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REPORT

on the integrated and interactive training of autistic individuals

Leader Partner: Learn Virtual Europe

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Abstract

Simulation-based vocational training provides autistic learners with structured, predictable, and supportive environments in which vocational skills can be developed gradually and safely. Within the Metautism training ecosystem, simulation technologies support career pathways in welding, professional painting and surface coating, warehouse logistics, forklift operations, truck driving, crane and heavy-load operation, agricultural machinery, chemistry laboratory work, car mechanics, and CNC machining. These learning environments allow learners to acquire technical competencies while simultaneously developing concentration, confidence, motor coordination, procedural understanding, and workplace readiness

The most effective simulation-based programmes are founded on the principles of individualization, sensory-friendly design, structured instruction, immediate feedback, and gradual progression. Progress is measured through a combination of performance indicators, engagement levels, observational data, and learner self-reflection. The involvement of educators, job coaches, therapists, family members, and workplace mentors helps reinforce learning and supports the successful transfer of skills from simulation environments to real employment settings.

Depending on the profession, simulation may account for between 30% and 80% of the overall training process, providing a safe environment for repeated practice before learners transition to real equipment, workplaces, and professional responsibilities. When implemented through a structured and learner-centred approach, simulation-based vocational education contributes significantly to sustainable employment outcomes, greater inclusion, and increased learner confidence.

Introduction

Training autistic individuals through simulation-based vocational education requires a thoughtful combination of inclusive pedagogy, evidence-based practices, and technological solutions designed to accommodate diverse learning profiles.

Modern simulation technologies provide opportunities to develop vocational competencies in environments that are structured, safe, predictable, and adaptable to individual needs. They allow learners to acquire technical skills while reducing many of the barriers commonly encountered in real-world learning environments.

Simulation-based learning offers several important advantages:

- **Predictable and controlled environments**, helping reduce anxiety and minimize sensory overload.
- **Repeated practice opportunities**, allowing learners to progress through activities at a pace that matches their learning needs.

- **Immediate and objective feedback**, supporting understanding through clear cause-and-effect relationships.
- **Safe environments for experimentation and learning**, where mistakes can be addressed without material loss or safety risks.
- **Customizable levels of difficulty**, enabling personalized learning pathways and gradual progression.

Within vocational education, simulation-based learning can support training across a wide range of professions, including welding, logistics, transport, laboratory work, technical maintenance, manufacturing, and agricultural operations. These sectors often require the development of procedural knowledge, motor coordination, safety awareness, and technical skills that can be effectively introduced through simulation before learners engage with real equipment.

For autistic learners, the ability to repeat tasks, review procedures, and gradually increase complexity can create a more accessible and supportive learning experience. Simulation technologies therefore play an important role not only in skills development but also in confidence building, emotional regulation, and preparation for successful participation in vocational education and employment.

Guiding Principles

Simulation-based training for autistic individuals is most effective when it integrates five core principles:

1. Individualization and Personalization
2. Sensory-Friendly Design
3. Clear Instructions and Structured Scenarios
4. Consistent and Immediate Feedback
5. Support for Social and Communication Skills

Together, these principles form the foundation of inclusive, engaging, and effective vocational training environments.

At the same time, vocational education providers must carefully balance simulation-based learning with real-world practical experience. The optimal ratio between simulation and workplace practice varies depending on the complexity, safety requirements, and technical demands of each profession. High-risk occupations such as welding, forklift operations, truck driving, crane operations, and laboratory work particularly benefit from extensive simulator use before learners transition to real equipment and environments.

1. Individualization and Personalization

Effective vocational training begins with a comprehensive understanding of the learner's unique strengths, support needs, interests, and learning preferences. Assessment should consider cognitive abilities, communication styles, sensory processing characteristics, emotional regulation strategies, and vocational interests.

Many autistic learners demonstrate strengths in areas such as attention to detail, procedural thinking, visual learning, pattern recognition, and systematic problem solving. Training programmes should build upon these strengths while providing appropriate support in areas where additional assistance may be required.

Learning pathways should remain flexible, allowing learners to pause, repeat, revisit, or extend activities according to their individual pace. Such flexibility promotes confidence, autonomy, and long-term engagement.

Real-world Example

A learner with strong visual processing skills and a particular interest in transport systems begins training using a forklift simulator. The training programme emphasizes visual demonstrations, structured task sequences, and repeated pallet-loading exercises. Performance data is used to adjust task complexity gradually, allowing the learner to progress confidently toward real-world forklift operation. Simulation may account for approximately 60-70% of the initial training process before practical workplace training is introduced.

2. Sensory-Friendly Design

Sensory considerations play an essential role in the design of simulation-based learning environments for autistic individuals.

