Structured Teaching Approaches to Improve Vocational Skill Proficiency for Students with Autism Spectrum Disorder (ASD) in Technical and Vocational Education: A Literature Review.

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ABSTRACT

Learners with Autism Spectrum Disorder (ASD) often struggle to acquire and apply vocational skills. This underscores the need for structured and inclusive teaching methods in Technical and Vocational Education and Training (TVET). This literature review looks at how effective the Structured Teaching Model, based on the TEACCH framework, is for improving vocational skill development in learners with ASD. It draws from 14 peer-reviewed studies to show structured teaching approaches integrating visual supports, behavioral sequencing, workplace adaptations, and technology-enhanced tools to support vocational learning and employment readiness. The findings reveal that structured teaching consistently improves accuracy in vocational tasks, skill mastery, independence, and work readiness when used as a complete instructional system rather than just a collection of separate strategies. Visual supports and behavior sequencing are the most effective for teaching procedural vocational skills. Job coaching and structured workplace settings are essential for helping learners generalize these skills. Technology-based methods, like augmented and virtual reality, offer promising benefits for engagement and practice, but their use depends on the context. This review adds to the literature by presenting structured teaching as a flexible teaching framework for inclusive TVET. The findings highlight the need for teacher training, strengthening institutional capacity, and supporting policies to ensure effective and widespread implementation. This will ultimately enhance vocational outcomes and increase workforce participation for learners with ASD.

Keywords: Autism Spectrum Disorder (ASD), Structured Teaching, TEACCH Model, Inclusive TVET, Vocational Skills

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition marked by differences in social interaction, communication, and sensory-behavioral functioning. These differences affect how individuals learn (Ratz, 2014). For learners with ASD, gaining vocational and employability skills becomes vital as they move into upper secondary and post-secondary education. These skills are essential for a successful transition into adulthood and the workforce. However, research shows that individuals with ASD often struggle to maintain employment after leaving school. This is mainly due to difficulties in adjusting to new environments and handling social interactions at work (Taylor & Mailick, 2014). These issues reveal gaps in support for schoolto-work transitions and highlight the need for effective, evidence-based teaching methods within Technical and Vocational Education and Training (TVET) settings.

Despite the practical focus of TVET, traditional vocational teaching methods like fast-paced instruction, heavy verbal explanations, and loosely structured workshop activities—often do not address the learning needs of students with ASD. These methods can increase cognitive load and lower task engagement, especially for learners who find abstract verbal instructions challenging. On the other hand, learners with ASD tend to perform better in environments that are predictable, clearly structured, have fewer sensory demands, and include clear visual support (Ramadhani, Romadlon, & Sopingi, 2022). These optimal learning conditions align closely with the Structured Teaching Model based on the TEACCH (Treatment and Education of Autistic and Related Communication-Handicapped Children) framework.

Structured Teaching focuses on organizing the environment, using visual schedules, sequencing tasks systematically, and providing individualized instructional support. These elements take advantage of strengths commonly found in learners with ASD, such as visual processing, attention to detail, and a preference for routine and predictability. In TVET contexts, where vocational skills often involve multi-step tasks like tool handling, assembly, and safety compliance, structured teaching offers a solid framework for breaking down complex tasks into easy-to-understand visual steps. Research shows that structured teaching methods such as task analysis, video modeling, Behavioral Skills Training (BST), structured work systems, job coaching, and visual scheduling, effectively improve vocational task performance, independence, and job readiness for learners with ASD (Yakubova, Hughes, & Hornberger, 2019). Recently, technology-based tools like augmented reality (AR), virtual reality (VR), and computer-assisted instruction have been integrated into structured teaching practices. These tools provide low-stress, controlled environments that support practice and visual feedback during vocational skill development. While the benefits of structured teaching strategies are increasingly recognized, current research remains scattered, particularly within TVET contexts. There is no comprehensive synthesis that combines theoretical foundations, teaching effectiveness, and specific challenges in vocational education for learners with ASD. This gap is significant, especially with the rising focus on inclusive TVET in Malaysia and around the world. Therefore, this literature review seeks to evaluate existing studies on structured teaching models in vocational education for students with ASD, assess their effectiveness, explore their theoretical foundations, and identify key obstacles to implementation. The goal is to inform educators, curriculum developers, and policymakers about how to enhance inclusive vocational education and improve employment outcomes for learners with ASD.

