### Project information

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<td>Project partners</td>
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ABSTRACT

In the three-year Special Educational Needs Network (SENnet: http://sennet.eun.org), Work Package 2 has the task to deliver each year a Thematic Study presenting recent research and studies in the field of special education needs and ICT in the partner countries and in the wider European and global context. In this second study the theme is the Universal Design for Learning (UDL) approach to teaching practices, particularly how ICT can support UDL.

The study is divided into two parts: Part 1 focuses on the international overview of UDL (origin, adoption, tools, etc.) and on national partners’ state-of-the-art as for the uptake of UDL in their countries. Part 2 concentrates on case studies showing examples of the UDL approach in mainstream classes.

The study concludes: “Work by SENnet partners has shown that Universal Design for Learning (UDL) has much to offer in terms of improving access to learning for all. While widespread in the US, it is relatively unknown in Europe. In Europe, UDL principles are, to a great extent, not explicit but embedded in principles of inclusion, recognizing equity in access to education and life in society for all, including people with disability and disadvantaged minority groups. The country reports and case studies show how UDL principles are being applied in policy and practice to a varying extent depending on countries, but implicitly rather than explicitly. The time is perhaps right for raising awareness of UDL principles in Europe and to ensure that the use of technology in teaching and learning conforms to UDL principles.”
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The universal design concept is originally related to the architecture field and, in general, refers to conceiving buildings, products and environments accessible to all people, including those with limitations, such as older people or people with disabilities.

The principles of universal design embrace equitable use, flexibility, simplicity, perceptible information, tolerance for error, low physical effort, accessible size and space for approach. All these principles are based in the notion of barrier-free, since the problem is not in the people, but in the barriers that the environment poses to them. Examples that take into account these principles can be found in: ground level entrances without stairs or with smooth ramps; surfaces that are slip resistant; wide interior doors; automatic doors; lever handles for opening doors rather than twisting knobs; low floor bus; use of meaningful icons with text labels; closed captioning on television networks; instruction that presents material both orally and visually, audiobooks, velcro, and many other examples.

Design for All is an equivalent term used to describe a design philosophy targeting the use of products, services and systems by as many people as possible without the need for adaptation. The term is used in many European documents, recommendations and initiatives. Design for All is design for human diversity, social inclusion and equality (EIDD Stockholm Declaration, 2004). According to the European Commission, it "encourages manufacturers and service providers to produce new technologies for everyone: technologies that are suitable for the elderly and people with disabilities, as much as the teenage techno wizard."

Design for All (DfA) is also the name of the European initiative associated with ICT inclusive products and e-accessibility (Web Accessibility Initiative/WAI), in Europe’s Information Society portal. Design for All (DfA) embraces the idea that it is perfectly possible to produce ICT goods which can be accessed by nearly all potential users without modification or, failing that, products should be easy to adapt according to different needs, or should use standardized interfaces that can be accessed simply by using assistive technology.

International standardization considers principles of universal design, ISO 20282-1:2006 provides requirements and recommendations for the design easy-to-operate everyday products, taking into consideration design requirements for context of use and user characteristics aiming at ease of operation. Usability of consumer products and products for public use is also considered by an update in 2013 of ISO/TS 20282:2013, which specifies a user-based summative test method for the measurement of the usability and/or accessibility of consumer products for one or more specific user groups.

The universal design concept was transferred to the education field and applied to the learning process and learning environment, taking the expression of universal design for learning (UDL).

UDL is an educational framework based on research in the learning sciences, including cognitive neuroscience, that guides the development of flexible learning environments that can accommodate individual learning differences. UDL framework was first defined by the
US Center for Applied Special Technology (CAST) in the 1990s, arguing that the curriculum should fit different learners from the outset, following three main principles:

- **Multiple means of representation** to give learners various ways of acquiring information and knowledge,
- **Multiple means of expression** to provide learners alternatives for demonstrating what they know, and
- **Multiple means of engagement** to tap into learners' interests, challenge them appropriately, and motivate them to learn
This section contains international, European and national reports from SENnet partners on the state-of-the-art on UDL in their countries.
CAST, an American nonprofit research and development organization, founded in 1984, has developed research on UDL, as a transdisciplinary approach that synthesizes insights from the fields of developmental psychology, neuropsychology, neuroscience, and education research, as well as from education practice.

UDL was initially proposed as a means for including students with disabilities in the general-education classroom, it is now better understood as a general-education initiative that improves outcomes for all learners.

"UDL is one part of the overall movement toward universal design. The term UDL emphasizes the special purpose of learning environments – they are not created to provide access to information (that is the role for libraries and the Internet) but instead to foster the changes in knowledge and skills that we call learning. While providing access to information is often essential to learning, it is not sufficient. Success also requires that the means for learning – the pedagogical goals, methods, materials and assessments of instruction – are also accessible. UDL is the process by which we attempt to ensure that the means for learning, and their results, are equally accessible to all students."¹

CAST made available a reference website with useful learning tools and quality resources to help teachers develop UDL strategies. A number of videos have been produced along the years explaining the principles and practice of such approach. In conjunction with Google, to celebrate World Literacy Day in 2008, UDL editions of classic works from literature were published, allowing individualized support to many different kinds of learners.

«For the reader with dyslexia, these editions provided options that reduce or eliminate many barriers and impediments found in print editions. For example, any text, in whole or part, could be read aloud to reduce decoding barriers, key words were linked to a multimedia glossary to reduce vocabulary barriers, most passages had links to more information to reduce background knowledge barriers, and so forth. These versions also embedded highly customizable supports to help the student become a better reader: graduated scaffolds for building reading comprehension strategies, for identifying author’s craft, and so forth, along with models and feedback essential to a successful apprenticeship.» (Rose & Vue, 2010)

David Rose is one of the founders of CAST, a researcher and promoter of UDL worldwide. In a communication presented in 2010 at IDA (International Dyslexia Association) Annual Conference in Beijing under the theme «2020’s Learning Landscape», he referred that a

visitor of a 21st century class today wouldn’t find much difference in the teaching methodologies of previous centuries. Reading and writing literacy is still much based on printed text, though we have progressed towards much richer media mix, with all the ICT and mobile technology available and used by children and youth nowadays. Pedagogical practices in the classroom are still shaped in the industrial age than in the knowledge age. The curriculum has remained uniform, mass-produced and standardized as well as methods of teaching. In many schools, students sit in the same seat every day, doing the same activity at the same time and in the same way. Assessment tends to evaluate abilities and disabilities of the curriculum rather than the students, standardized testing and exams contradict the need for flexibility and personalized education.

«Whereas the “soul” of old media was its “fixedness” or permanence, the “soul” of new digital media is its flexibility—the flexibility that allows it to be customized, modified, and manipulated. Print constrained our thinking and learning linearly; new digital media expands our imagination and creativity.» (Rose & Vue, 2010)

The approach is to fix the student to a curriculum rather than turn the curriculum flexible to fit the student. In the UDL framework the curriculum term is broader than a specific body of knowledge, it refers to educational goals, methods, materials and assessment.

Some American universities have conducted extensive research in the field of disabilities and assistive technology and share this information and studies online, providing practical recommendations. Such is the case of the University of Washington with an excellent website DO-IT, an initiative supported by the US Department of Education. Prof. Sheryl Burgstahler highlights useful articles, one of which is about universal design of instruction (UDI), which aims:

«To maximize the learning of students with a wide range of characteristics by applying UD principles to all aspects of instruction (e.g., delivery methods, physical spaces, information resources, technology, personal interactions, and assessments).» (Burgstahler, 2012)

She provides a checklist of examples of UDI principles and practices:

<table>
<thead>
<tr>
<th>Class Climate</th>
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<tbody>
<tr>
<td><strong>Welcome everyone</strong></td>
<td>Create a welcoming environment for all students. Encourage the sharing of multiple perspectives. Demonstrate and demand mutual</td>
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<tr>
<td><strong>Avoid stereotyping</strong></td>
<td>Offer instruction and support based on student performance and requests, not simply on assumptions that members of certain groups (e.g., students with certain types of disabilities or from a specific racial or ethnic group) will automatically do well or poorly or require certain types of assistance.</td>
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</tbody>
</table>
Be approachable and available  Learn students’ names. Welcome questions in and outside of class, seek out a student’s point of view, and respond patiently. Maintain regular office hours, encourage students to meet with you, and offer alternatives when student schedules conflict with those hours; consider making a student-instructor meeting a course requirement. Be available for online communication as well.

Motivate students  Use teaching methods and materials that are motivating and relevant to students with diverse characteristics, such as age, gender, and culture.

Address individual needs in an inclusive manner  Both on the syllabus and in class, invite students to meet with you to discuss disability-related accommodations and other learning needs. Avoid segregating or stigmatizing any student by drawing undue attention to a difference (e.g., disability) or sharing private information (e.g., a specific student’s need for an accommodation) unless the student brings up the topic in front of others. Communicate effectively

Interaction

Encourage regular and effective interactions between students and the instructor and ensure that communication methods are accessible to all participants.

Promote effective communication  Employ interactive teaching techniques. Face the class, speak clearly, consider using a microphone, and make eye contact with students. Supplement in-person contact with online communication. Use straightforward language, avoid unnecessary jargon and complexity, and use student names in electronic, written, and in-person communications.

Make interactions accessible to all participants  For example, use a telephone conference only if all students can participate, given their abilities to hear, speak, and meet, and their schedule constraints. Also, require that small groups communicate in ways that are accessible to all group members.

Encourage cooperative learning  Assign group work for which learners must support each other and employ different skills and roles. Encourage different ways for students to interact with each other (e.g., in-class discussion, group work, and Internet-based communications). Insist that all students participate; facilitate their participation as needed.

