P/REFERENCES OF DESIGN

DESIGNING FUTURES: ASSESSING FUTURES CONSCIOUSNESS AND AI ATTITUDES IN AFRICAN DESIGN EDUCATION.

Ryna Cilliers*[a], Veronica Barnes[a]

a Cape Peninsula University of Technology, Department of Applied Design, South Africa
* cilliersr@cput.ac.za

DOI: 10.63442/HNSY1433

KEYWORDS | FUTURES CONSCIOUSNESS, GENERATIVE AI, DESIGN CURRICULA, AFRICAN FUTURES

ABSTRACT | The COVID-19 pandemic has underscored the necessity for adaptable and innovative curricula in design education, particularly emphasising the integration of futures thinking to adeptly navigate the complexities of the modern era. This research, grounded in the South African design education landscape, investigates the confluence of futures consciousness and attitudes towards generative artificial intelligence (AI) among South African design educators. By leveraging the Futures Consciousness Scale and an adapted AI Attitudes scale, the study evaluates educators' preparedness to incorporate AI into their pedagogical practices, ensuring a balance between technological progression, cultural pertinence, and ethical considerations. Our findings reveal a nuanced understanding among educators of the complex systems shaping our world, coupled with a balanced anticipation of future possibilities. Notably, a statistically significant correlation was identified between educators' time perception and their positive attitudes towards AI, suggesting that a temporal understanding of past, present, and future influences receptiveness to AI in educational contexts. Despite the overall positive inclination towards AI as a driver for creativity and innovation, this enthusiasm is moderated by pronounced ethical concerns and a commitment to preserving cultural authenticity in design practices. This investigation enriches the dialogue surrounding the amalgamation of futures literacy and AI in design education, advocating for a curriculum that nurtures a forward-thinking mindset while sensitively navigating the socio-cultural nuances of the South African milieu. The insights garnered highlight the pivotal role of educator preparation in traversing the evolving design education landscape, advocating for the responsible harnessing of AI to cultivate an educational ecosystem that is both future-oriented and deeply rooted in cultural integrity.

1. Introduction

The evolution of education in Africa, particularly in the realm of design, is at a pivotal juncture, influenced by a rich historical tapestry and the pressing need for forward-thinking educational paradigms. The historical context of African education, marked by efforts to decolonise and localise curricula post-independence, sets the backdrop for our inquiry. However, the transition has been fraught with challenges, from pedagogical conflicts to resource constraints (Odoch Pido, 2014; Sawyerr, 2004). In South Africa, these issues are compounded by the legacy of apartheid, necessitating a nuanced approach to integrating new technologies and future-oriented thinking into design education (Heleta, 2018; Mampane et al., 2018; Mudaly, 2018). This research focuses on assessing futures consciousness and attitudes towards generative artificial intelligence (AI) among design educators in South Africa, a region with a unique educational landscape shaped by its colonial and apartheid past. Futures consciousness is crucial for nurturing the ability to anticipate and shape future scenarios (Lalot, Ahvenharju, Minkkinen, & Wensing, 2020), while generative AI represents a transformative force in creative disciplines, offering new possibilities for innovation and collaboration (Ooi et al., 2023).

The study aims to bridge the gap in understanding how futures consciousness and technological readiness intersect in the context of African design education. By exploring the attitudes of design educators towards the integration of generative AI into their teaching and design practices, we seek to uncover the potential for fostering a more adaptive and innovative educational environment. Our research is driven by the following objectives: to assess the level of futures consciousness among a sample of design educators in South Africa, to explore their attitudes towards the use and potential of generative AI in design education, and to understand how cultural and contextual relevance influence these attitudes. This exploration is set against the broader goal of enhancing educational practices to better prepare students for the complexities of the future.

The Futures Consciousness Scale (Lalot, Ahvenharju, & Minkkinen, 2021; Lalot et al., 2020) and an adapted AI attitudes scale (Schepman & Rodway, 2020) were used to gather data from design educators, providing a comprehensive view of their perspectives and readiness to embrace these concepts. In acknowledging the critical perspectives on technology integration, we emphasise the importance of cultural relevance and ethical considerations, ensuring that the adoption of generative AI in design education aligns with the principles of decolonisation and inclusivity (Adams, 2021; Mohamed, Png, & Isaac, 2020)). As we explore the intricacies of futures consciousness and AI attitudes, this study serves as a foundational step towards understanding the dynamic interplay between technology, education, and cultural context in shaping the future of design education in South Africa.

The significance of this study lies in its potential to ascertain the current state of educator readiness to incorporate AI into design education, based on their futures consciousness. By identifying key concerns and strengths, the study can offer insights into how design education in Africa can evolve to meet the demands of the future. By integrating futures consciousness and generative AI into the curriculum, educators can equip students with the skills and mindset needed to navigate and shape an increasingly complex world.

1.1 From Futures Consciousness to Futures Literacy

In the evolving landscape of design education, understanding the future is imperative. Futures consciousness refers to an awareness and understanding of the myriad possibilities that the future holds, serving as a foundational layer for perceiving, imagining, and understanding various future scenarios (Ahvenharju, Minkkinen, & Lalot, 2018). The five dimensions of future consciousness detailed in Figure 1—Time Perspective, Agency Beliefs, Openness to Alternatives, Systems Perception, and Concern for Others—encompass an individual's sense of efficacy and control over the future, optimism, capacity for critical thinking, tolerance of uncertainty, holistic and systemic thinking, eco-psychological self, and moral and communal considerations, all of which inform a person’s engagement with future possibilities (Ahvenharju, Lalot, Minkkinen, & Quiamzade, 2021).