Simulation systems should minimize unnecessary sensory demands by avoiding excessive visual clutter, flashing effects, abrupt transitions, loud noises, or unpredictable environmental events. Interfaces should be clear, organized, and intuitive, with adjustable settings that allow learners to modify brightness, audio levels, contrast, visual complexity, and haptic feedback according to their preferences.

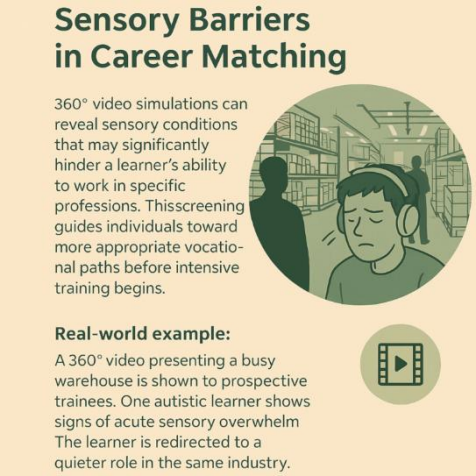
Scheduled sensory breaks and self-regulation tools can further support learner wellbeing and sustained engagement.

Real-world Example

Within a professional painting and surface coating simulator, a learner who experiences discomfort with sudden sounds uses a low-stimulation mode that reduces auditory effects and visual intensity. Following each practice session, the learner is offered a short guided break featuring calming animations and breathing

exercises. This approach allows the learner to develop technical skills while maintaining comfort and concentration throughout the training process.

Using Videos to Identify Sensory Barriers in Career Matching



While simulations often aim to create comfortable and controlled learning environments, it is equally important to understand how learners may respond to authentic workplace conditions.

The 360° videos developed within Work Package 3 can be used as an initial career exploration and assessment tool. These immersive experiences allow learners to observe real vocational environments and consider whether specific working conditions are compatible with their sensory preferences and personal comfort levels.

This process supports informed career decision-making and may reduce future training barriers, workplace stress, and dropout rates.

Real-world Example

A learner views a 360° video of a busy warehouse environment and experiences significant discomfort due to noise levels, rapid movement, and visual complexity. Following discussion with educators and support staff, the learner chooses to pursue a chemistry laboratory pathway, where work environments tend to be quieter, more structured, and procedurally organized. This decision is not based on exclusion but on identifying a vocational pathway that better matches the learner's strengths and sensory preferences.

3. Clear Instructions and Structured Scenarios

Structure and predictability are essential elements of effective learning for many autistic individuals.

Simulation activities should be organized into clear, manageable stages supported by visual instructions, demonstrations, icons, videos, or narrated guidance. Tasks should be broken into smaller components and introduced progressively, allowing learners to master each stage before moving on to more complex activities.

The ability to review demonstrations repeatedly and revisit previous stages helps strengthen understanding and supports independent learning.

Real-world Example

A chemistry laboratory simulator introduces learners to measuring substances, labelling samples, and following laboratory procedures through step-by-step interactive demonstrations. Each activity is separated into clearly defined stages, supported by colour-coded guidance and visual feedback. Learners may replay instructional videos before each attempt, allowing them to build confidence before working in a real laboratory environment.

4. Consistent and Immediate Feedback

Feedback plays a central role in simulation-based vocational education.

Effective simulations provide clear, objective, and immediate responses to learner actions. Feedback should explain both what was performed correctly and what should be improved. Ambiguous error messages should be avoided in favour of specific and actionable guidance.

Visual performance reports, replay functions, progress indicators, badges, and achievement systems can further support motivation and skill development.

Real-world Example

During a CNC machining simulation, a learner receives immediate feedback when an incorrect machining parameter is selected. The simulator highlights the specific setting involved, explains the reason for the error, and suggests corrective actions. At the same time, successful steps are acknowledged through progress indicators and performance scores. This approach supports learning while maintaining motivation and confidence.

5. Support for Social and Communication Skills

Simulation-based learning can significantly support the development of workplace communication and social interaction skills that are required across many vocational sectors. Although technical competence remains the primary focus of most vocational simulations, learners also benefit from opportunities to practice communication, collaboration, problem-solving, and emotional regulation within realistic but low-pressure environments.

Virtual interactions allow learners to explore workplace conversations, respond to instructions, ask for clarification, report issues, and communicate with supervisors or colleagues without the stress often associated with real-world situations. Through pre-recorded avatars, guided communication scenarios, or structured dialogue systems, learners can safely practise different communication approaches and observe the consequences of their decisions.

To support learners with varying communication preferences and abilities, simulations should incorporate visual communication aids, prompt cards, structured scripts, and model responses. These scaffolding tools can be used before, during,

and after simulation exercises, helping learners gradually build confidence and independence in workplace communication.

Simulation environments can also integrate emotional regulation supports, including guided breaks, reflection activities, visual emotion scales, and calming exercises that help learners process challenging situations and develop coping strategies that can later be transferred into real workplaces.

