ROBOSTEAMSEN
Training SEN teachers to use ROBOTICS for fostering STEAM and develop computational thinking

Project Number: 2023-1-ES01-KA220-SCH-000155379

GENERAL GUIDE FOR PERSONALIZING STEAM FOR STUDENTS WITH IDD IN THE Finnish CONTEXT

Ilkka Jormanainen / Samuel Yigzaw

University of Eastern Finland

ilkka.jormanainen@uef.fi / *samuel.yigzaw@uef.fi*

Abstract

This guide presents an adaptation of the user model and taxonomy resource for planning personalized STEAM educational interventions for students with Intellectual and Developmental Disabilities (IDD) in the Finnish context. This helps to characterize students by using the user model and later look into the repository for resources that could fit the students' needs and learning objectives related to the corresponding STEAM disciplines.

1. INTRODUCTION

The adaptation of interventions to facilitate STEAM education for students with IDD requires careful consideration of three key factors: 1) the student's individual profile and learning needs; 2) the educational environment where learning takes place; and 3) the targeted STEAM discipline and associated learning objectives. The Taxonomy and User Model developed in the RoboSTEAMSEN project provide a structured framework to support such personalization in an inclusive and evidence-based manner.

- Taxonomy: https://robosteamsen.eu/taxonomy-classification-samples.php (Figure 1)
- User Model: https://robosteamsen.eu/userModel/public/home (Figure 2)

This guide aims to clarify when, why, and how to apply these resources to ensure meaningful, inclusive, and personalized learning experiences for students with IDD in the Finnish context. It incorporates Finnish-specific data, educational practices, and policy frameworks to illustrate how these tools can be effectively applied in local schools.

The rest of the guide is structured as follows: Section 2 outlines the characteristics and current state of IDD in Finland. Section 3 identifies the main considerations for planning educational interventions. Section 4 explains how to implement the Taxonomy and User Model. Section 5 presents a case study from Finland, and Section 6 offers concluding reflections.

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Project Number: 2023-1-ES01-KA220-SCH-000155379

2. FINNISH IDD CONTEXT

Recent studies estimate that approximately 0.97% of Finland's population lives with intellectual disabilities (ID), with a higher prevalence among children and adolescents- 1.19% at age 17 [1]. The same study also indicated that in 2017, 53,684 individuals in Finland were identified as having ID. Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), and Specific Learning Disorders (SLD) are also recognized among school-aged populations.

Mental health and comorbid conditions are also highly relevant. According to 2024 data, 24% of Finnish adults reported living with a mental health condition such as burnout, depression, or anxiety—the most prevalent health issue among all chronic conditions reported by working-age adults [2]

Despite Finland's inclusive education model and comprehensive welfare system, structural barriers to inclusion remain. According to the European Disability Forum's 2023 report, only 600 out of 25,000 working-age people with intellectual and developmental disabilities are employed in the open labour market and receive a salary [3].

Analyses of Finnish disability allowance recipients under 15 years indicate that ID is nearly twice as common in boys, and ASD as a comorbidity is almost four times more frequent among boys [4]. As per a study on increase in occurrence of some IDD cases [5]:

- National registry data (2015–2020) reveals ADHD diagnoses and medication usage more than doubled across all age groups, especially in adolescence
- In 2020, ADHD prevalence in boys aged 6–12 was 4.2%, rising to 6.7% in ages 13–17; for girls, it was 1.1% and 2.6%, respectively
- Earlier assessments found ADHD rates of ~8.5% in adolescents, with a strong male bias (M:F = 5.7:1)

In terms of educational services, Finnish schools operate under a three-tiered support model: general, intensified, and special support. Students with IDD commonly have an Individual Education Plan (IEP), are supported by school assistants and therapists, and increasingly benefit from digital and assistive technologies. However, these services are often inequitably distributed, and teachers may not always be trained in using the tools effectively for students with cognitive and developmental challenges.

The digital skills gap is another critical issue. While Finland leads the EU in general digital literacy, people with disabilities do not have equal access to digital education and training. Barriers include a lack of accessible interfaces, insuficient availability of tailored training, and financial constraints that limit access to necessary devices and software. Organizations of Persons with Disabilities (OPDs) have called for better support systems and training programs to improve digital inclusion and employment-readiness among their communities, presented in the European Disability forum, 2023 [3].