Physical Environments and Products

Ensure that facilities, activities, materials, and equipment are physically accessible to and usable by all students, and that all potential student characteristics are addressed in safety
| **Ensure physical access to facilities** | Use classrooms, labs, workspaces, and fieldwork sites that are accessible to individuals with a wide range of physical abilities. |
| **Arrange instructional spaces to maximize inclusion and comfort** | Arrange seating to encourage participation, giving each student a clear line of sight to the instructor and visual aids and allowing room for wheelchairs, personal assistants, sign language interpreters, captionists, and assistive technology. Minimize distractions for students with a range of attention abilities (e.g., put small groups in quiet work areas). Encourage administrators to apply UD principles in facility design and renovation. |
| **Ensure that everyone can use equipment and materials** | Minimize nonessential physical effort and provide options for operation of equipment, handles, locks, cabinets, and drawers from different heights, with different physical abilities, with one hand, and by right- and left-handed students. Use large print to clearly label controls on lab equipment and other educational aids, using symbols as well as words. Provide straightforward, simple oral and printed directions for operation and use. |
| **Ensure safety** | Consider the impact of specific disabilities in emergency situations. Develop procedures for all potential students, including those who are blind, deaf, or wheelchair users. Label safety equipment in simple terms, in large print, and in a location viewable from a variety of angles. Provide written and oral safety instructions. |

### Delivery Methods

**Use multiple, accessible instructional methods that are accessible to all learners.**

<p>| <strong>Select flexible curriculum</strong> | Choose textbooks and other curriculum materials that address the needs of students with diverse abilities, interests, learning styles, and preferences. Use curriculum materials that are well organized, emphasize important points, provide references for gaining background knowledge, include indices and glossaries, and have chapter outlines, study questions, and practice exercises. Consider technology-based materials that provide feedback, background information, vocabulary, and other supports based on student responses. |
| <strong>Make content relevant</strong> | Put learning in context. Incorporate multiple examples and perspectives to make specific concepts relevant to individuals with diverse characteristics such as age, ability, gender, ethnicity, race, socioeconomic status, and interests. |</p>
<table>
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<tr>
<th><strong>Provide cognitive supports</strong></th>
<th>Summarize major points, give background and contextual information, and prompt students. Provide scaffolding tools (e.g., outlines, class notes, summaries, study guides, presentation visuals with room for note-taking) and other cognitive supports in both printed and text-based electronic formats. Provide options for gaining background information, vocabulary, and practice.</th>
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<tr>
<td><strong>Provide multiple ways to gain knowledge</strong></td>
<td>Use multiple modes to deliver content and, when possible, allow students to choose from multiple options for learning content. Options to consider include lectures, collaborative learning, small group discussions, hands-on activities, Internet-based resources, educational software, and fieldwork.</td>
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<tr>
<td><strong>Deliver instructions clearly and in multiple ways</strong></td>
<td>Provide instructions both orally and in printed form. Have students summarize instructions to ensure understanding.</td>
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<tr>
<td><strong>Make each teaching method accessible to all students</strong></td>
<td>Consider a wide range of abilities, interests, learning styles, and previous experiences when implementing each instructional method to ensure the participation of all students. For example, speak content presented visually.</td>
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### Information Resources and Technology

Ensure that course materials, notes, and other information resources are engaging, flexible, and accessible for all students.

<table>
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<tr>
<th><strong>Select materials early</strong></th>
<th>Choose printed materials and prepare a syllabus early to allow students the option of beginning to read materials and work on assignments before the course begins. Allow adequate time to arrange for electronic and other alternative formats to be obtained.</th>
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<tr>
<td><strong>Provide materials in accessible formats</strong></td>
<td>Select or create materials that are universally designed. Use textbooks that are available in an accessible electronic format with flexible features. Provide the syllabus and other teacher-created materials in a text-based electronic format. Use captioned videos and provide transcriptions for audio presentations. Apply accessibility standards to websites.</td>
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<tr>
<td><strong>Accommodate a variety of reading levels and language skills, when appropriate, given the goals of the</strong></td>
<td>Present content in a logical, straightforward manner and in an order that reflects its importance. Avoid unnecessary jargon and complexity and define new terms when they are presented. Create materials in simple, intuitive formats.</td>
</tr>
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</table>
### Course

Ensure the availability of appropriate assistive technology

If computer or science labs are used, ensure that assistive technology for students with disabilities is available or can be readily acquired.

### Feedback

Provide specific feedback on a regular basis

Provide regular feedback and corrective opportunities

Allow students to turn in parts of large projects for feedback before the final project is due. Give students resubmission options to correct errors in assignments or exams. Arrange for peer feedback when appropriate. Solicit feedback from students regarding course effectiveness.

### Assessment

Regularly assess student progress using multiple accessible methods and tools, and adjust instruction accordingly

Set clear expectations

Keep academic standards consistent for all students, including those who require accommodations. Provide a syllabus with clear statements of course expectations, assignment descriptions, and deadlines, as well as assessment methods and dates. Include a straightforward grading rubric.

Provide multiple ways to demonstrate knowledge

Assess group and cooperative performance, as well as individual achievement. Consider using traditional tests with a variety of formats (e.g., multiple choice, essay, short answer), papers, group work, demonstrations, portfolios, and presentations as options for demonstrating knowledge. Provide students choices in assessment methods when appropriate. Allow students to use information technology to complete exams.

Monitor and adjust

Regularly assess students’ background knowledge and current learning informally (e.g., through class discussion) and formally (e.g., through frequent, short exams), and adjust instructional content and methods accordingly.

Test in the same manner in which you teach

Ensure that a test measures what students have learned and not their ability to adapt to a new format or style of presentation.
**Minimize time constraints when appropriate**

Plan for variety in students’ ability to complete work by announcing assignments well in advance of due dates. Allow extended time on tests and projects, unless speed is an essential outcome of instruction.

**Accommodation**

Plan for accommodations for students whose needs are not met by the instructional design.

**Know how to arrange for accommodations**

Know campus protocols for getting materials in alternate formats, rescheduling classroom locations, and arranging for other accommodations for students with disabilities. Make sure that assistive technology can be made available in a computer or science lab in a timely manner. Ensure the course experience is equivalent for students with accommodations.

Legislation in the United States stipulates that all textbooks published for schools after 2006 must be available not only in print, but also in an alternative format, that is, digital “source file,” a simple electronic version of the textbook can be transformed easily into various formats (e.g., digital talking book, audio book, large print book, regular print book, and others) more accessible to many students than the print version. These alternative formats are delivered to students with special needs for free. Subsequently to this legislation, publishers began to market and distribute more flexible digital versions—for all students.

«The flexibility of modern media makes it routine to present information in multiple formats and media, to adjust presentation, pace, supports, and challenges to meet needs of individual students, to allow them to articulate what they know in various ways, and so forth.» (Rose & Vue, 2010)

The National UDL Task Force established in 2006, constituted by organizations dealing with disability, is dedicated to raise awareness of UDL among national, state, and local policymakers, turning UDL pervasive in schools. In 2007, a congressional initiative took place supporting efforts to include UDL in major education legislation for both K-12 and postsecondary.

In 2012, in a hearing at the US Senate, John B. Quick, superintendent of Bartholomew Consolidated Schools, Corporation (BCSC) in Columbus, Indiana, was invited to testify and share information about how his school district used the framework of Universal Design for Learning (UDL) to expand and guide the use of accessible technologies to enhance instruction and gain better outcomes for their students. The school district had a high percentage of 13.9% students eligible for special education services.

In 2004 the BCSC leadership identified Universal Design for Learning (UDL) as the framework to support the inclusive practices for students with disabilities and enhance the access of curriculum for all students. One of the ways to make curriculum accessible to all students is through the use of accessible technology. UDL helps teachers to design
lessons accessible to all students, sustained in the three overarching principles of engagement, representation, action and expression.

The guidelines help teachers select teaching strategies, methods and accessible technologies, which will, when combined, create an accessible learning environment. The curriculum is not altered; rather, it is enhanced through the teacher’s application of the UDL principles and use of accessible technologies. John B. Quick gives the following example:

«For example, a second grade teacher creates an introductory lesson about electricity. First and foremost, a goal linked to the state standards is determined: Students will demonstrate their current knowledge of the flow of electricity. Next, the teacher uses the nine guidelines to determine what strategies and technology to use. The following example focuses on the principle of engagement and the first guideline of “options for recruiting interest.” When the teacher considers options for recruiting interest, he designs the lesson so the topic is relevant and authentic to his students. He might use pictures, multimedia (e.g., showing a brief child-centered video about electricity or an app demonstrating how electricity is made), a group discussion to list what items utilize electricity, and/or allow students to safely hold or touch items that utilize electricity. The teacher knows, because of the defined guideline, that these activities must be personalized and contextualized to his students’ lives while being relevant for different racial, ethnic, cultural, and gender groups. By addressing each of the nine guidelines, the teacher can be confident that he is creating a learning environment and using technologies, which are accessible to his learners. »(Quick, 2012)

He gives another example of a student with autism spectrum disorder experiencing significant behavior problems. Although the student was identified as high ability, continued to struggle in core subjects and it took just a computer based program to solve the student’s problem.

More recently the school district embraced the trend BYOD (Bring Your Own Device), which include smart phones, tablets, and iTouches, able to connect to Internet: 748 students bring their own devices while 380 BCSC-owned devices support the other students.

In an article written by Elizabeth Hertmann (teacher of students with multiple disabilities) is also given the example of UDL approach applied to deaf-blind students:

«During an elementary school science lesson on the weather, a student with deaf blindness is likely to face barriers if his or her learning needs are not taken into consideration. It may be a struggle for the student to understand the concepts being taught and connect them to personal experiences. He or she may not have ways to express his or her own unique understanding of weather, causing isolation from peers. Last, but not least, the lesson may not provide ways to keep the student interested and focused on the topic, resulting in the student becoming withdrawn.

Now, consider a UDL lesson on the weather that is designed from the start to maximize learning for the student with deaf-blindness (and all other students in the
Instead of modifying a standard lesson designed for “typical” learners, the teacher has the flexibility to:

- Use a variety of materials, media, language, and symbols to represent concepts,
- Give students choices in how to respond to what they are learning, and
- Provide opportunities for students who have different learning styles and support needs to stay interested in the lesson.» (Hartmann, 2011)

As referred in an article of Patricia Ralabate (university professor of special education courses), each student has different needs, abilities and preferences. Strengths and barriers to learning are not always obvious and it is common that some students stay «in the margins». Groups are heterogeneous and some students may have particular conditions:

- Sensory or physical disabilities;
- Emotional or behavioral challenges;
- Learning disabilities or reading difficulties;
- Autism spectrum disorders;
- Attention deficit hyperactivity disorder;
- Lack of appropriate background knowledge;
- Minority cultural background;
- Language barriers.

Today, most of these students are in mainstream schools, in regular classrooms. Usually the typical curriculum is centered in printed materials, the traditional textbook, designed for a homogeneous group of students - «one size fits all». To provide different needs, alternative personalized materials have to be produced.

