Generative Artificial Intelligence and Learners with Additional Support Needs: Literature Review

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Summary

This review explores the topic of how Generative Artificial Intelligence (GenAI) tools could be used to support learners with additional support needs (ASN), particularly under the backdrop of increased levels of ASN learners seeking support. The review focuses on primary research of new GenAI tools used with learners with ASN, including learners that speak English as an additional language (ESOL), and assesses to what extent the research is useful in providing evidence that GenAI could be used in this way.

The literature indicates that, in general, GenAI tools show promise for supporting learners with ASN. In particular, the GenAI tools researched may enhance ASN learners' self-directed learning to facilitate parity with their peers. Table 1 summarises the tools researched in the literature, the groups they helped, and how they may be used to support learners with specific needs.

Table 1: Summary of AI tools outlined in the literature review and their use

Tool used	Function	ASN	Use
Chatbot assistant, such as ChatGPT and Google Gemini	Simulates conversation with users through textual prompts.	Dyslexia	Summarising reading materials.
Chatbot assistant, such as ChatGPT and Google Gemini	Simulates conversation with users through textual prompts.	ESOL	Complementing human interaction; creating accessible materials; supporting language development by providing access to text on different reading levels; generating content into English; summarising large amounts of text; improving access to accessibility features; and creating support for grammar and

			sentence structure.
Chatbot assistant, such as ChatGPT and Google Gemini	Simulates conversation with users through textual prompts.	Anxiety/stress	Provides regular and targeted feedback to support studies. Offers advice and acts as a sounding board to ideas.
Chatbot assistant, such as ChatGPT and Google Gemini	Simulates conversation with users through textual prompts.	Visual impairment	Preparing content; producing better alternative descriptions for pictures; proofreading and fixing formatting errors; and assisting with research.
Grammar and spelling correction tools, such as GrammarlyGo	Reviews grammatical mistakes, spelling and sentence structure and suggests improvements.	Dyslexia	Improves writing, increases confidence with online communications, helps with ease of writing.
Avatar/humanoid robot	Generates conversation/interaction with user.	ASD	Improves social playing skills, retention and cognitive load.
AI-assisted task manager, such as Goblin Tools and Claude	Generates plans and lists based on prompts. Organises prompts/thoughts into structure.	ADHD	Helps with time blindness and time management.

Text-to-image generator	Generates images from text prompts.	Fine motor disability	Helps translate ideas into content and boosts creativity.
Speech-to-text generator	Generates text from speaking.	Visual impairment	Helps to generate content or materials that suit changing needs.

It should be noted that the findings observed in this literature review do not present an in-depth investigation into the tools and their effectiveness in complementing the learning of young people with ASN. There are still significant gaps in the research: the number of people involved was usually small, was concerned with just one or a few GenAI tools, and they often focused only on a specific group of people. However, the studies reviewed in this paper do provide a good starting point for further research and inquiry into this issue.

Introduction

Evidence suggests that the number of learners with ASN in Scotland has risen substantially in recent years. Since 2019, the number of requests for reasonable adjustment received by SQA has increased by 32% (SQA, 2024a). Data from the Scottish Pupil Census indicates that the total number of pupils (aged 4 to 18) who have been assessed or have declared a disability rose by 16% between 2019 and 2023 (Scottish Government, 2023a). In the same period, the number of pupils who requested additional support because they spoke English as an additional language increased by 26% (Scottish Government, 2023a).

Reasonable adjustment is a concept that follows a social inclusion model of disability, whereby people are disadvantaged by barriers put in place by society (Collins, *et al.* 2018; Collins, 2003). According to this model, reasonable adjustments must be put in place for candidates who are facing barriers to equitable participation in assessment compared to their peers (Ofqual, 2016). Awarding bodies must ensure that in removing or reducing these barriers through additional assessment arrangements, candidates can demonstrate their ability in the assessment while maintaining its validity and reliability.