In general, while the Finnish system provides a strong policy foundation for inclusion[6,7], there is a clear need to translate this framework into more effective, equitable, and practical support across education and employment sectors. These challenges must be addressed to enable full participation of individuals with IDD, particularly in areas like STEAM education where specialized adaptation and support are essential.

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

3. MAIN ISSUES TO CONSIDER BEFORE INTERVENTION

Before developing or implementing any STEAM-related educational interventions for students with IDD, educators and support teams must take the following key aspects into account:

1. Student Profile
Defining the student profile is the foundational step for personalized planning. This involves identifying the type(s) of intellectual and developmental disabilities the student may have, using standard diagnostic frameworks such as DSM-5 and Finnish national diagnostic criteria. Profiles should be based on a combination of medical evaluations, psychological assessments, school records, and teacher observations.

Key considerations include:

- Type of disability (e.g., Autism Spectrum Disorder, ADHD, Dyslexia, Global Developmental Delay, etc.)
- Severity level (mild, moderate, severe, or profound)
- Functional abilities and challenges (e.g., communication skills, self-regulation, motor coordination)
- Comorbid conditions (e.g., mental health issues, sensory processing disorders)
- Cognitive and emotional development stage
- Interests and motivational factors (which can influence learning engagement)

A comprehensive profile helps identify the specific supports, accommodations, and resources that will be most effective.

2. Context of the Educational Program
Understanding the educational environment is crucial for seting realistic and meaningful learning goals. Finnish schools are legally mandated to provide inclusive education whenever possible, which often includes support in mainstream setings.

Elements to evaluate:

- Type of classroom: Is the student in a fully inclusive classroom, a partially integrated program, or a specialized learning environment?
- Human resources: Does the student receive help from a special education teacher, classroom assistant, or therapist?
- Scheduling: How much time is allocated weekly for STEAM subjects? Are there additional hours available for individualized instruction?
- Peer environment: What is the level of social integration and support from classmates?
- School infrastructure and digital readiness: Are classrooms equipped with assistive technologies, adapted learning software, or sensory-friendly spaces?

Clarifying the educational seting ensures that interventions are feasible, aligned with the school's capacity, and integrated with broader learning plans.

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Project Number: 2023-1-ES01-KA220-SCH-000155379

3. Discipline and Learning Objective

It is important to specify which STEAM subject (Science, Technology, Engineering, Arts, or Mathematics) the activity targets, and what the intended learning outcomes are. Learning goals should be tailored to the student's cognitive profile and abilities, ensuring they are both achievable and motivating.

Guidelines for this step:

- Identify the specific discipline and narrow the focus (e.g., basic circuits in Technology, shapes and patterns in Mathematics)
- Define measurable and realistic learning objectives (e.g., "complete a simple science experiment with step-by-step guidance")
- Link goals to dificulties defined in the taxonomy (e.g., "dificulty following instructions" → objective: "improve ability to sequence tasks")
- Review available tools and resources (robotic kits, software, visual aids, tactile learning materials)
- Consider environmental or sensory adjustments necessary for participation (e.g., noise reduction, fidget tools, ergonomic seating)

This structured approach ensures that all aspects of the intervention—from pedagogy to logistics—are attuned to the student's actual needs and capacities

4. STEPS FOR USING THE TAXONOMY AND USER MODEL

It is recommended to begin with defining the student's profile (bottom-up).

4.1 Taxonomy Use

- **IDD**: ASD, ADHD, Dyslexia.
- **Levels**: Mild, Moderate, Severe.
- **Features**: e.g., poor concentration, sensory sensitivities.
- **Dificulties**: teamwork, understanding abstract concepts.
- **Educational Area**: social-emotional learning, collaboration.
- **Learning Objective**: Improve group participation in a science experiment.