The four interrelated components of the UDL curriculum are referred in ASHA Leader, the newsmagazine for and about speech-language pathologists, audiologists, and speech, language, and hearing scientists:

- **Goals** are typically described as learning expectations. They represent the knowledge, concepts, and skills students need to master and are usually aligned to state standards. Recent national discussions about Common Core Standards have heightened the critical importance of linking goals in Individualized Education Programs (IEPs) with state standards and classroom expectations.

- **Methods** are generally defined as the instructional strategies used by educators to support student learning. Methods should be evidence-based and supported by an analysis of learner variability. UDL methods are flexible and adjusted through consistent monitoring of student progress.

- **Materials** are the media used to present content and demonstrate learning. UDL materials offer multiple media options and include embedded supports².

² A list of free and commercial learning tools suggested by CAST is available here: [http://www.cast.org/learningtools/](http://www.cast.org/learningtools/)
Assessment within the UDL framework refers to the process of gathering information about a learner's progress using a variety of methods and materials. UDL assessments are particularly concerned with accurately measuring learner knowledge, skills, and engagement by maintaining construct relevance and reducing or eliminating irrelevant or distracting elements that interfere with the assessment's validity. (Ralabate, 2011)

**UDL AND ASSESSMENT**

Assessment issues are hotly debated and many educators and researchers have pointed out the contradiction between competences for the 21st century (critical thinking, problem-solving…), learner-centred pedagogical practices and a traditional assessment system based on summative testing and national exams, with too much importance on scores and rankings.

Authentic assessment is defined by Jon Mueller as «a form of assessment in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills» and the attributes for traditional versus authentic assessment are presented in this table:

<table>
<thead>
<tr>
<th>Traditional assessment</th>
<th>Authentic Assessment</th>
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<tr>
<td>Selecting a Response</td>
<td>Performing a Task</td>
</tr>
<tr>
<td>Contrived</td>
<td>Real-life</td>
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<tr>
<td>Recall/Recognition</td>
<td>Construction/Application</td>
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<tr>
<td>Teacher-structured</td>
<td>Student-structured</td>
</tr>
<tr>
<td>Indirect Evidence</td>
<td>Direct Evidence</td>
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</tbody>
</table>

In authentic assessment instruments such as eportfolios, self assessment, peer assessment, feedback are more adequate.

In an interview with Robert Mislevy, educational assessment researcher and professor at the University of Maryland, he states that practice of large-scale testing has not changed much. The traditional assessment has always been to present everyone with the same tests, expecting them to respond the same way, with a belief that this method allows to obtain comparable evidence. Many critiques to massive testing and exams have been raised because these cannot take into account local contexts where learning takes place or individual needs.

Mislevy and other researchers are involved in projects to build design patterns for assessment and instruction and to think assessment from a UDL perspective.

«The PADI project seeks to layout a rigorous conceptual basis for assessment using principles for Universal Design for Learning (UDL). We are working to develop more tailored assessment situations for different individuals that still make sense using the same frame of interpretation across individuals. That frame of interpretation is driven by clearly defining the specific knowledge, skills, or abilities that we want our students to develop. Often times, a “one size fits all” assessment is developed, and adaptations and accommodations are made only after the fact. This is the hard way to build accessible assessments; the adaptations are constrained by the “one size fits
all” conception of how you develop and interpret tests. This method does not tell you how to think in a principled way about the students for whom the “one size fits all” test does not work. After-the-fact adaptations might make some improvements in inclusion, but you do not put it in the framework for drawing the inferences that you want to make. In the PADI project, we are thinking about the range of students’ abilities and disabilities from the very beginning. It is a different way of thinking about what assessment is.» (Mislevy, 2009).

Mislevy gives a successful example of consistent learning and assessment in the CISCO Academy, whose courses are designed on simulation-based tasks that deal with troubleshooting, network design and setting up networks.

«The simulation tasks range in their level of complexity. Some may require students to work collaboratively for a number of hours, while less complex tasks may require only ten minutes of individual work. The final exams are based on smaller segments of the same kinds of simulation tasks. At the end of the course, students are well prepared for the exam because the assessment is compatible with the ways in which they have been learning—and the skills that they need in the real world. In fact, their focus of study and their final exam will also be compatible with some of the tasks on their certification test should students decide to pursue the area further. The final exams are not developed simply from a measurement point of view; they are derived from the same learning goals and the same psychology of learning used to create the courses» (Mislevy, 2011).
INCLUSION IN EUROPE

UDL is an expression commonly used in American educational contexts and policy but not so current in European strategy education documents, though we can find several academic articles, online courses and events promoted by different European countries concerning universal design in education, such as the example in the national overview. The European project «Open Discovery Space» mentions UDL as a promising approach in the curriculum design (http://www.opendiscoveryspace.eu/).

In Europe, UDL principles are, to a great extent, not explicit but embedded in principles of inclusion, recognizing equity in access to education and life in society for all, including people with disability and disadvantaged minority groups. In schools and in a classroom, pupils and students bring different backgrounds, are diverse and heterogeneous, so different methods and alternative resources must be used to fit individual needs.

European policy frameworks promote the inclusion of all pupils and students in mainstream schools, following the principles of Salamanca Statement, UNESCO document dedicated to special needs education, published in 1994, embedded in the Declaration of Human Rights (1948). It highlights the value of adaptive systems, a flexible curriculum and adjustable processes to include difference and diversity:

- Every child has a fundamental right to education
- Every child has unique characteristics, interests, abilities and learning needs
- Education systems should be designed and educational programmes implemented to meet these diversities among children
- Students with special needs must have access to regular schools with adapted education
- Regular schools with an inclusive orientation are the most effective means of combating and preventing discriminative attitudes and building up an inclusive society

It recommends to national authorities and governments:

- Improve the education system so it can include all students
- Adopt the principle of inclusive education in the legislation system to enrol all children
- Encourage the participation of parents and relevant user organisation (NGO)
- Pay attention to early identification of special needs and Early Intervention
- Give relevant education, further education, training and support to teachers and other relevant professionals

The Salamanca Statement brings a big shift to pay more attention to possibilities than to limitations and that education be adapted to the student rather than the opposite. The fundamental principle is that all children are together as much as possible.
However the transition from segregated environments to mainstream has been sometimes controversial. Removing barriers – environmental, structural or attitudinal – to children’s participation has been challenging. Many doubts and concerns about the capacity of the education system to embrace inclusion have been raised, whether mainstream schools are able to provide a suitable education for children and youth with more severe conditions.

Probably the main difficulty doesn’t rely on the inclusion of SEN pupils, but rather on the inclusion of a diversity of students. Compulsory education is a recent historical phenomenon that brings together pupils from diverse cultural backgrounds and social strata. At present, with the opening up of frontiers in Europe the diversity trend is a multicultural one (raising racial and religious issues).

The concept of inclusion remains tied more closely to special education than to democratic education. In fact, UNICEF statistics show that the number of children and youth that are not in school is quite high and «minority ethnic groups were reported as being at an educational disadvantage in several countries and children of Romania, Bulgaria, Hungary, Serbia, Montenegro and Macedonia, were particularly under-represented in school population and over-represented in residential care institutions and special schools» (Allan, 2010).

Many countries have adopted the requirement for Individual Educational Plan for this special group of pupils but, probably, this requirement should be extended to every pupil and student, as Salamanca Statement recognizes «every child has unique characteristics, interests, abilities and learning needs».

The European Disability Strategy for 2010-2020, built on the United Nations Convention on the Rights of Persons with Disabilities dedicates a section to Education and Training, to promote inclusive education and lifelong learning for students and pupils with disabilities:

«In the 16-19 age group the rate of non-participation in education is 37 % for considerably restricted people, and 25 % for those restricted to some extent, against 17 % for those not restricted. Access to mainstream education for children with severe disabilities is difficult and sometimes segregated. People with disabilities, in particular children, need to be integrated appropriately into the general education system and provided with individual support in the best interest of the child. With full respect for the responsibility of the Member States for the content of teaching and the organization of education systems, the Commission will support the goal of inclusive, quality education and training under the Youth on the Move initiative. It will increase knowledge on levels of education and opportunities for people with disabilities, and increase their mobility by facilitating participation in the Lifelong Learning Programme. EU action will support national efforts through ET 2020, the strategic framework for European cooperation in education and training, to remove legal and organizational barriers for people with disabilities to general education and lifelong learning systems; provide timely support for inclusive education and personalized learning, and early identification of special needs; provide adequate training and support for professionals working at all levels of education and report on participation rates and outcomes.»(EU Disability Strategy, 2010-2020)

Inclusion in Europe progresses at different pace and varies between countries, in some countries the trend is to include SEN pupils in regular classes, other countries keep special classes in regular schools and other ones still have many segregated special schools.
Inclusion generally progresses well at the primary education level, but at secondary level serious problems emerge, owing to increased subject specialization and the different organization of secondary schools. Generally the gap between pupils with special needs and their peers increases with age (Meyer, 2010).

Eventually the democratic school movement, modern school movement and other alternative school models provide the best inclusion environment, considering pupil’s flexible curriculum and individual progression path. The inclusion in traditional school environments is not so naturally embedded. Transition to post-compulsory education is problematic for students with disabilities in all countries and the same restriction to find a job, employment rate tends to be much lower than to their peers with no disabilities.

In some countries where free school choice and the absence of an obligation for schools to admit all pupils within the catchment area, may contradict the principle of equal opportunities for SEN pupils. The competitiveness among schools and the wish to achieve high rankings may also be a negative factor to include SEN pupils.