Objectives

This literature review examines the application of the Structured Teaching Model in Technical and Vocational Education and Training (TVET) settings for students with autism spectrum disorder (ASD). Based on the scope of the review, the following research objectives are formulated:

i. To identify structured teaching approaches employed in vocational education for learners with ASD, including visual schedules, task analysis, structured work systems, video modeling, and Behavioral Skills Training (BST).

ii. To evaluate the effectiveness of structured teaching strategies in improving vocational task performance, skill mastery, independence, and job readiness among learners with ASD in TVET environments.

iii. To examine the theoretical foundations underpinning the Structured Teaching Model within the TEACCH framework.

iv. To analyse the challenges, limitations, and implementation barriers faced by educators and institutions in applying structured teaching approaches within technical and vocational education programs for learners with ASD.

Theoretical Foundations of the Teacch Structured Teaching Model

The Structured Teaching Model comes from the TEACCH framework, which stands for Treatment and Education of Autistic and Related Communication-Handicapped Children. This framework was developed to meet the cognitive, sensory, and behavioral needs of people with autism spectrum disorder (ASD). TEACCH is based on the idea that learners with ASD process information better when instruction is given visually, organized step-by-step, and embedded in predictable environments (Mesibov et al., 2005). Instead of trying to change learner behavior on its own, the model focuses on adjusting teaching settings and task structures to match the strengths and needs of students with ASD.

The TEACCH Structured Teaching Model has four main components: physical structure, visual schedules, work systems, and task organization. Physical structure means arranging learning spaces to reduce distractions and clearly define activity areas, which helps decrease sensory overload and support sustained focus. Visual schedules give learners a clear sequence of activities so they can anticipate transitions and understand what is expected. Work systems spell out what tasks need to be done, the amount of work involved, and how to know when tasks are complete, promoting independence and lessening reliance on verbal instructions. Task organization supports

learning by breaking complex activities into visually clear and manageable steps. Together, these components match the strengths of ASD learners in visual processing, attention to detail, and preference for routine.

In Technical and Vocational Education and Training (TVET) contexts, structured teaching is especially relevant. Vocational tasks, such as assembly work, machining, tool handling, and safety procedures, usually require multiple steps and precise execution. When these tasks are taught using unstructured or verbally heavy methods, they can be very challenging for learners with ASD. TEACCH-based structured teaching makes it possible to visually organize and sequence these tasks, which reduces cognitive load and helps learners engage more effectively with technical processes in a clear routine. Research consistently shows that structured teaching components are effective in vocational settings. Visual supports, like schedules and task analyses, are linked to better task accuracy and completion. Additionally, structured work systems and behavioral sequencing methods lead to greater independence and fewer errors. Studies focusing on workplace applications indicate that structured environments help skills transfer beyond training, supporting successful transitions to employment (Terranova et al., 2022). While existing reviews have looked at individual strategies, such as video modeling or behavioral interventions, they often treat these methods separately or outside of clear TVET contexts.

The value of this review lies in its combined theoretical approach to TEACCH-based structured teaching in vocational education. By integrating visual supports, behavioral sequencing, and environmental structuring into a single framework, this review shows how structured teaching acts as a unified instructional system instead of just a set of separate techniques. This synthesis adds to the existing literature by placing TEACCH principles within TVET environments, thereby reinforcing the connection between ASD learning traits, instructional design, and vocational skill development. In summary, the TEACCH Structured Teaching Model offers both a solid theoretical base and a practical framework for vocational education. Its focus on organizing environments, providing visual clarity, and ensuring task predictability closely aligns with the demands of TVET and the learning profiles of students with ASD. By combining evidence from various studies and placing TEACCH within vocational education, this review enhances the understanding of structured teaching as a vital method for improving vocational learning and smooth transitions from school to work for learners with ASD.

