
Optimising the Interface between Artificial Intelligence and Human Intelligence in Higher Education

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Abstract

If you thought the recent pandemic was a major disruptor, society is on the cusp of a far more pervasive and ubiquitous shift in human existence. The rapid development and roll-out of Artificial Intelligence (AI) technologies, is looming as a quintessential disruptor of quantum proportions and will eventually permeate most, if not all, corners of our lives. This paper investigates the initial fall-out and potential impact of AI generative technologies on the higher education sector. When ChatGPT and similar software programs were released in late 2022, a knee-jerk reaction from some Government authorities, and institutions was to ban their use in education. Others recommended the development of academic policies and strategies to mitigate the risks to academic integrity and quality assurance. Pragmatic and adventurous educators embraced the opportunities that AI technologies offer to enhance the education sector and expand opportunities for life-long learning. Whilst there is general consensus that that higher education will need to undergo major reform to address the changes that AI will force on the future of learning and higher education institutions. The way forward is less clear. The proposition explored in this paper is that in order to filter, interpret, evaluate and apply AI generated content it might be helpful to consider the challenge through a research lens. The preliminary result is a Framework which focuses on the interface between artificial intelligence and human intelligence in the development and design of future-orientated curriculum, pedagogy, learning activities and assessments in higher education.

Keywords— artificial intelligence, human interface, research lens, higher education

I. INTRODUCTION

Whilst the recent world-wide pandemic was a major disruptor, society is on the cusp of a change far more pervasive and powerful, which will eventually permeate most, if not all, aspects of human existence. The rapid developments and roll-out of Artificial Intelligence (AI) technologies is looming as a quintessential disruptor and 'game changer'. The new generation of AI software is capable of generating sophisticated, quality text, images, music, and coding responses to a short prompt or question in a matter of seconds. It is poised to change the nature of work, education, and the way we live, in more profound and uncertain ways than ever before.

Like the recent pandemic, the speed and extent of change will catch communities off-guard. It is anticipated that the function and nature of the higher education sector will be seriously challenged and destabilised as access to 'machine thinking' competes with 'human thinking'. A, high-profile, clinical psychologist and social commentator, Jordan Peterson predicts that at least one third of universities will go broke in the next five years (Peterson, 2023a).

When OpenAI's ChatGPT, DALL-3 and related AI technologies were released in late 2022, a knee-jerk reaction from some regulatory authorities, senior management, and academics was to ban or 'pause' their

use in higher education. Others acknowledged the risk to academic integrity and quality assurance and moved to mitigate the risks by expanding existing plagiarism, academic misconduct and contract cheating policies to incorporate misappropriation of AI content. Optimists embraced the opportunities AI technologies offer and advocated for strategies and approaches to incorporate AI into higher education. As conversations and discussions mature, there is an emerging acceptance that changes will need to be made to contemporary higher education curriculum, pedagogy and assessment design, to address the proliferation of AI technologies. (Crossley, 2023). To date, there have been less conversations about how this reform might be achieved.

The key challenge for the academy is to design and offer curriculum which provides students with the skills to filter the wealth of AI content, to think for themselves (human thinking), and to produce original and innovative solutions. In other words, to develop the skills and qualities required for future workplaces, which will most likely be resourced and driven by AI technologies.

The proposition explored in this paper is that curriculum designers might find it useful to draw upon a research lens and align and embed research methodologies, tools and practices into the development and design of curriculum, pedagogy, learning activities and assessments. The rationale is that this approach might help equip graduates with the knowledge and skills required to analyse, interpret, critically evaluate and make informed decisions about how to utilise outputs from AI 'machine thinking' and to become independent, discerning and compassionate lifelong learners.

PAPER OUTLINE

The paper covers the following topics:

- Introduction;
- Purpose of the Paper;
- The Research Question;
- Scope and Limitations;
- Definitions-contained in Glossary Appendix;
- A Review of Literature which:
 - investigates reactions to and implications of the new wave of AI technologies;
 - explores the potential to evaluate AI content through a research lens;

- Findings which present a Framework for managing the interface between Artificial Intelligence and Human Intelligence;
- Discussion;
- Conclusion;
- References; and,
- Appendix A (Glossary).

PURPOSE OF PAPER

The purpose of this paper is to contribute to the discourse on the impact of AI on the future of the higher education sector and to elaborate on the proposition that drawing upon a research lens to reconceptualise curriculum, pedagogy, learning activities and assessment design will enable 'human thinking' to maintain primacy over 'machine thinking'.

RESEARCH QUESTION

The research question posed is: At the interface between Artificial Intelligence and Human Intelligence is it useful to draw upon a research lens to filter, interpret, evaluate and apply AI generated knowledge to higher education curriculum, pedagogy, learning activities and assessment design?

SCOPE AND LIMITATIONS

The speed and extent to which AI technologies relevant to the higher education sector are becoming available means that it is difficult to keep pace with the latest developments. This paper aimed to capture the situation in the first half of 2023. It is acknowledged that new challenges may arise between the time of writing and the paper being available to the academic community.