The European Agency for the Development of Special Needs Education has provided data about the evolution of inclusion policy across Europe, the latest published in 2012 (though related to 2010-2011 collected data by the states). Here are a few examples:

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total no. pupils</th>
<th>No. SEN pupils in mainstream schools</th>
<th>% SEN pupils in mainstream schools</th>
<th>No. pupils in segregated special schools</th>
<th>% pupils in segregated special schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium (Fl.)</td>
<td>863,334</td>
<td>57,261</td>
<td>6,6%</td>
<td>47,712</td>
<td>5,5%</td>
</tr>
<tr>
<td>Austria</td>
<td>770,762</td>
<td>29,242</td>
<td>3,7%</td>
<td>11,615</td>
<td>1,5%</td>
</tr>
<tr>
<td>Italy</td>
<td>7,278,018</td>
<td>189,563</td>
<td>2,6%</td>
<td>1,835</td>
<td>0,02%</td>
</tr>
<tr>
<td>Estonia</td>
<td>110,854</td>
<td>6,530</td>
<td>5,8%</td>
<td>3,370</td>
<td>3%</td>
</tr>
<tr>
<td>Portugal</td>
<td>1,349,711</td>
<td>43,156</td>
<td>3,1%</td>
<td>1,975</td>
<td>0,1%</td>
</tr>
<tr>
<td>Denmark</td>
<td>713,041</td>
<td>35,827</td>
<td>5%</td>
<td>13,256</td>
<td>1,8%</td>
</tr>
</tbody>
</table>

The European Agency has elaborated many reports and recommendations to European countries, such as Raising Achievement for All Learners: Quality in Inclusive Education, published in 2012, which addresses issues of (i) collaborative policies between education, health, social services and other agencies and networking at all levels – national, local area, school and classroom – between all stakeholders, learners and families; (ii) support to school leaders to promote a culture and practice of inclusion; (iii) personalization of learning, involving the students and parents; (iv) improvement of teacher competences, both initial and
in-service training; (v) pedagogical approaches that benefit all learners, for example team teaching and peer assisted learning.

The group of students with emotional and behavioural disorders (EBD) seems to be the most problematic to cope with in schools, compared to children with learning disabilities or physical and sensory difficulties. According to a study by the Open University of Netherlands two main types of EBD exist: (i) the first concerns externalizing disorders which include aggression, antisocial behaviour, defiance, impulsivity, and hyperactivity; the second type refers to internalizing disorders such as withdrawal, anxiety, depression, low self-esteem, and obsessive and compulsive behaviour. Some cases of autism spectrum disorders may also be included in this group (Mooij & Smeets, 2009).

Strategies to include EBD students involve articulated efforts between teachers, specialized staff and family. Social-emotional acceptance by classroom peers is important for EBD pupils, something that can be encouraged by cooperative learning and peer tutoring.

Teachers tend to react to pupils’ disruptive behaviour in ways that amplify the problem, so appropriate teacher-mediated interventions are helpful, as well as paying more attention, guiding to explore the learning material and giving feedback to task improvement. Teachers need to be trained and assisted in managing this kind of behavior, helping pupils to control themselves and improve relationship.

The sooner EBD disorders are detected the earlier intervention will produce results. It’s important to gain the child’s confidence, expressing personal interest and showing supportive behaviour. «Circle time» may also contribute to reducing EBD, involving regular timetable sessions when teaching groups are given the opportunity to reflect on and share experiences, to discuss issues and find solutions.

Despite the existence of a European legal framework on equality of opportunities and non-discrimination, implementing «education for all» is only at its very beginning and the real efficiency of the results is difficult to measure (Ebersold, 2011). In general terms, there are examples of countries data to show that people with disabilities have a lower level of qualification than the general population. But overall, educational opportunities in the mainstream have been increasing over the last decade in Europe and the number of children in special schools seems to be decreasing.

In 2003 the European Agency published a study on School and Classroom Practice, followed by another one focused on secondary education in 2005. The studies aimed at responding to two main questions: (i) How can differences in the classroom be dealt with? (ii) How can mainstream schools be equipped and organized in order to deal with pupils with special educational needs? Some conclusions were extracted:

1. Inclusive classrooms do exist in many European countries;
2. Pupils with behavior, social/emotional disorders are the most problematic to deal with;
3. Dealing with differences and diversity in the classroom is difficult and challenging.

According to these studies, some approaches appear to be effective in schools:

| Co-operative | Teachers need support from, and to be able to co-operate with, a |
Co-operative learning

Peer tutoring or co-operative learning is effective in cognitive and affective (social-emotional) areas of pupils; learning and development. Pupils who help each other, especially within a system of flexible and well-considered pupil grouping, profit from learning together.

Collaborative problem-solving

Particularly for teachers who need help in including pupils with social/behavioural problems, a systematic way of approaching undesired behaviour in the classroom is an effective tool for decreasing the amount and intensity of disturbances during the lessons. Clear class rules and a set of borders, agreed with all the pupils (alongside appropriate incentives) have proven to be effective.

Heterogeneous grouping

Heterogeneous grouping and a more differentiated approach in education are necessary and effective when dealing with a diversity of pupils in the classroom. Targeted goals, alternative routes for learning, flexible instruction and the abundance of homogenous ways of grouping enhance inclusive education.

Effective teaching

The arrangements mentioned above should take place within an overall effective school/teaching approach where education is based on assessment and evaluation, high expectations, direct instruction and feedback. All pupils, and thus also pupils with SEN, improve with systematic monitoring, assessment, planning and evaluation of the work. The curriculum can be geared to individual needs and additional support can be introduced adequately through the Individual Educational Plan (IEP). This IEP should fit within the normal curriculum.

From the point of view of SEN learners the European Agency has promoted Parliament Hearings at national and European level. In 2011, a European Parliament Hearing took place where young people from 31 national delegations took the stand to state their viewpoints and personal experience. These are just a few examples of their opinions:

«I am in the catering industry, I have cooking classes, catering classes, waiting staff classes etc. The goal is to get a job in the catering industry, but it is difficult: people with a disability are sometimes badly treated. A lot of changes still need to be made. The regular curriculum can sometimes be confusing for students with disabilities. The teachers are stressed for national exams and do not pay enough attention to students who need more help (Stefanos).»
«I attend a mainstream secondary school. I think it is necessary to improve teaching methods; to have more technology, visual aids and different exams (Andreani).»

«We attend a mainstream secondary school. The school provides sign interpreters, elevators and lights indicating breaks. There needs to be more technology and a change in teachers’ and students’ mentalities (Diogo and Josette).»

«I don’t benefit from additional support in my school. My classmates support me and help me by bringing me my homework. They understand me better sometimes than the teachers. I am in a mainstream school, and in my class, I am the only one with a special need. They don’t really help me as I am in a ‘normal’ school (Melanie).»

«Mainstream school made me a tougher person; it prepared me for the real world. Preparing inclusive education properly is crucial, proper materials in proper formats are crucial. You need to raise awareness and have tools to help change attitudes towards people with different needs (Gemma).»

«The ICT teacher in my school is disabled, too – this helps him understand special needs better – he is more familiar with the problems of his students (Áron).»

«Students must not be discouraged in any way (Robert). There is a need for confidence in oneself (James). It is important that teachers believe in me (Efstathios). Teachers must pay more attention to what pupils can do, instead of what they can’t do. People must see behind the disability. I am hearing impaired – that’s not me, just my ears. There is a difference between me and my disorder. Teachers need knowledge about disability. We need more activities together – out of school, leisure, sport, etc. – for fun (Elin).»

«Teachers must make it as easy as possible for everyone to learn to the same standards. Disabled young people must be involved in decisions. They are at the forefront of decisions for themselves (Keenan). Everyone must be involved, whether or not they are different – everyone is who they are (Katrina).»

«The more we mix disabled people with others – the quicker we will have positive attitudes. Not enough aids are provided – this needs to be the core initiative to make people more autonomous. For those who are included, it brings a very important social meaning to life and creates support for homework after classes and in and out of school activities. Sport is an important way of being included in social life (François).»

In conclusion, there were a number of opinions shared by many young delegates, such as:

- In terms of inclusive classes, the young delegates expect that teachers and the ‘other students’ make more effort to understand and include students with disabilities;

- Young delegates acknowledge that it is important to reduce the number of students, or to have small class sizes and to promote universal design in buildings and facilities in society generally;

- It is important to receive support without needing to fight for it;

- Training for school peers should take individual needs and attitudes into more account;
Inclusive education varies across different countries, as well as within a country. (European Agency, 2011)

Allan, J. (2010). Questions of inclusion in Scotland and Europe. European Journal of Special Needs Education, 25(2), 199-208. [https://dspace.stir.ac.uk/bitstream/1893/2821/1/QuestionsofInclusion%5B1%5D.pdf](https://dspace.stir.ac.uk/bitstream/1893/2821/1/QuestionsofInclusion%5B1%5D.pdf)

Allan, J. (2012). The inclusion challenge. [https://dspace.stir.ac.uk/bitstream/1893/9104/1/J%20Allan.pdf](https://dspace.stir.ac.uk/bitstream/1893/9104/1/J%20Allan.pdf)


CAST (website) [http://cast.org/](http://cast.org/)

Centre for Excellence in Universal Design (website) [http://www.universaldesign.ie/](http://www.universaldesign.ie/)


European Design for All Network (EDeAN website) http://www.edean.org/central.aspx?slId=641160132713231259530&lanID=1&resID=1&assID=99&inplID=3&disID=1&famID=3&skinID=3


Sánchez, S., & Díez, E. La atención a la diversidad en la universidad: Construcción de un herramienta Web de autoevaluación curricular basada en los principios del Diseño Universal para el Aprendizaje. [http://cdjornadas-inico.usal.es/docs/826.pdf](http://cdjornadas-inico.usal.es/docs/826.pdf)


http://www.lifespan.it/Client/rivista/ENG40_Unico_XIV_2011_1_engl_ok.pdf#page=77

WAI. Web Accessibility Initiative. http://www.w3.org/WAI/


AUSTRIA

LEGAL SITUATION

In 2008, the UN Convention on the Rights of Persons with Disabilities came into effect in Austria. Article 2 mentions the concept of “Universal Design”: “Universal design” means the design of products, environments, programmes and services to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. “Universal design” shall not exclude assistive devices for particular groups of persons with disabilities where this is needed.3

By signing it, the state committed to “undertake or promote research and development of universally designed goods, services, equipment and facilities, ... which should require the minimum possible adaptation and the least cost to meet the specific needs of a person with disabilities, to promote their availability and use, and to promote universal design in the development of standards and guidelines.4

To support the implementation of this convention, the Austrian Federal Ministry of Labour, Social Affairs and Consumer Protection published the “National Action Plan on Disability 2012-2020 – Strategy of the Austrian Federal Government for the Implementation of the UN Disability Rights Convention”. It also mentions “universal design”: “Starting out from the concept of ‘design for all’ or ‘universal design’, the physical environment and products and services should be designed in such a way that it can be used as simply, without problems and efficiently by as large as possible a group of persons with different conditions, abilities, preferences or needs.5 The Action Plan also mentions the “inclusion of accessibility and design for all as a compulsory subject in all relevant degrees and training courses (e.g. architecture, civil engineering, building technology) as well as for the persons responsible for these fields in building authorities and the protection of historical buildings6 and plans to realize this measure until the end of 2013. Overall, the action plan includes no standards or guidelines concerning UDL – universal design/design for all is basically only mentioned in the context of building, constructing, public transport and physical accessibility.

