# Adoption of Generative Artificial Intelligence in K12 Design and Technology Education

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***Abstract***

Technological artefacts and tools play a crucial role in design and technology (D&T) education as they support the mediation between individuals and their environment. With the advent of generative artificial intelligence (Gen-AI), popularised by large language models and tools, D&T practices are being challenged as the technology is being integrated into the educational landscape. Although AI is attracting growing attention because of the potentialities it offers, it is not yet clear about the reasons underlying an adoption and/or rejection when addressing educational, but also technical and social challenges in classrooms. This paper investigates these reasons adopting a mixed research methodology which involves a survey addressed to D&T educators to collect their views and determine factors that influence AI adoption, and a case study that discusses ten capabilities from three well-known Gen-AI platforms (Midjourney, Padlet, and Newarc.ai) with respect to D&T teaching and learning. Results from the survey showed that participants recognised the value, accuracy and benefit of AI in D&T in a very high level of acceptance, whereas trust in transparency, explainability, privacy and data security depicted a different viewpoint, indicating potential uncertainties around AI. Additionally, a couple of strong pairwise correlations were found between drivers. These results are particularly important as they provide directions and insights into the development and validation of a framework towards AI adoption with respect to D&T but also practical implications for research and education when developing effective, efficient and personalised AI-supported instructions.

*Key Words: Artificial intelligence, AI Adoption framework, Design and technology education, Generative AI, Generative design.*

## 1. INTRODUCTION

The integration of artificial intelligence (AI) into education has attracted considerable attention in the recent decade and shown a potential transformative impact on all levels of educational settings. This embracement encompasses a broad spectrum of applications ranging from administrative, human resource tasks to intelligent tutors, chatbots and personalised learning (e.g. Zhang and Aslan, 2021). Within AI, generative AI (Gen-AI) has emerged to be a driving force. Powered by popular models such as generative pretrained transformers (GPT), bidirectional encoder representations from transformers (BERT), Gemini, LLaMA, etc. this technology has enabled capabilities in the automation and/or semi-automation of several ordinary human tasks

in the academic workplace. However, this implementation is not without concerns namely technical, ethical, social, etc. (e.g. Zhang & Aslan, 2021; Luan et al., 2020), a 'dark side' (Wach et al. 2023) that need to be addressed for the benefits of education.

Of importance is understanding the adoption and/or rejection of AI in design and technology (D&T) education. While there are a bunch of research in higher education, however, few is known when it comes to the adoption by K12 D&T educators. This paper explores this issue and examines factors that influence AI adoption while identifying the benefits, challenges and future directions of this rapidly developing AI technology. By collecting teachers' views and discussing a case study on AI in D&T education, the paper aims to give a comprehensive overview of how the technology shapes the D&T education landscape and what this would mean for educators, learners and policy makers. The paper provides theoretical elements towards a framework for the adoption of AI as well as recommendations on its use in K12 D&T education.

*Table 1 Examples of existing frameworks on the adoption of AI technology in academia and education*

| Contexts | Examples of frameworks-models used or developed | References |
|---|---|---|
| Educational organizations and academia (university, higher education, libraries, human resource) | Unified Theory of Acceptance and Use of Technology (UTAUT); - Technology Organization Environment (TOE) framework; - Framework assessing when and how AI could enhance academic pursuits; - UTAUT; - TPACK. | Ahmad et al. 2023; Sharma et al., 2024; Andrews, Ward, and Yoon, 2021; Yawson, 2024; Jo and Bang, 2023; Strzelecki and ElArabawy, 2024; Jain and Raghuram, 2024; Tanantong and Wongras, 2024. |
| Education and teacher education | "Five S" prompting framework for assessment; - TPACK and UTAUT frameworks – UTAUT; - Davis's TAM and Biesta's Three functions of education | Tassoti, 2024; O'Dea and O'Dea, 2023; Xiaohong et al. 2024; Butler and Starkey, 2024 |
| User experience and perception | UTAUT; - Technological Acceptance Model (TAM) and the Moral Foundation Theory with a Three-pronged approach; | Lin, Ho, and Yang, 2022; Ho, Mantello, and Ho, 2023 |