SQA defines assessment arrangements as those which:

> '[…] allow candidates who are disabled, and/or have been identified as having additional support needs, access to appropriate arrangements to complete the assessment without compromising its integrity.' (SQA, 2024a)

Assessment arrangements can be made by SQA to support learners with a range of additional needs, including disabilities, and those who speak English as an additional language.

The literature indicates that teachers are experiencing significant pressure, highlighting the urgent requirement for support to assist them in addressing the needs of learners with ASN. In this context, GenAI tools could prove to be beneficial. This paper will first outline the current context in Scottish education in relation to the rise in assessment arrangement requests. Subsequently, it will review the primary research studies published to date that examine the application of GenAI tools in supporting learners with ASN.

Contextual background

Rise in learners with ASN

A number of publications have attributed the rise in ASN among learners to the COVID-19 pandemic, citing the impact on young people's mental, behavioural and social development as a catalyst to realising or exacerbating mental health issues (McCluskey, *et al.*, 2023; Mental Health Foundation Scotland, 2020; Cosma, *et al.*, 2023; Kwong, *et al.*, 2021). Evidence suggests that this rise has been a symptom of the disruption caused by the pandemic, with practitioners and organisations perceiving higher levels of mental health issues among learners (Scottish Centre for Social Research, 2023; Public Health Scotland, 2021; HBSC, 2022).

However, as shown in Figure 1, the increase of learners with ASN has been on this same trajectory since before the pandemic. The number of pupils with an assessed or declared disability has increased by 15% between 2013 and 2023, and has therefore been continuing at around the same rate since 2019. The findings from this analysis suggest that various factors should be considered, rather than solely attributing the increase in ASN among learners to the pandemic and viewing it as a temporary rise. In doing so, SQA can avoid missing opportunities to establish infrastructure that could support an ongoing increase.

Figure 1:
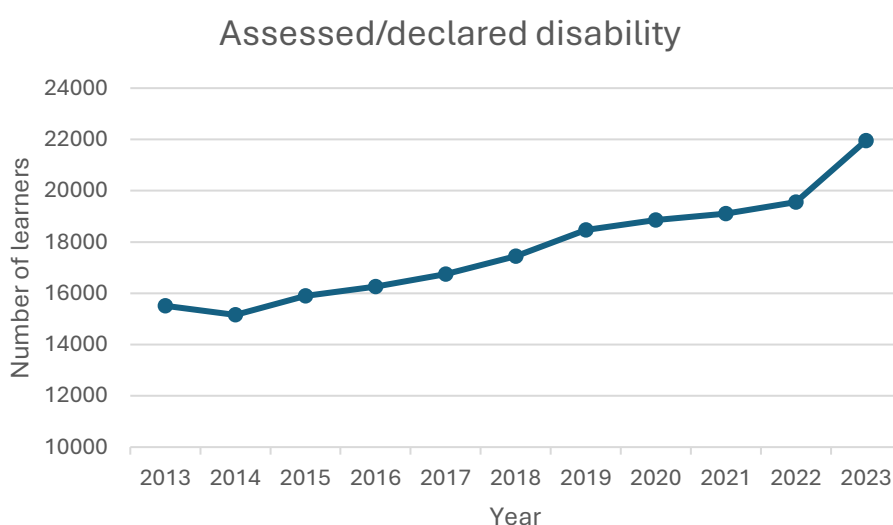
Data from: Scottish Pupil Census 2023 (Scottish Government, 2023a)

While the Scottish Pupil Census indicates an increase in assessed or declared disabilities overall, it is clear that there has been a surge — in particular among the number of learners seeking support for neurodevelopmental and learning difficulties — over the past ten years. The number of learners seeking support for autistic spectrum disorder (ASD) has tripled since 2013, while the number of learners seeking additional support for mental health issues has multiplied by five in the same period (Scottish Government, 2023a). Other conditions that learners sought support for which had increased rates between 2013 and 2023 were dyslexia; other specific

learning difficulties; social, emotional and behavioural issues; and a physical health problem (Scottish Government, 2023a).