EUROPEAN PROJECT INVESTT

The University College of Salzburg, the University of Salzburg and the “SchulefürSozialbetreuungsberufe” in Salzburg are part of the partnership of the European


project INVESTT (www.investt.eu) which is coordinated by the European Association of Service Providers for Persons with Disabilities. The aim of the project is to apply “Universal Design in Vocational Education and Training to guide all students, with a wide range of abilities, towards success in the open labour market.” The project started in December 2012 and will finish in November 2015. In the first months of the project, the consortium conducted research on the VET educational system in the partner countries (Austria, Germany, Belgium, Norway and Slovenia) and on UDL in the learning environment. Unfortunately, the results of this research are not available yet. Starting in September 2013, the schools which form part of the consortium will pilot new practices in VET to support the inclusion of young people with disabilities in mainstream education and to make sure they can reach the same skill level as other students successfully.

MA PROGRAMME “INFORMATION DESIGN” AT THE DANUBE UNIVERSITY KREMS

The Danube University Krems, one of the pioneering institutions in Europe in the field of university-based advanced education, offers a wide range of study programmes which are specifically oriented toward the needs of working people. The master programme “Information design “, which started in 2012, aims to teach the phenomena and theories of design and information processing with a focus on the respective target audiences, usability and perception.

The programme includes 5 compulsory modules – one of them is dedicated to “Visual information design”. Its goal is to gain competence on the visualisation of data, to broaden the learner’s knowledge about Universal Design and to initiate concrete design projects.

EXPERT CLUSTER

“ExpertsCluster” are interest groups of members of designaustria which represents the country’s design scene on both national and international levels. In 2012 and 2013, two ExpertsClusters were launched which also cover aspects of Universal Design:

- Informationsdesign (information design) was launched by the Danube University Krems and the International Institute for Information Design. The meetings organised by the cluster so far also included an event dedicated to Universal Design. However, this mainly covered the topic of accessibility.
- In 2013, the cluster “Inclusive Design” was launched. It dedicates to the design of products, services and rooms to make sure as many people as possible can use them independently and effortlessly.

CONCLUSION

Research about the situation in Austria showed that the concept of “Universal Design” is mainly limited to the design of public buildings and accessibility. Apart from the European

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7http://www.investt.eu/about-investt
8http://www.designaustria.at/posts/1364-expertscluster-informationsdesign-barrierefreiheit-universal-design
Universal design in general means designing products that are totally accessible and/or usable by all people, with or without disabilities. It also means that concepts such as equality, safety, comfort and accessibility are not just considered in the final stage but influence the entire process of designing.

Universal Design is an approach that aims to exclude nobody from tangible products (such as buildings, public spaces, transportation) and intangible services (such as communication and information), however diverse people in our society might be. This is endorsed in Flanders by a number of initiatives. We will discuss 4 exemplary organisations here. The first is the NGO Enter vzw, the Flemish expertise centre on accessibility. The next two are initiatives that try to apply the principles of universal design for learning in higher education: SIHO, the Flemish support centre for inclusive higher education, and KU Leuven, the largest university in Flanders. The last organisation is the Government of Flanders, which also aims to adopt the principles of universal design into its policy.

ENTER VZW

Founded in 2006 by the Ministry of Equal Opportunities, Enter vzw is a pioneer in Flanders in the domain of accessibility. Its mission statement is threefold:

- Improve integral accessibility and promote universal design in order to create equal opportunities for everyone. Special attention is paid to people with a handicap and elderly people.
- Aim at all parties involved and all those who are interested: citizens, professionals, volunteers, governments, companies and organisations.
- Contribute to a coherent Flemish accessibility policy by inspiring, supporting, sensitizing, informing and collaborating.

Operating principles

Enter vzw primarily wants to achieve these targets by developing lasting expertise and collaborating with professional partners.

The non-profit organisation starts by mapping and evaluating the accessibility in various sectors. Enter vzw stays on track of the most recent developments in Flanders and thinks of new accessibility concepts. Their research is aimed at improving the Flemish policy and/or is applied in practical applications and instruments.

Besides doing research, Enter vzw also wants to inspire and inform all those who have questions regarding accessibility with folders and brochures. These publications document renewed concepts and guidelines, concrete tips and examples of good practice. Enter vzw has a specialized documentation centre and organizes workshops and promotional
campaigns. All these initiatives try to sensitize both the general public and specific groups such as shopkeepers, developers and architects, officials and policy makers.

Enter vzw is a structural partner of Equal Opportunities in Flanders and therefore has a significant task in supporting the policy. It wants to include accessibility in all areas of governing. For the practical execution, Enter vzw supports, collaborates with and gives advice to the provincial consultancies and the private sector. Enter vzw is also active in various European accessibility networks, which makes it possible to stay abreast of foreign developments.

### Accessibility of public buildings

The policy on the accessibility of public buildings deserves special attention. In March 2010, new regulations on the accessibility of public buildings became effective in Flanders. Public buildings had to become more usable, accessible and easier to reach for all citizens. Applications for all urban planning permissions now had to meet certain standards with respect to the accessibility of the building. This means that the authorized municipal officials have a crucial task in the first stage of granting planning permissions because they have to check each application to guarantee basic accessibility. In March 2011, a number of changes were made to these regulations to include all buildings open for public such as hotels, dressing rooms and student homes.

In order to facilitate the integration of these regulations on the accessibility of public buildings, Enter vzw has developed a manual and two digital tools for designers, builders and officials. The first tool is a checklist. This is a concrete list of questions which can be used to test the final design of a building. It indicates to what degree the building has to apply to the standards and which standards have to be followed. It can be added to the application for an urban planning permission, but this is not yet necessary. The second tool is a quickscan, which can be used from the initial stage up to the complete designing and building stages of a project. Starting from a list of questions, the quickscan gives advice with respect to the new regulations for that specific project. This way, it can serve as a guiding principle for the standards that should be followed. If the project changes during the designing or building stages, the quickscan can be adjusted so that the most significant issues always emerge.

### Projects on every level

Besides the accessibility of public buildings, Enter vzw also wants to endorse the accessibility policy in Flanders on all other levels of society. These will be discussed briefly below.

- **Public environment**: all accessible public areas have to have smooth, high and wide passages, a clear and unobstructed surface and no thresholds.
- **Mobility**: focus on research projects on accessible public and private transport systems in Flanders and information on the current range of accessible and adjusted modes of transportation.
- **Living**: practical information for everyone about the adjustments of private homes so that people can live independently at home for a longer time. Also the neighbourhood and municipality or city level is considered.
- **Health care**: an ergonomic, safe and pleasant environment contributes to a more efficient care provision, which benefits both health care worker and patient.
• Culture and leisure: linked to the accessibility of public buildings such as museums and concert halls and the accessibility of service and communication.
• Tourism: information on the level of accessibility of touristic infrastructure such as hotels and camp sites.
• Education: support designers and builders to optimize the accessibility of schools to make them pleasant and safe environments for all those involved.
• Patrimony: enable creative solutions by eliminating the obstacles to information on people’s history and identity.
• Parks and green areas: sufficient paved roads and benches, without disrupting the natural character.
• Communication: priority to understanding and being understood, with initiatives such as accessible signposting, websites and fonts.
• Sports: attention to the range and organisation of sports events and multifunctional solutions with respect to the infrastructure.

SIHO

SIHO, the Flemish support centre for inclusive higher education, was founded in July 2008. The organisation promotes equal opportunities in all institutions of higher education for students with disabilities. It is the result of the collaboration between the Flemish Government, the consortium University College West-Flanders, Ghent University and the Vrije Universiteit Brussel for a period of five years. In 2010, Antwerp University and the University College of Limburg joined in for a period of three years.

SIHO carries out research and cooperates with all institutions concerned to support people with disabilities to fully participate in higher education.

Besides SIHo we see some initiatives in individual institutions for higher education:

• KU Leuven: guidelines for accessible documents, developing technology and improve access for school age learners with special educational needs.
• Antwerp University: chair at the university.
• PHLimburg: partner in creating a website about ICT tools to make learning more accessible for all students, regardless of their capacities or limitations.

Website universal design for learning

Each student is unique, and tools or software that want to be based on the principles of UDL have to be accessible to all of them, however varied this group of students might be. The website of SIHO features a collection of tools that are based on the principles of UDL. These tools and learning objects take the differences between students into account right from the start. This approach is different from assistive technology, which is aimed at solving a specific individual need for support.

SIHO is also developing an online course on UDL. The first module is an introduction into UDL and was launched in September 2013. The second module goes deeper into the principles and guidelines discussed below and will start in December 2013.

Principles and guidelines
Each UDL tool on SIHO’s website is labelled with a number of guidelines or principles on which it is based. SIHO distinguishes three main principles and nine guidelines:

Provide multiple means of representation:

- Making it possible to absorb information through various senses.
- Clarifying and offering structure.
- Offering various possibilities.

Provide multiple means of action and expression:

- Handling the subject matter in various ways.
- Demonstrating what the user has learned in various ways.
- Offering support with setting targets and priorities.

Provide multiple means of engagement:

- Anticipating interests.
- Creating perseverance.
- Offering possibilities to evaluate and adjust the own performance.

KU LEUVEN

The largest university in Flanders has provided solutions for students and staff with disabilities for several decades. It has its own guidelines for web accessibility, which guarantee that all visitors of their websites and all users of their applications can use them in various circumstances and configurations. Several of its websites have the AnySurfer label, a Belgian quality label for websites that can be used by everyone, including blind, colour blind and elderly people and people with visual, auditory or motor disabilities. The label is granted by Blindenzorg Licht en Liefde vzw.

KU Leuven has also issued a folder with guidelines and examples of good practice for creating accessible documents such as Word, PowerPoint and PDF files and other types of multimedia. It is very important to create a layout and text that are highly ‘visible’ for people with disabilities, so they can use the various tools (text-to-speech software, screen reader, etc.) available to them to navigate through these documents.

