SENnet

WP3 Report

D3.1 Issues related to digital multimedia learning resources for students with disabilities

Report updated 1.1- 22 April 2013

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.
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<td><strong>Authors of the report:</strong></td>
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Index

Executive summary .................................................................................................................................................. 4
Introduction ............................................................................................................................................................ 5
Application profiles .................................................................................................................................................. 7
  Turning WCAG 2.0 into a metadata profile ........................................................................................................... 7
  SENnet-LRE Metadata Application Profile ........................................................................................................ 7
  MLR – Metadata for Learning Resources ......................................................................................................... 8
Examples of guideline approaches to categorization .......................................................................................... 10
  Universal Design .............................................................................................................................................. 10
  Universal Design for Learning .......................................................................................................................... 12
  Principles for Accessibility in Online Distributed Learning ........................................................................... 12
  Web Content Accessibility Guidelines (WCAG) ................................................................................................. 13
  IMS Global Access for All (AfA) Information Model Data Element Specification ........................................ 14
  Eifl – FOSS Accessibility Tools for Libraries ................................................................................................ 15
Examples of repository approaches to categorization ......................................................................................... 18
  Choosing and using digital learning resources, Becta 2008 ........................................................................... 18
  Freeware-Recursos Livres-Necessidades Especiais-Deficiência ....................................................................... 18
  Leerzorgsite.be ................................................................................................................................................. 19
  ATHENA Free AT Software Inventory ............................................................................................................... 19
  OATS – open source assistive technology software ........................................................................................ 20
  TES Special Educational Needs catalogue ...................................................................................................... 21
A Toolbox for inclusion ......................................................................................................................................... 22
  Sketch-up for a ToolBox for Inclusion ................................................................................................................ 22
Conclusions and recommendations .................................................................................................................... 24
Executive summary

The report introduces its role of creating a common understanding and a common conceptual framework within the SENnet partnership to describing SEN resources and categorizing them in metadata application profiles in repositories.

The report gives examples of internationally adopted guidelines for the design of (educational) products for people with special needs, and gives examples of well know and commonly used existing repositories of SEN resources.

The report also suggests a research angle with the definition of a toolbox for inclusion, an alternative approach to identifying a SEN resource.

Thus SENnet will need to make a choice of approach from the following:

- A profile based on the WCAG 2.0 guideline (or UDL guidelines) – Section Turning WCAG 2.0 into a metadata profile
- A profile based on the LRE Metadata Application Profile – Section SENnet-LRE Metadata Application Profile
- Applying a currently dominating ‘disability profile’ based on categories of disabilities – Section Examples of repository approaches to categorization
- Developing a toolbox with descriptions in three dimensions – Section A Toolbox for inclusion

The choice is between a well-known approach and an innovative approach, which is new but also pointing forward with respect to an inclusion way of thinking, and rooted in an internationally adopted application profile.

The options are discussed in the following sections.

Eventually, the report recommends that the project adopts the LRE Metadata Application Profile for its future work on establishing and describing a pool of SEN resources to be registered in the EUN LRE.
Introduction

This report arises from the SENnet project task **3.1 Documenting specific issues** when using multimedia resources for students with disabilities (e.g. access, usability) and is Deliverable 3.1.

The aim of this deliverable is to introduce and discuss a number of approaches to describing a Special Educational Needs resource, and eventually to describe the common understanding of a repository or resource collection. This theme was discussed and agreed on at the SENnet meetings in Firenze and Copenhagen. So the aim is to *improve the availability and access to online resources to support learners with SEN*. The outcomes of this report will underpin future work leading to Deliverable 3.2 Survey report on availability of digital resources for SEN.

The issues different from standard repositories with learning materials are not many, but quite important. When the resources are going to be used by both specialized SEN teachers and by a broader range of the teachers, we have to help them giving them annotations and keywords for a better overview than just the standard metadata tagging methods. The descriptions later in this document are meant as add-ons to the standards of tagging resources if not available in the existing system.