Real-World Example

In a warehouse logistics simulation, an autistic learner is required to communicate with a virtual supervisor regarding a delayed shipment and the correct storage location of incoming goods. Before beginning the task, the learner reviews visual communication cards containing phrases such as:

- "The shipment has been received."
- "Could you please confirm the storage location?"
- "This item has been placed in the designated area."

The learner then navigates the conversation by selecting dialogue options and observing the outcomes of different responses. Following the activity, the simulation provides structured feedback, a reflection screen, and an optional relaxation exercise designed to support emotional self-regulation. Such scenarios help learners develop workplace communication skills while maintaining a direct connection to authentic warehouse logistics operations.

By integrating these principles and balancing simulation-based learning with practical workplace experience, vocational education providers can create personalized and supportive learning environments that promote skill acquisition, confidence, independence, and successful employment outcomes.

Learner-Centric Design Flow for Simulation-Based Skill Development in Autistic Individuals

The learner-centric design flow is a structured framework that places the autistic learner at the centre of the training process. It integrates individualized assessment, adaptive instruction, simulation-based learning, and carefully planned workplace transition strategies. The framework can be applied across all vocational pathways represented within the Metautism training ecosystem, including welding, professional painting and surface coating, warehouse logistics, forklift operations, truck driving, crane and heavy load operations, agricultural machinery and tractor operations, chemistry laboratory work, car mechanics, and CNC machining.

The model consists of five interconnected phases:



1. Initial Assessment

Training begins with a comprehensive assessment designed to understand the learner's unique profile. This process identifies strengths such as attention to detail, visual learning abilities, pattern recognition, procedural thinking, or strong memory for routines that can be used to support vocational development.

The assessment also explores sensory preferences and sensitivities, including reactions to noise, lighting conditions, crowded environments, and other workplace-related factors that may influence learning outcomes or career suitability.

In addition, information is collected regarding vocational interests, motivation, communication preferences, learning styles, and long-term career aspirations. This information is essential for designing meaningful and engaging learning experiences that align with both learner strengths and vocational opportunities.

Assessment activities may include structured interviews with learners and caregivers, vocational interest inventories, observational assessments, and direct evaluation of practical skills.

The outcome of this phase is a detailed learner profile that guides all further educational planning.

2. Simulator Onboarding

Following assessment, learners are gradually introduced to the simulation environment through a supportive and low-pressure onboarding process.

The primary goal of this phase is not immediate skill mastery but rather building familiarity, comfort, and confidence with the simulation technology. Interfaces should be intuitive, predictable, and visually clear, incorporating consistent navigation features, icons, instructions, and optional voice support.

Learners begin with simple exploratory activities that demonstrate how the simulator functions. These introductory tasks may include video modelling, guided demonstrations, interactive tutorials, and low-demand practice scenarios.

This phase allows learners to become familiar with virtual environments before progressing to occupation-specific tasks and helps reduce anxiety associated with new technologies or unfamiliar settings.

3. Skill Development

The skill development phase forms the core of the training programme.

Learners engage in structured simulation exercises that mirror real vocational activities while remaining adaptable to individual learning needs. Tasks are broken into manageable stages that allow learners to focus on one skill component at a time.

Immediate feedback is provided throughout the learning process through visual indicators, performance reports, guidance prompts, and objective assessments. This helps learners understand both successful actions and areas needing improvement.

The simulation environment should remain flexible and adaptive, enabling activities to increase or decrease in complexity according to learner performance. Structured repetition allows skills to develop gradually while maintaining the predictability and consistency often preferred by autistic learners.

4. Progress Evaluation

Progress evaluation provides ongoing insight into learner development and supports evidence-based instructional decision-making.

This phase combines quantitative and qualitative assessment approaches to create a comprehensive understanding of learner progress.

Quantitative indicators may include:

- Task completion times
- Accuracy levels
- Error frequency
- Number of prompts required
- Safety compliance measures
- Performance scores generated by the simulation

Qualitative indicators may include:

- Learner engagement
- Motivation levels
- Confidence growth

- Frustration tolerance
- Independence during activities
- Communication and interaction skills

Learners should also be encouraged to reflect on their experiences whenever possible. Reflection activities may take the form of guided discussions, visual scales, structured questionnaires, journals, or other communication methods suited to individual preferences.

The data gathered during this phase supports informed decisions regarding pacing, instructional modifications, additional supports, and readiness for real-world experiences.

5. Real-World Transfer

The final phase focuses on helping learners apply their newly acquired skills within authentic vocational environments.

This transition is facilitated through carefully structured activities such as workplace visits, internships, job-shadowing opportunities, practical placements, and supervised training experiences. The objective is to create continuity between simulated practice and real-world application.