A couple of years ago, the university also started various initiatives on digital accessibility that start from the international and Flemish regulations and policy on accessibility. They define digital accessibility as the accessibility of electronic information, software and services for people with a functional limitation. These include websites, digital learning environments, intranet, e-mail services, library catalogues and all the information that is offered through these media.

KU Leuven also has a working group on digital accessibility which stimulates, coordinates and attunes all initiatives of the university with respect to accessibility. This way, it can gather expertise so that it can inform and advice others. The working group consists of representatives of the internal services of the KU Leuven that are active in the area of ICT and/or functional limitations, technical experts and participants in the policy.
The coalition agreement 2009-2014 of the Government of Flanders endorses the importance of Enter vzw in increasing the overall accessibility on all levels of society. It also states that the provincial consultancies on accessibility will get more support, so that these can improve their sensitizing and supporting role with regard to local authorities and citizens. Special attention will also be paid to the accessibility of public transportation for people with disabilities and initiatives in this area will be supported.

Accessibility is also one of the five main objectives of the policy on mobility. No citizen should have to feel restrained in his or her personal development due to limitations on mobility. If everyone wants to fully participate in our society, we all should have the possibility to move around without any obstacles. Accessibility is then understood as the extent to which people can make use of (means of) transportation in meeting their need for moving around without the assistance of third parties.

The government will also make some changes to their websites in order to be more accessible. If they meet the requirements, they can get the AnySurfer label.

CONCLUSION

Accessibility seems to become a major topic that is taken into account when designing and building products, buildings and society in general. However, most of these initiatives to promote accessibility are taken at the final stage of a project or are meant to improve already existing products, building or services.

Universal design for learning is not yet an issue for educational organisations in Flanders. We have a system where pupils with special education are mainly in special schools. We also have integration projects (GON) but the main focus lies here in the integration of the pupil with special education needs and less to include the pupil. So we focus more on the accessibility tools and less on the UDL.

We have a smaller project for inclusion (ION), but here lies the main focus on pupils with a mental disability, mostly in primary education.

DENMARK

OVERVIEW OF CURRENT DANISH NATIONAL INITIATIVES ON UDL/INCLUSION

In our national analysis of relevant UDL research, policies, products or cases of learning practices we did not identify specific UDL references. In Denmark researchers, policy makers and teachers primarily address the principles of Universal Design for Learning (UDL) as 'inclusion'. We mainly use universal design in architecture and building technology, although what is understood by the concept is a more basic general effort to develop 'products', which in their function are inclusive already by the features of the product. Some researchers say that they have given up trying to use the UDL-term because it was often misunderstood.

The UCDL principles are thus embedded in the term inclusion, and this is the philosophy, which lies underneath the new Danish initiatives and ways of thinking.
A cooperation enabling inclusion by meeting current, local demands and making research available for pedagogical practitioners.

The National Inclusive Counseling Unit is an outgoing consulting unit of the Ministry of Education, aiming to support improved inclusion in day-care facilities, schools and after-school centres by cooperating with municipals on meeting local needs. In its facilitating work, the Counseling Unit cooperates with the Center for Inclusive Education and Special Needs Education, which is a knowledge gathering unit, aiming to make knowledge available and applicable.

The National Inclusive Counseling Unit was initiated by the Ministry of Education in August 2012, and is nationally funded through 2015. It cooperates with twenty municipalities on overcoming challenges and supporting initiatives in relation to the process of increased inclusion. It’s main objective in this process is to ensure that local actions for improving inclusion are professionally justifiable on the basis of research-based knowledge and skills of pedagogues and teachers.

Though the cooperation is limited to twenty municipalities, the National Inclusive Counseling Unit offers national support through networking, conferences, seminars and this online website. The vision of the effort is to ensure inclusive learning environments, making it possible for all children to thrive and achieve high academic skills through active participation. In fulfilling this task, the National Inclusive Counseling Unit profits greatly from cooperating with the Center for Inclusive Education and Special Needs Education.

Accumulating, applicating and developing knowledge
The Center for Inclusive Education and Special Needs Education has the overall objective of linking pedagogical research and practice. In the pursue of this ambition, it strives to:

- gather and systematize existing knowledge
- make existing knowledge applicable
- develop new knowledge on inclusive learning environments.

The Center for Inclusive Education and Special Needs Education works closely with the Panel of Practitioners and Experts, which has the objective of identifying current knowledge deficits in pre-schools, schools and leisure time facilities. On this basis, the center is capable of initiating relevant activities in relation to an established knowledge network, which consists of representatives from universities, research institutions and university colleges, and thereby eliminating the shortage of knowledge on inclusive learning environments. It is this production and gathering of currently demanded knowledge that the National Inclusive Counseling Unit ensures is distributed to municipals as well as on a national level, hereby enabling a professionally justifiable transition to increased inclusion.

**REVIEWS OF INITIATIVES OF INCLUSION**

In 2012 The Center for Inclusive Education and Special Needs Education commissioned the Danish Clearinghouse for Educational Research to conduct a systematic review of effect and pedagogical activities of inclusion of SEN children in primary and lower secondary schools.

On the basis of the synthesis, the researchers conclude that it is possible to include students with special needs in general education, and it can have a positive effect on the academic and social development of all students. It requires that teachers have access to training, resource persons and knowledge of teaching methods and interventions that target students with special needs.

In connection with the project ‘Organisation of Provision to Support Inclusive Education’ the European Agency has conducted another literature review.

None of these initiatives refer directly to principles of UDL, but they review initiatives that effect inclusion of SEN students.

**INCLUSION IN PRIMARY SCHOOL - WHAT WORKS?**

New research from the Danish Clearinghouse for Educational Research

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9 The review is accessible at: http://inklusionsudvikling.dk/Service/~/media/Inklusion/Filer/pdf/relis/systematisk%20review%20-%20effekt%20og%20p%c3%a6dagogisk%20indsats%20ved%20inklusion%20af%20b%c3%b8rn%20med%20%20c%3a6rilge%20behov.ashx?smarturl404=true

10 The review is accessible at: https://www.european-agency.org/agency-projects/organisation-of-provision/organisation-of-provision-literture-review.pdf.
How do we most effectively include children with special needs in general education? At present it is one of the key issues, where inclusion is a significant milestone in Danish and international special needs policies. In a new systematic review the Danish Clearinghouse for Educational Research at Aarhus University identified the international research in this area in order to enhance our knowledge about the teaching and learning methods that have the greatest effect. Among other findings research indicates that it has a significant impact on the effect of inclusion if teachers have access to the right competences, for example in the form of training or the ability to consult special resource persons. In this respect, research emphasizes that two-teacher teams with both a general teacher and a special education teacher present in the class at the same time have a positive effect - but only if teachers are instructed in collaborative learning.¹¹

"INCLUSION IN PRIMARY SCHOOLS WORKS!"

The site of Local Government Denmark (Kommunernes Landsforening) reports http://www.kl.dk/menu/Inklusion-i-folkeskolen-virker-id138047/

An interim report shows for the first time in many years that fewer children are sent from the regular public school class and in a special class.

For the first time since the late 1990s schools have succeeded in reducing the number of children being sent away from the regular public school class into a special class.

In 2010, 93.1% of all school children attended a regular class in compulsory school. In 2013 this number was 94.9%, which represents an increase of 1.8%. The results are based on 12 representatively selected municipalities.

"We have tried to crack this curve since the late 1990s. We have talked about inclusiveness and inclusion, and nothing happened. And then poof! We did it", one of the researchers NielsEgelund reported to the newspaper Politiken.

The revised rate is due to mainly two things: A change in the law, which means that since August 2012, special education is targeted to only those students who have extensive needs for support. And that many municipalities use economic incentives for schools to keep students with special needs.

At the same time the interim report refutes that municipalities use inclusion as a saving exercise. According to NielsEgelund experience so far shows that the economy follows with students when you start introducing inclusive measures.

"So this means that the money that otherwise would previously have been earmarked for a particular student to a particular special class or special school, is being channeled to the school leader’s office in the ordinary school," says NielsEgelund, who co-authored the report.

Estonia has adopted the principles of inclusive education and in the development plan for the general education system, one of the leading goals is to further implement the principles of inclusive education together with counselling and make support specialists available for children with special educational needs. Also, the challenge is to develop necessary study material and ensure a suitable study environment for the talented ones (“Development plan for the general education system in 2007-2013,” p 10).

In the Basic School and Upper Secondary School Act, the principles of supporting the development of students in schools are set out. According to the Act, teachers have to adjust the teaching according to the students' needs: choose suitable teaching methods and use differentiated instruction when needed. The Act also states that in order to ensure suitable learning conditions for a student with special educational needs, one has to make changes or adjustments in the content, study process, workload, duration, environment (such as tools, classes, communication language, also sign language or other alternative means of communication, support personnel, teachers with special preparation), expected study results or a study programme for the students that is put together by the teacher.

The Institute of Psychology at Tallinn University carried out a survey where the impact of teachers' knowledge of children's special needs on the children's academic development in a different language of instruction was examined. 28 schools where the language of instruction was Estonian took part in the longitudinal survey. These were schools where bilingual children and children who spoke Estonian as mother tongue studied together. The survey included only bilingual students (whose home language was different from the language of instruction and/or who chose the Russian version of cognitive tests). The teachers' knowledge of the children's special needs was measured by a test that consisted of 30 factual questions on six topics: general learning disorders, hyperactivity, depression, epilepsy, dysgraphia and talented children. The teachers' knowledge had an impact on children whose intellectual level was average. The students of teachers with better preparation could develop and were able to achieve higher goals relative to their potential in mathematics. Teachers with weaker results tended to be associated with pupils who didn’t realise their academic potential (The Institute of Psychology at the Tallinn University 2012, p 31-213).

Including children with special needs in regular schools is a great change and challenge for teachers. In order for it to succeed, the teacher has to get to know the children with special
needs better and be aware of methods implemented in special needs education. In-service training in special education is provided to teachers at the University of Tartu and Tallinn University, which offer teacher training in Estonia. A special education course is also included in initial teacher training programmes in universities.

In order to support children with special needs, study counselling centres were established in every county in 2009. The establishment of the centres was funded by the European Social Fund programme “Developing an educational counselling system.” In the counselling centres, parents and teachers are given help in connection with special education, social education and psychology (“Study counselling services” of Foundation Innove). In addition to evaluating the children’s development level, knowledge and skills, a lot of attention is placed on advising the teachers on special educational needs and drawing up an individual study programme.