METHODOLOGY

This literature review followed a systematic method based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to maintain clarity and thoroughness. The review looked at structured teaching strategies, including TEACCH-based approaches, task analysis, video modeling, structured work systems, Behavioral Skills Training (BST), job coaching, and technology-enhanced instruction in Technical and Vocational Education and Training (TVET) settings for students with autism spectrum disorder (ASD). A thorough search was carried out across Scopus, Web of Science, ERIC, Google Scholar, ScienceDirect, and APA PsycINFO using specific keywords and Boolean combinations. Peer-reviewed studies published between 2013 and 2025 were included to reflect current evidence-based practices.

Inclusion criteria required that studies involve ASD learners, focus on vocational or work-preparation skills, and use structured teaching strategies. Studies not related to vocational education or structured instruction were excluded. The PRISMA screening process started with 612 records, which dropped to 398 after removing duplicates, 127 after screening titles and abstracts, and ultimately narrowed down to 14 studies after assessing full-text eligibility. Data were gathered using a structured template that recorded authorship, year of publication, instructional strategies, vocational skill targets, and key findings. While no specific quality scoring tool was used, methodological factors such as study design, context, and outcome focus were considered during analysis to ensure a fair interpretation. Since this was a secondary analysis of published literature, ethical approval was not necessary. Despite some limitations regarding database coverage and the small number of vocational-focused studies, the systematic approach provided a clear and credible overview of structured teaching interventions for ASD learners in TVET settings.

RESULTS

The studies included in Table 1 demonstrate that Structured Teaching, particularly TEACCH, works best for assisting students with autism spectrum disorders (ASD) in acquiring vocational skills in Technical and Vocational Education and Training (TVET). The studies that have been reviewed (Ratz, 2014; Yakubova et

al., 2019; Kellems et al., 2021) showed the use of visual-based strategies such as visual task analysis, video modeling, structured work systems, and visual schedules, the most frequently used interventions. These techniques were associated with improvements in task clarity, cognitive load, and independent performance on a skill. More complexity in a multi-step vocational task was mastered and fluency improved with the use of task analysis, systematic prompting, and Behavioral Skills Training (BST) (Nuernberger et al., 2013; Leaf et al., 2016). The use of technology-enhanced structured instruction is yet another emerging major focus area.

Table 1: Summary of Structured Teaching Approaches

Author (Year)	**Title**	**Structured Teaching Strategy**	**Vocational Skill Target**	**Key Findings**	**Structured Teaching Component**
Ratz (2014)	Method and Educational Tool for Teaching Vocational Skills to People with Autism	Visual task analysis; structured work systems	Basic vocational tasks	Improved independence; reduced errors	Visual structure; task sequencing
Yakubova, Hughes & Hornberger (2019)	Video Modeling and Task Analysis to Teach Vocational Skills to Students with ASD: A Review	Video modeling + task analysis	Multi-step vocational tasks	Increased task initiation & completion	Visual modeling; step-by-step instruction
Kellems et al. (2021)	Mobile Video Modeling to Teach Employment Skills to Youth with Disabilities	Mobile video modeling	Job readiness & employment skills	Higher accuracy; increased independence	Visual supports; predictable routines
Nuernberger et al. (2013)	Task Analysis and Systematic Instruction for Students with Autism in Vocational Settings	Task analysis & systematic prompting	Tool use, assembly	Improved accuracy; reduced prompt dependence	Prompting hierarchy; task sequencing
Leaf et al. (2016)	Teaching Vocational Skills to Individuals with Autism: A Review of Behavioral Interventions	Behavioral Skills Training (BST)	Safety, machinery tasks	Higher mastery through modeling/rehearsal	Structured feedback; reinforcement
Chen et al. (2023)	Augmented Reality for Vocational Skill Training Among Learners with ASD	AR-based visual cues	Motor sequencing, assembly tasks	Reduced errors; improved motor planning	Visual scaffolding; guided steps
Xue, Tao & Li (2025)	Augmented Reality–Supported Vocational Training for	Virtual Reality (VR) simulations	Pre-vocational & safety tasks	Higher engagement; reduced sensory overload	Structured environment; repetition