The paper is based on a review of current scholarly literature and discourse drawn from academic texts, journal articles, conference presentations, webinars, podcasts and mainstream media. The literature review was restricted to English language publications and primarily focused on accessible resources from Australia, the USA and United Kingdom.

As the latest wave of ChatBot websites have only been available for a few weeks, there is very little long-term case study research available. This paper relies heavily on opinion, comments and reports from experienced academics, scholars and leaders in education and AI technology. As the discourse on the impact of AI on the higher education sector matures it is anticipated that more research will emerge on the implications of AI 'machine thinking' on 'human thinking'. The plan is for subsequent papers to address

some of these developments. The author reports there are no competing interests to declare.

DEFINITIONS

The emerging area of AI technologies is bursting with new terminology and acronyms. Research theory and practice also contain a number of concepts which require working definitions. In order to assist the reader and due to the large number of definitions and acronyms identified, in preference to inserting the definitions in the body of the paper, a Glossary has been included as an Appendix at the end of the paper.

II. REVIEW OF LITERATURE

The review of literature provides an overview of the typical reactions to the rapid expansion and accessibility of AI technologies in terms of risks and opportunities, with a focus on higher education. It also provides an overview of potential research concepts, tools and practices for informing a framework for filtering interpreting, evaluating and applying AI generated content to the development and design of higher education curriculum, pedagogy, learning activities and assessments for the future.

Reactions to and implications of the new wave of AI technologies

This section on the impact of AI on society and higher education, relied heavily upon higher education online conference presentations and forums, regulator-sponsored webinars, and more popular media sources such as YouTube discussions. It also drew upon reports and commentary from high profile experts and global management consultants such as McKinsey and Company, whose stated purpose is 'to help create positive, enduring change in the world' (McKinsey, 2023 & Chui, 2022b).

The investigation commenced with an overview of recent literature related to the new wave of AI generative technologies such as ChatGPT, DALL-3 and CodeX and discussed projected implications of these technologies on society, business, education and individuals. As defined in the Glossary, attached to this paper, generative artificial intelligence (AI) draws upon language, image, code and audio models and uses algorithms, such as ChatGPT, to create new content (Chui, 2022a). AI content is generated in response to a prompt or question. In a recent publication by business psychologist Chamorro-Premuzic (2023), he predicts that recent breakthroughs in AI have the potential to drastically change the way we approach content

creation and indeed the way we live, work, learn and play. He suggests that our 'ability to ask the right questions', our 'willingness to evaluate the quality of the answer', and our 'desire to learn and get better' should be central to future approaches to education (Chamorro-Premuzic, 2023. p132). Locally, a number of voices reiterated the view that we cannot afford not to invest in AI (Dodd, 2023a).

Just prior to the release of the first wave of ChatBot software, the Future of Life Institute (2023), whose stated mission is: 'steering transformative technology towards benefitting life and away from extreme large-scale risks' released a letter, which called for a six month moratorium or pause on the release of AI generative software more powerful than GPT-3, as it felt there had been insufficient preparation, policy development and infrastructure planning. The letter warned of the potential damage, to society and its institutions, of the premature release of the disruptive technologies before adequate safety protocols are in place. The letter also stressed that decisions about the release and application of powerful AI tools should not be delegated to 'unelected tech leaders' and that further research is needed to ensure that AI technologies are accurate, transparent, robust, and safe (Future of Life Institute, 2022).

In a slightly earlier publication, Swedish-American cosmologist Tegmark (2017), introduced the concept that the risks of AI will come from a misalignment of the goals of AI and those of humans. In a podcast Tegmark discusses the potential impact of AI technologies, both good and bad. One of the most profound statements he makes echoes the Cheshire cat's conversation with Alice in Wonderland. 'Would you tell me, please, which way I ought to go from here?' 'That depends a good deal on where you want to get to,' said the Cat. 'I don't much care where--' said Alice. 'Then it doesn't matter which way you go,' said the Cat (Carroll, 1865). Compare Tegmark's response to a similar question about the future direction of AI. 'We really need the wisdom of everybody to chart a future worth aiming for. If we don't know what kind of future we want, we're not going to get it' (Tegmark, 2017).

Christian (2020), an established international author and researcher with a particular interest in the impact of AI on society, refers to the tension between machine learning and human values as the 'alignment problem'. He raises concerns about AI's lack of ability to process ethical and cultural nuances and deal with inbuilt bias. He warns that AI is already changing the nature of work and making life-changing judgements

based on algorithms, such as assessing mortgage applications or medical tests, exclusive of human input.

Ngo and colleagues (2022) are researching 'misalignment' in terms of the potential for AI to surpass human capabilities in a wide range of important tasks. They warn that without substantial effort to prevent it, AI could learn to act deceptively and undermine human control. Bucknall and Dori-Hacohen (2022) raise concerns about the risks of unregulated AI on society, politics and humanity and the capacity of AI to influence power dynamics and information security.