### *1.1. Background: frameworks and adoption factors*

A rapid review in the Web of Science database shows that the last decade has witnessed a growing interest in AI adoption in education globally. This tendency is also confirmed by a recent review of Bahroun et al. (2023) who identified Gen-AI as having an exponential growth in research, and ChatGPT as a dominant Gen-AI tool. Several frameworks and models have been developed and used to frame the adoption of AI in academia (Table 1). For instance, Jo and Bang (2023) investigated factors in the adoption of ChatGPT with the 'technology – organization - environment' (TOE) framework using the concept of knowledge application. They found that quality of network, accessibility, and system responsiveness contributed to satisfaction. Ho, Mantello, and Ho (2023) combined the 'technology acceptance model' (TAM) and the 'moral foundation theory' (MFT) with an analytical framework, i.e. a 'three-pronged' approach to study determinants of emotional AI's acceptance. Andrews, Ward, and Yoon (2021) utilised the unified

theory of acceptance and use of technology (UTAUT) as a framework to predict librarians' intentions to adopt AI and related technologies. While they concluded that the UTAUT framework can be a viable framework to study intentions in adoption, they found that performance expectancy and attitude toward AI had strong effects on intentions, whereas social influence and expected effort did not. Elkefi, Tounsi, and Kefi (2024) also used this model to investigate engineering students' use of ChatGPT. Most students used the chatbot with strong UTAUT predictors being highlighted. Similar to this, Cortez et al. (2024) utilised the extended UTAUT, that is UTAUT2 from (Venkatesh et al. 2003), and a self-determination theory to point out variables like promoting conditions, habits and performance expectations had a direct impact on behavioural intention and an indirect effect on educational use. As for Mazarakis et al. (2023) a theory of human-centred interdisciplinary AI, that is for instance the synergistic human-AI symbiosis theory (SHAST) can be relevant to address interactions. Richardson et al. (2022) developed a framework based on patients' experiences, beliefs and attitudes towards AI in healthcare. Their study concluded that patients' attitudes and beliefs towards healthcare AI were the first decisive steps to effective patient participation and education.

While there is evidence of research developments in education globally, however, few of these applications are specific to K12 D&T teaching and learning. What can be learned from literature is that critical factors are driven by trust, safety and ethical issues in most cases. According to Yawson (2024), two principles appear to be crucial in adopting technologies such as AI: the 'substantial equivalence principle' which suggests that assessing new technologies are based on how functionally comparable they are to existing accepted practices, and the 'precautionary principle' that is the technology undergoes rigorous risks' assessment before its widespread adoption. This is positioned as two ends of a spectrum of viewpoints on integrating emerging Gen-AI into academia. Sharma et al.'s (2024) study showed significant relationships between factors including self-efficacy of AI, behavioural intention, AI adoption in higher education, and perceptions of risk, usefulness, effectiveness and organizational support. However, perceived usefulness was not identified as a significant factor in influencing the intention to adopt AI in higher education in Jain and Raghuram's (2024) study. Notably, they viewed key drivers such as perceived ease of use, TPACK, and trust. Li et al. (2024) reviewed findings on interpersonal trust, human automation and human AI from a three-dimensional perspective based on trustee, trustor and their interactive contexts. Their framework summarises factors related to trust formation and dynamics among different trust types. They argued that these factors clearly define the baseline for the development of reliable AI and provide guidance for its development, especially for user education and training. Similar to these is the study of Ayanwale and Ndlovu (2024) who evidenced that students who recognise the advantages of chatbots have shown a strong intention to use it for educational purposes. They found relationships between benefits, compatibility, trialability, trust, perceived usefulness, perceived ease of use, and behavioural intention. For Elkefi, Tounsi, and Kefi (2024) who investigated engineering students' adoption of ChatGPT, determinants like peer support, high frequency use, perceived benefits positively influence intention of using ChatGPT, whereas concerns about laziness, accuracy, privacy are negatively related to the intention to use. As research increases, other drivers (e.g. emotional, empathy, cultural) can be central in uncovering human-AI interactions in D&T.

### *1.2. Towards a framework for the adoption of AI in K12 design and technology education*

Let us now recontextualised the use of AI in D&T education within the technology education literature. Over its relatively brief history, technology education has had foundational connections with technological artefacts, tools, and objects. This has been subject to intense philosophical, epistemological, sociocultural, and educational debates among researchers. From a philosophical point of view, researchers have identified four types of technology means: 'technology as artefacts', 'as knowledge', 'as activities', and 'as a characteristic of humanity' (Mitcham 1994). Jones et al. (2013) discussed that these categories appear to be relevant to D&T education. For instance, artefacts have both physical and functional nature. They can be multifaceted (Verkerk et al. 2015), e.g. physical object with an interface such as robots or 3D printers. As a computational model aiming to simulate human reasoning, AI is an intelligent modelling tool embedded into virtual and physical artefacts (e.g. computers, tablets). This refers to the artefactual account of models which Nia and de Vries (2016) describe as 'techno-scientific artefacts' of dual nature: intrinsic and intentional.