Some studies have shown that practitioners have been facing pressure to support learners with more complex needs under the backdrop of a decrease in funding and subsequent reduced resource for support for learning (Ballantyne, *et al.*, 2022; EIS, 2019; Scottish Centre for Social Research, 2023). For example, the 2023 Behaviour in Scottish Schools research found that schools lacked funding or support from local authorities to provide specialist staffing and enhanced support provision. Additionally, this study found that in 2022, the majority of support staff in secondary schools disagreed or strongly disagreed that they had time to support planning and enable feedback sessions with colleagues. School staff expressed that additional funding was needed for more staffing to help address behavioural issues, which they felt partially stemmed from a lack of support for pupils with ASN, particularly those with ASD and attention deficit hyperactivity disorder (ADHD), and poor mental health and a lack of resilience among pupils. Additionally, the Teacher Workload Research Report (2024) reported that a key driver of amplified teacher workload was increased and more complex ASN among pupils, and that the demands of excessive workload was one of the key factors that influenced teachers in Scotland to leave the profession.

The perception among school staff of a lack of funding for supporting learners with additional needs can be backed up in the data (SCSC, 2024). Using data from the Teacher Census, the Scottish Children's Services Coalition has pointed to a cut in spending of £1,934 per pupil since 2012/13 (34%) for those with ASN, alongside a cut of 546 full-time ASN teachers in primary, secondary and special schools altogether (SCSC, 2024).

Rise in English language learners

On top of the heightened demands placed on the educational sector due to a surge in learners requiring additional support for disabilities, since 2013, the number of learners seeking assistance related to English as an additional language has increased at an even greater rate than those seeking support for disability-related reasons. While the number of learners with an assessed or declared disability has increased by 15% between 2013 and 2023, the number of pupils who received support with English as an additional language increased by 66% in the same period (Figure 2).

Figure 2:
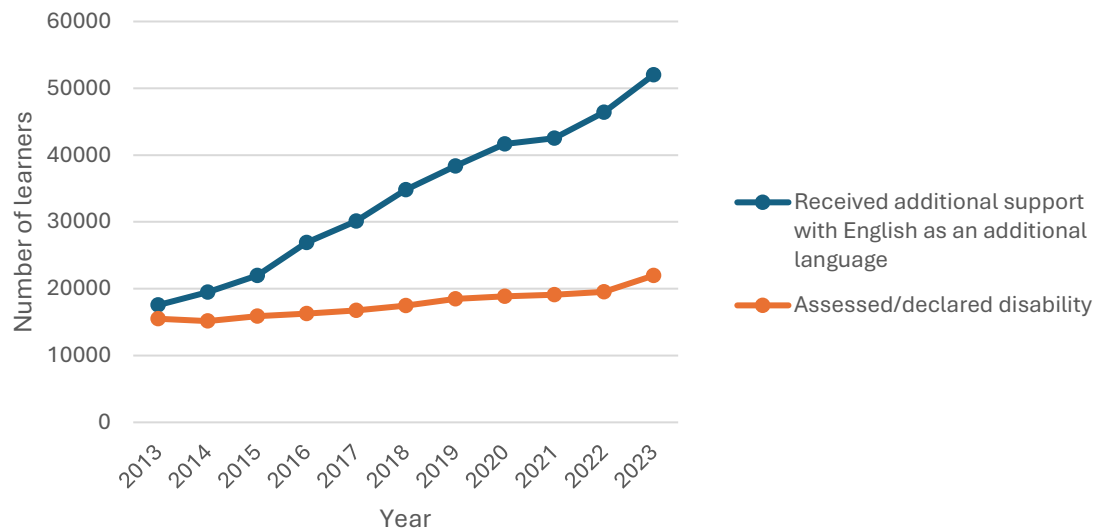
Data from: Scottish Pupil Census (Scottish Government, 2023a)

The increase in the number of ESOL learners seeking support over the last decade could be attributed to a number of different factors. International migration to Scotland has increased by 53% between 2012–13 and 2021–22, which is likely to have impacted on the number of non-native English speakers seeking education in Scotland (National Records for Scotland, 2024). Moreover, since 2015, the number of refugees resettled into Scotland through the Vulnerable Persons Resettlement Scheme increased significantly, while separate schemes for refugees coming from Ukraine and Afghanistan also contributed to higher numbers of people resettled into Scotland in recent years (Scottish Government, 2023b).