The role of report D3.1 is to create a common understanding and a common conceptual framework within the SENnet partnership. The report and the approach chosen are to form the basis for the design of the questionnaire D3.2. The survey here should be so precise and detailed that we are able to locate the 200 resources, which are the minimum requirements in D3.3, while providing a comprehensive and yet detailed tagging-profile and system which can form the basis for the construction of the new part of the LRE, with the 200 SEN resources.

The aim of this WP 3 is to make it easier for learners and teachers to find and retrieve the proper digital SEN resources. As this mini-overview demonstrates, previous approaches to categorization of these resources follow different paths, but the general trend has been to describe (tag) the resources from a disability perspective.

Various internationally accepted guidelines for the development of SEN resources inspire to a new way of describing the materials based on the type of support the resource provides e.g. – text to speech devices; visual enhancing equipment etc. SENnet’s ambition is to introduce a metadata profile from this perspective, which must also be straightforward to manage and easy to understand. However, there is a risk that by introducing a new categorization approach, which does not comply to previously used metadata standards, ‘old’ users may not easily identify the resources they are looking for.
The project is assuming that the vast majority of SENnet resources will be web-based including downloads from the Internet (e.g. some Apps). However, some relevant resources may be tools to be installed from a CD-ROM.
Application profiles

Turning WCAG 2.0 into a metadata profile

An approach to a metadata application profile might be to turn the WCAG guidelines into metadata elements by evaluating/describing each resource with respect to whether it responds to a given guideline, or/and how it does so. See Section Web Content Accessibility Guidelines (WCAG).

(How) Does the resource... ?

1. 1 Perceivability
   1.1. ... Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
   1.2. ... Provide alternatives for time-based media.
   1.3. ... Present content in different ways (for example simpler layout) without losing information or structure.
   1.4. ... Make it easier for users to see and hear content including separating foreground from background.

2. Operability
   2.1. ... Make all functionality available from a keyboard.
   2.2. ... Provide users enough time to read and use content.
   2.3. ... Include content that may cause seizures/flash too quickly (photosensitivity).
   2.4. ... Provide ways to help navigate, find content, and determine where you are

3. Understandability
   3.1. ... Make text content readable and understandable.
   3.2. ... Make Web pages appear and operate in predictable ways.
   3.3. ... Help users avoid and correct mistakes.

4. Robust
   4.1. ... Provide compatibility with current and future user agents, including assistive technologies.

SENnet-LRE Metadata Application Profile

EUN’s LRE Group has developed an application profile based on the IMS Access for All specification. See section IMS Global Access for All (AfA) Information Model Data Element Specification. This classification may be an obvious solution for SENNET to adopt, also considering that an emerging MLR-based classification presumably will be close to this specification (see MLR–Metadata for Learning Resources).

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access Mode</td>
<td>Human sensory perceptual system or cognitive faculty through which a person may process or perceive information.</td>
</tr>
<tr>
<td>Adaptation Media</td>
<td>Term identifying a media type commonly used to aggregate</td>
</tr>
<tr>
<td>Type</td>
<td>accessibility modalities or functionalities as media.</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Adaptation Type</td>
<td>Term describing an adaptation type.</td>
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<td>Educational Complexity</td>
<td>Term describing a resource that is simplified or enriched relative to another resource that presents the same intellectual content.</td>
</tr>
<tr>
<td>Hazard</td>
<td>Term describing a characteristic of the described resource that must not be delivered to some users.</td>
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</tbody>
</table>

**MLR – Metadata for Learning Resources**

The currently dominating metadata profile for educational repositories is some version based on the IEEE 1484.12.1 – 2002 Standard for Learning Object Metadata (IEEE LOM). The LOM data model specifies which aspects of a learning object should be described and what vocabularies may be used for these descriptions; it also defines how this data model can be amended by additions or constraints. The IMS Global Learning Consortium did some further development towards the IMS Learning Resource Meta-data specification (IMS 1.2), which was finally published at the LOM standard. This profile has been adopted and localised into various international and national versions.

