Teachers' Perceived Acceptability towards Deploying Humanoid Robot KASPAR for Children with ASD in Primary Schools

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Abstract. In Malaysia, the number of autistic children registered under the Department of Social Welfare has been increasing dramatically from 6,991 children in 2013 to 53,323 children in 2023. Additionally, a study reported that the prevalence of autism spectrum disorder (ASD) was highest among primary school children compared to those in preschool and secondary schools. A recent news stated that Malaysia requires more specialist teachers, advanced infrastructure, quality curriculum, and individualised education plan to support children with special needs, such as ASD. As such, it becomes increasingly crucial for teachers to adapt their teaching methods and tools to better support these children. Some studies have shown that integration of technology, particularly humanoid robots, such as KASPAR, offers a promising avenue for enhancing engagement and learning outcome among students with ASD. Nevertheless, research focusing exclusively on teachers' perception in adopting humanoid robots for children with ASD remains underexplored in Malaysia. This study used a quantitative approach, wherein survey forms were administered to the respondents. The data was collected from the teachers who were watching their ASD students' engagement sessions with Kaspar. They were asked about their opinion on the potential of using KASPAR in their teaching with ASD students. A total of 14 teachers from three primary schools who are teaching in the Special Education Integrated Programme (SEIP) are involved in this study. The data was analysed using descriptive analysis on performance expectancy, effort expectancy, social influence, facilitating conditions and attitude. The results showed that generally teachers have a positive perception of-KASPAR in their teaching and learning activities.

Keywords: Special education, humanoid robot, ASD children, primary school, primary teacher, inclusive learning

1 Introduction

The prevalence of Autistic Spectrum Disorder (ASD) among school children is increasing worldwide. Past literature reveals that the overall prevalence of ASD among Malaysian school-aged children has increased significantly from 6.34 per 1000 children in 2018 to 9.29 per 1000 children in 2022 (Shair et al., 2024). Additionally, the study reported that the prevalence of ASD was highest among primary school children compared to those in preschool and secondary schools. Further exacerbating the concern is the lack of specialist teachers, advanced infrastructure, quality curriculum, and individualized education plans to support children with special needs, such as ASD (Ganeson, 2025).

In view of this, some scholars assert that the integration of technology, particularly humanoid robots, such as KASPAR, offers a promising avenue for enhancing engagement and learning outcomes among students with ASD (Yousif, 2021). Research has shown that such interventions can facilitate social interactions and improve communication skills, addressing some of the core challenges encountered by ASD children (Qidwai et al., 2020). Moreover, augmenting teaching with these technologies could significantly enhance educators' ability to foster an inclusive environment where all students can thrive (Azmi et al., 2022). Extant studies have tested the effectiveness of humanoid robots as therapeutic and educational tools in improving social, communication, and learning skills among ASD children. For example, evidence shows that humanoid robots, NAO and KASPAR help ASD children engage better in educational activities by reducing anxiety and increasing sensory receptivity (Ismail et al., 2012; Lakatos et al., 2023; Shamsuddin et al., 2012). These robots' predictable behaviour and lack of emotional complexity make them less intimidating for ASD children (Desideri et al., 2018).

Nevertheless, existing studies merely concentrate on the broader evaluations of humanoid robots' effectiveness as an intervention in supporting student learning. Research gaps exist in identifying the teachers' perception and readiness to integrate such technologies into their classrooms. Teacher's role is pivotal in facilitating students' interactions with humanoid robots, tailoring the use of the robots to suit individual needs, promoting collaboration and empathy among students, monitoring student progress, and influencing policies for the adoption of innovative teaching through humanoid robots, particularly for those with ASD (Appleton, 2019; Dochy, 1994; Qidwai et al., 2020; Tuna et al., 2019; Zeaiter & Heinsch, 2019). Therefore, gaining teachers' perspectives on using humanoid robots to support the learning of their ASD pupils serves as a prerequisite for ensuring the effectiveness of such an intervention (Alcorn et al., 2019).