During this same period, the Scottish Government released a new strategy for ESOL learners, *Welcoming Our Learners: Scotland's ESOL Strategy 2015–20,* to attempt to support ESOL people living in Scotland to participate more fully in their local and national communities (Education Scotland, 2015). The introduction of this policy may have led to more ESOL learners seeking out support for assessment.

Research indicates that there is a significant lack of provision for the teaching and learning of several languages spoken in Scotland, such as Romanian and Lithuanian (Hancock and Hancock, 2019). On top of this, Hancock and Hanock found that the availability of instruction in widely spoken languages, including Polish, Urdu, and Arabic, was limited (2019). This situation is not unexpected, given the predominantly monolingual composition of Scotland's teaching workforce, which some suggest has hindered ESOL learners from fully engaging in their education (Foley, *et al.*, 2019; Anderson *et al.*, 2016). The substantial rise in the number of ESOL learners seeking support in Scotland, coupled with a teaching population who arguably lack the necessary foreign language skills, will likely place additional pressure on practitioners in the field (Flockton and Cunningham, 2020).

GenAI

Evidence from qualitative studies suggests that the increase in learners seeking extra support has placed additional pressure on practitioners, impacting their own mental health and resilience (Scottish Government, 2023c; Scottish Centre for Social Research, 2023). Further research has shown that the increasing occupational demands of teaching can and has led to burnout, negatively impacting learners and others in the teaching profession (Brittle, 2020).

By 2024, the increasing demands placed on practitioners in Scotland and the associated risks of teacher burnout appeared to have attracted the attention of the government. In a recent address to Parliament, the Cabinet Secretary for Education and Skills, Jenny Gilruth, declared a commitment to decreasing teacher class-contact time and proposed the use of artificial intelligence (AI) tools as a potential means of alleviating teacher workload (Scottish Parliament, 2024; Scottish Government, 2024).

> *'[…] the Scottish Government remains fully committed to the delivery of our commitment to reduce class-contact time by 90 minutes a week. That matter is being prioritised by the Scottish Negotiating Committee for Teachers, which, members will recall, is a tripartite body that consists of the trade unions, the Convention of Scottish Local Authorities and the Scottish Government. It is imperative that all parties bring the necessary focus to delivery as quickly and effectively as possible, because we cannot reform our education system without giving teachers more time [...] Allied to that, and to help teachers to focus on learning and teaching, we have launched a CivTech challenge, which invites bids that are designed to reduce teacher workload via the use of artificial intelligence.'* (Scottish Parliament, 2024)

In light of this announcement, SQA should consider how AI tools could be used by teachers to assist learners with ASN in their assessments. In particular, SQA should explore the proliferation of Generative AI (GenAI) tools and how they may be used to enhance assessment arrangements and aid practitioners amid increasing teacher workloads and rising student support needs.

GenAI can be defined as a label used to describe any type of AI that is used to create text, prose, formulae, code, images, video or audio (SQA, 2024c). GenAI is a fairly new phenomenon and educational institutions have been grappling with how to set guidelines for using the tool ethically in practice (SQA, 2024c; Education Scotland, 2023; UNESCO, 2023; Luo, 2024; Concannon, *et al.*, 2023; Shailendra, 2024; Hsu & Ching, 2023).

Several researchers have identified the potential use of AI tools to support practitioners with teaching and ease pressures. Barau, *et al.* (2022) argue that GenAI can assist teachers in providing holistic and tailored support to pupils with additional needs, saving time and effort:

> *'Many schools have shortages of appropriate learning resources. Therefore, an assistive learning tool that can be personalised for children's individual learning challenges and needs would be very helpful for teachers and a great support in helping students meet their individual goals.'*

Additionally, in 2024, the Scottish Government announced a new programme called CivTech that aimed to investigate the use of AI tools that could be used to alleviate the unsustainable workload undertaken by teachers in Scotland.