'Technology as knowledge' helps clarify the characteristics of technological knowledge (e.g., normativity, propositionality, taciteness, ill-structuredness). 'As activity', technology fosters the design learning experience through the design process whereas 'technology as characteristic of humanity', which Jones et al. (2013) consider as the most grounded one, focuses on improving socially learners' experience of the world. While all these four means are integrated and taught together (Ibid.), teachers can for instance propose the design of artefacts inspired by AI - used as a tool, to explore variety of innovative artefacts they want students to design; It is also possible to develop activities that reflect on the non-linear design process (technology as activity), and confront student prior knowledge with technological knowledge conveyed by the AI-inspired artefact (technology as knowledge); Finally, with respect to technology as characteristic of humanity, educators can let students think about the values and concerns (e.g. ethics, originality, empathy bias, intellectual property, etc.) associated with the AI-inspired artefact.

Technology education puts a particular emphasis on the human activity as mediated by artefacts and tools. With this, D&T activities are embedded in the epistemology of technology, i.e. they are built and developed from a complex (functional and systemic) way of thinking. This allows to distinguish the teaching of technology (non-linear thinking aimed at concretizing objects or systems) from that of other scientific disciplines (de Vries, 2016). From an instructional perspective, D&T education adopts a pragmatical view in building with the learners the know-how, know-what and know-that, etc. with respect to any (Gen-AI) tools.

Broadly situated, the general use of AI in D&T can be shared across many application areas, with a critical determinant factor that is trust. This (potentially) explains why most research proliferate in higher education when K12 education remains more cautious. In this regard, Ofosu-Ampong et al. (2023) trustworthy issues are particularly adaptable to question D&T educators' scepticism. This is also discussed in Li et al. (2024) who adopted a three-dimension framework (i.e. the trustor, trustee, and their interactive context) to identify key interpersonal, human-AI trust and

human-automation drivers. However, there is a lack of considerations for specific elements related to teaching and learning in D&T education. Although samples of generic D&T tasks like planning lessons, effective management of administrative tasks (e.g. Ahmad et al. 2022), seeking feedback and grading (Rutner & Scott, 2022), developing teaching and learning resources (Song et al. 2024; Druga, Otero & Ko, 2022; Ng et al. 2023), using AI as a pedagogical tool (Celik, 2023), to enhance traditional pedagogical approaches (Darda, Gupta & Yadav, 2024), or create novel ones can be found in literature, yet specific D&T tasks that support most D&T instructions are to be explored further. To support the effective use of the technology, educators can also teach about how to use AI in the D&T classroom (Ho et al., 2019; Ng et al., 2023). Teaching and learning D&T provides a unique opportunity to investigate the nature of technological artefacts and tools as cultural mediators (e.g., Impedovo et al., 2017) as discussed above. It is believed that when included in a well-informed process of thinking relevant to D&T, AI can support teachers in developing relevant technological and pedagogical contents and enhance the teaching-learning process. For instance, AI can support multimodal ideation and the making process with cognitively deficient learners while discussing the challenges of tools and their choice. Notably, Vartiainen and Tedre (2023) found that AI can inspire educators to consider both the unique nature of crafts and the tensions of introducing it into design and crafts practices.

### *1.3. Research Objective*

This paper aims to provide an overview of the adoption of AI in K12 design and technology education and brings pieces together for the elaboration of a framework on the adoption of AI. It builds on educators' views on their use and the applications of AI in their daily instructional practices, as well as factors that contribute to explaining AI adoption in the educational workplace, especially for teaching and learning purposes. With respect to that, the study also presents a case study that investigates three advanced Gen-AI tools and discuss their opportunities and challenges, as well as recommendations when developing AI-supported instructions.

## 2. METHODOLOGY

Data were collected following a mixed research method combining a survey distributed to D&T educators in the UK (via the D&T Association and CLEAPSS mailing lists and posted on LinkedIn) to collect their views on the use of Gen-AI and a case study describing some capabilities of Gen-AI in D&T classrooms. 19 teachers of D&T completed the survey (see survey findings below). All computations were performed on Microsoft Excel to obtain the visualisations and descriptive statistics. The next section presents a multi-platform case study of the potential for the use of Gen-AI in D&T.

## 3. EXAMPLES OF GEN-AI USE IN D&T

The examples below explore and exemplify the application of three advanced AI tools in the context of teaching design and technology: Midjourney, Padlet, and Newarc.ai. These tools

leverage artificial intelligence to create and manipulate visual content, enhancing the teaching and learning experience. By examining their use in classroom settings, this study highlights their potential to improve resource creation, student engagement, and the iterative design process.