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

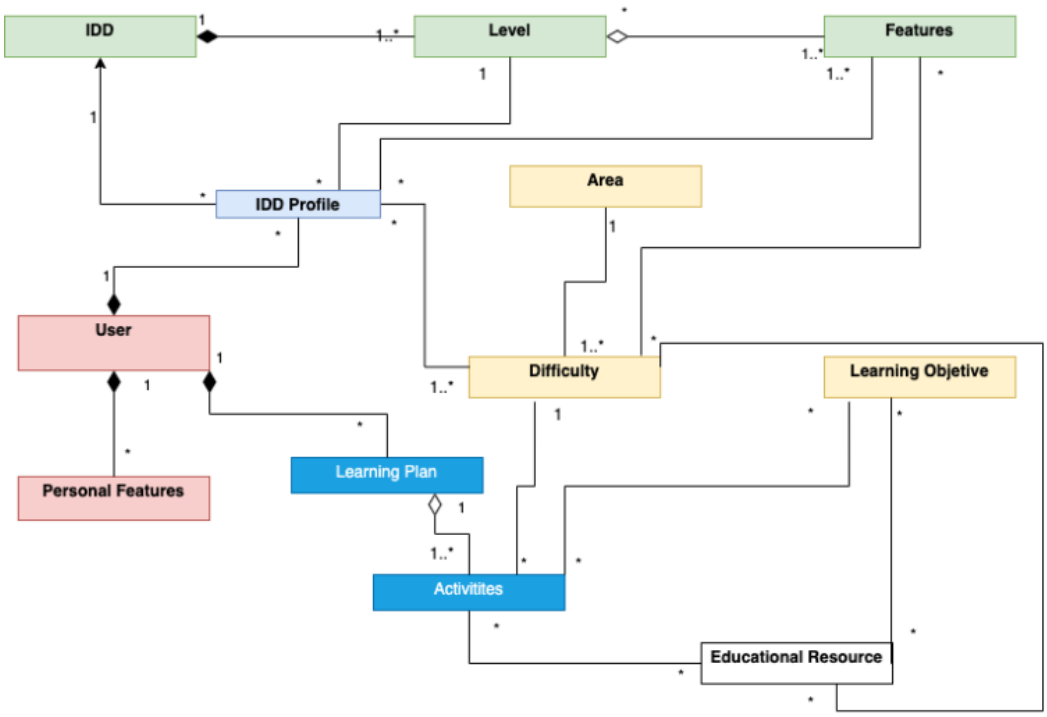


Figure 1. – UML Class Diagram for taxonomy description proposal

The identified IDDs have been mentioned above, but the features already included were compiled using the DSM-5 criteria and are presented in Table 1.

Table 1. – Features based on IDDs

IDD	Main Symptoms	Sub-Symptoms
ASD	Social communication and social interaction	Social-emotional reciprocity
		Nonverbal communicative behaviors used for social interaction
		Developing, maintaining, and understanding relationships
	Restricted, repetitive patterns of behavior, interests, or activities	Stereotyped or repetitive actions
		Insistence on sameness, inflexible adherence to routines, or ritualized patterns or verbal nonverbal behavior
		Highly restricted, fixated interests that are abnormal in intensity or focus
		Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment
ADHD	Inattention	Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities
		Often has dificulty sustaining attention in tasks or play activities
		Often does not seem to listen when spoken to directly
		Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace
		Often has dificulty organizing tasks and activities
		Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort
		Often loses things necessary for tasks or activities

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

		Is often easily distracted by extraneous stimuli (for older adolescents and adults, may include unrelated thoughts).
		Is often forgetful in daily activities
	Hyperactivity and impulsivity	Often fidgets with or taps hands or feet or squirms in seat.
		Often leaves seat in situations when remaining seated is expected
		Often runs about or climbs in situations where it is inappropriate. (Note: In adolescents or adults, may be limited to feeling restless).
		Often unable to play or take part in leisure activities quietly.
		Is often "on the go" acting as if "driven by a motor"
		Often talks excessively.
		Often blurts out an answer before a question has been completed
		Often has trouble waiting his/her turn
		Often interrupts or intrudes on others
SLD	Dificulty reading	
	Dificulty understanding the meaning of what is read.	

Additionally, the taxa related to the identified dificulties are presented in Tables 2, 3, and 4, while the taxa for the learning objectives are shown in Table 5.