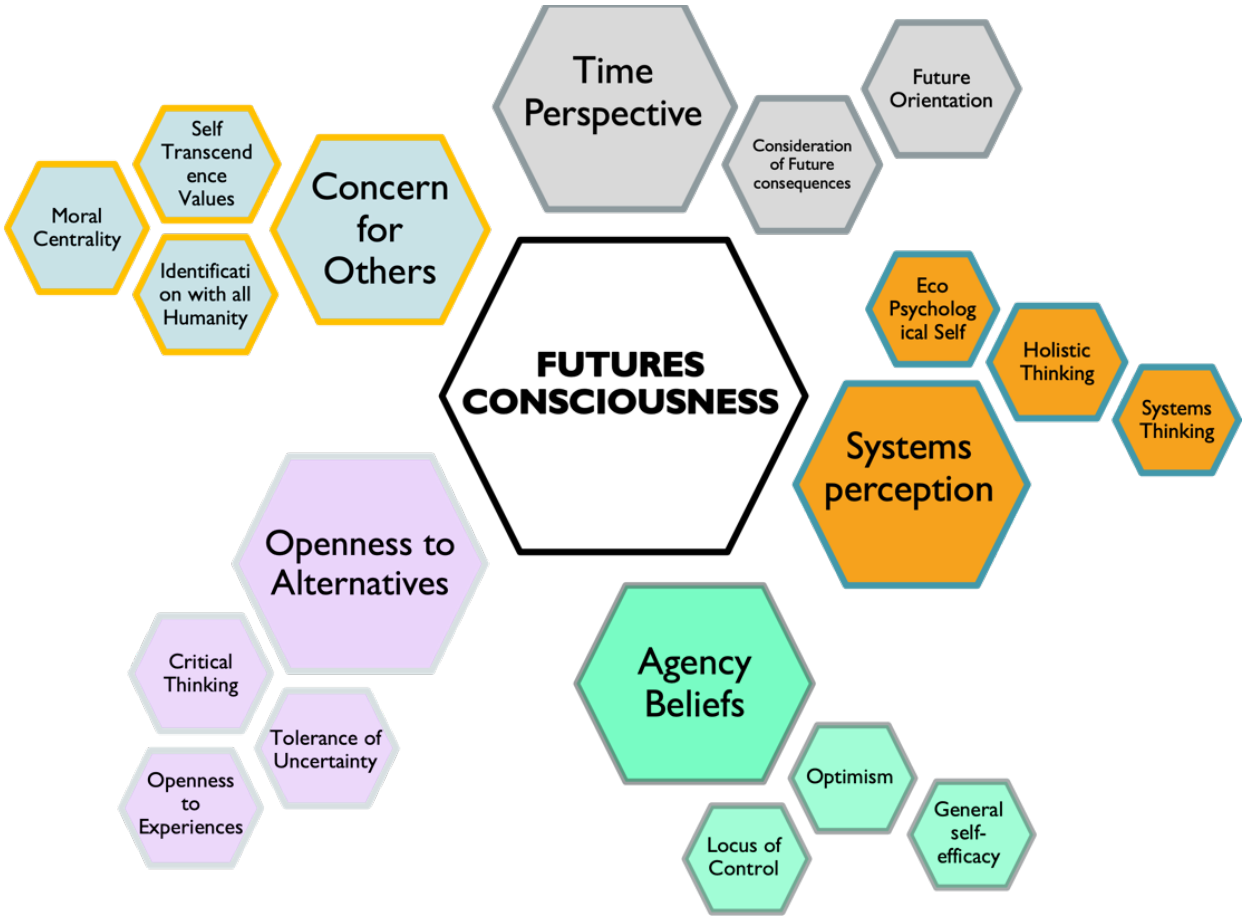

Figure 1. The five dimensions of futures consciousness (Finland Futures Research Centre, Ahvenharju et al., 2018).

Conversely, futures literacy builds upon futures consciousness, equipping individuals with the skills and methodologies to apply their orientation towards the future in practical decision-making and innovation, thus enhancing their ability to navigate and shape complex future contexts (Miller, 2015). Table 1 outlines the distinctions and overlaps between futures consciousness and futures literacy, highlighting their complementary roles. Understanding and engaging with future possibilities requires both, yet assessing futures literacy in educational contexts is challenging due to its broad and sometimes intangible skill set (Häggström & Schmidt, 2021; Mangnus, Oomen, Vervoort, & Hajer, 2021). Therefore, our study pivots toward exploring futures consciousness as a more accessible starting point for assessment in design education, using the Futures Consciousness Scale as our initial measurement tool (Lalot et al., 2021).

Table 1: Comparison of Futures Consciousness and Futures Literacy (from Ahvenharju et al., 2021, 2018; Facer & Sriprakash, 2021; Mangnus et al., 2021; Miller, 2015).

Aspect	Futures Consciousness	Futures Literacy	Similarities
Definition	Refers to an individual's awareness, attitude, and approach towards the future.	Involves the skills, knowledge, and abilities to effectively use information about the future.	Both relate to how people engage with and think about the future.
Focus	Emphasises psychological and cognitive dimensions, including beliefs, values, and emotions related to the future.	Focuses on the ability to analyse, interpret, and apply future-related information and scenarios.	Aim to enhance understanding and interaction with future possibilities.
Key Components	Time perspective, agency, open-mindedness, concern for the future, and participation in shaping the future.	Critical thinking, anticipation and scenario development, and the ability to apply these in decision-making.	Involve elements of forward-thinking and anticipation.
Educational Approach	Often developed through reflective practices, mindfulness, and emotional intelligence training.	Developed through educational programs that teach foresight methodologies, futures studies, and scenario planning.	Both can be cultivated through structured learning and personal development.
Application	Used to foster personal growth, resilience, and adaptability.	Employed in strategic planning, policymaking, and innovation to navigate future challenges and opportunities.	Both can enhance individual and organisational capacity to face future challenges.
Outcome	Enhanced personal well-being, a sense of purpose, and proactive engagement with the future.	Improved decision-making, innovation, and strategic outcomes by incorporating future insights.	Lead to more informed and considered approaches to future possibilities and challenges.

In African design education, the integration of futures consciousness and literacy is essential. Africa's journey through issues like climate change, rapid urbanisation, and socio-economic disparities calls for a forward-thinking approach to problem-solving and strategic planning (Cobbinah, Erdiaw-Kwasie, & Amoateng, 2015) Design educators have a responsibility to prepare students to create solutions that are not only innovative but also culturally and environmentally sustainable . By fostering futures consciousness, educators can encourage students to think beyond traditional design paradigms and consider long-term impacts and ethical implications of their designs. In the context of African design education, where unique socio-economic and environmental challenges prevail, such an approach is not just beneficial but necessary. The five dimensions of futures consciousness can serve as guiding principles for educators, helping to instil a holistic and forward-looking mindset in students. This is particularly relevant as they devise innovative and culturally relevant solutions to address issues like climate change, rapid urbanisation, and socio-economic disparities.

By prioritising the assessment of futures consciousness, we establish a baseline of future-oriented thinking among educators, which is a critical step toward enhancing futures literacy and fostering culturally and environmentally sustainable design solutions. The preparedness of educators is key to this integration, with support required to relate futures literacy to classroom practices effectively (Bateman, 2012; Slaughter Richard, 2008). Recognising futures consciousness as foundational allows for an inclusive development of futures literacy, which encompasses a wide range of adaptable methodologies. This approach ensures that futures literacy is informed by and respects diverse cultural landscapes, promoting a bottom-up approach where visions for the future are reflective of internal cultural landscapes, thus reducing the risk of cultural recolonisation.