### *3.1. Midjourney*

**Midjourney** is an AI-powered tool that generates images from text descriptions. It assists artists and designers in quickly creating detailed and creative visuals based on their input. The images produced can range from realistic to highly stylised, depending on the given prompts. Among various text-to-image AI generators, Midjourney is renowned for its high-quality outputs, comparable to other leading tools such as DALL-E and Stable Diffusion.

(i) **Resource Creation:** Midjourney allows teachers to create visual exemplars and resources within seconds. This capability directly impacts teacher wellbeing and productivity by providing access to a wider array of visual options for any given learning objective. AI-generated images can serve as inspiration, exemplification, or prompts for discussion, making them versatile teaching aids.

*Figure 1 Examples from Midjourney*

(ii) **Differentiation:** The speed of image creation with Midjourney enables teachers to react quickly to the needs of their lessons. For example, in a lesson focused on understanding and applying construction lines in sketching, a teacher used Midjourney to create a bespoke exemplar featuring a ‘Star Wars’ theme, engaging and motivating learners who were fans of the franchise (Figure 2). This ability to tailor resources in real-time enhances student engagement and learning outcomes.

*Figure 2 Example of Star Wars themed design ideas with Midjourney.*

(iii) **Prompting a Persona:** Gen-AI tools allow users to alter the persona of the output creator within the prompt. For instance, when using text-to-text models like ChatGPT, the written output can be tailored to a specific reading age or style. Similarly, with image generators, teachers can create exemplars suited to specific age groups. An example prompt might be: 'Create a colourful poster about sustainability designed by an 8-year-old at school,' resulting in age-appropriate educational materials (Figure 3).

*Figure 3 Creating age-appropriate artwork using Midjourney.*

(iv) **Knolling:** Images created with the term 'knolling' are particularly useful for D&T teachers (Figure 4). Knolling involves arranging items neatly at right angles, often in a grid or parallel lines, making it easy to see all items clearly. Originating in the 1980s from a furniture shop practice inspired by Knoll furniture's clean lines, this method is now popular in photography, art, and organisation. Using knolling prompts can produce tidy, organised images ideal for classroom discussions.

*Figure 4 Example of 'knolling' using Midjourney.*

### *3.2. Padlet*

**Padlet** is an essential educational tool with a dynamic platform for sharing and assessing student work. Its 'post-it' style interface facilitates the sharing of visual content, fostering collaboration and peer assessment. The recent addition of an AI-powered function, 'I can't draw', enables students to generate images from prompts, enhancing creativity and descriptive skills. Despite suggestions to rename this feature to encourage drawing skills positively, its current functionality supports imaginative exercises and discussions.

Padlet has significantly impacted teaching and learning, particularly during the remote learning phase of the pandemic. Its gallery or pinboard interface allows instant sharing of work, fostering a collaborative and interactive classroom environment. For D&T teachers, Padlet is especially beneficial for displaying visual content, such as photographs of practical work or design drawings, enabling real-time sharing on devices and classroom screens.

(v) **Peer Assessment:** Padlet supports peer assessment by allowing teachers to set criteria for students to assess each other's work through live comments. This promotes critical thinking and feedback skills, enhancing learning outcomes and building a sense of community among students.

(vi) **AI Functionality:** The 'I can't draw' feature leverages AI to generate images from textual prompts provided by students, encouraging the use of descriptive vocabulary and creative thinking. The tool produces six generated images rapidly for students to choose from and share.

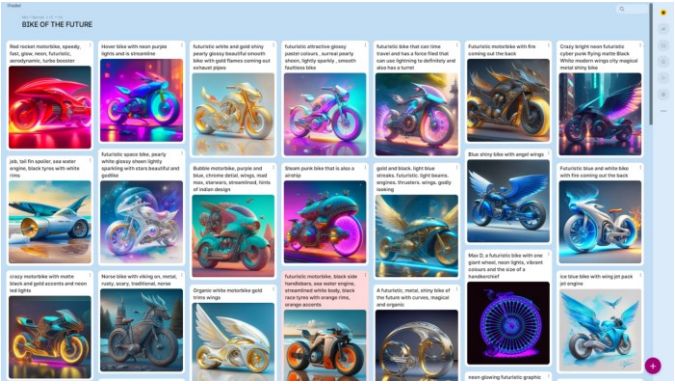



*Figure 5 Examples from Padlet*

Example Activity 1: In one activity (Figure 5), students were asked to imagine a ‘bike of the future from the year 2100’. After sharing their ideas verbally with a partner, they summarised their descriptions into written prompts and chose images that most closely resembled their vision. This activity enhanced their descriptive vocabulary and set a creative tone for the lesson.