Another vocal voice in the discussion about the potential implications of new AI technologies and the lack of safety protocols is that of Moore (2023), an active religious leader. He acknowledges the potential transformative and positive benefits of AI when applied to health and medical research but warns of the risks if AI is left unrestrained or is harnessed by unscrupulous cartels or world governments. He is particularly concerned about the development of AI weapons and the potential for machines to make decisions for themselves. Moore calls for the inclusion of ethicists and faith leaders in conversations about AI policies, protocols and regulations and notes their absence up until now.

In both popular media and academic publications, the roll-out of ChatGPT and related text, image, coding and music AI programs since November 2022, has met with mixed reactions. Peterson describes the changes coming as a result of AI innovation, as a technology revolution. In a recent interview he expressed a view that the advancement of artificial intelligence is going to make us realise the importance of genuine intelligence, (think human intelligence) and to value our ability to provide meaning and context to content (Peterson, 2023b).

Academics warn that to maintain academic integrity standards, AI generated text will need to be treated like any other source and be acknowledged with appropriate attribution. Furthermore, the potential of AI software to deliver reasonable quality written work, calls into question the relevance of essays and simple written tasks for assessment purposes. The power of ChatGPT3 has been demonstrated in several trial scenarios. A study conducted at the University of Pennsylvania found that ChatGPT was capable of writing responses to an examination paper in a MBA course, to an overall B to B minus standard (Rosenblatt, 2023 & Terwiesch, 2023).

Other studies conducted across the world revealed similar results. In the UK a sample of AI

generated physics essays when graded according to normal marking processes, received scores equivalent to first class honours (Yeadon & Inyang et al., 2023). A study in the USA found that the earlier foundational, less powerful ChatBot, GPT-3.5 had the potential to pass the multi-state multiple choice section of the Law Bar Examination, which generally requires seven years post-secondary school education and months of targeted preparation (Bommarito & Katz, 2022).

Other commentary points to the potential for bias and inaccurate information (Stokel-Walker, 2022). AI generated-text software relies on algorithms to search through the masses of data that the program has been trained to sort and retrieve. Thus, its response is only as accurate as the information to which it has been exposed. Currently, the information that has been uploaded stops at 2021, so any developments since that time will not be captured. However, new information is being continually fed into the system as millions of users access the programs, so it must be assumed that the quality of responses will continue to improve. Another layer of complexity created by AI is that the technology is constantly evolving (Aceveda, 2023) so it is difficult to keep pace with guardrails and protocols.

A risk of AI that is raised frequently in the literature and panel discussions is the potential to infringe upon an individual's privacy. Whilst this concern is linked to academic integrity, it is also about protection of students' personal information, ownership of intellectual property and copyright. The issue of privacy also flows into concerns about transparency and authenticity. These are very complex issues and will need to be addressed as soon as possible. For example, who owns the marketing jingle written by AI at the request of the user, and can this jingle be used for commercial gain?

The need to distinguish between computer-generated output and human contribution can be partially addressed by a requirement to acknowledge and cite sources, which is in line with the required protocol for any academic work. However, the risk can be mitigated or minimised significantly, by rethinking assessment design and monitoring and evaluating assessment artefacts through various stages of development. This might mean monitoring assessment at the conception planning, drafting, feedback, and completion phases. Other strategies might be to preference recorded and personally narrated oral presentations, and peer and self-reflection assessments, above unsupervised, written essays.

To avoid blatant cheating and academic misconduct, curriculum designers and assessors would be wise to work with AI to redesign assessment tasks. It will no longer be sufficient to rely upon evidence of knowledge in a descriptive written form, assessment design will need to require evidence of higher order thinking such as analysis and evaluation of the ChatGPT generated text against discipline-based theories, or substantiation and reflection on the content generated by AI, in reference to a specific context or case study.

The potential to use computer programs to replace lecturers and human interaction was raised as a concern in some forums. This concern was often expressed in terms of the overall loss of intellectual capacity and collegiality in our universities, accompanied by extra demands on tenured staff, and casualisation of the workforce who receive inadequate compensation for demanding roles such as tutoring and marking assessments.

In the latter part of 2022, a group of eminent Australian academics and AI researchers, known as the Kingston Group, met to discuss the need for Australia to develop a national vision and strategy if it hoped to become a world leader in AI by 2030. Central to the proposed vision was a focus on developing small data sets customised to Australia's needs and enshrined in Australian sovereignty. The statement acknowledged the current lack of appropriately skilled workers and entrepreneurs to achieve this vision and pointed to the need for an integrated strategy to grow the entire education-to-industry pipeline. However, it was surprising silent on the need to invest seriously in higher education in city and regional areas, other than referencing a preference for focusing on onshore research and postgraduate courses (Kingston Group, 2022). If Australia is going to become a key player in AI and assist its citizens negotiate new ways of living, working, and learning within an AI dominated world it will require a broader vision than the one proposed by the Kingston Group.