	Autistic Youth: A Meta-Analysis				
Wehman et al. (2018)	Competitive Integrated Employment for Youth with Autism: A Randomized Trial	Job coaching & structured routines	Real workplace tasks	Better skill generalization; increased independence	Environmental structure; task fading
Bennett & Dukes (2013)	Employment Instruction for Individuals with Autism Spectrum Disorder: A Review	Structured employment instruction	Workplace performance	Improved accuracy & retention	Predictability; structured instruction
Ramadhani, Romadlon & Sopingi (2022)	Penerapan Metode TEACCH pada Pembelajaran Vokasional	TEACCH structured teaching	Vocational workshop tasks	Higher participation; fewer behavioral issues	Environmental organization; visual schedule
Seaman & Cannella-Malone (2016)	Vocational Training for Individuals with ASD: Barriers and Supports	Functional vocational training	Functional vocational tasks	Improved retention; reduced anxiety	Routine; structured practice
Ramasamy, Rahim & Hassan (2021)	Inclusive TVET: Challenges, Policies, and Practices in Malaysian Vocational Colleges	Structured support in TVET	Tool-based vocational skills	Teachers need more structure for ASD learners	TEACCH principles; instructional structure
León (2023)	Technology Integration Barriers in Special Education Classrooms	Technology-supported structured learning	Digital vocational tasks	Effective visual guidance; teacher readiness issues	Visual structure; tech-based instruction

Table 1 gives an overview of the structured teaching strategies, vocational skill targets, and key outcomes reported in the studies included. Instead of looking at these strategies on their own, the analysis across the studies shows clear and repeated patterns in how structured teaching helps with vocational skill development for learners with autism spectrum disorder (ASD). Visual-based structured supports, including task analysis, visual schedules, structured work systems, and video modeling, stand out as the most commonly used and consistently effective methods. They are particularly useful for improving task accuracy, sequencing, and independent task completion. Behavioral and skill-sequencing strategies, such as Behavioral Skills Training (BST) and systematic prompting, seem especially effective for improving skill mastery and procedural fluency in complex vocational tasks. New evidence also points to the helpful role of technology-enhanced instruction, like augmented and virtual reality, in keeping students engaged and reducing sensory overload. These patterns suggest that the effectiveness of structured teaching in TVET contexts comes from combining visual structure, behavioral sequencing, and environmental organization, instead of relying on just one teaching method.

Thematic Synthesis of Findings

Synthesis of the reviewed studies reveals four main themes that explain how structured teaching helps learners with autism spectrum disorder (ASD) develop vocational skills in Technical and Vocational Education and Training (TVET) settings. These themes—visual-based structured supports, behavioral and skill-sequencing approaches, technology-enhanced structured instruction, and vocational context adaptations with job coaching—

are not separate instructional techniques. Instead, they are interconnected methods that contribute to effective vocational learning.

The most prominent theme in the studies is the use of visual-based structured supports. This includes visual schedules, task analysis, structured work systems, and video modeling. These strategies consistently helped with task understanding, reduced confusion, and improved independent task completion across vocational areas. Visual supports were especially effective for multi-step vocational tasks, as they lessened cognitive load and provided clear, predictable task sequences. This theme aligns with TEACCH principles, which emphasize visual clarity and organized environments as essential supports for learners with ASD.

The second theme focuses on behavioral and skill-sequencing approaches, such as Behavioral Skills Training (BST), systematic prompting, and task chaining. These strategies effectively supported skill mastery, procedural fluency, and sustained performance, particularly for complex technical tasks that involve safety procedures, machinery operation, and tool handling. When combined with visual supports, behavioral sequencing helped learners move from guided practice to independent task execution, showing how behavioral structure works within structured teaching systems.

The third theme highlights the growing role of technology-enhanced structured instruction, especially augmented reality (AR), virtual reality (VR), and mobile video modeling. Although fewer studies examined these methods, the findings suggest that technology-supported instruction can improve engagement, accuracy, and skill retention by providing controlled, low-stress practice environments. These tools were particularly helpful for learners who struggle with sensory overload in traditional workshop settings. However, evidence in this area depends on the context and is influenced by the resources available and the digital readiness of teachers.

The final theme relates to adaptations in the vocational context and job coaching, which are crucial for supporting skill generalization and readiness for employment. Studies conducted in workplace or transition-toemployment settings show that structured environments, predictable routines, and gradual reduction of support help learners with ASD transfer vocational skills beyond training situations. Job coaching serves as a link between structured instruction and real-world job demands, highlighting the importance of environmental organization beyond the classroom.