Job coaches, workplace mentors, educators, and employers all play essential roles during this process. Their support helps learners adapt to workplace expectations, communication requirements, routines, and environmental conditions while building confidence and independence.

To maximize transfer effectiveness, simulation activities should closely resemble real workplace procedures, equipment, terminology, safety practices, and workflows.

Real-World Example

Following successful completion of a crane operation simulator programme, a learner participates in a structured observation visit to a logistics terminal where cranes are used for cargo handling. Supported by a workplace mentor and job coach, the learner gradually progresses from observation to supervised practical activities while applying operational procedures previously practised within the simulation environment. This staged approach promotes confidence, competence, and successful workplace integration.

Summary

The learner-centred design flow provides a comprehensive, flexible, and evidence-informed framework for vocational training of autistic learners. By combining individualized assessment, adaptive simulation-based instruction, continuous progress monitoring, and carefully supported workplace transition activities,

vocational education providers can create learning pathways that support both technical competence and long-term employment success.

The model recognizes that effective vocational development extends beyond technical skills alone. It also encompasses confidence building, communication development, emotional regulation, workplace readiness, and meaningful participation in society. Through the integration of simulation-based education with authentic workplace experiences, autistic learners can develop sustainable vocational competencies while progressing toward successful and inclusive employment outcomes.

Involving Support Systems

The success of simulation-based vocational training for autistic learners depends significantly on the active participation of a multidisciplinary support network. This network typically includes vocational trainers, educators, job coaches, therapists, workplace mentors, family members, and, where appropriate, peer supporters. Each stakeholder contributes to creating a learning environment that supports not only skill acquisition within simulations but also the successful transfer of those skills into real educational and employment settings.



Trainers and Vocational Educators

Trainers and vocational educators are often the primary facilitators of simulation-based learning. Their role extends beyond delivering technical instruction; they are also responsible for adapting teaching strategies, monitoring learner wellbeing, and creating inclusive learning experiences.

Educators should understand neurodiversity and be familiar with autism-inclusive teaching practices. They should be able to identify signs of sensory overload, stress, communication difficulties, or cognitive fatigue and respond appropriately. Instructors must also understand how to modify simulation settings, adjust pacing, provide alternative explanations, and create individualized learning pathways.

Example

During a CNC machining simulation, an instructor notices that a learner is becoming overwhelmed by multiple performance indicators displayed simultaneously. The trainer reduces on-screen information, introduces a step-by-step mode, and allows

the learner to focus on one machining process at a time. This adjustment improves engagement and learning outcomes while preserving confidence.

Job Coaches and Workplace Mentors

Job coaches play an essential role in helping learners transfer competencies gained through simulation into real workplaces. One of their primary responsibilities is supporting skill generalization, ensuring that knowledge acquired in simulated environments can be successfully applied in actual vocational settings.

Job coaches may participate in simulation sessions, observe progress, identify support needs, and assist learners during internships, placement programmes, workplace visits, or employment transitions. They can also work directly with employers to recommend workplace accommodations and support successful integration.

Example

A learner completes training using a forklift operations simulator and later transitions to a warehouse placement. The job coach helps break workplace procedures into manageable steps, reinforces safety routines practiced in the simulator, and supports communication with supervisors during the initial weeks of placement.

Therapists and Specialist Support Professionals

Occupational therapists, behavioural specialists, psychologists, and other support professionals provide valuable expertise regarding sensory regulation, emotional wellbeing, motor skills development, and communication needs.

These professionals can help ensure that simulation environments are aligned with learners' sensory profiles, learning styles, and emotional regulation strategies. Their input may influence simulator configuration, session duration, break schedules, environmental adaptations, and instructional approaches.

Collaboration between therapists, educators, and simulation developers contributes to creating learning environments that are both educationally effective and neurologically supportive.

Example

Before beginning training in a chemistry laboratory simulation, an occupational therapist assesses a learner's sensory profile and recommends adjustments to audio levels, colour contrast, and session duration. These modifications improve concentration and reduce fatigue throughout training.

Family Members and Peer Supporters

Family members often provide continuity beyond formal training sessions. When involved appropriately, they can encourage practice, reinforce newly acquired skills, support emotional regulation, and celebrate learner achievements.

Peer mentors can also play a valuable role. Individuals who have previously completed similar training programmes can provide practical advice, model successful participation, and help reduce anxiety associated with vocational learning and employment.

Example

A learner participating in a truck driving simulation programme reviews training concepts with family members between sessions while receiving encouragement and support. At the same time, a former trainee shares experiences of transitioning successfully from simulation-based learning into vocational employment.

Building a Supportive Learning Ecosystem

The most effective vocational programmes create a coordinated support ecosystem in which educators, therapists, job coaches, families, and workplace mentors collaborate toward common goals.