The ISO Metadata Standard MLR for Learning Resources (MLR) is an emerging approach to classification of learning resources: *Metadata for Learning Resources (MLR)* - ISO/IEC 19788-X. The primary purpose of the ISO/IEC 19788 multipart standard “Metadata for Learning Resources (MLR)” is to specify, in a rule-based manner, metadata elements and their attributes for the description of learning resources. This includes the rules governing the identification of metadata elements and the specification of metadata attributes. These metadata elements are used to form the description of a learning resource, i.e., as a metadata learning resource record.

MLR consists of a semantic web binding for educational metadata. The approach has the potential of being the future way of describing digital learning resources, including SEN resources. However, MLR is still not scaling to process large volumes of metadata and given
the amount of metadata in the LRE, EUN recommend to take a wait-and-see approach until the technology is mature enough.

When it comes to SEN resources the approach is not the disability perspective but describing the functionality, based on the standard ISO/IEC 24751 "Information technology — Individualized adaptability and accessibility in e-learning, education and training". See also http://wiki.fluidproject.org/display/ISO24751/AccessForAll+Working+Group. The updated standard is to be based on a modernization of the IMS-Global and AccessForAll standard (see Section 0), and also forms the basis for the Global Public Inclusive Infrastructure (GPII) http://gpii.net/

The suggested application profile for SENnet is defining an information model (elements and controlled vocabularies/ontologies). This model can be bound to semantic web technology in order to complement MLR descriptions.

Given the current state of the technology, using an XML binding, as is the case in the LRE, is more efficient than using a semantic web binding. However, if needed, it is not difficult to convert data from one binding to another (as the EUN have already done in iTEC). Thus, it is not a matter of having to select one or the other approach. One does not preclude the other.

The application profiles discussed in this section all take their point of departure in the functionalities of a given educational resource, not the disability of the learner.

Turning the WCAG guidelines into a functionality specification will be a truly innovative way of defining a profile. However it will not be based on international standards for metadata, and not well known to traditional users of SEN resources.

Adopting the SEN LRE metadata application profile will be both innovative and in compliance with international IMS Access for All specifications, and with an inclusion way of thinking. This approach will also be new to traditional users of SEN resources, but the profile will presumably be relatively close to an emerging, but not yet published, metadata standard for learning resources (MLR) from the ISO standardization body.
Examples of guideline approaches to categorization

Universal Design
The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

Under the auspices of NC State University, The Center for Universal Design a working group of architects, product designers, engineers and environmental design researchers, collaborated to establish the Principles of Universal Design to guide a wide range of design disciplines including environments, products, and communications (Copyright 1997 NC State University, The Center for Universal Design).

These seven principles may be applied to evaluate existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments.

PRINCIPLE ONE: Equitable Use
The design is useful and marketable to people with diverse abilities.

Guidelines:

1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.
1b. Avoid segregating or stigmatizing any users.
1c. Provisions for privacy, security, and safety should be equally available to all users.
1d. Make the design appealing to all users.

PRINCIPLE TWO: Flexibility in Use
The design accommodates a wide range of individual preferences and abilities.

Guidelines:

2a. Provide choice in methods of use.
2b. Accommodate right- or left-handed access and use.
2c. Facilitate the user’s accuracy and precision.
2d. Provide adaptability to the user’s pace.

PRINCIPLE THREE: Simple and Intuitive Use
Use of the design is easy to understand, regardless of the user’s experience, knowledge, language skills, or current concentration level.

Guidelines:

3a. Eliminate unnecessary complexity.
3b. Be consistent with user expectations and intuition.
3c. Accommodate a wide range of literacy and language skills.
3d. Arrange information consistent with its importance.
3e. Provide effective prompting and feedback during and after task completion.
PRINCIPLE FOUR: Perceptible Information
The design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities.