Table 2. – Difficulties for the three levels of ASD

Dificulties for ASD
Atypical response to sensory stimuli
Cooperative Interaction
Coordination and/or odd movements pattern
Delayed development or unusual speech patterns
Disconfort sensory-rich environments
Expressing Feelings
Eye contact during consversations
Fixed Interest
Hyper-responsiveness
Hyporesponsiveness
Intense attachment with object or activities
Limited language use
Literal interpretation of language and abstractions
Making/Keeping friends/ interaction with peers
Managing transition and adaption to changes and new situations
Memory and attention to detail
Memory and attention to detail, Intense focus
Mental rigidity,
Misinterpretation of social situations and intentions
Need to follow rutines
Non interactive play
Pragmatic language skills
Problems initiating and maintaining conversations. Lack of answer
Repetitive behavior

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Repetitive movements
Sensory Information Management
Sensory overload
Sensory-perceptual self-stimulation behaviors
Solitary Activities and Limited Engagement in meetings
Specific sensory preferences
Talks excessively. Impulsivity
Understanding facial expression or body language
Understanding social norms and rules. Inappropiate social behavior
Use of nonverbal cues

Table 3. – Difficulties for ADHD

Dificulties for ADHD
Avoidance behavior or meltdowns
Careless mistakes in schoolwork
Constant changing activity or task
Fixed Interest
Forgetful or losing things
Impulsiveness (waiting turns, interrupts)
Intense attachment with object or activities
Intense focus
Managing transition and adaption to changes and new situations
Memory attention to detail
Organization and planning task and activities
Repetitive behavior
Seeing things from different perspectives
Sharing a common focus
Short attention span
Stand up at the class
Talks excessively
Time management
Unability to follow instructions and rules
Unability to stick to tedius tasks
Unable to play quietly

Table 4. – Difficulties for SLD

Dificulties for SLD
Add, omit or substitute vowels or consonants
Cognitive Abilities
Dificulty connecting letters with the sounds
Dificulty grasping abstract concepts like fractions
Dificulty identifying the correct operation to use
Dificulty in applying steps to solve maths problems

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Dificulty understanding place value
Frequently guesses words while reading
Inaccurate or slow and effortful reading
Individualized learning strategies acommodations
Multiple grammatical or punctuation errors
Poor paragraph organization
Reading comprehension (sequence, relationship, inferences or deeper meanings)
Reading, writing or maths challenges
Recognizing words that rhyme;
Sounding out words
Struggles with counting sequences (finger counting) and simple operations
Trouble recalling basic math facts or applying math rules in daily tasks
Trouble understanding math problems
Written expression lacks clarity

Table 5. – Learning Objectives list

Learning Objectives to be addressed by the resourcses
Cognitive and Behavioral Flexibility
Develop functional writing skills
Developing accuracy in word reading skills
Developing fluency in word reading skills
Distinguising Meninful contents
Emphasize self-reliance
Engage in abstract thinking and Symbolic Though
Enhancing Language Skills
Enhancing Sensory Regulation Strategies
Estrategies for Effective Studying
Executive functions
Facilitating Peer Interaction and Social Interation Skills
Improve Restricted Interests and Repetitive Behaviors
Improving Attention and focus
Improving knowledge application
Improving metacognition (learning to learn)
Improving reading comprehension
Improving Social Communication Skills
Learning Arts concepts
Learning breathing and relaxation techniques
Learning competences
Learning Engineering concepts
Learning Maths concepts
Learning Science concepts

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Learning Technology concepts
Listening competences
Memory improvment
Organization of class structure.
Organization of space
Organization of time
Practical competences
Promote reading comprehension
Promote self-management
Promoting Flexibility and Adaptability
Regulating hyperactivity
Regulating impulsivity

To use the taxonomy effectively, some preparatory steps are required:

- **Step 1**: Gather the student's medical reports and analyze them to define an accurate profile.
- **Step 2**: Identify the student's specific educational dificulties associated with the profile's features.
- **Step 3**: Define the educational activity or activities to be developed, including the learning objectives to be achieved.

Once this information is clear, you can begin using the taxonomy:

- **Step 1**: Check whether the IDD is already included in the taxonomy. If it is, proceed to Step 3.
- **Step 2**: If the IDD is not included, describe it by detailing its different levels, features related to DSM-5 main symptoms, and potential dificulties associated with the disability.
- **Step 3**: Define one profile, ensuring that it corresponds to one and only one IDD level.
- **Step 4**: Associate dificulties and features with the profile.
- **Step 5**: If the student has only one IDD level, proceed to Step 6; otherwise, return to Step 3 and define a new profile.
- **Step 6**: Identify the learning objectives, considering your educational context and the student's needs.
- **Step 7**: Develop a learning plan that includes one or more adapted activities to address the learning objectives based on the student's IDD profile.