This coordinated approach helps learners move confidently through assessment, simulation-based training, workplace preparation, and employment transitions. By providing consistent support across environments, learners are more likely to achieve meaningful and sustainable employment outcomes.

Measuring Progress

Monitoring progress in simulation-based vocational training requires a multidimensional approach that captures technical performance, engagement, independence, confidence, and long-term development.

Because autistic learners may demonstrate progress in diverse and highly individualized ways, assessment should combine quantitative performance metrics with qualitative observations and learner feedback.



Performance Metrics

Simulation platforms provide valuable objective performance data that can be used to track skill development over time.

Examples include:

- Task completion rates
- Accuracy levels
- Error frequency
- Time required to complete tasks
- Number of prompts required
- Safety compliance indicators
- Equipment handling precision
- Procedure completion consistency

Example

A learner initially completes a forklift safety inspection only when prompted by the instructor. After several simulation sessions, the learner performs the entire procedure independently, demonstrating measurable progress in task mastery and procedural memory.

Engagement and Confidence Indicators

Technical performance alone does not provide a complete picture of learner development.

Engagement can be measured through:

- Session attendance
- Willingness to initiate activities
- Time spent actively participating
- Persistence during challenging tasks
- Reduction in avoidance behaviours

Confidence can be assessed through learner self-reports, visual scales, reflection exercises, and educator observations.

Example

A learner who initially avoided participating in crane operation simulations gradually begins volunteering for increasingly complex tasks and requesting additional practice opportunities. Such behavioural changes indicate growing confidence and vocational readiness.

Qualitative Reflection and Feedback

Regular reflection sessions provide valuable insight into the learner experience.

Educators and job coaches should create opportunities for learners to discuss:

- What they found easy or difficult.
- Which strategies were helpful.
- Areas where additional support is needed.
- Personal goals and interests.

For learners who communicate more effectively through visual supports, alternative methods such as pictorial surveys, visual scales, video diaries, or structured prompts may be used.

A Holistic View of Progress

By combining objective simulator data with educator observations, self-assessment tools, and support-team feedback, vocational programmes can develop a comprehensive understanding of learner growth.

This approach not only supports instructional decision-making but also helps learners recognize their own progress, contributing to greater motivation and self-confidence.

Good Practice Example

A vocational education centre uses a chemistry laboratory simulator to prepare autistic learners for laboratory technician training.

The simulation introduces activities such as:

- measuring liquids,
- preparing samples,
- labelling containers,
- following laboratory safety procedures,
- conducting basic experiments.

Each activity is divided into structured, repeatable steps supported by visual guidance, animations, and narrated instructions. Learners can practise tasks multiple times while receiving immediate and constructive feedback.

A "watch mode" allows learners to observe the complete procedure before attempting it independently. Performance data is reviewed by educators and job coaches, who then support the transfer of these skills into supervised practical laboratory sessions.

This approach combines predictability, safety, repetition, and gradual progression while preparing learners for genuine workplace responsibilities.

Blending Simulation and Real-World Practice

Simulation-based learning is most effective when integrated with real-world practical experience.

Rather than replacing hands-on training, simulations should serve as preparation for interactions with actual equipment, workplaces, and professional environments. This blended approach supports confidence building, reduces training risks, and allows learners to acquire foundational competencies before entering more demanding situations.

Gradual Transition from Simulation to Reality

Simulation environments allow learners to practise skills repeatedly without the risks associated with real equipment or workplace errors.

As competence increases, learners can gradually transition to practical experiences that mirror simulation activities.

Example

In a forklift operations programme, learners begin training using a simulator that introduces loading, transportation, and manoeuvring activities. Once performance indicators demonstrate competence and confidence, learners progress to supervised practical operation using real equipment within a controlled warehouse environment.

Inclusive Learning Environments

Inclusive learning environments support diverse communication styles, sensory needs, and learning preferences.

Effective vocational programmes use:

- visual supports,
- clear instructions,
- predictable routines,
- flexible grouping arrangements,
- multiple methods of engagement and assessment.

Such approaches improve participation, emotional regulation, and learning outcomes.

Sensory-Safe Training Environments

Both simulated and real learning environments should be designed with sensory accessibility in mind.

This may include:

- reducing background noise,
- controlling lighting conditions,
- providing quiet spaces,
- using clear visual organization,
- offering flexible sensory accommodations.

Example

During professional painting simulation training, learners can customize audio levels, visual contrast, and environmental complexity to create a comfortable and productive learning experience.

The Role of Educators

Educators must be capable of adapting both simulation-based and practical training experiences to meet individual learner needs.

This includes:

- breaking tasks into manageable stages,
- identifying signs of overload,
- modifying instruction,
- interpreting simulator analytics,
- supporting emotional wellbeing.