Guidelines:

4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
4b. Provide adequate contrast between essential information and its surroundings.
4c. Maximize “legibility” of essential information.
4d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
4e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

PRINCIPLE FIVE: Tolerance for Error
The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Guidelines:

5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
5b. Provide warnings of hazards and errors.
5c. Provide fail safe features.
5d. Discourage unconscious action in tasks that require vigilance.

PRINCIPLE SIX: Low Physical Effort
The design can be used efficiently and comfortably and with a minimum of fatigue.

Guidelines:

6a. Allow user to maintain a neutral body position.
6b. Use reasonable operating forces.
6c. Minimize repetitive actions.
6d. Minimize sustained physical effort.

PRINCIPLE SEVEN: Size and Space for Approach and Use
Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user’s body size, posture, or mobility.

Guidelines:

7a. Provide a clear line of sight to important elements for any seated or standing user.
7b. Make reach to all components comfortable for any seated or standing user.
7c. Accommodate variations in hand and grip size.
7d. Provide adequate space for the use of assistive devices or personal assistance.
Please note that the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible.

**Universal Design for Learning**

The Universal Design for Learning (UDL) was inspired by the Universal Design movement in architecture. Design learning activities ('buildings') so that they are accessible for everyone. This philosophy is expressed in a set of principles for curriculum development that give all individuals equal opportunities to learn.

**The three principles of Universal Design for Learning**


Three primary principles, which are based on neuroscience research, guide UDL and provide the underlying framework for the guidelines:

- **Principle I: Provide Multiple Means of Representation**  
  (the “what” of learning)  
  - Perception  
  - Language, expressions, and symbols  
  - Comprehension

- **Principle II: Provide Multiple Means of Action and Expression**  
  (the “how” of learning)  
  - Physical action  
  - Expression and communication  
  - Executive function

- **Principle III: Provide Multiple Means of Engagement**  
  (the “why” of learning)  
  - Recruiting interest  
  - Sustaining effort and persistence  
  - Self-regulation

From each of these principles a set of guidelines have been developed. See www.udlcenter.org/aboutudl/udlguidelines.

**Principles for Accessibility in Online Distributed Learning**

imsglobal.org/accessibility/accessiblevers/sec3.html

The IMS Guidelines for Developing Accessible Learning Applications include best practices for producing accessible software applications and accessible content for online distributed learning. Developers, content providers and educators involved in the creation of learning
products should adhere to these guidelines from the outset of the design process, since retrofitting an inaccessible product is almost always significantly more difficult, labour-intensive and expensive.

The guidelines present six principles that address accessibility for people who have sensory or mobility disabilities. These principles also address accessibility issues faced by people with cognitive disabilities, though often to a lesser extent.

1. Allow for customization based on user preference.
2. Provide equivalent access to auditory and visual content based on user preference.
3. Provide compatibility with assistive technologies and include complete keyboard access.
4. Provide context and orientation information.
5. Follow IMS specifications and other relevant specifications, standards, and/or guidelines.
6. Consider the use of XML.

Web Content Accessibility Guidelines (WCAG)
www.w3.org/TR/WCAG/

W3C’s Web Accessibility Initiative has published Web Content Accessibility Guidelines (WCAG) 2.0, which cover a wide range of recommendations for making Web content more accessible.

Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these. Following these guidelines will also often make Web content more usable to users in general.

Four principles provide the foundation for Web accessibility:

- perceivable, operable, understandable, and robust.

WCAG 2.0 Quick Reference List (www.w3.org/WAI/WCAG20/quickref/)

1 Perceivable
1.1 Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
1.2 Time-based Media: Provide alternatives for time-based media.
1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.
2 Operable
2.1 Keyboard Accessible: Make all functionality available from a keyboard.
2.2 Enough Time: Provide users enough time to read and use content.
2.3 Seizures: Do not design content in a way that is known to cause seizures.
2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.