> *'The Scottish Government will work with Qualifications Scotland and Education Scotland within this context to ensure that AI can be used effectively and safely in learning, teaching and assessment. […] Additionally, and to capitalise on the opportunity which AI may present for reducing teacher workload, we have recently launched an AI for impact 'CivTech Challenge' which invites bids designed to advance a reduction in teacher workload, via the use of AI. We believe that AI presents a unique opportunity to reduce teacher workload; we will use the results from the CivTech challenge to advance a reduction in teacher workload.'* (Scottish Government, 2024)

As GenAI is an emerging area in education, much of the literature on the topic has been published in only the past few years and there is limited research into how GenAI tools can be used to support learners with ASN. This review will examine the research carried out so far to understand how GenAI may be used to support SQA learners with ASN and those who speak English as an additional language.

Additionally, this review will aim to expose the substantial gaps in the current research that SQA can use to inform further research projects in this area with the aim of enhancing the learning experience of those with ASN.

Literature review

Few primary research studies currently exist which explore the relationship between ASN learners and GenAI tools. Of the small number of studies that have been published, the majority have focused on learners with specific learning difficulties (SpLD), such as dyslexia, and other neurodiversity, such as ADHD and ASD. There is a growing body of work, mainly published in Asia, which explores the use of GenAI by learners who speak English as an additional language. The remainder have explored the application of these tools with learners with physical disabilities and mental health problems.

Specific learning difficulties (SpLD)

Research published so far highlights some promise that GenAI tools can be utilised to help learners with SpLD, such as dyslexia. Zhao, *et al.* (2024) carried out a survey with disabled learners at the University of Sheffield to explore how they used GenAI in their studies. The study found that learners with dyslexia often used tools like ChatGPT to summarise reading materials to speed up the reading process for them. Although the majority of participants were native English speakers, the research also found that participants with dyslexia used Google Translate to improve their sentence structure and spelling. Other spelling and grammar checking tools, such as GrammarlyGo, were also used by participants with dyslexia to help improve their writing. While this study was helpful in identifying the types of tools that learners with dyslexia used to support their studies, it did not explore how useful learners found these tools or to what extent the tools helped improve their learning.

A study by Wu, *et al.* (2019), however, evaluated a GenAI writing tool they designed for people with dyslexia to use on social media sites. The researchers tested a writing tool that could identify dyslexic writing and suggest improvements in spelling and grammar. The study gathered qualitative data from people with dyslexia and found that those who used the GenAI tool held positive views of it, felt more confident with their writing and found writing easier after using the tool. However, it was noted that the tool did not appear to facilitate their ongoing learning development; once the tool was removed, participants expressed a loss of confidence and a reluctance to post on social media. It is important to note that the tool was only evaluated over a one-week period, limiting the investigation in terms of its long-term impacts on the learning of dyslexic individuals. Further research into the extent to which bespoke or other GenAI tools support people with SpLD would be beneficial.

Other neurodiversity

Two studies have examined the use of an AI robot with human-like features to facilitate people with ASD's learning. Research by Tuna in 2022 tested the use of a humanoid robot with two young children with ASD to examine how it could be used to support inclusive education. Tuna found that the children had high engagement with the robot and that it helped their social playing skills. While this research shows that a humanoid robot could be helpful towards improving the social interaction of children with ASD, it is unclear whether this GenAI tool could be used in the same

way to support young people with learning who are of an older age. Further, as this study was carried out with a very small sample, further research is needed to find out if the results would be replicated with a bigger sample.

Lim (2024) also tested the use of a human-like GenAI avatar in facilitating learning, but her study was carried out on a much larger scale, with 128 adults in higher education. Lim's study compared the attention-span, retention and cognitive load of participants who were taught through human-led instructional videos and GenAI avatar-led instructional videos. This study found that the GenAI instructional videos influenced learners' retention and cognitive load but not their attention. Lim suggests that the GenAI avatar could be used to facilitate learning for learners with ASD who tend to be visual learners and may find avatars more motivational for learning; however, the tool was not specifically tested with this group. Despite this, the larger sample size used in this research study holds greater promise that the results could be replicated with a group of learners with ASD.