Example

In welding training, an instructor introduces learners to a flat-screen movement simulator before progressing to immersive welding simulations. Visual feedback tools are used to demonstrate correct movement patterns and support gradual skill acquisition before learners move to actual welding equipment.

Organizational Infrastructure

Successful implementation requires institutional commitment to inclusion.

Vocational education providers should:

- align simulator training with professional standards,
- provide staff training,

- maintain equipment,
- involve specialist support professionals,
- establish inclusive policies and procedures.

Example

A vocational training centre administers sensory-profile assessments before training begins and uses the results to personalize simulation settings and learning supports from the outset.

Facilitating Real-World Transfer

The transition from simulation to employment should occur through carefully scaffolded experiences.

These may include:

- workplace visits,
- internships,
- supervised practical activities,
- mentoring programmes,
- structured reflection sessions.

Example

A learner completing truck driving simulation training participates in workplace visits, reviews transport procedures used during simulation, and receives coaching from a workplace mentor before beginning supervised practical driving activities.

Simulation-Based Job Interview Preparation

Job interviews often present significant challenges for autistic learners due to unfamiliar social expectations and communication demands.

Simulation-based interview preparation provides opportunities to practise:

- self-introduction,
- responding to common interview questions,
- discussing strengths,
- managing anxiety,
- understanding workplace expectations.

Example

A learner preparing for a warehouse logistics role participates in a simulated interview in which virtual interviewers present common recruitment questions. Through repeated practice and feedback, the learner builds confidence before participating in a real interview with an employer.

Monitoring Progress and Emotional Safety

Monitoring should address both learning outcomes and emotional wellbeing.

Simulation platforms provide objective performance data, while educators monitor:

- emotional regulation,
- stress responses,
- participation levels,
- communication behaviours,
- confidence indicators.

Learners should also have opportunities to reflect upon their experiences using formats that match their communication preferences.

Responding to Emotional Overload

Vocational training programmes should anticipate and proactively support learners who experience emotional overload, anxiety, or sensory distress.

Staff should recognize early indicators and implement agreed support strategies promptly and respectfully. These may include breaks, access to quiet spaces, sensory supports, modified tasks, or temporary withdrawal from activities without penalty.

Example

During a warehouse logistics training session, a learner becomes overwhelmed by environmental noise and task demands. The instructor uses a previously agreed visual cue, escorts the learner to a quiet space, and provides time for self-regulation before offering a simplified activity and gradual return to training.

Toward Sustainable Inclusion and Employment Outcomes

Successful employment outcomes are achieved when simulation technologies are integrated into a broader system of inclusive vocational education, individualized support, workplace preparation, and ongoing mentorship.

When educators, families, therapists, job coaches, employers, and learners work together, simulation-based learning becomes far more than a technological tool. It becomes a pathway to confidence, independence, technical competence, and sustainable employment.

Example

A learner completing an agricultural machinery training pathway progresses from tractor simulation exercises to supervised field operations and eventually transitions into supported employment. The success of this pathway is the result of coordinated support, gradual progression, appropriate workplace accommodations, and carefully structured learning experiences that respect the learner's individual strengths and needs.

Structured Simulation Approaches for Autistic Learners Across Vocational Fields

Simulation-based vocational training should begin with flat-screen learning environments that help learners develop concentration, coordination, procedural thinking, and confidence before progressing to occupation-specific simulations. This approach aligns with the principle of gradual progression and is particularly beneficial for autistic learners, who often benefit from structured learning pathways, predictable environments, and opportunities for repetition.

Flat-screen simulations allow learners to become familiar with core concepts and task sequences before experiencing more immersive XR and VR environments. They also provide extended practice opportunities with lower sensory demands, making them an ideal starting point for vocational preparation.

The recommended training pathway therefore consists of two stages:

1. **Foundation Skills Development**
    - Concentration
    - Motor coordination
    - Following procedures
    - Understanding workflows
    - Safety awareness
2. **Occupation-Specific Simulation Training**
    - Industry-specific knowledge
    - Equipment operation

- Professional procedures
- Workplace scenarios
- Preparation for real-world practice

This two-step approach supports safe, cost-effective, and individualized learning while allowing repeated practice without additional material costs.

1. Welding

Key Strengths

- Attention to detail
- Consistency and precision
- Comfort with structured routines
- Ability to focus intensely on specific tasks

Simulation Goals

- Develop hand-eye coordination and manual dexterity
- Improve concentration and attention control
- Introduce welding procedures safely
- Build understanding of machine settings and welding parameters
- Develop awareness of occupational safety requirements

Training Tips

Begin with flat-screen welding motion training systems that focus on movement quality and coordination. Once learners demonstrate consistent performance, progress to immersive welding simulators that incorporate realistic welding procedures, equipment settings, and workpiece configurations.