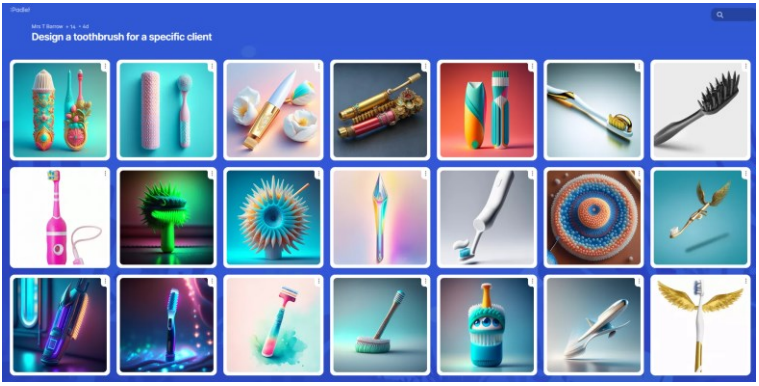



*Figure 6 Examples of toothbrush ideas from Padlet.*

Example Activity 2: Another activity (Figure 6) involved students designing toothbrushes for specific clients without revealing the clients' identities. This prompted discussions about the intended clients based on the generated images, enhancing analytical and deductive reasoning skills. This approach was used to teach ergonomics and anthropometrics, facilitating rich discussions and focused learning outcomes.

### *3.3. Newarc.ai*

**Newarc.ai** is an image-to-image Gen-AI tool that can transform an input image and a written prompt into a refined outcome (e.g. Figure 7). Offered free for educational purposes, Newarc.ai is highly valued in the fashion and footwear industries for its ability to render fabrics and materials to a very high standard.


*Figure 7 Example of image-to-image development from Newarc.ai.*

(vii) **Engagement and Encouragement:** In D&T education, many students believe they lack drawing skills or creativity. Newarc.ai has proven effective in overcoming this barrier. For example, year 8 students sketched outlines of future vehicles (Figure 8), which were then scanned into Newarc.ai. Discussions about materials led to descriptive prompts, and the resulting images gave students a sense of achievement and pride in their designs.

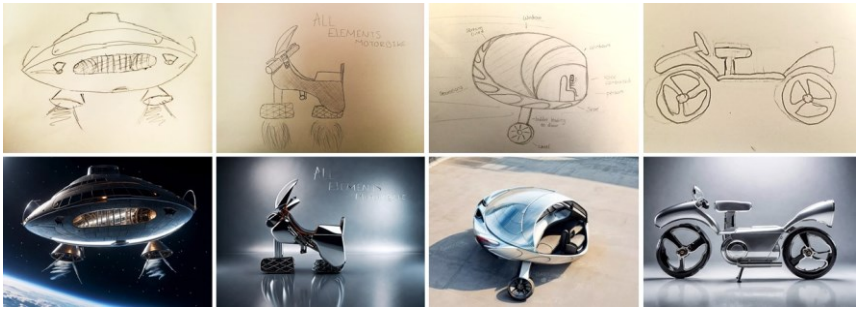


*Figure 8 Example of turning drawings into images from Newarc.ai.*

(viii) **Iterative Design Process:** For older students, Newarc.ai is integrated into the iterative design process, allowing experimentation with materials and aesthetics. The

tool's ability to provide multiple options and fine-tune specific parts of an image facilitates rapid trial and error, aiding decision-making (Figure 9).

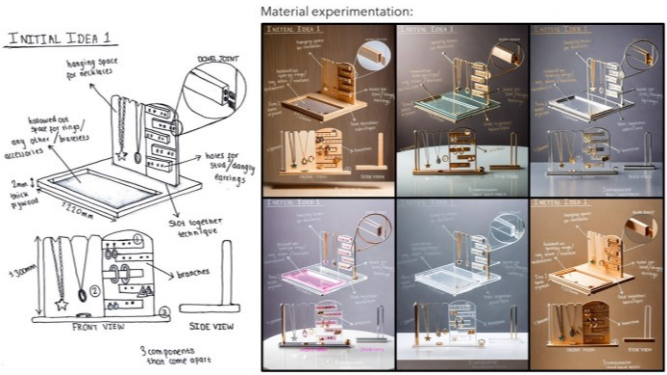



*Figure 9 Example of idea development using Newarc.ai.*

(ix) **Augmenting Designs:** Newarc.ai allows users to alter the background 'world', light quality, or time of day in their rendered images. CAD models can be input and rendered in various materials and locations, enhancing the design process (Figure 10).