1.2 AI and Design in Africa

That generative AI has had an impact on the design industry is undisputed (De Peuter, Oulasvirta, & Kaski, 2023, p. 85). These new tools are reshaping the workplace in many difference areas (Edberg & Beck, 2020). Digital design, a broad field that can be especially impacted by AI, includes professions that create and package graphic solutions used in “websites, mobile apps, video games, animation, and digital marketing materials” (Forsgren & Schröder, 2023, p. 6). The value to this industry of AI tools include time-saving, generating more options (such as colour palettes or layouts), possibly more creativity and reducing errors. Efficiency and innovation can be fostered using AI tools. Mundane and repetitive parts of the design process can be automated by AI, streamlining the process (Forsgren & Schröder, 2023, pp. 41–42). In fact, humans cannot compete in terms of speed of processing, prediction and project execution with automated systems or machine learning (Matthews, Shannon, & Roxburgh, 2023, p. 368).

While a variety of graphic design software was the first tool that revolutionised the creative processes, these increasingly include AI tools. In their 2020 study in the field of digital design, Edberg and Beck concluded that “AI has affected the nature of the digital design profession”, indicating a subtle yet significant shift in the design landscape that many practitioners may not fully recognise. Most designers, whether they realise it or not, engage with AI to some extent in their work, affecting the way they approach design problems (Edberg & Beck, 2020; Forsgren & Schröder, 2023, p. 41). This pervasive integration of AI invites scrutiny on its impact on employment and the potential for a homogenisation of design creativity (Forsgren & Schröder, 2023, p. 41).

Moreover, the integration of AI in the design process inherently involves the risk of perpetuating existing biases. Whether intentional or not, the issue of human bias and prejudice becomes part of the algorithms designed for AI, as seen in ”racist software” (Matthews et al., 2023, p. 374) . This highlights that a computer “cannot easily” develop a context appropriate response (Matthews et al., 2023, p. 372) and thus decolonialising AI is a concern amongst African design professionals and educators. The literature and discourse on decolonising AI emphasise the critical need to integrate decolonial theories to mitigate the complex risks AI technologies pose, particularly their potential to exacerbate vulnerabilities among marginalised groups.

Acknowledging these issues, Mohamed, Png, & Isaac (2020) advocate for a critical science approach that incorporates post-colonial and decolonial insights into AI development. They argue for the adoption of critical technical practices that are self-reflexive, recognise power imbalances, and incorporate learning from marginalised communities. These practices are aimed at reshaping educational methods to ensure AI development aligns with ethical standards and community-centric values.

At the heart of this new approach is a commitment to epistemic disobedience and border thinking, as conceptualised by Mignolo (2011). This involves challenging the dominance of Western knowledge systems and fostering a plurality of understandings that embrace the diverse "borderlands" of culture, thought, and knowledge production. By doing so, AI design can subvert traditional power dynamics and contribute to a design landscape that is not only inclusive and equitable but also rich with a multiplicity of socio-political, ecological, and economic perspectives.

This holistic view extends to the educational sector as well, where the decolonisation of AI is seen as a vital part of curriculum development. Zembylas (2023) underscores the importance of decolonial educational strategies that promote algorithmic fairness and counter digital neo-colonialism. The objective is to design and use AI in ways that foster decolonial futures and support equitable and just outcomes, particularly for communities that have been historically marginalised by colonial structures (Adams, 2021). Thus, the conversation about AI in design is not just about efficiency and innovation, but also about ensuring that these advancements contribute positively to all sections of society.

2. Research Methods

2.1 Participants

The study was conducted within the Applied Design department of a South African University of Technology (UoT). Participants were recruited through an electronic survey distributed to the department's educators, with an aim to capture a diverse representation of experiences and viewpoints. The survey reached 26 participants, which is approximately 65% of the department's faculty, ensuring a substantive sample for analysis. Participant demographics were recorded - encompassing gender, age, teaching experience, educational qualifications, and linguistic and racial background - to understand the diversity within the responses.

2.2 Instrumentation

The research instrument was a single, comprehensive, electronic questionnaire that amalgamated two scales and incorporated open-ended questions to capture qualitative data.

- **Futures Consciousness Scale (FCS):** The Revised Futures Consciousness Scale was used to measure the educators' future-oriented mindset across five dimensions. The scale is designed to be answered on a Likert scale, providing a quantifiable measure of each dimension of futures consciousness.
- **Adapted General Attitudes towards Artificial Intelligence Scale (GAAIS):** The GAAIS was adapted to specifically address attitudes toward generative AI within the design context. This adaptation included items that evaluate the perceived impact of generative AI on creativity, innovation, and educational practices in the South African design context.

The questionnaire also contained three open-ended questions aimed at eliciting qualitative insights into the participants' willingness to integrate generative AI into their curriculum, the perceived benefits of such integration, and their main concerns.

Data Analysis

Quantitative responses were subjected to statistical analysis to discern patterns and correlations within the data. Descriptive statistics illuminated the central tendencies and dispersions of the Likert-scale responses. Kendall’s Tau correlation coefficient (Salkind, 2007) was employed to identify relationships within the scales' dimensions and between futures consciousness and attitudes towards AI. Statistical software was used.

Qualitative responses from the open-ended questions were analysed thematically to extract deeper insights into the participants' perspectives, enriching the quantitative findings and providing a more nuanced understanding of the educators' stances.

2.3 Ethical Considerations

Ethical clearance for the study was obtained from the university's ethics committee, ensuring that the research adhered to the highest standards of academic integrity. Participants were informed about the purpose of the study, their right to confidentiality, and the voluntary nature of their participation. Informed consent was acquired electronically before the commencement of the questionnaire.

2.4 Limitations

Acknowledging the limitations inherent to electronic surveys and self-report measures, concerted efforts were made to mitigate bias and ensure the reliability of the data. To reduce self-selection bias, the study used targeted reminders to encourage a broad spectrum of participants to respond (Christensen et al., 2015), thereby aiming to secure a representative sample of the population. Despite these efforts, the potential for self-selection bias persists, as individuals who are more engaged or have stronger opinions may be more inclined to participate.

The study's generalisability is limited, as the participant pool was drawn from a single department of Applied Design, which may not reflect the diversity of design education settings across South Africa or other contexts. The findings, therefore, are not overstated and are presented as exploratory. This study serves as an initial foray into understanding the futures consciousness and AI attitudes within this specific educational context and provides a basis for future research that could expand to broader populations and regions.

3. Results

3.1 Futures Consciousness

In examining the data from our study, a pattern emerges regarding the participants' outlook on their influence over and understanding of the future. The dimension where participants rated themselves highest was *Systems Perception*, with a mean score of 4.19, indicating a strong collective grasp of the interconnectedness of various systems. On the other end, *Agency Beliefs* received the lowest mean rating at 3.44, suggesting a more moderate view of their ability to shape future outcomes.