3 Understandable
3.1 Readable: Make text content readable and understandable.
3.2 Predictable: Make Web pages appear and operate in predictable ways.
3.3 Input Assistance: Help users avoid and correct mistakes.

4 Robust
4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

The 12 guidelines provide the basic goals that authors should work toward in order to make content more accessible to users with different disabilities. The guidelines are not testable, but provide the framework and overall objectives to help authors understand the success criteria and better implement the techniques.

IMS Global Access for All (AfA) Information Model Data Element Specification
Version 3.0 Specification

www.imsglobal.org/accessibility/afav3p0pd/AfA3p0_DESinfoModel_v1p0pd.html#_Toc323719825

The IMS Global Access For All Specification (AfA) is intended to promote an inclusive user experience by enabling the matching of the characteristics of resources to the needs and preferences of individual users.

The specification defines a set of Vocabulary Classes, each followed by a set of vocabulary terms that are used as the values for the set of vocabulary classes.

The Vocabulary Classes:

AccessibilityAPI, AccessMode, AdaptationDetail, AdaptationMediaType, AdaptationType, ControlFlexibility, DisplayTransformability, EducationalComplexity, Hazard.

From this specification the EUN LRE group has developed a classification to be implemented into EUN’s LRE (Learning Resource Exchange). See http://bit.ly/15DCugM.
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<td>Access Mode</td>
<td>Human sensory perceptual system or cognitive faculty through which a person may process or perceive information.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Auditory, colour, tactile, textOnImage, textual, visual</td>
</tr>
<tr>
<td>Adaptation Media Type</td>
<td>Term identifying a media type commonly used to aggregate accessibility modalities or functionalities as media.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Braille, ChemML, Daisy, EPUB3, NIMAS, LaTex, LIT, MathML, Nemeth, OEBPS, PDF</td>
</tr>
<tr>
<td>Adaptation Type</td>
<td>Term describing an adaptation type.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>alternativeText, audioDescription, captions, e-book, haptic, highContrast, signLanguage, transcript, longDescription</td>
</tr>
<tr>
<td>Control Flexibility</td>
<td>Term describing an input method.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>fullKeyboardControl, fullMouseControl</td>
</tr>
<tr>
<td>Display Transformability</td>
<td>Term describing a characteristic of a resource display that can be modified.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>backgroundColour, cursorPresentation, fontFace, fontSize, fontWeight, foregroundColour, highlightPresentation, layout, letterSpacing, lineHeight, structurePresentation, wordSpacing</td>
</tr>
<tr>
<td>Educational Complexity</td>
<td>Term describing a resource that is simplified or enriched relative to another resource that presents the same intellectual content.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Simplified, enriched</td>
</tr>
<tr>
<td>Hazard</td>
<td>Term describing a characteristic of the described resource that must not be delivered to some users.</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>Flashing, motionSimulation, sound</td>
</tr>
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</table>

**Eifl – FOSS Accessibility Tools for Libraries**  
**Step-By-Step Guide**


The FOSS guidelines describe how using technology appropriately can enhance the library experience for all users, but is particularly significant for users with disabilities.
• Display Enhancement Tools
  - to support users who need larger text, different colours, screen magnification, etc...
• Audio Tools
  – to support users who prefer to listen to the spoken word rather than (or in addition to) reading text.
• ScreenReaders
  – for completely blind users to be able to operate a computer
• Writing Tools
  – to help users with entering text or with spelling
• Planning Tools
  – to help users make notes or create schematics

These guidelines may inspire SENnet to categorize digital learning resources:

Display Enhancement Tools (the term may not reflect what it contains)

1. Magnifiers (Magnifier, Desktop Zoom, Super Magnify, Virtual Magnifying Glass,...)
2. Windows screen configurations /Mac configurations

Audio Tools (too global for specific software)

1. Speech synthesizers / Text-to-Speech (Balabolka, DSpeech, eSpeak, Wordflashreader, iSpeech, AMIS/Daisy for All...)
2. Talking tools (ex: Powertalk, SlideTalk, Wordtalk, etc)
4. Audio Recorders (Audacity, Vocaroo, SoundCloud, ...)

