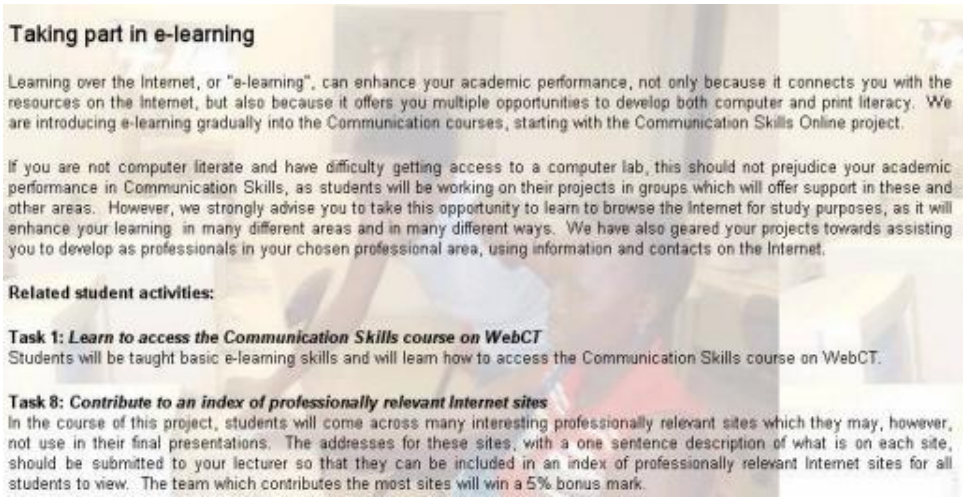

Figure 4 Student photo shots as background to online course materials

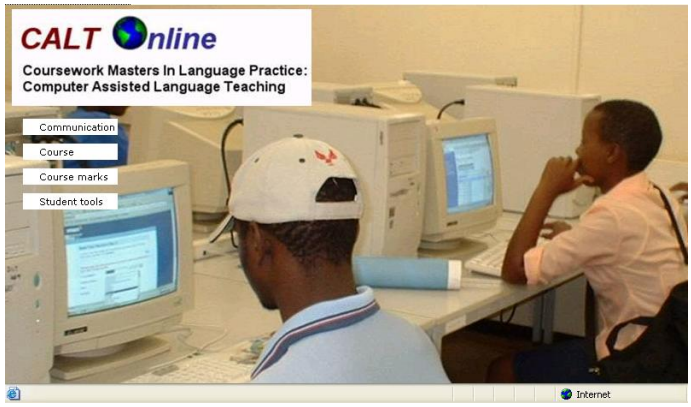

Figure 5 Homepage of *CALT Online*

Systemic Modelling within a Critical Realist Approach

Modelling is a typical preoccupation of critical realism, a philosophy developed primarily by Roy Bhaskar (1979, 1986, 1989, 1994, 2008) with notable contributions by Margaret Archer (1995, 1998, 2002, 2004) on social structure. The authors adopted this orientation because Bhaskar's ontology explains how real world events and our perceptions of them are shaped by underlying mechanisms, which constitute the 'DNA', as it were, of material and social entities and their functioning in the real world (Bhaskar 1998: xii). In other words, it explains the deep structure or principles of entities, including social structures and processes. These deep structures are not observable, and are apparent only in their outer manifestations, but they are real in terms of causality: they cause real entities to be what they are and behave as they do (Bhaskar 2008: 8). Using systemic modelling to understand such principles offers insight into ways of improving the quality of life in key areas such as communication, education, and research. Such insights can also suggest how to create meaningful innovations which will consolidate as well as improve social

structures and not just function as arbitrary 'add-ons' or 'one solution solves all problems', as appears to be academia's current reaction to AI.

Systemic modelling uses reverse engineering, or classical induction, to model social systems in various discipline in the social sciences, including archaeology, demography, economy, engineering, geography, comparative politics, experimental psychology, sociology and the philosophy of science (Franck 2002, 2011). The systemic modelling process described by the authors is based on the seminal work of Robert Franck (2002), who summarises the systemic modelling process as follows:

> (1) Beginning with the systematic observation of certain properties of a given social system, (2) we infer the formal (conceptual) structure which is implied by those properties. (3) This formal structure, in turn, guides our study of the social mechanism which generates the observed properties. (4) The mechanism, once identified, either confirms the advanced formal structure, or indicates that we need to revise it. (Franck 2002: 295).