4.2 User Model

Once you have classified the student's IDD using the taxonomy and defined a potential learning plan, it is time to implement it in the User Model. This allows you to search for specific resources tailored to the student's profile and find similar activities that can help personalize the learning plan.

A detailed guide on how to use the User Model can be found here:
https://robosteamsen.eu/userModel/public/home
The manual for using the tool is available here: XXXXX.

The steps to follow to use the User Model are as follows:

- **Step 1:** If the IDD already exists in the system, proceed to Step 2. If not, send the information about the IDD, including its levels, features, and associated dificulties, to mcong@unileon.es so it can be incorporated into the User Model.
- **Step 2:** Create one or more profiles for the student by completing the following steps in the User Model:
    - Step 2.1: Click on "Users Management" (Figure 4).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

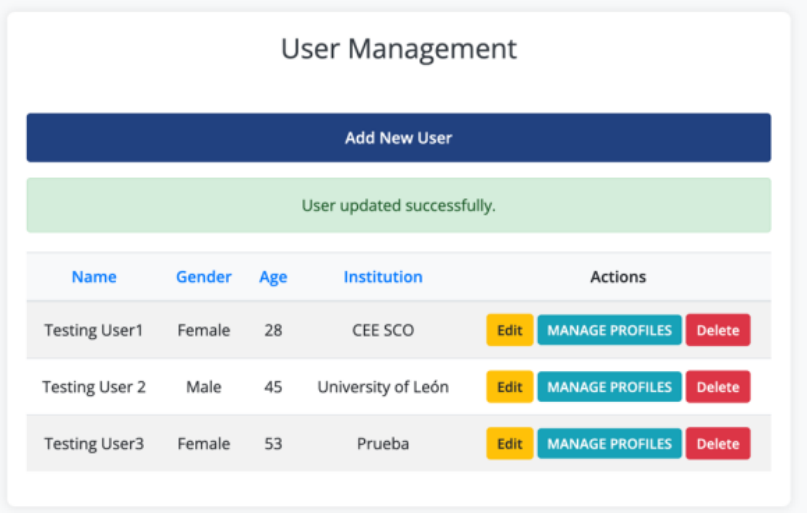


Figure 1. – User management

- Step 2.2. – Click on add a New User.
- Step 2.3. – Introduce the main data of your user, the name can be anonymous, but you need to be able to identify it later (Figure 5).

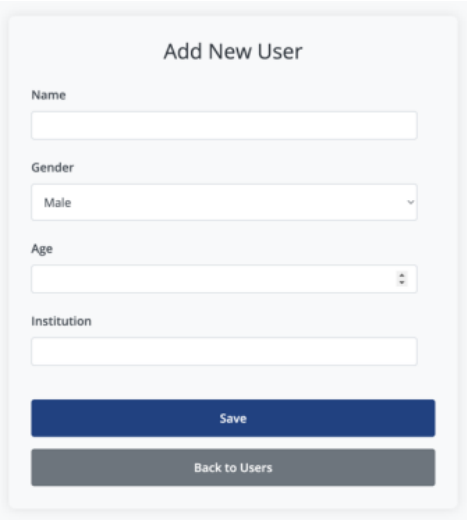
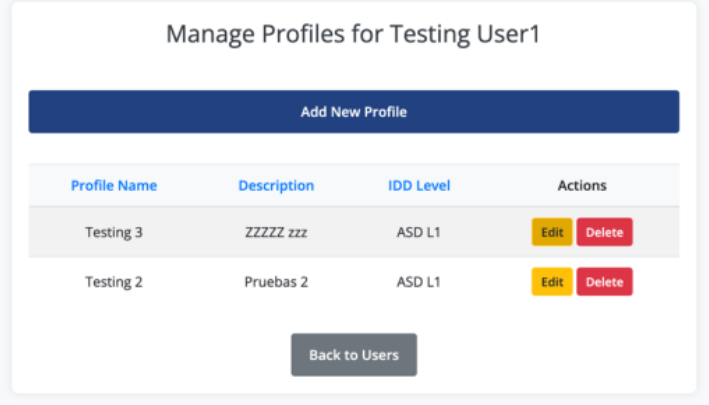


Figure 2. New user form

- Step 2.4. – Identify the created user on the list and click on the manage profiles button of this user (Figure 6)