Provide visual performance reports, heat maps, and objective scoring systems to reinforce learning. Structured progression from simple welds to more complex joints helps maintain predictability and confidence.

2. Professional Painting and Surface Coating

Key Strengths

- Precision and attention to detail
- Strong visual observation skills
- Ability to follow systematic procedures
- Interest in quality and consistency

Simulation Goals

- Learn cleaning and preparation procedures

- Develop spray painting techniques
- Understand coating materials and equipment settings
- Build awareness of quality standards and defects
- Strengthen fine motor control

Training Tips

Use simulation systems that provide visual demonstrations and step-by-step guidance. Feedback should include information about paint coverage, coating thickness, overspray, drips, dry spray areas, and surface quality.

Sensory adjustments such as volume control, reduced environmental effects, and configurable haptic feedback can increase accessibility for autistic learners.

3. Warehouse Logistics

Key Strengths

- Process-oriented thinking
- Preference for organized systems
- Ability to follow established procedures
- Strong task consistency

Simulation Goals

- Develop understanding of warehouse workflows
- Practice inventory management procedures
- Learn receiving, storage, picking, and dispatching operations
- Strengthen procedural memory
- Improve accuracy in item identification and handling

Training Tips

Provide simulations that include warehouse navigation, barcode scanning, digital inventory systems, and goods handling scenarios. Structured repetition and visual workflow guidance can support learner confidence and procedural understanding.

Gamified feedback mechanisms may help reinforce accuracy and engagement while maintaining clear educational objectives.

4. Forklift Operations

Key Strengths

- Strong rule-following behaviour
- Preference for predictable procedures
- Interest in safety-focused activities
- Spatial awareness and attention to surroundings

Simulation Goals

- Learn forklift controls and operating procedures
- Develop safe driving habits
- Practise loading and unloading operations
- Improve spatial awareness
- Understand workplace safety requirements

Training Tips

Begin with simplified environments and gradually increase complexity. Structure training into clear modules that cover inspection procedures, vehicle operation, load handling, manoeuvring, and parking.

Incorporate visual performance dashboards, safety indicators, and objective progress measures. Frequent repetition of safety-critical procedures helps reinforce confidence and competence.

5. Truck Driving

Key Strengths

- Preference for structured routines
- Ability to work independently
- Strong compliance with rules and procedures
- Consistency in task performance

Simulation Goals

- Understand vehicle systems and controls
- Practise route planning and navigation
- Develop safe driving behaviours
- Learn loading and unloading procedures
- Build awareness of transport regulations and safety requirements

Training Tips

Where available, begin with flat-screen route planning and driving exercises before introducing immersive truck simulators. Create clear routines for vehicle inspections, route preparation, delivery procedures, and vehicle safety checks.

Environmental variables such as weather, traffic density, and driving complexity should be introduced gradually.

6. Crane and Heavy Load Operations

Key Strengths

- Ability to maintain concentration
- Comfort with routine-based tasks
- Attention to safety procedures
- Precision and patience

Simulation Goals

- Develop load-handling skills
- Understand lifting procedures and safety zones
- Learn load dynamics and weight distribution principles
- Practise emergency procedures
- Improve equipment operation skills

Training Tips

Progress from introductory load-handling activities to more advanced crane operation scenarios. Allow learners to preview tasks through instructional videos or observation modes before performing them independently.

Performance indicators should focus on safety, precision, efficiency, and procedural compliance.

7. Agricultural Machinery and Tractor Operations

Key Strengths

- Preference for structured work
- Interest in machinery and equipment
- Ability to perform routine-based tasks
- Strong procedural consistency

Simulation Goals

- Learn tractor controls and machinery operation

- Develop navigation and manoeuvring skills
- Understand agricultural workflows
- Practise equipment maintenance procedures
- Strengthen safety awareness

Training Tips

Introduce learners to machine controls through guided tutorials before progressing to complete agricultural scenarios. Training should include realistic farming operations, vehicle handling, and workplace safety procedures.

Visual instructions and clear performance indicators can improve learning outcomes and confidence.

8. Chemistry Laboratory Technician

Key Strengths

- Attention to detail
- Preference for clearly defined rules
- Ability to follow structured procedures
- Interest in precision and accuracy

Simulation Goals

- Learn laboratory safety procedures
- Develop familiarity with laboratory equipment
- Practise measuring, labelling, and sample handling
- Understand chemical safety requirements
- Improve accuracy in data recording

Training Tips

Begin with guided laboratory tutorials before introducing more complex experimental activities. Simulations should provide clear operating procedures, built-in safety guidance, and opportunities for repeated practice.

Achievement systems and progress tracking can help reinforce motivation and procedural consistency.