*Figure 10 Example of augmentations from Newarc.ai.*

(x) **Textiles and Fabric Rendering:** Primarily used by professional fashion and footwear designers, Newarc.ai excels in rendering fabrics to an incredibly high quality. The output images reflect not only the aesthetics but also the weight and drape of the fabrics, making it an invaluable tool for textile and fashion design education (Figure 11).

*Figure 11 Example of fabric rendering of a fashion design from Newarc.ai.*

### *3.4. Summary*

The integration of AI tools like Midjourney, Padlet, and Newarc.ai into D&T education offers significant benefits. These tools enhance resource creation, student engagement, and the iterative design process, providing teachers and students with innovative ways to explore and develop their creativity and skills. The use of these advanced technologies fosters a more interactive and collaborative learning environment, leading to improved educational outcomes. Having explored examples of how Gen-AI is being and can be used in the classroom, in the next section we will explore the findings from the survey of teachers of D&T.

## 4. FINDINGS

The online survey was organised into four (4) sections: demographic information; general information; experience of AI in general; and use of AI to support the teaching of design and technology.

### *4.1 Demographic Information*

19 participants completed the questionnaire, all of whom confirmed that they were practicing teachers; 14 (73.68%) participants identified and male (sex) and man (gender) and 5 (26.32%) as female (sex) and woman (gender); 16 (84.21%) identified as heterosexual and 3 (15.79%) Homosexual; and 16 (84.21%) selected their ethnicity as 'White: English, Welsh, Scottish, Northern Irish or British', 1 (5.26%) as 'White: Any other White background', 1 (5.26%) as 'Asian or Asian British: Indian', and 1 (5.26%) as 'Mixed or multiple ethnic groups: White and Asian'. The majority work in secondary schools only (17 / 89.47%), with 1 (5.26%) working on further education (18 years +) and 1 (5.26%) across all phases from primary to on further education. Table 2 indicates that almost two thirds of the participants were aged between 35 and 54 years, and the years in-service ranged from 4 to 35 years in teaching.

*Table 2 Age Range*

| Age | No. |
|---|---|
| 25-34 years | 3 |
| 35-44 years | 6 |
| 45-54 years | 6 |
| 55-64 years | 3 |
| 65-74 years | 1 |

### *4.2 General Information*

Table 3 illustrates a very high level of awareness of using AI embedded in other applications (e.g. grammar checks in word processing packages), with only 10.53% (n=2) indicated that they were never aware of it. Whereas Table 4 shows a relatively lower level of engagement with Gen-AI, with 10.53% (n=2) rarely and 15.79% (n=3). Nevertheless, over half of the participants regularly engage, at least once a day (36.84%) or week (26.32%). There is slightly higher level of familiarity (Table 5) compared with usage (Table 4), indicating that knowledge of Gen-AI does not necessarily lead to use. Regarding confidence, there is a swing towards the middle of the range, with 21.05% admitting that they are somewhat unconfident. This suggests a tendency towards experimentation and a relative lack of barriers to engagement.

*Table 3 Q11 How frequently are you aware of using AI that is embedded into other applications?*

| Frequency | Percentage |
|---|---|
| at least once a day | 57.89% |
| at least once a week | 21.05% |
| at least once a month | 10.53% |
| rarely | 0.00% |
| never | 10.53% |

*Table 4 Q13 To what extent do you use generative AI?*

| Frequency | Percentage |
|---|---|
| at least once a day | 36.84% |
| at least once a week | 26.32% |
| at least once a month | 10.53% |
| rarely | 10.53% |
| never | 15.79% |

*Table 5 Q12 How familiar are you with Generative AI?*

| Familiarity | Percentage |
|---|---|
| very familiar | 26.32% |
| somewhat familiar | 47.37% |
| neither familiar nor unfamiliar | 10.53% |
| somewhat unfamiliar | 10.53% |
| very unfamiliar | 5.26% |

*Table 6 Q14 How confident are you using generative AI?*

| Confidence | Percentage |
|---|---|
| very confident | 15.79% |
| somewhat confident | 52.63% |
| neither confident nor unconfident | 5.26% |
| somewhat unconfident | 21.05% |
| very unconfident | 5.26% |