Past studies that have examined teachers' acceptability level in using KASPAR for their ASD children show desirable outcomes gained by the children from interacting with KASPAR (Robins & Dautenhahn, 2019; Syrdal et al., 2020). However, scholars urged that similar studies should be conducted in different contexts to further investigate the effectiveness of KASPAR in supporting children with ASD (Syrdal et.al., 2020). Considering these, the current study aims to address the existing gap by examining teachers' perceived acceptability towards deploying humanoid robot KASPAR to

support ASD children's learning across three primary schools in Malaysia. As such, this study adopts the factors of behavioural intention from UTAUT model (Venkatesh et al., 2003) including performance expectancy, effort expectancy, social influence, facilitating condition and attitude to understand the perceived acceptability of teachers in adopting humanoid robot in the teaching.

2 Literature Review

Based on the previous studies, despite the challenges from technical, economic and logistical aspects perceived by teachers, humanoid robots have demonstrated significant benefits in education (Babić & Etinger, 2022; Ates & Polat, 2025). However, their success as an educational intervention depends on teachers' willingness to accept and adopt them in their teaching practices (Alcorn et al., 2019).

The Unified Theory of Acceptance and Use of Technology (UTAUT) model focuses on four key constructs – performance expectancy, effort expectancy, social influence, and facilitating conditions, which explains individual's intention to use a technology or system and predicts his/her subsequent usage behavior (Venkatesh et al., 2003). In the context of education, *performance expectancy* refers to the degree of an individual's beliefs that technology helps to enhance instructional effectiveness and student engagement (Venkatesh et al., 2003; Ates & Polat, 2025). This factor is the strongest determinant of a user's behavioural intention to adopt a technology (Venkatesh et al., 2003). According to a study conducted by Babić and Etinger (2022), most of the secondary school teachers believed that humanoid robots can assists in the education of children with learning disabilities. *Effort expectancy* refers to the teachers' perception on how easy technology is to be used (Venkatesh et al., 2003; Ates & Polat, 2025). Individuals are willing to adopt new technology if the effort to learn is minimal (Lu et al., 2019). *Social influence* is defined as the intensity to which an individual perceives that important others such as peers, administrators, or students who inspire him or her to use the technology (Venkatesh et al., 2003; Ates & Polat, 2025). *Facilitating conditions* is referred to the availability of the resources, to which technical innovation encourages and supports the users to understand them and sort out the effective way to resolve issues that occur while performing some technical tasks (Hassan et al., 2022; Odei-Appiah et al., 2022). Facilitating condition plays an important role in enabling the adoption of technology (Cabellos et al., 2024).

Although *attitude towards technology* is not a core construct of the UTAUT model, it is considered important to determine an individual's positive or negative feelings about performing the target behaviour with regards to the technology (Dwivedi et al., 2019; Fishbein & Ajzen, 1975), and thus, was included as mediating construct in the revised UTAUT model (Dwivedi et al., 2019). Based on the meta-analysis done by Marikyan, et al. (2023), trust, performance expectancy and social influence positively affect attitude and intention to use. In the context of AI adoption, Kelly et al. (2023) found that perceived usefulness, performance expectancy, attitudes, trust, and effort expectancy significantly and positively predicted behavioural intention, willingness,

and utilisation behaviour across multiple industries. Notably, in short-term use scenarios, individuals may base their intention to use a particular technology on its functional aspects, such as convenience and usefulness, rather than relational aspects, such as trust, as it may require longer interactions to develop trust (Ejdys, 2020).

As such, this study aims to examine teachers' perceived acceptability toward deploying the humanoid robot, KASPAR in teaching children with ASD across three primary schools in Malaysia. Grounded in the UTAUT model, this study measures teachers' intention to use KASPAR for teaching autistic learners in terms of performance expectancy, effort expectancy, social influence, facilitating conditions, attitudes towards using KASPAR and their adoption intention.

3 Methodology

This exploratory study was approved by the Ethics Committee of Multimedia University (Approval No: EA0232023). Research teams from Multimedia University, Malaysia and University of Hertfordshire, United Kingdom (UK), collaborated to design and execute the study. In this study, the humanoid robot, KASPAR, which was developed by the University of Hertfordshire in 2005 (Robins, Dautenhahn & Nadel, 2018; Wood et al., 2021), was used in the learning activities with students who have ASD (Dautenhahn, 2009). KASPAR was developed to assist children with ASD in communication and social interaction skills (Moros et al, n.d.; Robins, Dautenhahn & Nadel, 2018) and help teachers and parents support the children.