A recent thoughtful and scholarly contribution to the issue of 'human thinking' versus 'machine thinking' is provided by Chamorro-Premuzic (2023) in his book entitled *I, Human AI, Automation, and the Quest to Reclaim What Makes Us Unique*. His proposition is that the 'key goal is not for AI to replace human expertise, but to enhance it'. He suggests that we harness the opportunity to assess the impact of the AI age on human behaviour in an evidence-based way...reclaim our humanity to display our most virtuous side and avoid

being alienated and dehumanized, let alone automated, by technology' (p.4-5).

In a similar vein, Bubeck et al., (2023) suggest that their research into GPT-4, demonstrates that AI is becoming smarter and more capable all the time. They predict 'promising possibilities ahead for extending human intellect and abilities with new kinds of human-AI interaction and collaboration'. They elaborate on this view by stating that they expect 'rich opportunities for innovation and transformation of occupations with creative uses of AI technologies to support human agency and creativity and to enhance and extend human capabilities (Bubeck et al., 2023, p.90).

In an effort to explore ways to work with AI content and to treat AI technology as a tool that can be incorporated into learning activities and assessment, the next section of the review of literature focusses on research methodology, concepts, tools and practices that could be employed to help verify the value of the AI content.

The potential to evaluate AI content through a research lens

Quality research is based on principles, methodologies, practices and tools which determine the value of research outcomes. A number of components of research were identified in the literature review and earmarked for inclusion in the proposed framework. The following section elaborates on these research underpinnings.

Research design is determined by whether the question or hypothesis posed seeks quantitative or qualitative data or a mixture of both. Quantitative research is primarily about collecting and analysing numerical data or information that can be counted (quantified). Quantitative research often relies on an experimental design which uses a control group and a treatment group to measure the impact or effect of a variable or set of variables.

Qualitative research collects and analyses non-numerical information such as opinions, attitudes, perceptions and personal feelings. Qualitative research relies on individual interviews, focus groups and observation to provide source data.

Two critical concepts in research are validity and reliability. Validity relates to the extent to which the research methods and instruments accurately measure what they purport to measure. Reliability relates to the stability of the research methodology and research

instruments and if the research were repeated, would it produce the same results.

Academic integrity is a broad term which covers a number of areas which can potentially corrupt or misinform the researcher. It includes the concept of objectivity which relates to the extent to which the research findings are independent of the researcher's personal biases and values. Two additional important components of academic integrity are transparency and ethics. Transparency relates to the availability of the research process, analysis and findings and is directly linked to ethical behaviour. Academic literature indicates that adherence to ethical principles and guidelines in conducting research, including obtaining informed consent, protecting participant confidentiality, and minimising harm to participants, is becoming increasingly urgent with the growth in AI technologies and a focus on privacy and individual rights. Consideration of ethics also extends to concerns around plagiarism, contract cheating and now non-appropriation of material sourced from AI.

Many of the concepts related to research address the need for original thought, innovation and new knowledge. For example, the Organisation for Economic Cooperation and Development (OECD) identifies three streams of research and development (R&D). These are basic research, applied research and experimental development research. The third stream relates to creative activity which is undertaken to increase the stock of knowledge of man, culture and society and to use this knowledge to devise new applications (OECDilibrary, 2023).

Another group of research concepts and tools which are relevant to analysing and evaluating AI generated material are those which are linked to the development of the research hypothesis, or in terms of AI generated content, the prompt or question. The important lesson is that the more carefully crafted and defined the question, the more likelihood of obtaining a quality response. In both research and AI generated content the output still needs to be assessed and the following research concepts and tools assist in this process. They include knowing the difference between objective and subjective data and opinions, consideration of sampling procedures, sampling size and possible sampling bias, awareness of the distinction between cause and effect and correlation, and mathematical concepts such as predictability, probability and significant difference.

The next section of this paper draws together the findings from the review of literature in relation to the risks and potential enhancements of AI and the potential research concepts and tools that can be used to filter and evaluate AI content. The challenge is to find a way to foster and advance original, creative, innovative and ethical thought and activity, perhaps sparked by AI, to inform future-oriented approaches to curriculum, pedagogy, learning activities and assessment design. Korteling & van de Boer-Visschedijk et al., (2021) suggest a collaborative approach drawing upon the specific strengths of both human intelligence and artificial intelligence. This approach distinguishes between biological (human) and digital (machine) behaviours and concepts of intelligence.

III. FINDINGS

The review of literature confirmed that society will experience a significant shift in human existence in the near future, due to the growth and popularity of powerful AI technologies that will impact all aspects of our lives. This is a world-wide issue and is not restricted to the education sector, although this is the context which is being addressed in this paper. Some leaders and academics expressed concern at the speed of AI advancements and the lag in guardrails, protocols, policies, and procedures to manage its roll-out and application. However, on the whole, arguments in support of the potential of AI technologies to enhance the higher education experience, overshadow the envisaged risks and threats to academic quality.