Screenreaders (NVDA, ORCA, Thunder,...)

Writing Tools

1. Word prediction
2. Storytelling/Book Creation (Book Builder, Storybird, StoryJumper, Little Bird Tales, ClassTools, TikaTok, Penzu,...)

Planning/Mindmapping/Diagram Tools (Mindomo, Mindmeister, Mind 42, xMind, FreeMind, Gliffy, Bubbl.us, ...)

The listed examples of guidelines for developing products and resources for people with special needs


all provide well documented design guidelines – similar in quite a number of areas -,
all give thoughts for criteria for functionality of SEN resources and how SEN resources may be described in a systematic way.
Examples of repository approaches to categorization

Choosing and using digital learning resources, Becta 2008

In 2008 Becta published a guide for school leaders on Choosing and using digital learning resources. These guidelines also include as one of the quality principles for assessing an item:

- have an easy-to-use interface which presents information clearly. The teacher or learner should be able to adapt features such as font size and colour
- offer guidance and relevant information on the resource’s accessibility features (this should be included with technical specifications).

Freeware-Recursos Livres-Necessidades Especiais-Deficiência

This Portuguese repository of SEN freeware (freewarenee.weebly.com), organized by The Portuguese Ministry of Education (DGE), applies the following categories of resources:

Writing with Symbols, Braille, Kit Accessibility, Screen Readers, Virtual Keyboards, Computer Access, Predicting Words, Screen Magnifiers, Visual Perception and Discrimination, Text-to-Speech and Voice Recognition, Sign Language, Miscellaneous.
Leerzorgsite.be

In Belgium the Leerzorgsite.be repository, which is linked to the national KlasCement repository of free learning resource for mainstream education, applies a disability oriented categorization (illustration right), because “this is what the teachers and learners ask for”.

Leerzorg (Special education) is a website for teachers who work with children and adolescents with special needs or learning disabilities.

This site collects resources that are specifically designed to be used with children and adolescents with special needs. Contributions that were not specifically designed for this target group, but that have an obvious added value can be found as well. Examples: explicit differentiation, strong visualization, step by step planning, etc.

ATHENA Free AT Software Inventory
access.uoa.gr/ATHENA/eng/pages/home

By Category

Voice Recognition, Screen Daisy Reader, Calculator, Mouse Cursor, Click Helper, Virtual Keyboard, Camera Mouse, Alternative Communication, Text To Speech, Screen Magnifier, Braille Translator, Web Browser, Mouse Emulator, Contrast Adjustment, Keyboard Shortcuts, Voice Mail, Clock, Video Call

By disability

Blindness, Dyslexia, Hearing, Low Vision, Motor/Dexterity, Speech
OATS – open source assistive technology software

www.oatsoft.org/Software

By the need that it meets

Text input Projects, Communication, Using the Mouse, Viewing the screen, Accessing the Web, Symbols, Alternative Access, Learning and Education, General Tools, Other need

By the type of software

On Screen Keyboard Projects, Symbol Library, Text to Speech, Computer Automation, Switch Input Software, Alternative and Augmentative Communication, Environmental Control, Educational and Learning, General Tools, Other function
TES Special Educational Needs catalogue

www.tes.co.uk/teaching-resources/

The TES Special Educational Needs catalogue comprises 138 free resources to support teachers working with special needs children including, codes code of practice, free lesson plans, activities, worksheets, games, teaching ideas and advice on SEN in schools and the classroom.

Categories

Attention deficit / and hyperactivity disorder (ADD / ADHD), Autism spectrum disorders (ASD) and Asperger Syndrome, Behavioural, emotional and social difficulties (BESD), Cognitive impairment: Moderate learning difficulties (MLD), Cognitive impairment: Severe learning difficulties (SLD), Down's Syndrome, Gifted and talented, Hearing impairment, Mental health issues, Physical impairments, Profound and multiple learning difficulties (PMLD), Sensory integration disorder, Specific learning difficulties, Speech and language communication difficulties, Tourette's Syndrome, Visual impairment, Well Being / Emotional Literacy.