The median scores in most dimensions lean higher than the averages, particularly in *Time Perspective*, *Openness to Alternatives*, and *Systems Perception*, hinting at an optimistic self-assessment among most participants in these areas. This is clearly visible in Table 2.

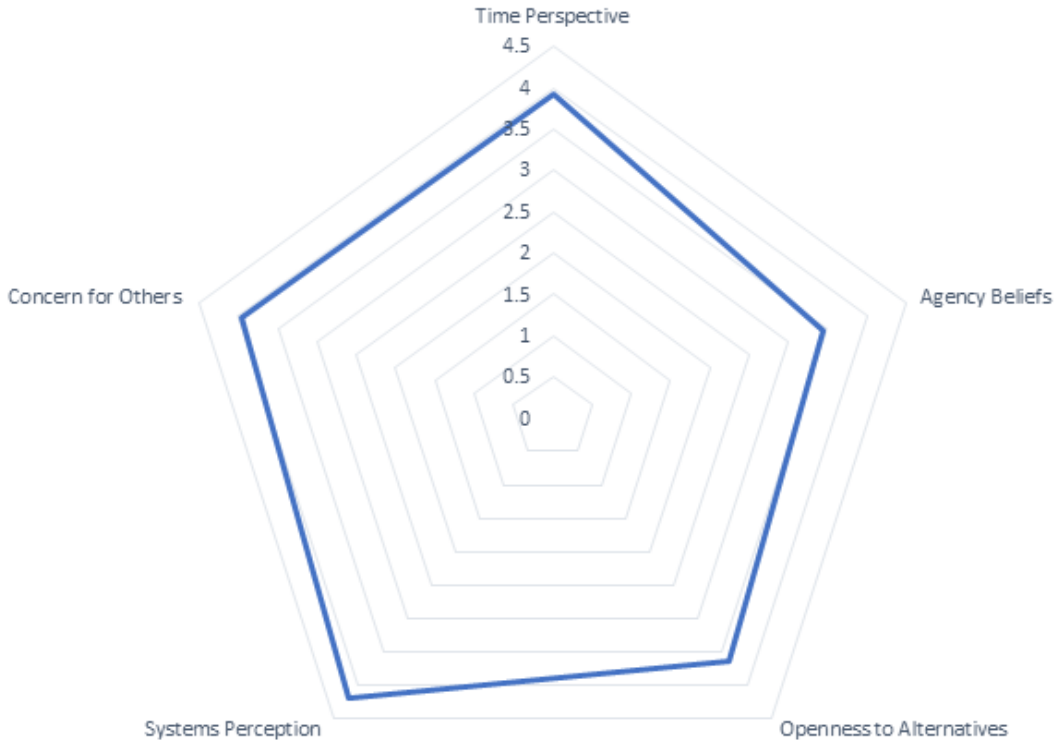

Figure 2. The mean results for the five dimensions of futures consciousness.

The standard deviation is relatively small across all dimensions, but it is narrowest in *Openness to Alternatives* (0.55), pointing to a high level of agreement in participants' willingness to consider different future possibilities. Although *Time Perspective* shows the widest spread in scores, its strong mean and median suggest that participants consistently consider the past, present, and future in their thinking. The similarity in scores for *Concern for Others* and *Openness to Alternatives* suggests a group that equally values the impact of their decisions on others and is open to new ideas.

Table 2. The mean, median and std deviation of results for the five dimensions of futures consciousness.

	Time Perspective	Agency Beliefs	Openness to Alternatives	Systems Perception	Concern for Others
MEAN	3,91	3,44	3,63	4,19	3,96
MEDIAN	4,00	3,50	3,75	4,38	4,00
STANDARD DEVIATION	0,80	0,69	0,55	0,70	0,61

Overall, the findings indicate a group with a shared and well-rounded perspective on futures consciousness, particularly marked by an insightful understanding of complex systems and a somewhat restrained belief in personal or collective agency.

3.2 AI Attitudes

This section presents responses from revised AI attitudes scale. The scale measured the perceptions of generative AI in the design field, particularly within the South African context. The responses are categorised into five options: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The data was analysed to understand the participants' attitudes towards the use of generative AI in design, its ethical implications, its impact on creativity and innovation, and concerns about cultural sensitivity and privacy.

Figure 3. Visualisation of Positive Attitudes to AI results.

The dataset (figure 3) offers a perspective on the South African design community's views towards generative AI, characterised by a mix of optimism and caution. Ethical worries are pronounced, with 30.8% expressing 'Disagree' and 46.2% 'Neutral' on the ethical deployment of generative AI by design organisations. The responses show a divided stance on employing generative AI for routine tasks, with responses spread evenly across all options, indicating no definitive preference.

Nonetheless, there is a noticeable optimism regarding generative AI's capacity to enhance creativity and innovation, with 38.5% 'Agreeing' and 11.5% 'Strongly Agreeing'. The capabilities of generative AI are particularly impressive to many, as evidenced by the highest 'Strongly Agree' rate (38.5%) in this aspect.

There's a robust interest in integrating generative AI into design practice and education, with both 'Agree' and 'Strongly Agree' garnering 30.8% each for practice integration. Similarly, positive responses are seen for its potential to improve educational outcomes (42.3% 'Agree', 19.2% 'Strongly Agree') and to stimulate development (30.8% 'Agree', 26.9% 'Strongly Agree').

Despite varied opinions on AI's efficiency for routine tasks, with 'Neutral' (34.6%) being the most common response, there is a belief in its beneficial applications in education (30.8% 'Agree', 19.2% 'Strongly Agree'). The responses are split on AI's capability to outperform humans in creative tasks, yet there is a cautious optimism about its wider benefits, with 'Neutral' (38.5%) and 'Strongly Agree' (23.1%) being significant. The eagerness to use generative AI in teaching is evident, with 26.9% 'Agreeing' and another 26.9% 'Strongly Agreeing', showing a readiness to embrace AI tools in educational settings.

In essence, the data depicts a community that is cautiously optimistic about the role of generative AI in fostering design creativity, innovation, and education, albeit with reservations about ethical issues and mixed views on its efficiency and creative edge.

Figure 4 depicts the sample’s concerns about integrating generative AI, with a focus on cultural and ethical implications. A significant portion of respondents, 57.7% ('Agree') and 15.4% ('Strongly Agree'), express apprehension that the unique cultural aspects of South African design might be lost with the increasing use of generative AI. Concerns about privacy and surveillance issues in design education due to generative AI are also prominent, with 50% strongly agreeing this could be a risk.

The fear that generative AI may not fully comprehend the cultural context of South African design is shared by 26.9% ('Agree') and 53.8% ('Strongly Agree'), indicating a widespread concern. Similarly, 50% ('Agree') and 23.1% ('Strongly Agree') find the use of generative AI in design concerning due to potential cultural insensitivity, suggesting significant apprehension.