This process results in two models, theoretical and empirical, representing the formal and applied aspects of the social mechanism. While the modelling process is similar to that used in grounded theory methodology (Strauss and Corbin 1994, 1999), Franck's formulation of the modelling process illustrates more precisely the ways in which theory and data interact to develop a theoretical model (Pratt 2007b: 65).

The formulation of the various models described in this paper was influenced by teaching and research needs, and jumped backwards and forwards along a chronological continuum:

- 1986-1987: Investigation into the nature of writing identified writing as a communicative process, mediated by text (Pratt 1987). The text was the code, not the process, which was seen to occur in five recursive stages, without the underlying rationale for these specific stages being explained.
- 2002-2008: Involvement in eLearning courses and systemic modelling to explain the stages involved in written communication led to the formulation of a model of communicative functions, revealing that the five stages carried out the functions needed to achieve communication, as well as how they operated in the context of hypermedia (Pratt 2007a).
- 2010-2011: Doctoral research and three books written in this period clarified the functioning of the systemic model in detailed examples of video protocol analysis of writing; identified the interactive principle underpinning writing; and explained how this principle underpinned research as well as teaching/learning interactions (Pratt 2010, 2011a, 2011b).
- 2012-2021: Conference papers/Supervision on ICT/Moodle research resources provided a multi-disciplinary perspective on the interactive principle, as well as suggesting that the Internet constitutes a social system (Pratt 2014).
- 2022-2025: A focus on AI in education, and developing a conceptual framework to inform AI applications, added yet another dimension to the principle's operation (Reddy and Pratt 2024; Pratt and Reddy 2025; Reddy and Pratt 2025).

The model of course design arose in the course of the above activities (Pratt 2005a), and the authors' involvement in pedagogy, research, conference papers, articles and practical

applications explored the model of course design in depth, starting with online courses and then turning back in recursive fashion to explain in-person pedagogy with a brief excursion into hypermedia communication. The products of this exploration were as follows:

- A model of eLearning/blended course design
- A model of in-person pedagogy (including peer and self-learning)
- The interactive principle (informing not only communication, but also other interactive processes, e.g. research, teaching/learning)
- An explanation of how distancing in communication affected delivery mode
- A theory explaining hypermedia communication
- A theoretical framework clarifying the role of AI agents and agentic AI in education.

At the time of writing this paper there was no systemic model of innovation as yet formulated, merely agreement that innovation is context-dependent (Baumol 2010; Autio *et al.* 2014; Fernández and Oliver 2025), which is why it has been depicted in the corner quadrants of Figure 2.

AI in Education

In keeping with the critical realist approach, it is suggested that AI should be envisaged as a mechanism with the potential to impact significantly on pedagogy. A mechanism is defined as "a physical, social or mental process characterized by some particular configuration of its components, that normally leads to some specific outcome" (Pratt 2011a: 208). It can refer to natural or social processes, but a social mechanism involves more than a description of a social process: it includes a formal or theoretical aspect which characterises the essential nature of that process (Bhaskar 1978: 88; Franck 2002: 96). The systemic model of course design contains a formal aspect, the system of essential functions, which underpins the applied aspect, the latter being practical accounts of how these functions are carried out in different real-world educational contexts.

In our conceptual exploration and practical work on AI in education so far, we have developed a theoretical framework comprising a model of AI/human interaction (Hansen 2023: 3) and the systemic model of course design (Reddy and Pratt 2024; Reddy and Pratt 2025). The systemic model of course design shows what functions need to be carried out in designing courses (in-person, blended or virtual). Hansen's (2023: 3) model showed how AI tools can act as enhancements (termed "augmentations") to design processes. Hansen was dealing specifically with the graphic design process, but his model has been adapted to cater for any design process, including course design (Reddy and Pratt 2025). According to the adapted model, while there is some overlap between the elements, human designers are able to carry out certain design processes better than AI tools and vice versa, suggesting that collaboration between human designers and AI tools should be based on what each does best. Hansen's adapted model shows that abductive, deductive and inductive processing should be shared between human and AI agency as follows:

> The key aspects of the model relevant to pedagogical processes are that abduction refers to reasoning done by human designers, which needs human judgement and creativity; deduction, to ready-made rules and/or tools which can be applied by digital apps; and induction, to tools which digital apps can create from data gathered, including agents designed for specific tasks. (Pratt and Reddy 2025: 226)

These modes are all aspects of human thinking, as shown in Figure 6. However, delegating onerous aspects of left-brain analytical thinking to AI tools can relieve educators of boring, repetitive and exhausting large-scale processing, and allow us to focus on the more creative, intuitive aspects of course design, using our pedagogical experience and applying an ethic of care. While the human brain processes real-world data in much the same way as AI algorithms (Mahner *et al.* 2025), AI agents do not possess educator experience or emotional empathy (Gibbs 2017). AI tools and agentic AI can analyze texts to assess what students are feeling, but they cannot actually understand what it is to experience emotion. Finally, human interactions (including pedagogical) have long-established and culture-specific moves and sequences which even then need to be adjusted to suit learner age, gender, and culture.

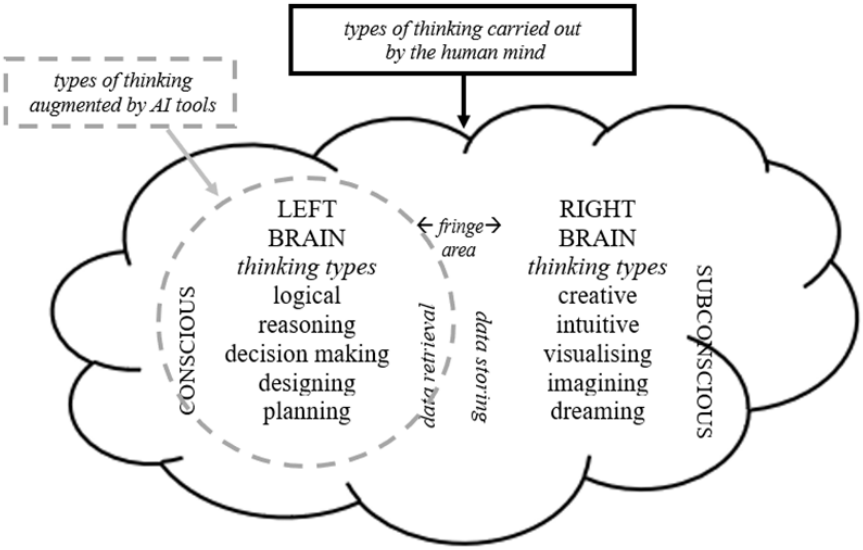

Figure 6 Types of thinking augmented by AI tools (Pratt 2025: 4)

It is unlikely that AI agents will ever be able to think and/or communicate as sentient human beings (Fjelland 2020). It is rather the powerful and swift processing skills of vast amounts of data that make AI tools (agentic and simple agents) an invaluable enhancement for educational processes (Tahiru 2021: 3; Brits 2025: [1]; Gerlich 2025: 27-28). These are the attributes the authors harnessed for two AI applications developed thus far, a course design evaluator, and a course feedback survey for students, both intended to operate on the DUT LMS, Moodle.

The course design evaluator dealt with evaluation of online course design, as expressed in verbal text, using agentic AI to develop an evaluator agent (agentic AI had the complex task of constructing the agent, whereas the simple agent thus created had one function only (i.e., text analysis). The course feedback survey involved evaluation of the actual course, as an event experienced by participants, using an AI agent, but set up by the authors. However, both apps were informed by the online course design rubric, which was formulated for evaluation of course design as well as course delivery (Reddy and Pratt 2024).

Online Course Design Evaluator

The course design evaluator is an AI agent which agentic AI, Copilot, was briefed to produce. The briefing consisted of giving it (Copilot) the model of course design: this was achieved simply by inputting (into Copilot) the author's paper describing "The proposed online course assessment model" (Reddy and Pratt 2024: 6897). This rubric was the authors' means of giving agentic AI educator experience of the prerequisites for effective course design. Copilot then produced an AI agent, course design evaluator, with an input option for inserting the names of courses to be evaluated, using the course design rubric with which it had been programmed by Copilot. Course design evaluator was given two online course designs (chosen randomly) to evaluate: the MIT course, *Introduction to Computational Thinking and Data Science* and the *AI Fluency Project* on GitHub. This involved a verbal analysis of the course design text; research (Carew 2025)(REFS) has shown that AI tools are better (and much faster) at textual analysis than humans (we do not claim that the AI evaluator *understood* the text).