A key premise of this paper is that if left unchecked, AI technologies will weaken the value of a higher education qualification. Bearing in mind the words of Byrne and Clarke (2020) 'high quality universities are the best way to help our world deal with the enormous challenges of accelerating change' (p. 245), reform of higher education is urgently needed. Some commentators have expressed the view that we need to a move to a more focussed system which promotes and values mastery of higher order cognitive skills such as critical thinking, resilience, problem solving, creativity, evidenced-based judgement, innovation and quality verbal, written, and computer literacies (Dondi & Panier et al., 2021, Girdhar, 2022: Yousuf &Wahid, 2021).

However, while the issue of major reform of higher education is urgent, this is a topic for another time and another paper. The challenge addressed in this paper is how to optimise the benefits of AI technologies

to improve the quality of curriculum, pedagogy, learning activities, and assessments while minimising the risks to academic integrity and ethical practices. The assessments described in the Interface Framework reference a recently published Digital Assessment Framework, DASH C21 which stands for Digital Assessment Stretching Horizons Framework for the Twenty-first Century (Bennett & Abusalem, 2023). The digital assessments are designed to be ‘innovative’ (foster original and creative thinking), ‘authentic’ (related to real-world situations, ‘experiential’ (involve active engagement), ‘forward looking’ (preparation for

future workplaces/lifestyle challenges within a landscape embedded in ‘academic integrity’ (focus on ethical and quality actions).

The outcome is a research-informed Artificial Intelligence and Human Intelligence Interface (AIHII) Framework for informing future approaches to curriculum, pedagogy and assessment design in higher education (Table 1).

Artificial Intelligence and Human Intelligence Interface Framework

Table 1

Research concepts methodologies and tools	Apply to AI produced content	Implications for curriculum, pedagogy and learning activities	Implications for assessment design
<p><i>Validity</i></p> <p>relates to whether the outcome provides an accurate measure of, or response to, the research question posed.</p>	<p>Verify source(s) of information.</p> <p>Review question and response for bias, misinformation and propaganda.</p> <p>Consider whether the AI prompt (question) needs to be refined.</p> <p>Determine if the AI generated content identifies relevant factors.</p> <p>Cross references with academic sources.</p>	<p>Design curriculum and learning activities which teach and practise skills of critical thinking, objective analysis, reflective practice, and evidence-based decision making.</p> <p>Experiment with interactive pedagogies such as constructivism, flipped classrooms and active learning.</p>	<p>Design assessments which are <i>authentic</i> and based on real-world problems, issues and relevant contexts.</p> <p>Build in components which require personal reflection and which demonstrate individual input, analysis and evidence-based conclusions.</p> <p>Consider assessments which require students to conduct interviews, focus groups or surveys.</p>
<p><i>Reliability</i></p> <p>relates to the consistency of the findings if the research was to be repeated.</p>	<p>Compare AI content to discipline theories, frameworks and models.</p> <p>Evaluate AI generated content against leading authorities and scholars for consistency.</p>	<p>Develop curriculum which requires students to seek out and compare original sources, experts’ opinions and other studies to confirm or discard AI findings. Move away from didactic forms of teaching which foster passive learning.</p>	<p>Design assessments and assessment rubrics which involve <i>experiential</i> learning check for consistency and maturity in responses.</p> <p>Consider oral presentations, pre-recorded (video & slide presentations) or live, small group oral questioning, confirmation of learning in reflective journals.</p>

<p><i>Academic integrity</i> in higher education is a complex concept which is used to cover a broad range of issues and expectations to do with honest and ethical practices by both academic staff and students.</p> <p>It is often approached from a negative perspective and focuses on academic misconduct such as plagiarism, cheating, fraud, and dishonesty.</p>	<p>Identify origin of AI material and transparency of source(s). Analyse for bias, propaganda and errors. Consider issues of plagiarism, contract cheating, ethics, privacy and cultural sensitivities.</p>	<p>Educate students to acknowledge sources, especially AI generated content. Ensure, plagiarism, cheating and academic misconduct policies and procedures are in place to educate and support learners as well as penalise repeat offenders. Prepare learning activities which help students identify and grapple with social, political, gender, racial or cultural biases.</p>	<p>Design assessments which require adherence to ethical and culturally sensitivities and meet professional and community <i>academic integrity</i> standards.</p> <p>Assessment designs which require pilot-project studies and which are scaffolded through stages of development assist in embedding good academic integrity practices.</p> <p>Task 1 might involve preparation of a project proposal.</p> <p>Task 2, the development of the Project Proposal into a Project Plan.</p> <p>Task 3, Implementation of the Plan and</p> <p>Task 4 Evaluation of the Process.</p> <p>Academic integrity can also be introduced through self and peer assessment.</p>
<p><i>Verification</i> is about providing proof that something is true and that it can be substantiated.</p>	<p>To verifying AI content for accuracy, lack of bias, and blatant dishonesty, it is beneficial to draw upon a number of research tools. Many of these tools may not provide definitive answers but they will call into question dubious content.</p>	<p>Approaches to curriculum and pedagogy that help students identify fake content, particularly from AI courses is a valuable skill.</p>	<p>Concern has been raised that with ready access to AI content students may not bother to master the fundamental knowledge and skills required to progress in each discipline.</p> <p>Formative assessments, which can help verify that students have mastered the fundamentals, include timed online quizzes, self-paced quizzes, and multiple choice tests using any of the free game-based learning platforms such as <i>Kahoot</i>, <i>Socrates</i> and <i>Moodle</i>.</p>