The possibility that generative AI might overshadow traditional design methods, integral to cultural identity, is another major concern, with 57.7% ('Agree') and 23.1% ('Strongly Agree') reflecting a majority viewpoint. Ethical considerations are also paramount, with 34.6% ('Agree') and 53.8% ('Strongly Agree') wary of uncritical generative AI use leading to unethical design practices.

Additionally, there is unease about relying on generative AI for creative aspects of design, with 30.8% ('Agree') and 26.9% ('Strongly Agree') showing varied levels of concern, while 42.3% remain neutral.

In summary, the data highlights significant apprehensions about the impact of generative AI on cultural integrity, ethical practices, and traditional design methods. The potential for privacy and surveillance issues is notably alarming to half of the respondents, with broad concern also about generative AI's ability to respect and understand the unique cultural context of South African design.

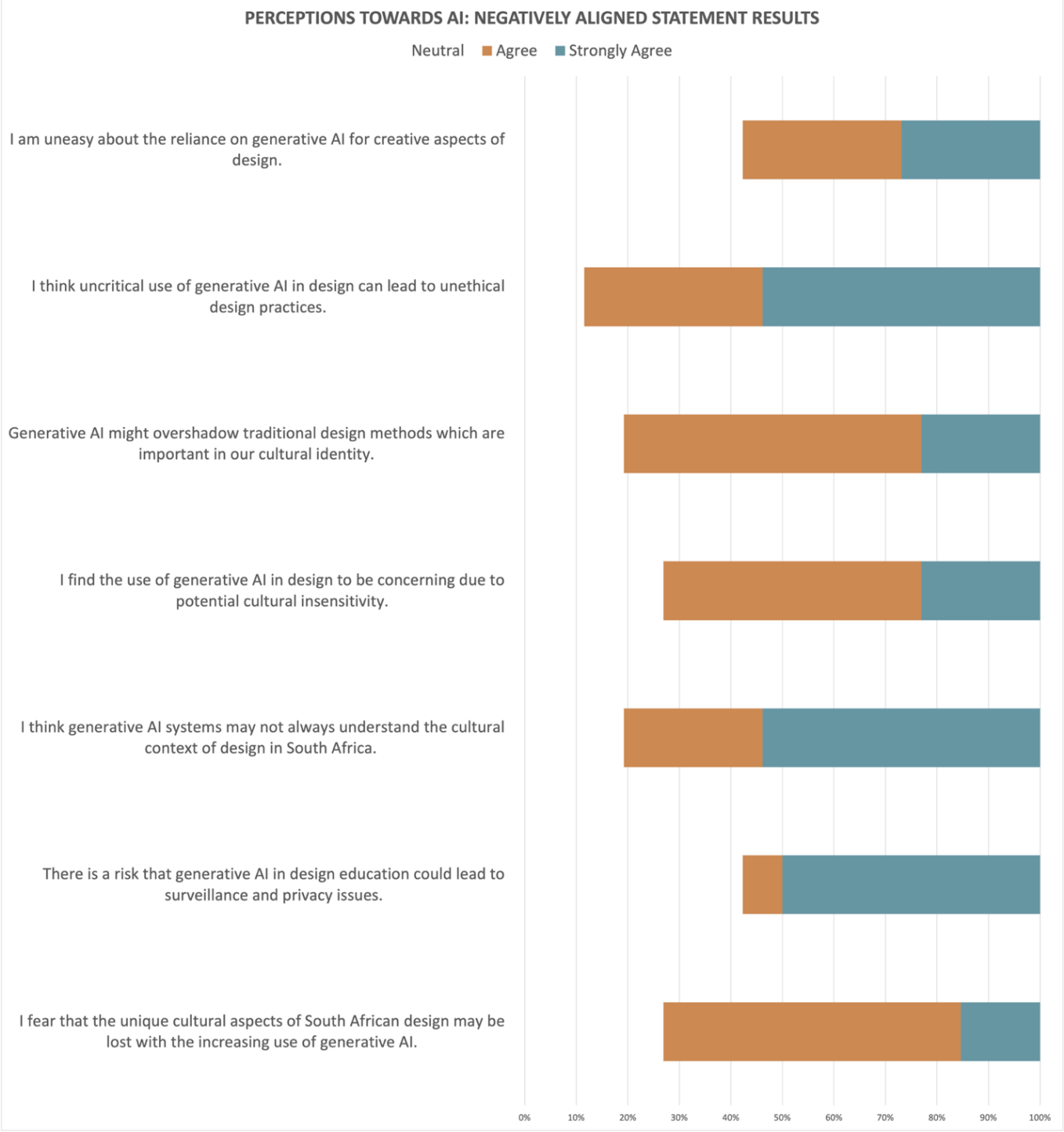

Figure 4. Visualisation of Negative Perceptions to AI results.

3.3 Correlation Between Quantitative Results

The Kendall's Tau correlation (Table 3) analysis conducted on the survey data from design educators revealed significant and meaningful relationships, underscored by confidence intervals that affirm the robustness of these findings. A significant positive correlation emerged between 'Systems Perception' and 'Time Perspective' (Tau = 0.461, with a 95% CI of 0.170 to 0.752, p = 0.003), suggesting a strong association between a comprehensive time perspective and an acute awareness of systemic interrelations. Correspondingly, 'Openness to Alternatives' showed a notable positive correlation with 'Agency Beliefs' (Tau = 0.475, with a 95% CI of 0.247 to 0.704, p = 0.002), indicating that educators who are more receptive to alternative ideas also tend to hold more potent beliefs in their efficacy to effect change. Moreover, a positive relationship was identified between 'Time Perspective' and 'POSITIVE' attitudes towards AI (Tau = 0.420, with a 95% CI of 0.178 to 0.663, p = 0.005), linking a forward-looking perspective with a propensity towards embracing AI in design education. These statistically significant correlations, bolstered by confidence intervals that exclude zero, provide a compelling narrative about the orientations of design educators, while also laying a foundation for subsequent studies to build upon and explore.

Table 3. Correlation of results for the five dimensions of futures consciousness and positive and negative attitudes toward generative AI in design.