The listed examples of repositories of SEN resources

Freeware-Recursos Livres-Necessidades Especiais-Deficiência, Leerzorgsite.be, ATHENA Free AT Software Inventory, OATS – open source assistive technology software, TES Special Educational Needs catalogue

are well established, known and used by many SEN learners, and they all classify their many resources by disability of the learner. The advantage of this approach is that it is the common way of describing SEN resources so far, and it will be straightforward for SENnet to extract an application profile based on it. However, presumably this will not reflect the future line of thinking of SEN resources.
A Toolbox for inclusion
SENnet may develop a toolbox in three dimensions as an innovative way of categorizing learning resources:

A. Problem Formulation
B. Target group
C. Possible solutions.

Sketch-up for a ToolBox for Inclusion
A space with three dimensions:

A. What is the problem or need?

- Problem/challenge
- What type of problem
- Disability, etc.

B. Who is involved (Target groups?)

- Whole class
- Groups
- Individuals
- Colleagues
- Head of department, parents, etc.

C. Possible solutions/issues

- Organization of education
- Classroom management
- Methods
- Teaching materials
- Evaluation
- Feed-back to students and parents
- Alternative activities
- Practical training
- Accessibility
- Professional support
- Etc.

Each of the three dimensions should be elaborated, and there must be a formalized description of the individual elements so that the model can be provided with descriptions of all types of materials, which are classified with a description key consisting of the three dimensions.

Probably you could just establish a descriptive model that operates with two dimensions, namely A. Problem Formulation and C. Possible solutions. However, the value of the utility will be higher if the model has three dimensions, with the information that B. the target group, brings.
The key issue is that the model should result in a tool where the teacher relatively easily and quickly gets information about the ICT tools that are relevant and accessible.

The model can also be used for classification of other ICT materials, for example games, best practice descriptions, manuals and articles for teachers, so that this kind of material is described with a pedagogical focus - especially for material that is not primarily intended for use in teaching, e.g. games. This toolbox can contribute to the integration of new and more varied educational materials. Existing knowledge about metadata will be investigated and incorporated as the basis for the designing of the questionnaire.

It is of importance that the descriptions can be used by both specialized SEN teachers and teachers teaching normal classes, so they all, using the toolbox, can find answers to their needs on ICT tools that can help them face the challenges with students with various needs of support. It's not just about the actual teaching, but also on the framework for this, where the teacher has the responsibility and control.

It is also important that the Tool-box can continuously be supplemented with new content based on new materials, illustrations, games and videos. It should be an open resource that can be developed to support teachers in maximizing the benefits of education for all, in other words a tool for differentiation and individualization of teaching.

The descriptions of the content in ICT-supported inclusion may be based on the principles of Universal Design (see 0) or Universal Design for learning (see 0).

The toolbox should be an open platform that will easily be able to inform the teacher about what kind of ICT-based help is available.

A three-dimensional toolbox for inclusion will introduce a truly new way of describing a SEN resource. From a research perspective it is very interesting as it suggests a method of localising the ‘right product for the right user(s) and the right need and the right type’. However, defining and introducing a new typology different from adopted standards, and a new technical platform will probably be too ambitious within the scope of the SENnet project.
Conclusions and recommendations

Having considered the various options, it is recommended that future work on improving access to digital resources use the LRE Metadata Application Profile, because

- it describes SEN resources from perspectives of inclusion and functionality
- it is based on the international IMS Accessibility-for-All specification (see also section SENnet-LRE Metadata Application Profile, and section IMS Global Access for All (AfA) Information Model Data Element Specification), presumably backed up by an emerging MLR classification.

In parallel, subject to resourcing work should proceed on a toolkit approach from a research perspective.