<p><i>Qualitative and quantitative data</i></p>	<p>Distinguish between quantitative and qualitative content generated by AI and ensure appropriateness of data format to answer posed question.</p>	<p>Regardless of discipline area, ensure curriculum includes fundamental research methodology learning activities. Expose students to the difference between quantitative and qualitative data and how to evaluate and manage the different forms of data.</p>	<p>Aim to include a range of assessment types across a course. Include multi-media assessments, ePortfolios, posters and photographic folios, surveys, case studies as well as <i>authentic</i> written tasks which are linked to personal contexts.</p>
<p><i>Research question Hypothesis</i></p>	<p>Check if AI generated content is 'fit for purpose' or if research question (hypothesis) needs to be refined or amended. <i>N.B. The way you ask the question largely determines the answer you will get.</i></p>	<p>Utilise social constructivism pedagogies and build into curriculum learning activities based on inquiry and investigation. Stress the importance of questioning and ensure that the question being asked has the potential to provide the required response/information. Introduce concept of control and treatment groups, the placebo effect, inherent bias and sampling bias. Give attention to the development of 'soft skills' empathy, cultural awareness, effective communication, digital literacy.</p>	<p><i>Design experiential</i> assessments which focus on hands-on activities. Focuses on assessments which require students to pose questions and develop and test hypotheses relevant to the discipline and learning outcomes. Staff and student co-design assessments and assessments rubrics is worth considering. Project-based assessments (mini research) projects are ideal for group assessments. Development of electronic games to teach and reinforce difficult concepts are worthwhile assessment tasks.</p>
<p><i>Data collection tools.</i> Include experiments, literature reviews, surveys, choose appropriate tool to answer research question, depending on whether you want <i>quantitative or qualitative data.</i></p>	<p>Consider how data or information was collected. Was it based on surveys, review of literature or experiments, and was the approach 'fit for purpose'. Filter AI content for potential sampling effect or sampling bias.</p>	<p>Ensure curriculum includes learning activities which examine and evaluate source of information. Introduce importance of reference to primary sources, methods for collecting qualitative and quantitative data, and for analysing different data formats.</p>	<p>Design assessments which are <i>experiential</i> and requires students to conduct surveys and interviews, design, implement and analyse questionnaires, prepare photographic portfolios and video clippings, conduct interviews.</p>
<p><i>Conducting research.</i></p>	<p>Review AI content through a research methodology</p>	<p>If content is going to be readily accessible through</p>	<p>Design <i>innovative</i> assessments which draw</p>

<p>Higher education operates within a set of research protocols, controls extraneous variables, maintains privacy of personal data, ensures integrity and ethics of research tools and research results.</p>	<p>lens. Ask questions such as; 'Who prepared the content?' 'How was the content collected?' 'What was the sample size?' 'Can the information be easily verified by referring to other reliable sources?'</p>	<p>AI, undergraduate curriculum will need to shift from a focus on learning content, to focus on evaluating content. This will require greater attention to the fundamental concepts and tools used in research and more inquiry-based learning activities.</p>	<p>upon concepts of creativity informed by neuroscience and educational psychology such as mind maps, brain storming and divergent thinking. Challenge students to demonstrate higher-order thinking, curiosity and inquiry, through preparation of business, marketing, research and project plans and proposals.</p>
<p><i>Data analysis tools.</i> These tools can be used to measure for significant difference, to identify correlation and shared variance as well as other important factors.</p>	<p>Filter AI content to ensure that the information presented has been interpreted correctly. For example, if research data is cited, has an inference been made that there is a cause and effect between two variables when in fact there is only a correlation. Does the content report a significance difference between the treatment and control group. What level of acceptability has been chosen?</p>	<p>Regardless of the discipline area, students need to be introduced to basic research tools and statistical calculations in order to make sound judgements about academic/research material. Introduce concepts such as correlation, cause and effect, statistical analysis to determine probability, predictability, significant difference, single factor and multi-factor analysis, and covariance, to expand students' higher order thinking capacity.</p>	<p>Assessments which require students to select appropriate research tools and methods to solve problems help expand students problem solving and decision making capabilities. These <i>Forward looking</i> assessments are critical for developing skills for future workplaces and for working with AI generated content.</p>
<p><i>Discuss findings.</i> Draw upon outcomes of AI searches and discuss comparisons with findings from learning activities and assessment tasks. Make recommendations.</p>	<p>If the AI content presents findings or makes recommendations it needs to be scrutinised for accuracy, validity and reliability. Often this will require higher order thinking skills such as critical analysis to check for logic and confirmation of facts. Interpreting AI content will also benefit from evaluation which draws upon emotional, cultural,</p>	<p>Develop curriculum and learning activities which require new approaches to learning such as thinking outside the square, co-creating and demonstrating flexibility, resilience and sustainability. Curriculum and learning activities which sharpen multiple intelligences such as emotional, cultural and ethical awareness will be required to address future</p>	<p>Design assessments which are <i>forward looking</i> and <i>innovative</i> and address emerging issues, new contexts and workplaces, and respond to changing nature of employment opportunities. Ensure the student voice is captured. Consider live and recorded oral assessments, use of multi-media technologies, staged assessment responses.</p>