Correlation

Kendall's Tau Correlations

Variable		Time Perspective	Agency Beliefs	Openness to Alternatives	Systems Perception	Concern for Others	POSITIVE	NEGATIVE
1. Time Perspective	Kendall's Tau B	—						
	p-value	—						
	Upper 95% CI	—						
	Lower 95% CI	—						
2. Agency Beliefs	Kendall's Tau B	0.181	—					
	p-value	0.231	—					
	Upper 95% CI	0.537	—					
	Lower 95% CI	−0.175	—					
3. Openness to Alternatives	Kendall's Tau B	0.251	0.475**	—				
	p-value	0.105	0.002	—				
	Upper 95% CI	0.581	0.704	—				
	Lower 95% CI	−0.079	0.247	—				
4. Systems Perception	Kendall's Tau B	0.461**	0.163	0.260	—			
	p-value	0.003	0.279	0.092	—			
	Upper 95% CI	0.752	0.489	0.571	—			
	Lower 95% CI	0.170	−0.162	−0.051	—			
5. Concern for Others	Kendall's Tau B	0.291	−0.129	0.032	0.258	—		
	p-value	0.057	0.392	0.838	0.090	—		
	Upper 95% CI	0.594	0.230	0.335	0.578	—		
	Lower 95% CI	−0.012	−0.488	−0.272	−0.061	—		
6. POSITIVE	Kendall's Tau B	0.420**	0.026	0.274	0.299*	0.056	—	
	p-value	0.005	0.858	0.068	0.044	0.703	—	
	Upper 95% CI	0.663	0.286	0.563	0.594	0.335	—	
	Lower 95% CI	0.178	−0.233	−0.015	0.003	−0.223	—	
7. NEGATIVE	Kendall's Tau B	0.184	0.110	0.055	0.031	0.162	0.121	—
	p-value	0.223	0.459	0.717	0.839	0.280	0.409	—
	Upper 95% CI	0.465	0.363	0.315	0.342	0.464	0.403	—
	Lower 95% CI	−0.097	−0.142	−0.205	−0.281	−0.139	−0.162	—

* p < .05, ** p < .01, *** p < .001

3.4 Qualitative Responses

The questionnaire asked three open-ended questions, and these reflect the perspectives of educators in the South African design education environment on three interrelated aspects: factors influencing their willingness to integrate generative AI into the curriculum, main concerns regarding the use of generative AI, and potential benefits of its integration. Across these responses, several themes emerged (Figure 5), encapsulating the complexities and nuances of introducing AI technologies into educational practices.

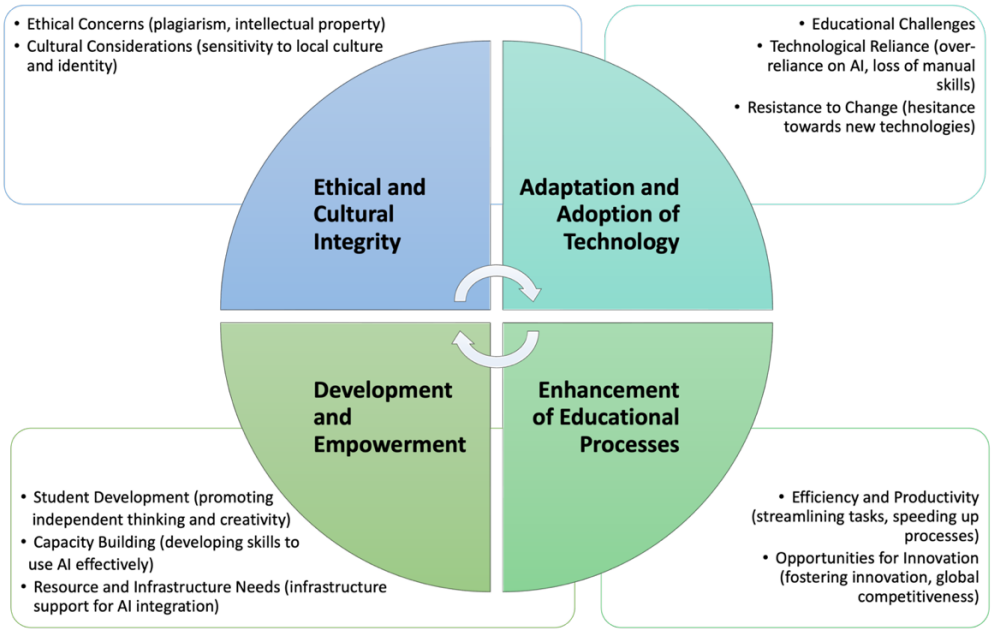

Figure 5. Considerations for introducing AI technologies into educational practices.

In the theme of *Ethical and Cultural Integrity*, educators express significant ethical concerns. Issues such as plagiarism and the safeguarding of intellectual property rights are at the forefront of the discourse. For instance, Participant 4 voices a critical perspective on the potential misuse of AI, underscoring the ethical dilemma with "Ethics in the use of/incorporation of the work of other designers." This concern is echoed by Participant 17, who stresses the systemic failures in the current educational milieu that might be exacerbated by AI without careful implementation. Simultaneously, an awareness of cultural considerations is evident. Participants are mindful of the need for generative AI to be sensitive to local culture and identity. Participant 24 articulates this by emphasising the need to "Guard against losing human touch that identifies us as South African," reflecting a desire to maintain the unique cultural fabric in the face of homogenising technologies.

Adaptation and Adoption of Technology is another overarching theme, where educational challenges such as updating curricula and teaching methods are considered critical. Participant 5 points out the risk of educational systems falling behind due to not keeping up with AI advancements. Further, technological reliance is a subtheme highlighted by Participant 15's concern about "Fear and not understanding the fundamental technology behind generative AI," illustrating the anxiety over an over-reliance on AI that may diminish manual skills and critical thinking. A resistance to change among academics was mentioned by Participant 19, who notes that "Academics hate change in particular certain groups more than others." This might point to inherent inertia in academic circles towards adopting new technologies. The potential for enhancement of educational processes is also recognised, for example participant 4 see generative AI as a means to eliminate mundane tasks for better use of time. This is tied to the prospect of opportunities for innovation, where generative AI could potentially keep South African design education on par with global standards, as per the hopes of Participant 26, who looks forward to "Integration that will keep us on a global par."

Lastly, the theme of *Development and Empowerment* the need for student development in the use of generative AI is noted, where fostering independent thinking and creativity is crucial, as Participant 7 fears the loss of originality and personal creativity. Capacity building is also underscored by Participant 31's mention of the "Lack of capacity building," indicating a need for skill development to effectively leverage AI. Resource and Infrastructure Needs, is also identified as a significant barrier by Participant 17, considering the existing "failed school education system."

These thematic insights reveal a complex and cautious optimism among educators, balancing the potential for technological empowerment with a commitment to maintaining ethical and cultural standards, and a cognisance of the significant systemic changes required for the successful integration of generative AI in design education.