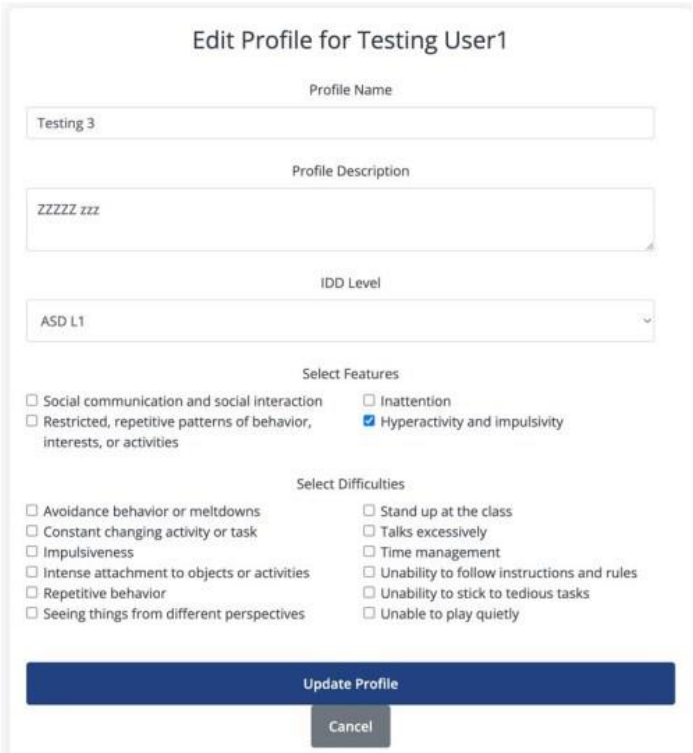
Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



- *Figure 3. – Profile Management for the testing user 1*

- Step 2.5. – Click on Add New Profile.
- Step 2.6. – Fulfill the profile form including idd, level, features and dificulties. After this click on create (Figure 7)



- *Figure 4. – Profile form for creation and edition.*

- Step 2.7.- Go to step 2.5 to create as many profiles for this student as you need.
- Step 2.8. – Click on Home link to finish or on Users link if you want to go to Step 2.1. again and create new users (Figure 8)

Figure 5. – Breadcrumb with the description of the current user situation into the system

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

- **Step 3:** Once defined the user it is necessary to create a new learning plan for the user, to do so click on "Training Plans Management" link. Once in this section the steps to follow are:
  - Step 3.1. – Click on "Create New Learning Plan" (Figure 9)

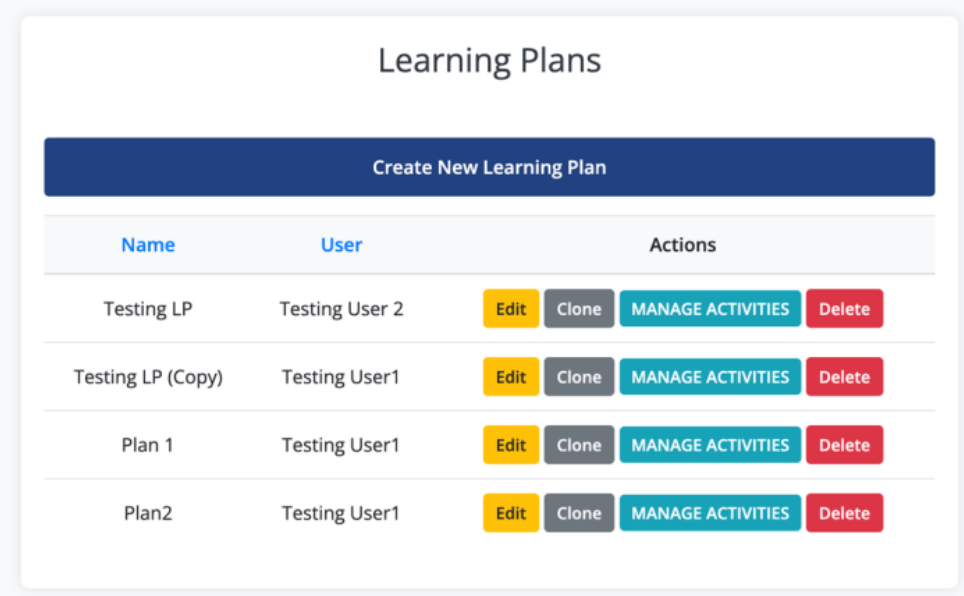


Figure 6. – List of existing Learning Plans

  - Step 3.2. – Create a plan for a user (Figure 10).