	spiritual and ethical awareness.	workplace and lifestyle scenarios. Encourage collaboration, partner and group work, and development of life-long learning skills	Case studies or scenarios which require consideration of ethical and cultural factors are also recommended.

IV. DISCUSSION

The research question posed in this paper was: At the interface between Artificial Intelligence and Human Intelligence is it useful to draw upon research lens to filter, interpret, evaluate, and apply AI generated knowledge to higher education curriculum, pedagogy, learning activities and assessment design?

The AIHII Framework presented in Table 1 lists and defines several of the most common research methodology concepts and tools in column 1. Column 2 suggests how these tools could be used to filter, interpret, evaluate and apply AI generated content. Column 3 provides suggestions as to how these research concepts and tools could be used to inform curriculum and pedagogy and column 4 provides ideas for assessment design which align with research-informed learning outcomes and approaches to curriculum and pedagogy.

The development of the AIHII Framework demonstrates that at the interface between Artificial Intelligence and Human Intelligence it is useful to draw upon a research lens because it provides a systematic and evidence-based approach to filter, interpret, evaluate, and apply AI generated knowledge to higher education curriculum, pedagogy, learning activities and assessment design in the future.

The next step will be to undertake a study to assess how effective this AIHII Framework is for filtering, interpreting and evaluating AI content and for informing new approaches to curriculum, pedagogy, learning activities and assessment design in higher education.

V. CONCLUSION

There is no doubt that powerful AI technologies capable of instantly generating quality text, images, computer codes and music in response to a question or prompt, are poised to create a major shift in many facets of our lives. The impact on learning and formal education will be significant. It is also clear that the way society responds to the availability of this ‘avalanche’ of

content, will determine whether AI advancements are used to improve or harm civilization.

The review of literature and proposition discussed in this paper, point to the urgent need for higher education to prioritise a major rethink of the way curriculum, teaching, learning and assessment is designed and implemented throughout the sector. A focus on developing higher order cognitive skills will be needed in order to filter, sort through, interpret and evaluate AI generated information. Greater attention will need to be placed on the development and role of human intelligence and values such as emotional, cultural, spiritual and ethical acuity, to harness and enhance AI’s ‘machine thinking’ outputs.

In the first quarter of 2023, society is on the cusp of this major shift, and on the whole is totally unprepared for the looming exponential expansion of AI technologies. Academic leaders will need to step up to the challenge but they cannot address the situation alone. It will require serious collaboration with all stakeholders such as Governments, business leaders, academics, students, employers, parents, AI leaders, and educational psychologists. It is highly likely that the bulk of students will start to seek education and learning outside of the university sector. Dodd (2023b) predicts that AI has the potential to liberate learning for many students.

An attractive option for universities might be that they move away from sanctioning substandard education to the masses, and pursue a narrower focus, that of growing the leaders, scholars and researchers needed for a future transformed by AI.

This paper attempted to capture the current mood and responses across the community and in particular the higher education sector to AI generated content. It outlines a Framework for optimising the interface between artificial intelligence and human intelligence. This interface involves the need to filter, interpret, evaluate and apply AI content to real issues. It suggests changes to curriculum, pedagogy and assessment design that address the knowledge and

skills required to evaluate machine thinking. It also raises the importance of developing human multi-intelligences such as emotional, cultural, spiritual, and ethical intelligences to retain the importance of our 'humanity' in judgement and decision making.

No doubt, in the next few months, and in the longer term, there will be extensive debate, studies and research on the impact of AI technologies on the higher education sector. Issues of cybersecurity and AI technologies in the hands of those who wish to dominate the world or use AI for warfare purposes will require visionary, informed, astute and wise leadership, and counter cyberterrorist strategies. As stated many times in this paper, we are at a significant point in the history of civilization and how we respond to the risks, threats, challenges and opportunities of AI generated content will be critical to our future.