Conversely, some research has suggested that GenAI tools are not helpful for learners with ASD. For example, Xi, *et al*. (2023) tested a text-to-image GenAI tool with seven learners with ASN, including those with autism, to examine how it impacted their learning. The experiment asked learners to use the tool to create AI-generated images in a game design project. Xi, *et al*. found that the images generated by the tool were not used by the participants who had ASD in their game development, and that those with ASD had less inclination to persist with the GenAI tool. This suggests that while some GenAI tools such as humanoid robots and avatars may be helpful to learners with ASD, others such as text-to-image tools are not (Tuna, 2022; Lim, 2024; Xi, *et al*, 2023). That being said, both Xi, *et al*. and Tuna's studies were carried out with very small sample sizes, so it is unclear how reliable the results of these studies are. Further research into these tools with a larger group of participants with ASD is necessary before drawing conclusions about how useful these tools are in supporting learners with ASN.

Studies that have explored the use of GenAI among learners with ADHD have been qualitative and report learners finding GenAI tools useful for their development. For example, research carried out by the UK government in 2024 reported that educators perceived some GenAI tools to benefit ADHD learners by helping them to defeat their 'starting paralysis' when beginning tasks (Department for Education, 2024). The University of Technology Sydney also reported that AI tools such as Yoodli and Goblin Tools: Magic ToDo were said to be helpful by students with ADHD in overcoming time blindness and helped with time management (Jones, 2023). Moreover, the Economic Times (2024) published an article that reported how GenAI tools like Claude have been perceived as helpful to people with ADHD with organising and planning.

While these reports are useful in pointing towards the potential for GenAI in supporting learners with ADHD, the articles published report evidence from a very small number of people who self-report the usefulness of these tools. Almost no quantitative research has been carried out that evaluate the use of GenAI tools with a wider sample of learners with ADHD, despite the increase of learners diagnosed with ADHD (NIHR, 2023).

Physical disabilities

Physical disability is a broad umbrella term and can cover many people with many different needs. Despite this, few studies have examined the relationship between individuals with any physical disability and GenAI. For this reason, the studies that have been published that explore this relationship have been grouped together for this literature review. However, it is important to acknowledge the very different needs of people with different physical disabilities and further research carried out in the future should aim to expand on how GenAI may meet these distinct needs.

As discussed in the previous section, Xi, *et al.'s* study found that the text-to-image GenAI tool was not helpful for learners with ASD; however, it was found to be beneficial to learners who struggle with fine motor skills. Xi, *et al.* (2023) found that these learners were able to translate their ideas into digital images which helped to enhance their creativity. While no students with ASD chose to use the AI-generated images in their game design, two learners with physical disabilities opted to. This research highlights the potential for learners with physical disabilities to use GenAI tools to enhance their learning, however, again, research with a larger sample size should be carried out before drawing any conclusions.

Adnin and Das (2024) published a study that sought to understand how 19 blind and visually impaired people used GenAI tools, such as ChatGPT, Gemini, Bing Chat, Copilot, Bard, and Claude. Their participants used GenAI to assist with a wide variety of tasks such as preparing content, producing better alt descriptions for pictures, proofreading and fixing formatting errors, and assisting with research. However, they also found that participants had to navigate several barriers when using GenAI tools such as accessibility issues and inaccuracies that may be easier to bypass for non-visually impaired people. This study was useful in that it surveyed 19 blind people with a range of ages and backgrounds; however, none of the participants were of secondary school age, so further research with blind learners under 18 would be helpful to understand how SQA learners with visual impairments use GenAI.

Poddar, *et al.* (2024) evaluated the use of a voice-based education platform they designed for children and teachers with visual impairments in India. One aspect of the platform allowed learners and teachers to generate content using speech-to-text services to create educational materials to suit changing needs. However, this aspect of the platform was not evaluated in the study, so it is unclear how useful teachers and learners found this service. Again, further research with learners of school age would be useful for SQA to understand how this GenAI could be used to support visually impaired learners with their learning.