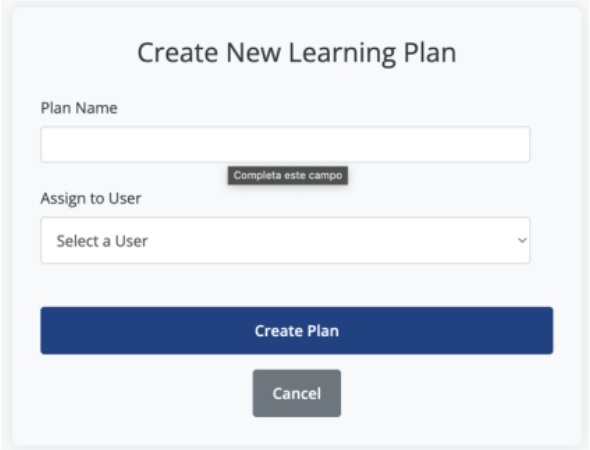


Figure 7. – Form to create a new Learning Plan

  - Step 3.3.- Click on Manage Activities button for the chosen learning plan (Figure 11).

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

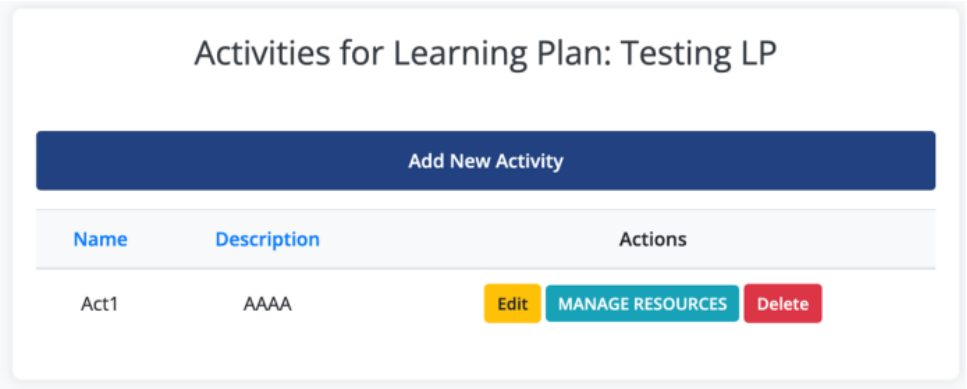


Figure 8. – Activities management view

- Step 3.4.- Click on Add New Activity for the specific plan, including a description, the dificulty to deal with (only one) and the learning objectives you aim to address (Figure 12)

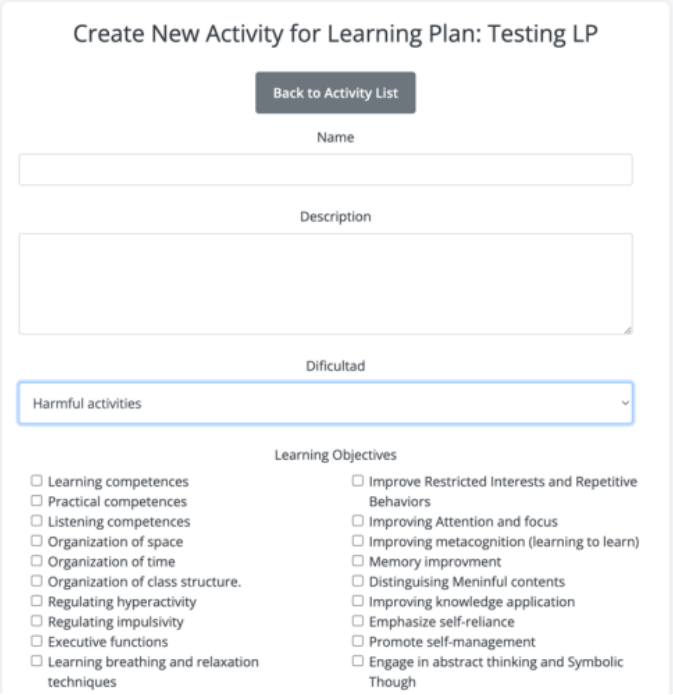


Figure 9. Create/Edit Activity form

- Step 3.5.- Per each activity it is possible to manage resources including one of several of the existing ones (Figure 13).