### *4.3 Experience of AI in general*

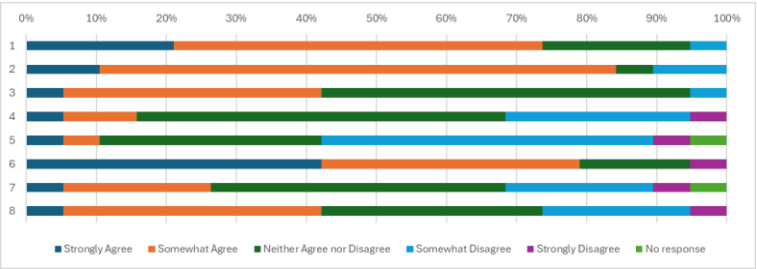
In this section, participants were asked to respond to eight (8) general statements about AI in education (Table 7), which were drawn from a study by Ofosu-Ampong et al. (2023).

*Table 7 Acceptance of Artificial Intelligence in Education Statements (Ofosu-Ampong et al., 2023)*

| |
|---|
| Q15.1 I trust in the value, accuracy and benefit expected from the use of AI systems in education. |
| Q15.2 I trust in the accessibility and user-friendliness of AI systems. |
| Q15.3 I trust AI technology and its decision-making capabilities. |
| Q15.4 I trust in the transparency and explainability of AI systems. |
| Q15.5 I trust in the privacy and data security measures in place for the use of AI systems. |
| Q15.6 I have a previous positive experience with the use of AI systems. |
| Q15.7 I trust in the social and ethical implications of the use of AI systems in education. |
| Q15.8 I trust my authorities to put in place criteria for the ethically acceptable use of AI. |

The participants indicated (Table 8) a very high level of acceptance of the value, accuracy and benefit expected from the use of AI systems in education (Q15.1: 21.05% strongly agree, 52.63% somewhat agree), and has having previous positive experience with the use of AI systems Q15.6: 42.11% strongly agree, 36.84% somewhat agree). Whereas trust in the transparency and explainability (Q15.4: 5.26% strongly agree, 10.53% somewhat agree) and the privacy and data security measures in place for the use (Q15.5: 5.26% strongly agree, 5.26% somewhat agree) of AI systems showed a markedly different picture, illustrating potential uncertainties around this emerging technology.

*Table 8 Responses to Acceptance Statements*




### *4.4 Use of AI to Support the Teaching of Design and Technology*

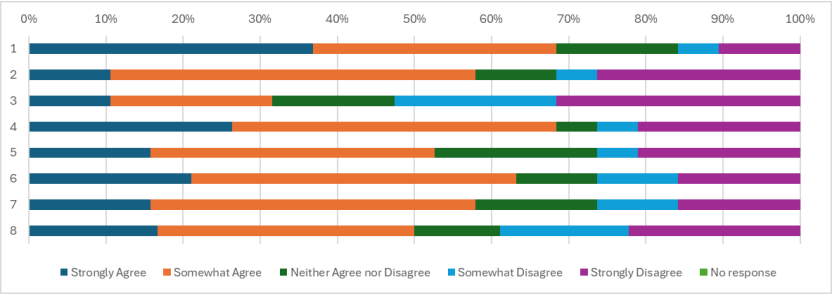
In this section, participants were asked to respond to another eight (8) statements focused on the use of AI to support the teaching of design and technology (Table 9).

*Table 9 Use of AI to Support the Teaching of Design and Technology Statements*

| |
|---|
| Q16.1 I use AI to complete admin tasks more efficiently. |
| Q16.2 I use AI to plan my lessons. |
| Q16.3 I use AI for feedback and marking. |
| Q16.4 I use AI to create teaching and learning resources. |
| Q16.5 I use AI as a pedagogical tool with pupils in the D&T classroom. |
| Q16.6 I teach about how to use AI in the D&T classroom. |
| Q16.7 I use AI to enhance the traditional pedagogical approaches I use. |
| Q16.8 I use AI to create novel pedagogical approaches. |

In terms of acceptance, the responses from the participants (Table 10) indicates that the use of AI to complete more routine administrative task more efficiently was higher (Q16.1: 21.05% strongly agree, 52.63% somewhat agree) than for its use to create novel pedagogical approaches (Q16.8: 5.26% strongly agree, 36.84% somewhat agree). However, with this group of participants approximately half were positive in their agreement, which is taken as a proxy for engagement and acceptance. The statement where there was a notably lower level of agreement was Q3: I use AI for feedback and marking. This may be in response to the elevated levels of anxiety in the education system around AI and academic malpractice at present.