English as an additional language

A mixed-methods study carried out by Evmenova, *et al.* (2024) explored the views of 137 teachers of multilingual learners into how ChatGPT could be used to support learners. The research found that 43% of teachers agreed or strongly agreed that ChatGPT would help make instruction more accessible for all learners, while 23% disagreed or strongly disagreed. Teachers of multilingual learners perceived that

ChatGPT would help learners who spoke English as an additional language by enabling collaborative learning and teamwork, complementing human interaction, creating accessible materials, supporting language development by providing access to text on different reading levels, generating content into English, summarising large amounts of text, improving access to accessibility features, and creating support for grammar and sentence structure.

Another study by Sexton (2024) explored the perceptions of 23 multilingual learners in using specific AI tools to support their learning. These tools were Achieve 3000, Duolingo and Lexia PowerUp. Learners expressed that Achieve 3000 was helpful in improving their reading skills but not other language skills such as writing, building vocabulary and speaking. Duolingo was perceived to be the best tool by multilingual learners to help them with reading, speaking, listening and writing. Lexia PowerUp was perceived positively overall by the multilingual learners interviewed, and was recommended for developing reading and writing skills. However, participants had a negative view of the enjoyability of using the program, which may influence them not using the app again.

Despite these perceived benefits, the platforms researched by Sexton appear to be more about self-teaching a language rather than facilitating ESOL students learning in the mainstream classroom. These two studies were helpful in understanding ESOL learners' perceptions of using AI tools to enhance their English learning, but did not test to what extent the tools helped them to improve their English.

Shi, *et al.* (2023) evaluated to what extent language proficiency improved by using a multi-modal learning model that incorporated AI-led teaching and human-led teaching with ESOL learners. They found there was a significant difference in the English proficiency test scores between experimental and control groups, with the experimental group scoring higher after using the AI learning model. Participants also consistently reported a heightened sense of engagement with the multi-modal approach, such as increased motivation and interactivity. An additional benefit found was that students were also able to individually tailor their learning experience using the model. The research also highlighted that the best results were found using a combination of human, AI and data teaching modes.

Wang and Xue (2024) found that GenAI tools positively enhanced the learning experience and motivation of English as a foreign language students, where higher grades were correlated with the use of GenAI in a quantitative study. The study also found that GenAI tools support learners with English language learning by offering instant feedback, challenging them with language 'just beyond their current proficiency' and adjusting learning materials based on students' interactions with the tool. The study was carried out with over 500 students in four Chinese universities. and could be replicated in Scotland to find out if the results of this research are context-specific or if they can be generalised to a wider population. Further, the study did not specify exactly which AI tools provided which results; however, the authors did name ChatGPT, Claude and Gemini as some of the tools used by learners.

Mental health

Research into how GenAI tools may be used to help people with mental health disorders has predominantly focused on self-help therapy chatbots, and there is little research into how they may be used to support learners in the classroom or with assessment (Capel, *et al.*, 2024; Tal, *et al.*, 2023; Vowels, *et al.*, 2024; Golden and Aboujaoude, 2024; Xu and Wang, 2024). There is some research however that suggests that AI tools could be used to reduce stress and anxiety among learners, or that educators could use AI to track learner data and predict mental health issues. Most studies on this topic, however, have raised the ethical implications of using AI in this way.

A study by Chambers and Owen (2024) explored the use of GenAI chatbots in supporting high school learners with preparing for exams. Specifically, the AI tools were tested with 40 participants, and the AI served as an additional mentor or sounding board for them to ask questions while they studied. A follow-up survey with participants found that those who used the tool found it useful in helping them to structure essays and to learn the course content. However, the data also showed that there was no self-reported change to the level of anxiety among participants after using the tools, so there is no evidence from this study that the tool may be used to support learners experiencing anxiety disorders.