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Appendix A

GLOSSARY

Academic Integrity in higher education covers a number of policy areas and is relevant across all disciplines and all levels of operation including governance, leadership, management, research, teaching, learning, and student services and support. It is interpreted in a number of ways to cover a wide range of issues, but central to its meaning are the concepts of honesty and ethical behaviour. Unfortunately, interpretation and focus on academic integrity in higher education tends to be heavily weighted towards, plagiarism, collusion, academic misconduct and contract cheating.

Algorithms are sets of instructions or steps, usually applied in mathematics or computing to solve a particular problem.

Artificial Intelligence (AI) refers to the practice of getting machines to mimic human intelligence to perform tasks.

Cause and Effect refers to the relationship between two variables in which one variable (the treatment) is responsible for producing a change in the other

variable (the effect). In research, cause and effect relationships are investigated through experimental designs.

ChatBot is software which simulates human-like conversations with users via chat. Its key task is to answer user questions with instant messages.

ChatGPT, the GPT stands for 'Generative Pretrained Transformer'. ChatGPT is an AI language model, that has been trained on a massive corpus of text data, including books, articles, websites, and other sources of information (currently sources up to 2021). The software has learned to recognise patterns and relationships within that data. The program uses algorithms and statistical models to generate responses based on the input (questions or prompts) it receives.

CodeX is an AI technology for producing computer coding.

Control Group is a group of individuals or items that are used as a comparison group in a research study. The control group is typically not exposed to the treatment or intervention being tested, allowing researchers to compare the outcomes of the treatment group to those of the control group.

Correlation refers to the relationship between two variables. In research, correlation is often used to examine the degree to which two variables are related and to determine whether changes in one variable are associated with changes in the other.

DALL-E a tool for AI-generated art. It is similar to ChatGPT but instead of being based on language, it specialises in images and visual outputs.

Degree of Significance refers to the level of confidence that can be placed in the results of a research study. It is often measured using statistical analysis and indicates the degree to which the findings of the study are likely to be true and applicable to the population as a whole.

Experimental Design refers to the plan or strategy that is used to conduct a research study. It typically involves the selection of participants, the selection of a treatment or intervention, and the collection and analysis of data.

Generative artificial intelligence (AI) describes language models (such as ChatGPT) which draw upon algorithms that can be used to create new content, including audio, code, images, text, simulations, and videos.

Hypothesis is a statement or proposition that is put forward as a potential explanation for a particular phenomenon. In research, a hypothesis is often tested through the collection and analysis of data.

Observation refer to the collection of data through direct observation of individuals or phenomena. In research, observations can be used to gather information about behaviour, attitudes, and other characteristics of interest.

Machine Learning is sometimes abbreviated to ML. It is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn.

OpenAI was founded in 2015. It is an AI research and deployment company whose stated mission is to ensure that artificial general intelligence (AGI) benefits all of humanity. It is building a stable of software packages the most popular at this time being ChatGPT (text creation), DALL-E (image creation) and CodeX for coding.

Placebo Effect refers to the phenomenon in which the mere belief that one is receiving a treatment or intervention can lead to improvements in health or behaviour. In research, the placebo effect is often used to control for the potential influence of expectations or beliefs on the outcomes of a study.

Predictability refers to the ability to forecast or anticipate future events or outcomes. In research, predictability is often assessed through the use of statistical models that can be used to make predictions based on the data that has been collected.

Probability is likelihood of an event occurring. In research, probability is often used to calculate the chances of a particular outcome or result based on the data that has been collected.

Prompts refer to the key words or questions you devise to ask program such as ChatGPT. The more specific and detailed the questions the better the output. A new concept of 'prompt engineering' is emerging in the business literature which refers to identifying the elements which make a quality prompt. These elements include stating the style, format and length of text required, points to be addressed, and the perspective to be taken.

Quantitative and Qualitative Methods involve the collection and analysis of numerical data, while qualitative research methods involve the collection and analysis of non-numerical data. Both methods can be used in research to gain a better understanding of a particular phenomenon.

Reliability is the consistency and stability of the research findings over time and across different samples. This can be ensured by using standardized procedures, multiple measures, and inter-rater reliability checks.

Robotics rely on AI mostly associated with engineering. It involves design, construction, and use of machines (robots) to perform tasks done traditionally by human beings.

Sampling is the process of selecting a representative group of individuals or items from a larger population for the purpose of research. Sampling can be done randomly or by selection, and the size of the sample is an important consideration in determining the accuracy of the results obtained.

Testing Effect refers to the phenomenon in which testing can improve memory retention and retrieval of information. In research, the testing effect is often used to assess the effectiveness of different methods of learning and retention.

TEQSA is the acronym for the Tertiary Education Quality and Standard Agency. The regulator of higher education in Australia.

Verify is the ability to substantiate content or claimed facts.

Validity is the extent to which the research accurately measures what it is supposed to measure. This can be achieved by using appropriate research design, instrumentation, and data analysis techniques.