*Table 10 Reponses to Design and Technology Focused Statements*




### *4.5 Correlations*

The Pearson Correlation Coefficients (r) show eight (8) strong positive relationships ($r > 0.8$) between seven (7) of the quantitative questions/ statements in the questionnaire. The correlations suggest that the following AI trends go hand-in-hand:

(i) positive experiences *and* frequency of use;
(ii) frequency of use *and* confidence levels;
(iii) confidence levels *and* explicit teaching about how to use;
(iv) confidence levels *and* use to enhance traditional pedagogical approaches;
(v) use to produce resources *and* use as a pedagogical tool with pupils;
(vi) use to produce resources *and* use of AI for enhancement;
(vii) use as a pedagogical tool with pupils *and* use to enhance traditional pedagogical approaches;

(viii) explicit teaching about how to use *and* use to enhance traditional pedagogical approaches.

So, positive experience, frequent use and higher confidence levels appear to correlate (i, ii & iii), reflecting the findings of Andrews, Ward, and Yoon (2021). Whilst there is no clear causal relationship, it could be inferred that this cluster of factors influences the explicit teaching of how to use AI in the D&T classroom (viii) and as an enhancement to traditional pedagogical approaches (iv), aligning with Yawson's (2024) principle of substantial equivalence. Therefore, an emergent adoption framework should begin with addressing success and confidence through frequent and exploratory use of Gen-AI in the D&T classroom. The second level incorporates Gen-AI into current practices, adapting approaches to lesson planning, teaching methods and curriculum content. An aspirational third level, but as yet not represented in the higher correlated statements, might include the creation of new and novel practices. However, with the emergence of examples, such as those presented in Section 3 (above), alongside rigorous intellectual critique and empirical research, the pragmatic nature of teachers of D&T subjects will no-doubt embrace, adopt and adapt this new technology. Difficult questions need to be asked to probe and test the benefits and limitations of Gen-AI. One such difficult question is around the tendency for Gen-AI to draw on archetypal motifs, such as the stereotypical profile of a motorcycle in Figure 8 or rocket as in Figure 10. Albeit in critique of product analyses and the negative impact of a narrow focus on artifacts that have the same function as potential design solutions on creativity, McLellen and Nicholl (2011) state in the title of their article "If I was going to design a chair, the last thing I would look at is a chair"! Therefore, a key question the critically engaged Gen-AI adopter might ask themselves is "If the whole class produces ideas or solutions that look very similar, are they really being creative?" – i.e. Might Gen-AI provide an illusion of creativity, by presenting interestingly decorated templates? As suggested in the examples above, one way to address this apparent flaw and dispel illusions is to expand pupils' AI literacy, creative vocabulary and thinking skills.

## 5. CONCLUSION

Moving towards an acceptance framework for Gen-AI in technology education, the brief discussion of the questionnaire findings above, indicates that teacher adoption in D&T follows similar patterns to other disciplines. However, a limitation of this study was the small sample size, with the high level of acceptance, indicating potential self-selection or volunteer bias. Therefore, the next step would be to undertake a larger-scale survey of teachers. Nevertheless, the findings offer a key insight into the behaviours of early adopters, such as a willingness to experiment with limited prior knowledge and create early successes to build confidence. There is, of course, a risk of an uncritical adoption of Gen-AI, without asking difficult questions. However, this should not be a barrier, but an enhancement to experimentation and creative adoption. Teachers of D&T who want critically to engage with Gen-AI might use SWOT analysis to critique the strengths, weaknesses, opportunities and threats associated with the ten (10) capabilities identified in the

examples (Section 3), alongside established 'signature' and groundbreaking emerging pedagogies.

In response to the findings from this study, and with an eye on policy developments in the public domain (e.g. DfE, 2024), the following principles are proposed as a starting point for scholarly discussions on an emergent Gen-AI acceptance framework for D&T and other technology education subjects:

(i) Understanding the benefits and limitations of Gen-AI in both the general and subject specific contexts for teachers of D&T;
(ii) Frequent, heuristic, and critical use of Gen-AI to support routine administrative tasks to improve efficiency;
(iii) Explicit teaching about the use of Gen-AI in D&T curriculum, including issues relating to ethical and responsible use;
(iv) Open and collaborative development of subject specific approaches to Gen-AI in D&T practice, including co-creation with teachers and learners;
(v) Use of Gen-AI to adapt and enhance established pedagogical techniques and approaches;
(vi) Experimentation and evaluation of new Gen-AI inspired pedagogical techniques and approaches;
(vii) Continuous evaluation of Gen-AI in the D&T curriculum, and as an administrative and pedagogical tool;

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