Course Feedback Survey

The Moodle survey tool was set up (by human agency) according to the framework given in the model, so that it might elicit, collate and analyse participants' responses to online courses. Participants would include not only students, but also lecturers and course designers. The survey took longer to set up, and required adjustments to ensure that it met the given parameters and did the job it was intended to do, assuring participants of anonymity. While it has not yet been set up on DUT TLZ Moodle and tested out by registered students, results so far show that it operates as designed, that is, to collect confidential feedback on how individual participants experienced a course, including suggestions as to how the course could be improved.

Results

The online course evaluator removed the drudgery of trolling through course design texts and was able to identify and deliver a comprehensive and clear exposition on both exemplary features and shortcomings in course design in under 45 seconds. This provides an exemplar of using AI for a function at which it is best, textual analysis, providing a clear picture of the verbal content of documents, or "cognitive empathy" (Carew 2025: 4). The course feedback survey is built into Moodle and thus will expedite the course evaluation process, enabling it to be completed at the participants' convenience, giving them a 'voice' and collecting and analysing evidence as to how they actually experienced doing the course.

Conclusion

The concepts in this paper are grounded in first-hand course design and teaching experience, research, and most importantly, in continued attempts to explain these concepts in writing. Writing is how inchoate, fleeting moments of insight become anchored in verbal texts, explaining discoveries not only to the intended readers but also to the authors themselves. It is in fact a key learning mechanism, as, in the attempt to explain our ideas to others, our writing tells *us* what *we* are thinking. Moreover, use of multimedia in conference YouTube presentations, and even now developing as a feature of hitherto print text research publications, means that visual and kinetic media are now included in the layers enhancing understanding. The projects described here provide exemplars of digital/human collaboration which might form the basis of later projects using AI agents in more complex scenarios. The contribution to knowledge is thought to

lie in demonstrating the practical application of curriculum theory to provide feedback that can not only carry out mass evaluation of online courses but can also be used to suggest refinements to specific courses. It must be noted that the model of online course design developed by the authors, while underpinned by the interactive principle, specifically mentioned online course design, feedback by participants (including instructors) and encouragement to suggest improvements to the course (Reddy and Pratt 2024: 6897).

We conclude, however, with the caveat that that AI tools are currently, and will be in the future, incapable of human thought or meaningful interpersonal communication (Fjelland 2020; Peter, Riemer and West 2025), which makes their use in higher education problematic, and the term 'human-AI collaboration' fraught with misconceptions. Humans do not collaborate with machines: we live in technosystems layered with machines (Aunger 2010: 776), and need to adapt to their use, without over-personification of their attributes with smiley faces or imagining they can replace us (Claypool 2023). Mechanisms have been used to extend human capacity ever since our forbears picked up the first rock. Social structure might have changed over the eons as we adapted to live in increasingly complex technosystems, but we are not puppets of social structures (Archer 2004, 2007) and our actions are motivated by personal aspirations, affections and values.

References

Anderson, J. 2023. Higher education's resistance to change. *EdCast*. Available: https://www.gse.harvard.edu/ideas/edcast/23/11/higher-educations-resistance-change (Accessed 29 September 2025).

Archer, M. 1995. *Realist social theory: the morphogenetic approach*. Cambridge: Cambridge University Press.

Archer, M. 1998. Introduction: realism in the social sciences. In: Archer, M., Bhaskar, R., Collier, A., Lawson, T. and Norrie, A. eds. *Critical realism. Essential readings*. London: Routledge, 189-205.

Archer, M. 2002. Realism and the problem of agency. *Journal of Critical Realism* 5(1): 11-20.

Archer, M. 2004. *Being human: the problem of agency*. Cambridge: Cambridge University Press.

Archer, M. 2007. The trajectory of the morphogenetic approach. *Sociologia, Problemas e Práticas*, 54: 35-47.

Aunger, R. 2010. Types of technology. *Technological Forecasting & Social Change*, 77: 762-782.