In the framework of the European Social Fund programme “Developing study material for children with special needs” a lot of methodical and study material has been produced for children studying according to a simplified national curriculum for basic schools and children studying according to the national curriculum for students with moderate and severe learning disabilities.

**SOURCES:**

**ITALY**

**LEGISLATION AND UDL**

In 1977, Italy was the first country in Europe to adopt a model of full school inclusion. Law no. 517 of 1977 rules that the right to education has to be guaranteed to every child, regardless of any disability. The law also calls for some fundamental principles, such as the personalization of learning and assessment. Later on, in 2003, another law, Law no. 53, strengthened those principles by broadening the scope of the previous law to the professional training and vocational education. In 1992, practical guidelines were also given, including the use of assistive technologies and ICT. However, the model was based on a biomedical approach to disability and the main point was the medical diagnosis of disabilities.

In 2010, by means of Law no. 170, approaching specific learning disorders, beside the medical diagnosis, another point is highlighted, that is the right to have a personalization as to teaching methods and tools. Differently from disabled students such as motor disabled students, deaf, blind etc., for whom a SEN teacher is provided, specific learning disorders
students have the right to use ICT and to be taught by subject teachers who have to adapt their teaching methodologies to them.

In 2004 another important Law was ruled out: it is Law no. 4, calling for the accessibility of elearning tools and platforms and in 2008 a specific Law - Law no. 133 - approached the issue of digital textbooks, obliging school publishers to make them accessible.

As in other European countries, the term “inclusion” is progressively being used instead of the term “integration” since the fact of guaranteeing SEN students to attend mainstream schools is not enough. Teachers have to modify their style and way of teaching according to every student preferences, needs, learning style etc. The debate in Italy is fueled also by the data: the number of students with a disability certification has increased from 1.7% in 2000 to 2.5% in 2010. Other reports, such as the one by Caritas Italy and Fondazione Agnelli – a Foundation studying the state-of-the-art of the Italian school system - point out that the percentage of students with learning difficulties is two times the official one. The report by Caritas and Fondazione Agnelli concludes that apart from the “good principles” supported by legislation, the school situation is far away from making inclusion a reality.

In 2005, Dario Ianes, an eminent professor and expert in the field, defined the concept of Special Education Need in a rather innovative way, dropping out the biomedical approach and referring to “Any developmental difficulty, in education or learning, on a functional level as defined by the ICF [International Classification of Functioning Disability and Health], difficulty that can be seen as a damage, as an obstacle to the child wellbeing, or as a limitation to his/her freedom, his/her social and interpersonal growth and his/her opportunity to self-actualization, regardless of its etiology (that is structural, functional, family, environmental or cultural origins) thus implying the need for personalized education”. Ianes’ definition tends to identify SEN students with all students needing some degree of personalization and he usually says that “All of us, at least once in life, are SEN people”.

Recently, in 2013, the Ministry of Education measure named “Intervention tools for SEN students and local organization for school inclusion” and the consequent Ministry communication to schools of March 2013 show the resonance of this international and national debate.

All teachers are now required to know about SEN specificities and to approach the issue in the sense Ianes’ pointed out already in 2005. There can be permanent or temporary SEN students but regardless of the time factor and of the formal certification they may have, they all deserve the best teaching strategy from all curriculum subject teachers through an accurate planning to be described in the students’ Personalized Teaching Plan. This implies more training and more responsibility for the whole school.

Another Ministry communication, no. 1551/2013, says that each school should provide an Annual Plan for Inclusion, thus identifying the “Plan as a tool to increase the awareness of school leadership and community, who has to consider inclusion as a crucial issue to reach qualitative educational outcomes”.

12 D. Ianes, Bisogni Educativi Speciali e inclusione, Erickson, Trento 2005
The latest legislation framework has brought about a lot of discussion among teachers and school personnel and the concept of Universal Design for Learning is ever more cited, if not formally at least informally, in those debates.

UNIVERSITY RESEARCH AND UDL

In 2003, a decree established that Universities can use elearning in the delivering of lessons. Since then, the interest from universities on information and content accessibility has increased and now the UDL framework is often studied by researchers and taught in university courses.

Just to mention some university initiatives relating to UDL, in 2009 the University of Bari hosted the 8th European conference on elearning, where a plenary speech was given by professor Scott Grabiger of the University of Colorado on the topic. The University of Bari has also designed an online environment based on UDL principles, together with the Design for All fundamentals and multiple intelligence theory suggestions. On a technological level, the platform was also implemented with ontology-driven features with the collaboration of the University of Salerno.

Another interesting project at the university level is the WISE project (Wiring Individualized Special Education), 2010-2012, managed by a Consortium made up of several Universities and the Institute of Educational Technologies of the National Research Council in Italy, where the ICF model was adopted and UDL principles were also taken into account.

In the University of Rome, at the PHD school on Pedagogy and Social services, the PHD student Eleonora Guglielman wrote a doctoral dissertation on UDL in relation to teaching methodology guidelines for accessibility in schools.

At the doctoral school of Bergamo, dedicated to human resources and labour market, a doctoral dissertation was made by PHD student Federica Baroni tackling the issue of school inclusion and ICT, with a strong focus on planning teaching practices to support and foster the valorization of students’ differences.

In the University of Florence, the Educational Technologies Lab, led by professor Antonio Calvani, has included a module on UDL with their elearning master degree courses, with a special attention to evidenced-based education policies. In a recent international conference host in Florence in 2011, titled “ICT for inclusive learning: the way forward” Professor Calvani and his group presented a paper on UDL named “Instructional principles, universal learning design and role of technologies”. Furthermore, a publication of 2013 by professor Calvani includes an analytical section on UDL.13

Finally, in the first volume of the REM (Research on Education and Media) journal, whose Editorial Board is made up of important universities - such as the University of Bari, of Macerata, of Salerno, of Milano-Bicocca, of Milano-Cattolica, of Politecnico of Torino and of

13 A. Calvani, Per un’istruzione evidence based. Analisi teorico-metodologica internazionale sulle didattiche efficaci e inclusive, Erickson, 2013
Stanford -, there are two articles dedicated to UDL, one of which is a systematic review of 80 research articles dealing with UDL.\textsuperscript{14}

EDUCATIONAL SYSTEM AND UDL

Within the educational system, the concept of UDL was referenced when talking of education through media, ICT and the like since the latter have proved to be effective in empowering the students’ self-esteem and resilience.

In Italy, in the latest years, the massive plan for the introduction of Interactive White Boards (IWB) in schools, and the national initiatives addressed to the innovation of class settings and practices\textsuperscript{15} have engendered the adoption of new teaching practices and the exploitation of the ICT potential for learning, including the inclusive dimensions of those.

At the same time, the introduction of digital textbooks, as provided by Law 133/2008, has reinforced the accessibility principles mentioned in the previous legislation measures and many instructional design experts have referenced the UDL framework as a lighthouse in the field.

A field-research carried out by the Department for Human and Social Sciences of the University of Bergamo\textsuperscript{16}, dealing with digital textbook, User Centered Design and Design for All, found out that UDL could be the way to overcome the limits of assistive technologies and of special tailored solutions to start using a new approach in instructional design where flexibility and multiple representations could be the key to equal opportunities in accessing information and learning.

During the school year 2012/13, the University of Bari, within the project “From theory to practice”, has carried out an action-research activity dealing with teaching strategies, metacognition, cooperative learning, student networking, vertical continuity and innovative learning practices, based on UDL guidelines.

During this academic fall, the University of Bicocca in Milan, has introduced the UDL framework and its practical guidelines within the master degree course addressed to in-service teachers and new teachers, titled “Teaching to Specific Learning Disorders Students” and within the course “Technologies for Inclusion”. The University of Florence is actually running a master degree titled “New digital competences: open education, social e mobile learning” within which UDL is presented as an effective and inclusive way of instructional design.

Finally, the Local School Authority of the Emilia Romagna Region in the communication to the schools on the Annual Plan on Inclusion (ministry measure no.1551/2013) has attached

\textsuperscript{14} Universal Design for Learning: A meta-analytic review of 80 abstracts from peer reviewed journals was also presented at the conference “Learning & Teaching with Media & Technology” by ATEE (Association for Teacher Education in Europe, host in Genoa in March 2013.

\textsuperscript{15} The National plan “Digital School” (It: Piano scuola digitale), starting from 2008 onwards.

\textsuperscript{16} The paper was also presented at the 27th conference “DidaMatica”, held in Pisa 2013.
to it a detailed dossier for teachers, head teachers and school professionals to consult, where the UDL framework is specifically mentioned.

**CONCLUSION**

In conclusion, we may say that the UDL framework is starting to be used and referenced in University contexts, where training courses addressed to teachers are delivered. In the educational research field it seems to be a promising area of study as well. As for the policy and education system contexts, the term “UDL” is never mentioned apart from a formal communication of the Emilia Romagna regional educational authority since the Ministry and Governmental measures and laws still prefer to use the term “inclusion”. However, the latter is intended with a meaning that is quite close to the UDL’s one.

**PORTUGAL**

**NATIONAL OVERVIEW ON UDL POLICIES, EXPERIMENTATIONS, STUDIES IN PORTUGAL**

In Portugal, the legislation passed in 2008 (D.L. no. 3/2008) to reorganize special needs education gave a big impulse to inclusion in mainstream schools, since it made compulsory the enrollment of SEN pupils in regular schools. A negotiation with special schools took place to agree a new framework of action turning them into resource centres (90, in 2013), taking advantage of their specialized staff (technical/therapeutical) to support pupils in mainstream schools.

Since 2008 a growing number of SEN pupils have enrolled in mainstream schools (49,149 pupils in 2012-2013). Pupils eligible for special needs are profiled according to the International Classification of Functionality and only those with severe difficulties benefit from special educational measures. These measures include personalized pedagogical support, individual curriculum accommodations, enrollment process adjustments, specific individual curriculum, assessment accommodations and assistive technologies. Moderate or milder learning disabilities are dealt with general support to pupils in schools. Those with severe difficulties count on extra specialized staff support and material support.

Some reference schools were established for the teaching of blind and low vision pupils (44 schools, in 2013) as well as deaf pupils (23 schools, in 2013) and many specialized units were set up in regular schools to support pupils with multiple disabilities (336 units, in 2013) and autism spectrum disorders (256 units, in 2013).