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

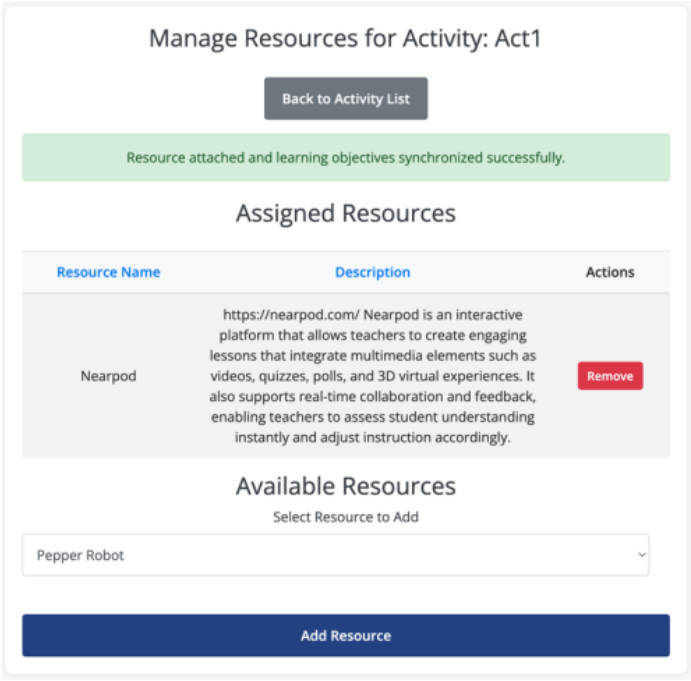


Figure 10. – Resources view for Act1

- Step 3.6.- Add as many resources as necessary going to Step 3.5.
- Step 3.7.- Add as many activities as needed to the learning plan, going to Step 3.3.

Optional. Search for specific resources for student profile or for the educational dificulties or learning objectives in the option “Educational resources and activities search” (Figure 14).

Figure 11. – Possible searching options.

Co-funded by the European Union
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

5. EXAMPLE CASE FROM FINLAND

Profile: 11-year-old student diagnosed with ASD and mild ID. Sensory sensitivities and communication challenges are noted.

Context: Integrated mainstream classroom with assistant support. Weekly 2-hour STEAM lab sessions.

Discipline: Technology (Robotics)

Learning Objective: Participate in group assembly of a simple robot using instructions.

Taxonomy Application:

- **Feature**: dificulty following multi-step instructions.
- **Dificulty**: needs visual aids.
- **Educational Area**: planning & execution.

Adaptation Strategy:

- Use visual instruction cards.
- Assign clear, singular tasks within the group.
- Employ noise-cancelling headphones to address auditory sensitivity.

6. CONCLUSION

This Finnish adaptation confirms the feasibility and relevance of the RoboSTEAMSEN Taxonomy and User Model for tailoring STEAM education to students with IDD. With Finland's strong educational inclusion framework and ongoing emphasis on digital and assistive technologies, structured implementation can greatly enhance learning outcomes for this population.

References

[1] Westerinen, Hannu. (2018). Prevalence of Intellectual Disability in Finland. 10.13140/RG.2.2.18628.99201.

[2] Statista Consumer Insights 2025. https://www.statista.com/forecasts/1466596/prevalence-of-health-conditions-in-finland

[3] European Disability Forum: Finland Report (2023). https://www.edf-feph.org/publications/edf-annual-report-2023/

[4] Finland Medical Journal, 2024… available at: www.laakarilehti.fi/e39223

[5] Westman E, Prami T, Kallio A, Iso-Mustajärvi I, Jukka J, Raittinen P, Korhonen MJ, Puustjärvi A, Leppämäki S. Increase in Occurrence of Attention Deficit Hyperactivity Disorder Differs by Age Group and Gender-Finnish Nationwide Register Study. Brain Behav. 2025 Jan;15(1):e70253. doi: 10.1002/brb3.70253. PMID: 39829159; PMCID: PMC11743994.

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

[6] OECD/European Observatory on Health Systems and Policies (2023), *Finland: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, https://doi.org/10.1787/e7af1b4d-en.

[7] Tynkkynen, Liina-Kaisa, Keskimäki, Ilmo & Karanikolos, Marina. (2024). European Observatory on Health Systems and Policies. Finland

Co-funded by the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.