Overall, this thematic synthesis shows that the success of structured teaching in TVET contexts is greatest when instructional strategies are integrated instead of used in isolation. Visual structure establishes task clarity, behavioral sequencing supports skill mastery, technology improves engagement, and vocational adaptations encourage generalization. Together, these themes position structured teaching as a flexible and effective framework for enhancing vocational outcomes for learners with ASD.

Table 2: Thematic Analysis of Structured Teaching Approaches in Vocational Education for ASD Learners

Theme	**Supporting Studies**	**Example Interventions**	**Summary of Findings**
Visual-Based Structured Supports	Ratz (2014); Yakubova et al. (2019); Kellems et al. (2021)	Visual schedules, task analysis, video modeling	Clear visual supports reduce cognitive load, improve accuracy, and raise independence in multi-step vocational tasks.
Behavioral & SkillSequencing Approaches	Nuernberger et al. (2013); Leaf et al. (2016)	BST, task chaining, systematic prompts	Behavioral sequencing strengthens skill mastery, precision, and fluency in technical tasks.
Technology-Enhanced Structured Instruction	Chen et al. (2023); Xue et al. (2025); Kellems et al. (2021)	VR simulations, AR overlays, mobile video modeling	Technology provides structured, repeatable, low-stress environments

			that enhance vocational skill learning for ASD.
Vocational Context Adaptations & Job Coaching	Wehman et al. (2018); Bennett & Dukes (2013)	Job coaching, structured workstations, predictable routines	Structured workplace environments help ASD learners generalize skills and achieve work readiness.
Implementation Challenges in TVET	Ramasamy et al. (2021); Seaman & Cannella-Malone (2016); León (2023)	Limited training, sensory barriers, lack of technology	TVET educators face training, environment, and resource barriers that affect structured teaching implementation.

Table 2 summarizes the reviewed studies into higher-level themes. It shows how different structured teaching parts work across vocational learning settings. The comparison across these themes reveals that visualbased structured supports and step-by-step behavior techniques have the strongest and most consistent effects on vocational task accuracy, procedural fluency, and independent task completion. These strategies serve as the main teaching methods in TVET environments. Technology-supported structured instruction, though less frequently reported, shows encouraging supplementary effects on student engagement and skill retention, especially for tasks that need repeated practice in low-stress settings. In contrast, adjustments to vocational contexts and job coaching are essential for supporting skill generalization and work readiness, rather than initial skill acquisition. Overall, these findings suggest that the effectiveness of structured teaching differs based on function and context, with various components playing distinct but supportive roles in vocational skill development. This combined understanding lays the groundwork for the following discussion on implementation feasibility, contextual differences, and policy implications in inclusive TVET.

DISSCUSION

The findings from this literature review provide strong evidence that the Structured Teaching Model, based on the TEACCH framework, is an effective and coherent approach to improving vocational skill development for learners with autism spectrum disorder (ASD) in Technical and Vocational Education and Training (TVET) settings. This review shows that structured teaching functions as an integrated instructional system. Visual structure, behavioral sequencing, environmental organization, and contextual support all work together to support vocational learning and work readiness. A key interpretive point of this review is clarifying the roles of different components of structured teaching. Visual supports form the foundation for vocational instruction. They help learners with ASD understand task expectations, lessen cognitive load, and navigate multistep vocational tasks. These supports are crucial in TVET settings, where tasks need precision, sequencing, and adherence to safety protocols. While previous studies have noted the benefits of visual supports, this review combines evidence that shows their consistent effectiveness across various vocational skill areas, making them essential instructional elements rather than supplementary ones.

Behavioral and skill-sequencing strategies, such as Behavioral Skills Training (BST), systematic prompting, and task chaining, enhance the impact of visual structure by supporting skill mastery and procedural fluency. The findings suggest that while visual supports help with starting tasks and understanding them, behavioral sequencing is especially important for improving performance quality and encouraging independence. This insight advances existing literature by showing that the effectiveness of structured teaching relies on careful integration, rather than uniform use, of instructional elements based on the complexity of tasks. The increased use of technology-enhanced structured instruction, including augmented reality (AR) and virtual reality (VR), represents an important new aspect of structured teaching in TVET. These technologies connect well with TEACCH principles by offering predictable, visually rich, and low-stress practice environments that support repeated practice. However, this review notes that their effectiveness largely depends on contextual factors, such as resource availability, institutional capacity, and teachers' digital skills. Therefore, while AR and VR have promising educational value, they should serve as complementary tools rather than substitutes for core structured teaching practices.