The respondents of this study were teachers at public primary schools who are teaching special needs students in Malaysia. Three public primary schools which are equipped with the Special Education Integrated Programme (SEIP) in Melaka are involved in this study. A total of 14 teachers were involved in this study. Out of these, 8 teachers represent School A, 2 teachers were from School B and 4 teachers were from School C. The activities that involve interaction between ASD children and KASPAR were conducted in three sessions for each school from 27 March 2024 to 2 May 2024. After the 3 visits to schools, teachers who are involved in this SEIP program were asked about their acceptability perception towards the use of KASPAR in their teaching with a set of self-administered questionnaires.

The survey instrument was adapted from Venkatesh et al. (2003), with a 7-point Likert scale. It comprises the following sections: Part A consists of demographic profile; and Part B consists of closed questions related to the perception of teachers towards the use of humanoid robots in their teaching from the aspects of performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating conditions (FC), attitude (A), and adoption intention (AI). The survey was designed in bilingual, i.e. English and Malay languages to ensure the clarity and ease of use for respondents. Descriptive analysis was performed to analyse the collected data.

4 Findings and discussion

Most of the respondents are Chinese (85.71%) and the remaining are Malay. Teachers who are female represented by 92.86% and 7.14% are male. On average, they have 9.70 years of teaching experience with ASD children.

The data in Table 1 shows the mean scores for the items used to measure teachers' perception level in adopting KASPAR for ASD learners. The result with a mean score of 3.50 and above revealed that all the respondents generally have the intention to adopt KASPAR in the teaching and learning activities.

Table 1. Descriptive Analysis

	Mean	SD
Performance expectancy (PE)	**4.29**	**1.06**
Using KASPAR would improve my student's learning.	4.46	1.20
Using KASPAR increases my student's chances of achieving learning that is important to him or her.	4.31	1.18
Using KASPAR would allow my student to accomplish learning tasks more quickly.	4.15	0.99
Using KASPAR would enhance my student's effectiveness in learning.	4.23	1.09
Effort expectancy (EE)	**4.72**	**1.03**
Learning how to use KASPAR would be easy for me.	4.92	1.26
I find KASPAR easy to use.	5.00	1.08
It is easy for me to become skilful at using KASPAR.	4.92	1.19
I would find it easy to get KASPAR to do what I want it to do for my student.	4.23	1.09
I would find KASPAR to be flexible to interact with.	4.50	1.17
Social influence (SI)	**4.19**	**1.09**
The school management will encourage us to use KASPAR in my teaching of ASD students.	4.31	1.03
School teachers are supportive of the use of KASPAR as learning intervention.	4.08	1.19
Facilitating conditions (FC)	**4.08**	**1.04**
I think I have the resources necessary to use KASPAR in my teaching.	3.85	1.07
I think I would be able to access the knowledge necessary to use KASPAR in my teaching.	4.08	1.12
I believe that specialised instruction and guidance concerning KASPAR would be available to me.	4.31	1.32
Attitude towards Using KASPAR (A)	**4.69**	**1.23**
I believe using KASPAR would be a good idea in my teaching.	4.69	1.25
I believe KASPAR would make learning fun for my students.	4.77	1.30

I believe the actual process of using KASPAR would be pleasant.	4.54	1.13
I believe KASPAR would make learning more interesting for my students.	4.77	1.30
Adoption Intention (AI)	**4.53**	**1.25**
Assuming I had access to KASPAR, I intend to use it for my teaching frequently.	4.38	1.26
Given that I had access to KASPAR, I predict that I would use it for my teaching.	4.46	1.20

Note: SD = Standard Deviation

Out of the five factors measured, EE showed the highest mean score, which is 4.72. This implies that teachers generally think that they can effortlessly learn to use KASPAR and interact flexibly with it with their existing skills. However, they may be unsure about coordinating with KASPAR to meet their teaching requirements and individual student needs. In view of this, Ates and Polat (2025) accentuated that the integration of humanoid robots into education can be beneficial but entails several challenges and barriers, which may require extensive efforts, such as high initial and maintenance costs, especially for schools with limited budgets, technical complexity, etc. Likewise, in the present study, the teachers may recognize the potential benefits of using KASPAR in teaching, yet they may be concerned about the uncertainties or challenges in using it, due to lack of training or exposure, insufficient resources, or concerns about how to effectively meet the varying needs of students with the use of KASPAR.