4. Discussion

The integration of Artificial Intelligence (AI) into design education prompts a re-evaluation of pedagogical strategies and curriculum design to meet the demands of a rapidly evolving future. Our study has surfaced a key finding: the presence of a relationship between futures consciousness and attitudes toward AI among design educators, particularly within the dimension of time awareness. Educators with a deeper understanding of the interconnectedness of past, present, and future demonstrate more positive attitudes towards embracing AI. This correlation suggests that a nuanced perception of time might influence the adoption of future-oriented technologies.

Our investigation also reveals a general readiness among educators to integrate AI within design education, tempered by an understanding of the ethical considerations and a commitment to preserving cultural integrity, aligning with Adams (2021) concern for cultural integrity in technological adoption. This is also in line with Miller's (2015) notion of futures literacy, which emphasises the capacity to employ foresight and innovation within the context of one's culture.

However, our research also highlights critical areas requiring attention. The ability of educators to critically evaluate AI outputs for potential biases underscores the need for robust training programs focusing on AI ethics, culturally inclusive content, and the strategic use of AI in preserving cultural identity, aligning with Mohamed, Png, & Isaac's (2020) advocacy for decolonial approaches in AI development. Such educational initiatives are vital for fostering a futures consciousness that embraces the ethical dimensions identified by Ahvenharju et al. (2018), namely ethical pragmatism which emphasises practical wisdom and the integration of knowledge with ethical action, and an ethical concern for the future of others, highlighting the importance of values, morals, and ethical thinking in shaping futures.

Despite the optimistic stance on AI integration, the study confronts limitations due to its scope and sample size. The insights drawn from a single department at a South African University of Technology may not encapsulate the full spectrum of design education settings across Africa. Therefore, while the detected correlation between futures consciousness and AI attitudes is suggestive, it is not conclusive. The findings invite further inquiry into the diverse educational landscapes, cultural contexts, and design disciplines across the continent.

Considering these limitations, we conclude with strategic recommendations for advancing AI in design education. Curricula must evolve to integrate AI in ways that are consistent with decolonisation and inclusivity principles, reflecting the critical perspectives highlighted by Ndlovu-Gatsheni (2020). There is a clear imperative to close the infrastructure and resource gaps that hinder the full realisation of AI's potential in this field, as pointed out by Cobbinah et al. (2015). Moreover, the curriculum design must evolve to embed AI literacy, ensuring that students are equipped not just as users but as critical evaluators and ethical creators of AI technologies.

5. Conclusion

While the futures consciousness of our sample group appears relatively high, suggesting a forward-thinking mindset among educators, we recognise that futures consciousness alone may not suffice to navigate the rapidly evolving landscape of the design industry, especially with the advent of AI and other emerging technologies. This understanding serves as a critical starting point and a means to establish a baseline; however, the cultivation of futures literacy, particularly the cultural and ethical dimensions emphasised in Miller's framework, becomes imperative.

Miller's (2015) concept of futures literacy goes beyond mere awareness of future possibilities; it involves the ability to employ foresight and innovation within one's cultural context, thus enabling individuals to envision and shape futures that are culturally coherent and ethically sound. As echoed by insights from the All Africa Futures Forum (Karuri-Sebina & Miller, 2018, p. 166), capacity-building in futures literacy must engage with the rich tapestry of African culture and history. Findings from the forum concluded that "cultivating African Futures Literacy was seen as one mechanism for fostering identity precisely because it depends on a meaningful consciousness of heritage." This aspect of futures literacy is critical in design education where cultural relevance and ethical considerations are pivotal in the creation and implementation of design solutions.

To this end, our study underscores the importance of integrating futures literacy into design education to equip educators and students with the skills necessary to critically engage with AI technologies, assess their cultural and ethical implications, and apply this knowledge in their professional practice. The development of such competencies is essential for fostering a design education ecosystem that is not only technologically advanced but also culturally sensitive and ethically responsible.

Based on the study's findings, it is recommended to develop training programs focusing on AI ethics and to embed futures literacy within design curricula. Institutional support mechanisms are also suggested to aid in the ethical and culturally sensitive integration of AI in design education. These initiatives are vital for nurturing a futures consciousness that is attuned to the ethical and cultural dimensions of design practice.

Further research is needed to confirm the statistical correlation between time perception and AI attitudes, to explore the longitudinal impact of AI integration and to conduct comparative studies across different African cultural contexts. As we advocate for the integration of AI in design education, we must also champion the advancement of futures literacy as a key component of this transition. The journey towards a technologically enriched future in design education demands a concerted effort to uphold the rich tapestry of cultural diversity and ethical integrity that characterises the African continent. Our collective responsibility is to ensure that this evolution not only embraces technological innovation but also fosters an environment where cultural confidence and ethical considerations are at the forefront of educational endeavours. Educators play a pivotal role in shaping an educational ecosystem that embraces technology while staying true to cultural integrity. The importance of adaptability and responsiveness to technological advancements in education is emphasized, ensuring alignment with cultural values and ethical standards. Continuous research and adaptive strategies will be paramount in achieving a balanced integration of AI, where the future of design education is shaped by a harmonious blend of technology, culture, and ethics.

References

Adams, R. (2021). Can artificial intelligence be decolonized? *Interdisciplinary Science Reviews: ISR, 46*(1-2), 176-197. https://doi.org/10.1080/03080188.2020.1840225

Ahvenharju, S., Lalot, F., Minkkinen, M., & Quiamzade, A. (2021). Individual futures consciousness: Psychology behind the five-dimensional Futures Consciousness scale. *Futures, 128*, 102708. https://doi.org/10.1016/j.futures.2021.102708

Ahvenharju, S., Minkkinen, M., & Lalot, F. (2018). The five dimensions of Futures Consciousness. *Futures, 104*, 1-13. https://doi.org/10.1016/j.futures.2018.06.010

Bateman, D. (2012). Transforming teachers' temporalities: Futures in an Australian classroom. *Futures, 44*(1), 14-23. https://doi.org/10.1016/j.futures.2011.08.003

Christensen, A. I., Ekholm, O., Kristensen, P. L., Larsen, F. B., Vinding, A. L., Glümer, C., & Juel, K. (2015). The effect of multiple reminders on response patterns in a Danish health survey. *European Journal of Public Health, 25*(1), 156-161. https://doi.org/10.1093/eurpub/cku057

Cobbinah, P. B., Erdiaw-Kwasie, M. O., & Amoateng, P. (2015). Africa's urbanisation: Implications for sustainable development. *Cities (London, England), 47*, 62-72. https://doi.org/10.1016/j.cities.2015.03.013

De Peuter, S., Oulasvirta, A., & Kaski, S. (2023). Toward AI assistants that let designers design. *AI Magazine, 44*(1), 85-96. https://doi.org/10.1002/aaai.12077

Edberg, E., & Beck, L. (2020). Adoption of AI in digital design: A qualitative study about the effects on the profession. *Diva Portal*. Retrieved August 12, 2024, from https://www.diva-portal.org/smash/record.jsf?pid=diva2:1423516