Autio, E., Kenney, M., Mustar, P., Siegel, D. and Wright, M. 2014. Entrepreneurial innovation: the importance of context. *Research Policy*, 43 (7): 1097-1108.

Baumol, W. J. ed. 2010. *The microtheory of innovative entrepreneurship.* Princeton NJ: Princeton University Press.

Bhaskar, R. 1978. *A realist theory of science*. Hassocks: Harvester Press.

Bhaskar, R. 1979. *The possibility of naturalism: a philosophical critique of the contemporary human sciences*. Brighton: Harvester Press.

Bhaskar, R. 1986. *Scientific realism and human emancipation*. London: Verso.

Bhaskar, R. 1989. *Reclaiming reality: a critical introduction to philosophy*. London: Verso.

Bhaskar, R. 1994. *Plato etc.: the problems of philosophy and their resolution*. London: Verso.

Bhaskar, R. 1998. General introduction. In: Archer, M., Bhaskar, R., Collier, A., Lawson, T. and Norrie, A. eds. *Critical realism. Essential readings*. London: Routledge, ix-xxiv.

Bhaskar, R. 2008. *A realist theory of science.* 3rd ed. London: Routledge.

Brits, M. 2025. *Rethinking science education in the age of AI*. Available: https://www.ufs.ac.za/templates/news-archive-item/campus-news/2025/july/rethinking-science-education-in-the-age-of-ai (Accessed 28 September 2025).

Carew, J. 2025. Meeting of minds at Wits' AI institute. *ITWeb*. Available: https://www.itweb.co.za/article/meeting-of-minds-at-wits-ai-institute/kLgB17ezoe1M59N4 (Accessed 28 February 2025).

Claypool, R. 2023. Chatbots are not people: designed-in dangers of human-like AI systems. *Public Citizen,* 26 September 2023. Available: https://www.citizen.org/article/chatbots-are-not-people-dangerous-human-like-anthropomorphic-ai-report/

Fernández, D. L. and Oliver, M. 2025. Methodology, strategies, and factors for business innovation in large companies. *International Journal of Innovation Studies,* 9: 91-115. Available: https://www.sciencedirect.com/science/article/pii/S2096248725000025?via%3Dihub (Accessed 28 September 2025).

Fjelland, R. 2020. Why general artificial intelligence will not be realized. *Humanities and Social Sciences Communications*, 7 (10): 1-9.

Franck, R. 2002. *The explanatory power of models: bridging the gap between empirical and theoretical research in the social sciences*. Norwell, MA: Kluwer Academic Publishers.

Franck, R. 2011. Preface: in Pratt, D.D. *Modelling written communication: a new systems approach to modelling written communication*. Dordrecht, Springer.

Gerlich, M. 2025. AI tools in society: impacts on cognitive offloading and the future of critical thinking. *Societies,* 15 (6): 1-28. Available: https://www.mdpi.com/2075-4698/15/1/6 (Accessed 30 September 2025).

Gibbs, P. ed. 2017. *The pedagogy of compassion at the heart of higher education.* Cham, Switzerland: Springer International Publishing.

Hansen, S. M. 2023. A model for understanding the evolving role of graphic designers in the era of artificial intelligence. *HUB - Journal of Research in Art, Design and Society,* 1 (0). Available: https://www.researchcatalogue.net/view/2156238/2156237 (Accessed 1 October 2024).

Mahner, F. P., Muttenthaler, L., Güçlü, U. and Hebart, M. N. 2025. Dimensions underlying the representational alignment of deep neural networks with humans. *Nature Machine Intelligence*, 7: 848–859.

Masters, G. 2025. Will schools of the future be different? *Teacher*. Available: https://www.teachermagazine.com/au_en/articles/will-schools-of-the-future-be-different (Accessed 29 September 2025).

Peter, S., Riemer, K. and West, J. D. 2025. The benefits and dangers of anthropomorphic conversational agents. *PNAS,* 122 (22). Available: https://www.pnas.org/doi/10.1073/pnas.2415898122 (Accessed 30 September 2025).