A similar form of GenAI was examined in a study by Hauske and Bendel (2024) who sought to understand how three AI tools developed by the authors could be used to support learners with their self-directed learning and improve their wellbeing. One of the AI tools aimed to reduce stress and anxiety through giving regular and targeted feedback to learners, however while the researchers found that the tool was partly successful in this aim, they also found that at times the tool failed to provide consistent advice to learners and failed to adjust to the diverse range of inputs it was given, which paradoxically could generate more anxiety for the learners. How reliable these findings are is unclear as the methods used by the researchers to test this tool were not outlined in the paper. Further research into this tool would be needed before drawing any conclusions about its efficacy.

Research was also carried out by Yu, *et al.* (2024) to explore how GenAI could be used by teachers to track learners' mental health through monitoring student data from a number of resources, including smart phones, tablets and smart wearable devices, to notice patterns and predict behaviours. However, the researchers did not test their proposed technology in the paper so it is difficult to conclude how effective this proposal would be. Furthermore, there would be significant ethical and legal barriers to monitoring and collecting data from students' personal devices that are not addressed by Yu, *et al.*

The ethics of using AI tools to support mental health care has been raised by other researchers (Chenneville, *et al.*, 2024). For example, Solaiman (2024) argues that using GenAI chatbots has moral and legal implications, such as undermining the protection of patients in a healthcare context and increasing the risk of harm in the absence of human involvement. SQA should consider to what extent AI tools are helping or harming those with mental health disorders before exploring their implementation in assessment support.

Discussion

The findings from this review show promise that GenAI applications will be an effective tool in supporting learners with ASN. The research that has been carried out consistently highlights how beneficial these tools have been to the research participants with ASN, and the practitioners that teach them. In particular, the literature provides optimism that GenAI tools could provide support with self-directed learning as many of the tools reviewed focused on study or revision support, including providing feedback, improving writing skills, and accelerating administrative tasks.

As an emerging area, however, the research landscape on the use of GenAI to support the learning of those with ASN is currently limited. In the literature discussed in this review, sample sizes were often small, concerned with one or a few GenAI tools and tended to focus solely on a specific group of people with a shared characteristic. However, the lack of extensive research in this area is not surprising given that ChatGPT only came into public use in late 2022 and the term 'GenAI' is fairly new in the general lexicon.

Future research directions

There were a number of significant empirical gaps identified when reviewing the literature on the use of AI technology in educational settings to support learners with ASN.

Firstly, most of the available studies tended to examine AI tools with very small and specific samples of research participants, typically through isolated, one-off studies. Certain AI tools that have already been researched may have potential for helping other demographic groups, for example, humanoid robots could serve as an engaging medium to support students with ADHD in developing social skills, however there are no studies that currently explore this. Similarly, tools that appeal to visual learners may enhance engagement among many groups of neurodivergent learners. This indicates the need for a more comprehensive exploration of AI tools and their applications beyond the current, limited scope. To establish robust findings, there is a critical need for replication studies across different contexts and learner groups to validate and generalise these initial results.

Secondly, research is particularly lacking into how educators can employ AI tools to effectively support ASN learners. Current studies predominantly investigate the individualised use of AI tools by students, which could result in social isolation for ASN learners in classroom settings. Integrating AI in ways that encourage peer interaction and engagement within the classroom environment should be a priority for future studies.

The current body of research also predominantly focuses the role of AI in learning and teaching processes. There is a clear need for studies that examine the potential of AI tools in assessment, an area that remains comparatively underexplored and is perhaps more relevant to SQA's interests.

There was little evidence of the use of AI tools in a Scottish context. A potential area of research for SQA could be how these tools may be useful to learners in Scottish schools who have ASN.

It is also important that the environmental impact of using GenAI tools to support learners with ASN is examined. In particular, SQA should explore whether the extra energy expended using GenAI tools is justified by the benefits they provide in supporting learners with ASN.

Finally, research aimed at addressing student mental health concerns through AI is extremely limited, despite increasing reports of mental health challenges among school-aged learners. Future research could investigate the potential for AI-driven interventions or support systems designed to help students manage mental health issues within educational environments.

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