Facer, K., & Sriprakash, A. (2021). Provincialising Futures Literacy: A caution against codification. *Futures, 133*, 102807. https://doi.org/10.1016/j.futures.2021.102807

Forsgren, J., & Schröder, H. (2023). Can AI perform the work of human designers? A qualitative study on the impact of AI on digital design professions. *Diva Portal*. Retrieved August 12, 2024, from https://www.diva-portal.org/smash/record.jsf?pid=diva2:1786001

Häggström, M., & Schmidt, C. (2021). Futures literacy - To belong, participate and act! *Futures, 132*, 102813. https://doi.org/10.1016/j.futures.2021.102813

Heleta, S. (2018). Decolonizing knowledge in South Africa: Dismantling the 'pedagogy of big lies.' *Ufahamu, 40*(2). https://doi.org/10.5070/F7402040942

Karuri-Sebina, G., & Miller, R. (2018). All-Africa Futures Forum: Transforming Africa's futures. *PhilPapers*. Retrieved August 12, 2024, from https://philpapers.org/rec/KARAFF

Lalot, F., Ahvenharju, S., & Minkkinen, M. (2021). Aware of the future?: Adaptation and refinement of the futures consciousness scale. *Psychological Test Adaptation and Development, 2*(1), 102-110. https://doi.org/10.1027/2698-1866/a000014

Lalot, F., Ahvenharju, S., Minkkinen, M., & Wensing, E. (2020). Aware of the future?: Development and validation of the Futures Consciousness scale. *European Journal of Psychological Assessment, 36*(5), 874-888. https://doi.org/10.1027/1015-5759/a000565

Mampane, R. M., Omidire, M. F., Aluko, F. R. (2018). Decolonising higher education in Africa: Arriving at a glocal solution. *South African Journal of Education, 38*(4), 1-9. https://doi.org/10.15700/saje.v38n4a1636

Mangnus, A. C., Oomen, J., Vervoort, J. M., & Hajer, M. A. (2021). Futures literacy and the diversity of the future. *Futures, 132*, 102793. https://doi.org/10.1016/j.futures.2021.102793

Matthews, B., Shannon, B., & Roxburgh, M. (2023). Destroy all humans: The dematerialisation of the designer in an age of automation and its impact on graphic design-A literature review. *International Journal of Art & Design Education, 42*(3), 367-383. https://doi.org/10.1111/jade.12460

Mignolo, W. D. (2011). Geopolitics of sensing and knowing: On (de)coloniality, border thinking and epistemic disobedience. *Postcolonial Studies, 14*(3), 273-283. https://doi.org/10.1080/13688790.2011.613105

Miller, R. (2015). Learning, the future, and complexity: An essay on the emergence of futures literacy. *European Journal of Education, 50*(4), 513-523. https://doi.org/10.1111/ejed.12157

Mohamed, S., Png, M.-T., & Isaac, W. (2020). Decolonial AI: Decolonial theory as sociotechnical foresight in artificial intelligence. *Philosophy & Technology, 33*(4), 659-684. https://doi.org/10.1007/s13347-020-00405-8

Mudaly, R. (2018). Towards decolonising a module in the pre-service science teacher education curriculum: The role of indigenous knowledge systems in creating spaces for transforming the curriculum. *Journal of Education, (74)*, 47-66. https://doi.org/10.17159/2520-9868/i74a04

Ndlovu-Gatsheni, S. J. (2020). *Decolonization, development and knowledge in Africa: Turning over a new leaf.* Routledge. https://doi.org/10.4324/9781003030423

Odoch Pido, J. P. (2014). Pedagogical clashes in East African art and design education. *Critical Interventions, 8*(1), 119-132. https://doi.org/10.1080/19301944.2014.889955

Ooi, K.-B., Tan, G. W.-H., Al-Emran, M., Al-Sharafi, M. A., Capatina, A., Chakraborty, A., … Wong, L.-W. (2023). The potential of generative artificial intelligence across disciplines: Perspectives and future directions. *Journal of Computer Information Systems*, 1-32. https://doi.org/10.1080/08874417.2023.2261010

Salkind, N. (2007). Kendall rank correlation. In *Encyclopedia of measurement and statistics* (pp. 509-510). Sage. https://doi.org/10.4135/9781412952644

Sawyerr, A. (2004). Challenges facing African universities: Selected issues. *African Studies Review, 47*(1), 1-59. https://doi.org/10.1017/S0002020600026986

Schepman, A., & Rodway, P. (2020). Initial validation of the general attitudes towards Artificial Intelligence scale. *Computers in Human Behavior Reports, 1*, 100014. https://doi.org/10.1016/j.chbr.2020.100014

Slaughter, R. A. (2008). Futures education: Catalyst for our times. *Journal of Futures Studies, 12*(3), 15-30. https://doi.org/10.1163/9789087905132_005

Zembylas, M. (2023). A decolonial approach to AI in higher education teaching and learning: Strategies for undoing the ethics of digital neocolonialism. *Learning, Media and Technology, 48*(1), 25-37. https://doi.org/10.1080/17439884.2021.2010094

About the Authors:

Ryna Cilliers is a lecturer at Cape Peninsula University of Technology, earned her MFA from the University of Cape Town in 2010. She is pursuing a Doctorate in Applied Art and Design, focusing on design education, futures thinking and emerging technologies.

Veronica Barnes is a lecturer at Cape Peninsula University of Technology, completed a DTech in Design in 2020, focusing on empathy in product design. Her interests include design anthropology, critical thinking and digital storytelling.

P/REFERENCES OF DESIGN

This contribution was presented at Cumulus Budapest 2024: P/References of Design conference, hosted by the Moholy-Nagy University of Art and Design Budapest, Hungary between May 15-17, 2024.

Conference Website
cumulusbudapest2024.mome.hu

Conference Tracks
Centres and Peripheries
Converging Bodies of Knowledge
Redefining Data Boundaries
Bridging Design and Economics
Speculative Perspectives
The Power of Immersion
The Future of Well-being
Taming Entropy: Systems Design for Climate and Change
Ways of Living Together
Cumulus PhD Network

Full Conference Proceedings
https://cumulusbudapest2024.mome.hu/proceedings

ISBN Volume 1: 978-952-7549-02-5 (PDF)
ISBN Volume 2: 978-952-7549-03-2 (PDF)

DOI Volume 1: https://doi.org/10.63442/IZUP8898
DOI Volume 2: https://doi.org/10.63442/TADX4016

Conference Organisers
Moholy-Nagy University of Art and Design Budapest (MOME)
mome.hu
Cumulus Association
cumulusassociation.org