Pratt, D. D. 1987. A process approach: the formulation of a simplified conceptual framework showing the stages of the writing process, and an investigation into the effects on writing behaviour of communicating this framework directly to the learner (Masters in Applied Linguistics). Applied Linguistics, University of Natal, Durban. Available: https://www.academia.edu/4628511/Pratt_1987_A_process_approach_the_formulation_of_a_simplified_conceptual_framework_showing_the_stages_of_the_writing_process (Accessed 12 October 2024).

Pratt, D. D. 2005a. An analysis of the design features of three mixed-mode courses in a master's degree programme. In: Proceedings of *IASTED International Conference on Education and Technology (ICET 2005)*. Alberta, Canada, 4-6 July 2005.

Pratt, D. D. 2005b. Mixed-mode Communication courses at a multicultural technikon: a pilot study combining web-based learning and an Internet search project with face-to-face classroom instruction. In: Price, M. L. and Schaffer, S. P. eds. *Interactive Convergence in Multimedia*. Oxford: Interdisciplinary Press, 91-116.

Pratt, D. D. 2007a. No middle ground, but many mansions: design features of effective mixed mode courses. *SAJHE, 21(6), Special Edition from NADEOSA 2006*, 21 (6): 705-720.

Pratt, D. D. 2007b. A realist approach to writing: developing a theoretical model of written composition to inform a computer mediated learning application. DTech in Language Practice, Durban University of Technology. Available: https://www.academia.edu/3829511/Pratt_2007_A_realist_approach_to_writing_developing_a_theoretical_model_of_written_composition_to_inform_a_computer_mediated_learning_application (Accessed 8 September 2025).

Pratt, D. D. 2009. A systems approach to the teaching/research nexus. In: Proceedings of *7th International Conference on Education and Information Systems, Technologies and Applications (EISTA 2009)*. Orlando, FL, USA, 10–13 July 2009. Available: https://www.iiis.org/CDs2009/CD2009SCI/EISTA2009/PapersPdf/E244TR.pdf (Accessed

Pratt, D. D. 2010. *Protocols and processes: a case book of video protocol analyses in written composition*. Saarbrücken: Lambert Academic Publishers.

Pratt, D. D. 2011a. *Modelling written communication: a new systems approach to modelling in the social sciences*. Dordrecht: Springer, Methodos Series.

Pratt, D. D. 2011b. *Scenarios for learning: an integrated approach*. Saarbrücken: Lambert Academic Publishing.

Pratt, D. D. 2014. The Internet as social system: applying Margaret Archer's theory of morphogenesis to hypermedia communication. *Journal of Systemics, Cybernetics and Informatics,* 12 (1): 5-9.

Pratt, D. D. 2025. Types of thinking augmented by AI tools. *English for Research Purposes: Selected Papers* (Blog). Available: https://edufusionai.co.za/researchnet/pluginfile.php/365/mod_resource/content/3/Pratt%202025%20-%20Types%20of%20thinking%20augmented%20by%20AI%20tools.pdf (Accessed 27 April 2025).

Pratt, D. D. and Reddy, P. 2025. Digital-human collaboration in higher degree course evaluation. *International Journal of Technologies in Learning,* 32 (2): 223-240. Available: https://cgscholar.com/bookstore/works/digitalhuman-collaboration-in-higher-degree-course-evaluation (Accessed 17 September 2025).

Reddy, P. and Pratt, D. D. 2024. A systemic model for evaluating online course design: a critical realist approach. In: Proceedings of *18th International Technology, Education and Development Conference*. Valencia, Spain, 4-6 March, 2024. 6892-6901. Available: https://doi.org/10.21125/inted.2024.1818 (Accessed 12 March 2024).

Reddy, P. and Pratt, D. D. 2025. Copilot-assisted online course design evaluator. In: Bastiaens, T. ed. *EdMedia + Innovate Learning*. Barcelona, Spain: Association for the Advancement of Computing in Education (AACE), 395-405. Available: https://www.learntechlib.org/p/226168/ (Accessed 27 July 2025).

Strauss, A. and Corbin, J. 1994. Grounded theory methodology: an overview. In: Denzin, N. K. and Lincoln, Y. S. eds. *Handbook of qualitative research*. California: SAGE Publications.

Strauss, A. and Corbin, J. 1999. *Basics of qualitative research, 2nd Edition*. California: SAGE Publications.

Tahiru, F. 2021. AI in Education: a systematic literature review. *Journal of cases on Information Technology*, 23 (1).