The next highest is A (mean=4.69), followed by PE (mean=4.29), SI (mean =4.19) and FC (mean =4.08). In terms of A, teachers believed that using KASPAR would be a pleasant experience, as it can make learning more fun and interesting for the ASD students. Consistently, past findings also revealed that educators working with autistic learners were generally open to the idea of utilizing humanoid robots in teaching. However, they were uncritically approving as some expressed concerns about the potential incapacity of robots to convey complex human behaviours, excessive attachments of children to robots, reduced social interactions with humans (Alcorn et al., 2019), and the inability of robots to adapt to the different needs and unpredictable behaviors of ASD learners (Silvera-Tawil et al., 2022).

The mean score of PE in the present study indicates that the teachers believe KASPAR can improve students' learning but may be somewhat uncertain about its effectiveness in allowing students to accomplish learning tasks quickly as students' ASD severity level varies. Similarly, the findings by Alcorn et al. (2019) revealed that even though educators view robots as useful tools for autistic children, they highlighted the important conditions for successful robot use, which include careful integration of robots into existing curricula and tailoring them to the unique needs of learners. This also suggests that the teachers may believe KASPAR can enhance their teaching effectiveness, but they may require further training or support to fully grasp its potential in facilitating learning for children with ASD.

The SI score reflects that teachers somewhat perceive that the resources and guidance may be available for them to use KASPAR in their teaching. These findings seem

to be a recurring theme in literature. For example, Istenic et al. (2021) found that pre-service teachers exhibited a cautious attitude towards using humanoid robots in classrooms, wherein their social influence aspects, which include peer and managerial support had only a moderate effect on their intention to adopt the technologies. Perhaps, the lack of familiarity in using humanoid robots in Malaysian ASD educational settings causes ambivalence among teachers and the management of its effectiveness, leading to limited advocacy. This underscores the need for more research and comprehensive strategies to address individual, team, and institutional barriers in adopting humanoid robots for teaching.

FC obtained the lowest mean score in the present study. Past literature has reported similar findings. One possible reason for such an outcome is the lack of technical competencies among teachers, particularly those without a technology-based background. They may be uncertain about how to integrate the humanoid robot into their lesson plans and operate them effectively, thus causing them to feel unprepared (Papadakis et al., 2021). Also, lack of adequate resources or infrastructure, such as reliable Wi-Fi and maintenance support may impede educators' intention to adopt robotic tools in teaching (Silvera-Tawil et al., 2022).

Overall, the mean score of adoption intention (4.53) indicates that moderate intention exists among teachers across the three primary schools to use the humanoid robot, KASPAR in their teaching. Likewise, findings from past studies suggest that teachers may experience initial hesitancy towards adopting humanoid robots in teaching due to technical and infrastructure constraints, curriculum integration, lack of training and familiarity, cost concerns, as well as limited social influence and support (Alcorn et al., 2019; Ates & Polat, 2025; Istenic et al., 2021; Rao & Jalil, 2021). These underscore the need for targeted training, infrastructure development, and supportive policies to improve teachers' confidence and willingness to incorporate humanoid robots like KASPAR into their teaching for ASD children.

5 Conclusion and Implications

This study may contribute to the growing research on educational technology for schools or institutions for children with ASD, particularly robotic interventions. To promote the effective adoption of humanoid robots, educators' training programmes are essential to support them in their teaching and improving ASD children's cognitive, social and emotional skills. Additionally, the findings offer practical recommendations to the management to develop inclusive policies and relevant school management strategies to enhance the process of robotic adoption and implementation for ASD learners in Malaysia. By understanding these factors, teachers can overcome the barriers of adopting humanoid robots and leverage the potential of these advanced technologies in their teaching practices. The findings of this study also contribute to a deeper understanding of the perception of teachers in Malaysia on adopting humanoid robots in teaching students with ASD.

One key limitation in this study was the relatively small numbers of participants which may limit the generalizability of the findings. Additionally, the research was

conducted within a limited number of school settings, which may not fully represent the diversity of educational contexts.

Despite these limitations, the study offers valuable insights and serves as a foundation for future studies. Future research is recommended to expand on these findings with more an extensive participant pool and across different primary schools and educational institutions, or societies such as NASOM in Malaysia. Such effort will help to validate the current results, uncover patterns and enhance the applicability of the study's conclusion to a broader population.

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