From an implementation standpoint, the findings highlight notable differences in how structured teaching is applied across TVET institutions. Teacher readiness is a critical factor that impacts how well-structured teaching is used. Many educators report limited formal training in TEACCH principles and structured instructional design. Additionally, environmental factors like noisy workshops, rigid curricula, and time constraints can make it difficult to apply structured teaching strategies consistently. These challenges indicate that the effectiveness of structured teaching relies not just on instructional design but also on institutional support and organizational alignment. At the policy level, the review emphasizes the need for inclusive TVET frameworks to focus not just on access but also on instructional quality and capacity building. Policymakers and institutional leaders should prioritize professional development in structured teaching for vocational educators, ensure access to affordable visual supports, and encourage collaboration between education providers and industry partners to develop structured workplace settings. Such systemic support is crucial for scaling structured teaching practices across different TVET contexts and ensuring that these practices lead to sustainable employment outcomes for learners with ASD.

In summary, this discussion enhances scholarly understanding by showing that the TEACCH Structured Teaching Model serves as a comprehensive and flexible framework for vocational education. Its effectiveness comes not from isolated strategies but from the coordination of instructional, environmental, and institutional factors. When backed by adequate training, resources, and policy commitment, structured teaching offers a strong pathway to improve vocational skills, independence, and workforce participation for learners with ASD.

CONCLUSION

This literature review concludes that the Structured Teaching Model, based on the TEACCH framework, is a strong and evidence-based instructional approach for improving vocational skills in learners with autism spectrum disorder (ASD) within Technical and Vocational Education and Training (TVET) settings. The synthesis of the reviewed studies shows that structured teaching, implemented through a system of visual supports, behavioral sequencing, technology-based instruction, and organized environments, consistently increases vocational task accuracy, skill mastery, independence, and work readiness. These findings confirm that structured teaching fits well with the learning characteristics of ASD and the demands of vocational education. Importantly, this review adds to the existing literature by showing that the effectiveness of structured teaching does not come from isolated instructional methods but from the coordinated use of various structured elements designed for specific vocational tasks. Visual supports provide essential clarity for tasks and reduce cognitive load. Behavioral strategies like Behavioral Skills Training (BST) promote procedural fluency and independent performance. Technology tools, including augmented and virtual reality, have potential as additional support for engagement and skill practice, especially in controlled, low-stress learning environments. Moreover, structured workplace changes and job coaching help ensure skills transfer and successful movement from training to employment. Based on these findings, several practical recommendations emerge for TVET institutions.

First, the principles of structured teaching should be a key instructional framework in vocational programs for learners with ASD, rather than simple accommodations. Low-cost visual supports, structured work systems, and clear task sequences can easily fit into existing workshops without requiring significant resources. Second, teacher training should be a priority, with professional development focusing on TEACCH principles, task analysis, behavioral sequencing, and inclusive vocational teaching methods. This training is crucial for consistently implementing structured teaching effectively across different TVET contexts. At the institutional and policy levels, more focus should be placed on building capacity and promoting scalability. Policymakers and administrators should support structured teaching through curriculum guidelines, resource allocation for adaptive tools, and partnerships with industry to encourage supportive workplace environments. These steps are vital for turning instructional effectiveness into lasting employment outcomes for learners with ASD. Despite the solid evidence, this review also highlights gaps that need further exploration.

Future research should prioritize large-scale and long-term studies to assess the lasting impact of structured teaching on job retention and career advancement. Comparative studies across various TVET institutions and national contexts are necessary to gauge scalability and adaptability. Additionally, more research on cost-effective technology use and teacher training models would enhance the case for broader implementation. In conclusion, the TEACCH Structured Teaching Model serves as a practical, flexible, and wellsupported framework for inclusive vocational education. With solid teacher training, institutional commitment, and policy support,

structured teaching can significantly improve vocational skills, independence, and workforce participation among learners with ASD, leading to more equitable and effective TVET systems.

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