9. Car Mechanics

Key Strengths

- Interest in mechanical systems
- Logical and systematic thinking
- Pattern recognition abilities
- Preference for step-by-step problem solving

Simulation Goals

- Learn workshop procedures and safety requirements
- Develop tool-handling skills
- Practise vehicle maintenance and repair workflows
- Introduce diagnostic thinking
- Build confidence in mechanical problem solving

Training Tips

Use introductory simulations that familiarise learners with workshop environments and vehicle components before progressing to more advanced maintenance scenarios.

Provide visual demonstrations, guided repair procedures, and diagnostic simulations that clearly link causes and consequences within vehicle systems.

10. CNC Machining Basics

Key Strengths

- Precision and accuracy
- Strong procedural thinking
- Attention to measurement and detail
- Comfort with structured environments

Simulation Goals

- Understand CNC machine operation principles
- Learn manufacturing workflows
- Practise measurement and quality assurance processes
- Develop understanding of machining parameters
- Strengthen technical reasoning and accuracy

Training Tips

Begin with introductory simulations that explain machine components, coordinate systems, measurements, and workflow principles. Gradually introduce programming concepts, tool selection, machine setup procedures, and quality control activities.

Visual feedback, guided tutorials, and step-by-step progression are particularly beneficial when introducing CNC machining concepts to autistic learners.

Summary

Across all vocational pathways represented in the Metautism training ecosystem, the recommended model remains consistent:

Step 1: Foundational skill development through structured flat-screen simulations.

Step 2: Occupation-specific simulation training using professional vocational simulators.

Step 3: Gradual transfer to supervised real-world practice.

This progression supports concentration, confidence, safety awareness, vocational competence, and successful transition into employment while respecting the individual learning needs of autistic learners.

Conclusion

This report demonstrates the significant potential of simulation-based vocational education and training (VET) to support autistic learners in developing vocational competencies, workplace confidence, and long-term employability. When training is carefully individualized, supported by evidence-based educational practices, and delivered through structured simulation environments, learners can acquire technical, procedural, and social competencies within safe, predictable, and supportive settings.

The findings presented throughout this report confirm that simulation technologies are particularly valuable when they are embedded within a learner-centred training framework that includes comprehensive assessment, gradual onboarding, structured skill development, continuous progress monitoring, and carefully planned transitions into real-world environments. Such an approach recognizes the diversity of autistic learners and allows vocational pathways to be adapted according to individual strengths, interests, sensory preferences, and support needs

The recommended vocational pathways within the Metautism training ecosystem include:

- Welding
- Professional Painting and Surface Coating
- Warehouse Logistics
- Forklift Operations
- Truck Driving
- Crane and Heavy Load Operations
- Agricultural Machinery and Tractor Operations
- Chemistry Laboratory Technician
- Car Mechanics
- CNC Machining Basics

These vocational areas were selected because they combine structured workflows, clear procedures, measurable outcomes, and strong potential for simulation-based learning. They also represent sectors with significant employment opportunities and growing demand for skilled workers throughout Europe.

A key recommendation emerging from this work is the principle of **gradual progression**. Wherever possible, learners should begin with low-demand flat-screen simulation environments that develop concentration, procedural understanding, coordination, and confidence before progressing to immersive XR and VR experiences. This staged approach reduces cognitive overload, supports learner comfort, and provides a solid foundation for occupation-specific competency development.

The report also highlights the importance of integrating simulation with real-world learning experiences. Simulation should not replace practical training but rather serve

as a bridge between classroom learning and authentic workplace participation. Workplace visits, internships, supervised practical exercises, mentoring programmes, and job coaching all contribute to effective transfer of skills from virtual environments into employment settings.

Equally important is the involvement of a multidisciplinary support network. Educators, trainers, therapists, job coaches, workplace mentors, family members, and peer supporters each contribute to learner success. Their collaboration helps ensure that vocational development extends beyond technical competence and includes communication abilities, emotional regulation, workplace readiness, and self-confidence.

The use of supporting technologies developed within the project, including 360° vocational videos, profession-specific simulations, workplace scenario training, and interview preparation tools, further enhances the ability of learners to make informed career choices and prepare successfully for employment. These resources help identify suitable vocational pathways, reduce anxiety associated with unfamiliar environments, and support realistic career planning.

Ultimately, simulation-based vocational education offers more than technical training. It provides autistic learners with opportunities to explore careers, develop independence, build resilience, and increase their participation in education and employment. By combining inclusive pedagogy, carefully selected simulation technologies, and individualized support systems, vocational institutions can create learning environments that are accessible, sustainable, and responsive to the needs of neurodivergent learners.

The framework presented in this report offers a practical and scalable model for the future of inclusive vocational training. By implementing these recommendations, educational institutions, training providers, and employers can contribute to more equitable pathways into employment while supporting the successful participation of autistic individuals in modern vocational sectors.

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