Physical accessibilities were provided (ramps, lifts, etc) in schools and SEN teachers were placed to support SEN pupils as well as extra auxiliary staff, important to take care of less autonomous pupils (lunch, toilet assistance, etc).

Every SEN pupil has an individual educational plan and many school leaders try to create an inclusive environment in schools.

Teacher training on inclusion of SEN pupils and related issues has been provided, but a lot more training is required to involve all teachers that have SEN pupils in respective classrooms.
Regarding adapted educational materials, alternative formats have been produced by the central SNE services (MoE), with staff dedicated to adapt and provide textbooks in Braille, Daisy format, accessible pdf, as well as embossed materials.

Multimedia children’s stories with learning activities have been produced by SNE services (also in collaboration with an NGO), on a Design for All (DfA) approach, which include, pictographic version, Braille version and sign language.

A network of 25 ICT Resource Centres for Special Needs was created in 2007-2008 to raise awareness for inclusion and the benefits of assistive technology. UDL is a concept familiar to this network shared in the Moodle virtual community run at the Ministry of Education.

They assess SEN pupils’ needs for technology (namely, assistive technology), train teachers for the use of technology and promote many public sessions with specialized companies and experts addressed to school community (teachers, technical/therapeutic staff, families). Recently, they have been promoting the use of a software, that incorporates Daisy format, among teachers who support blind and low vision pupils, resulting from a partnership between the Ministry of Education, a mobile phone company and a school publisher. Simultaneously they have been disseminating a colour code (ColorADD/portuguese company) for colorblind people.

Some specific methodological approaches have been fostered such as the TEACCH model (Treatment and Education of Autistic and Related Communication Handicapped Children) for ASD pupils, in the ASD units in schools. TEACCH model was founded in the University of North Carolina and its philosophy recognizes autism as a lifelong condition. It does not aim to cure but to respond to autism as a culture. As people with autism are predominantly visual learners, intervention strategies are based around physical and visual structure, schedules, work systems and task organization.

Regarding the teaching and learning of deaf pupils, the Ministry of Education established a curriculum in sign language, recognizing it as the first language of deaf pupils. Sign language interpreters are assigned to support deaf pupils and subject teachers.

Several publications were produced by the central SNE services (MoE) with recommendations and curriculum guidelines for these specific special needs, addressed to schools and teachers. UDL approaches are referred in these guidelines, namely in the multiple disabilities and deaf-blind publication, which also addresses daily life activities, communication, orientation and mobility.

A special case of inclusion may be the example of the school «Escola da Ponte»17, a public school which embraces pupils from kindergarten to 9th grade and has a special management and pedagogical organization, with major intervention of parents and pupils. In 2011-12 it had around 170 pupils, among which 19 with special needs, around 62% of the pupils received social financial support. The school is not organized by school years or ages, as traditional ones. They have 3 levels of learning: (i)Initiation, (ii) Consolidation and (iii)Advanced. Curricular areas are gathered in broader and transdisciplinary dimensions: (i)

17 http://escoladaponte.pt/
linguistic, (ii) logic-math, (iii) nature, (iv) identity, (v) artistic, (vi) personal and social. Pupils plan their objectives and tasks for every fortnight with respective tutors. They try to research and learn by themselves, and when they have difficulties they ask for help of peers and finally of teachers. They are engaged in many projects and activities within the school and with the local community, organized by parents, teachers and other partners from the community. They are distributed by «Responsibilities» regarding the organization of events or projects. Pupils organize themselves and deliberate on many issues, such as discipline, they meet weekly in general assembly. Pupils with Special Needs have the same rights as their peers and are accepted by all. As they stipulate the rules of conduct, there are no problems of violence. The environment between the staff and pupils is collaborative and of mutual respect. According to surveys made by the school and included in their self evaluation report of 2011-12, the satisfaction of SEN pupils is 100% regarding the school, the peers that help, group work, teachers and other auxiliary staff. Regarding the opinion of other pupils towards their peers with special needs (many are not aware of the fact, for them these are just peers with more learning difficulties), most of them have a very positive attitude, considering important for their own development this relationship and solidarity.

A follow-up study to the implementation of the SNE legislation of 2008 was commissioned by the Ministry of Education to a Polytechnic Institute (coordinated by Prof. Simeonsson) which produced a report in 2010. It focused on the application of the International Classification of Functioning (ICF) and educational measures for SEN pupils.

A report on Special Education of the General Inspectorate of Education, for school year 2011-2012, was published as a follow-up of a previous report to monitor Special Needs Education, covering a sample of 97 schools with SEN pupils. The report addressed the dimensions of SNE planning, referral and evaluation procedures, IEP elaboration and implementation, articulation between schools, families and other services; human resources and material resources management; articulation with Early Childhood Intervention. The report presents the following conclusions:

Concerning organization and planning of special needs in schools:

- Management instruments of schools such as Internal Rules usually describe the organization and structure of special needs, but in many schools, other instruments such as the Educational and Curricular Project of the school fails to refer strategies and targets for special needs;
- Classroom/group curricular projects present the characterization of SEN pupils, but sometimes fail to plan educational measures to implement;
- A growing concern with the organization and guidance of special needs by schools is acknowledged this year;
- Criteria of distribution of service among SEN teachers and auxiliary staff and respective registration is missing, though globally defined; more planning and self-regulation of special needs is required;
- A big investment in protocols and partnerships to improve quality response to SEN pupils needs is acknowledged;
- More teacher and other staff training is required;
- Collaborative work among SEN teachers has proved productive for planning and evaluating results;
- There are still some constraints regarding physical accessibilities in some schools;
Better organization of individual records of SEN pupils is required, to make its consultation easier.

Concerning educational measures and results of SEN pupils:

- Effective integration of SEN pupils in school daily life is recognized, promoting their participation in interdisciplinary activities and cultural and social activities;
- Eligibility process for special needs, grounding reasons in technical-pedagogical reports (ICF) is still critical; sometimes evidences are missing;
- Deadlines for elaborating IEP are not met. Notwithstanding, responses to pupils needs are in place;
- Classroom council is not involved enough in the decisions about educational measures for SEN pupils;
- IEPs are not clear in what respects the level of participation of SEN pupils in school activities;
- Short term plans don’t express clearly strategies, curricular accommodations, activities, timings and who is in charge for them;
- In some schools, IEP monitoring and evaluation runs well but in other cases require better consolidation;
- Families are satisfied with educational and technical responses;
- Some pupils’ reports require more detailed information; SEN pupils results require monitoring and more systematic analysis;
- Good practices were found such as: the elaboration of a joint action plan by SEN teachers; daily records on the performance of pupils in a proper evaluation document; anticipation strategies to prepare subjects contents, as a personalized pedagogical support; specification of common criteria for SEN pupils assessment.

Recommendations are produced by the Inspectorate of Education in this report:

- To the teacher training centres is recommended the organization of training for all teachers from kindergarten to secondary school as well as classroom directors, on issues of IEP management, individual curricular accommodations and specific individual curriculum; training for auxiliary staff on issues related to the activity in specialized units (multiple disabilities and ASD);
- To schools: mind deadlines for referral processes and IEP elaboration; organize pupils’ records with all necessary documents, duly subscribed by staff in charge and family; to guarantee that the complete record of the pupil follows him/her in case of transition of school; to prevent that therapy sessions don’t overlap subjects timetable; to guarantee the appointment of teachers for ICT Resources Centres for Special Needs; to involve the classroom council in the implementation of IEP and other special measures; to endeavor the school accessibilities; to organize service and staff for early Childhood Intervention.

Despite the efforts there's a long path to achieve the standards of inclusiveness, aggravated at present with cuts in public budget owing to the financial crisis. Reduction of teachers in the education system and auxiliary staff as well as in resources, such as assistive technology, may constitute a drawback.

Work is in progress towards a full inclusion. The rhythm varies from school to school. It will take several years for the adjustment of the education system and the actors involved, but as
one of the youngsters said in the Parliament Hearing «The more we mix disabled people with others – the quicker we will have positive attitudes.»

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TEACCH.
PART 2: UDL IN PRACTICE – CASE STUDIES

The following case studies follow a similar format and show how UDL was adopted within mainstream classes. Each study provides information under the following headings:

- Title
- Case study video (if available)
- Who conducted the case study
- Institution where the practice was conducted
- Date (beginning and end of the practice)
- Period of observation (beginning and end)
- Universal Design for Learning pillars
  - Provide multiple means of representation
  - Provide multiple means of action and expression
  - Provide multiple means of engagement
- Age of the pupil(s)
- Context
  - Pupil(s) characterization – ICF (International Classification of Functionality) - condition of functionality and participation, IEP (individual educational programme), curricula adaptations
  - Pedagogical situation - description of tools and resources used in specific pedagogical activities, educational setting, assessment adaptations (if any)
- Teaching objectives (general and specific objectives)
- Teaching methodology (in the UDL perspective, please specify the individualization path applied to the learning disorder pupil and, if this is the case, how the individualized path was used by the whole classroom and how, i.e. for the same objectives? For different ones?)
- Teaching tools/materials (both online and offline)
- Assessment
- Theoretical references and in-service teacher training
- Case study methodology: case-study documentation analysis, observation, discussion, interviews with teachers, headteacher, parents and pupils
- External collaborations (when they exist)
- Links about the case study (website, videos, slideshare, materials, etc.).
DEVELOPMENT OF SOFTWARE FOR PEOPLE WITH DISABILITIES UNDER CONSIDERATION OF UDL CRITERIA

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E-Mail: office@lifetool.at

DATE (BEGINNING AND END OF THE PRACTICE)
January 1999
Consultation appointments from 2000-2012

Right from its foundation in 1998, LIFEtool has been dealing with the development of special software programs. In the last 15 years, 22 software titles were published. This number does not include upgrades which required a complete redevelopment of the program. This means that on average 1-2 programs were released a year. Depending on complexity, programming software usually takes between 500 and 1,000 hours. However, prior to the actual programming, a pedagogical concept has to be developed which takes several months.

PERIOD OF OBSERVATION (BEGINNING AND END)
After about two thirds of the programming time, intensive external testing starts. It focuses on usability, accessibility and rigour in terms of content. Potential future users of the program test it for about 4 weeks and then give feedback. The project manager analyses it and uses it as a basis for the final adaptations of the program.

UNIVERSAL DESIGN FOR LEARNING PILLARS

√ Provide multiple means of representation
√ Provide multiple means of action and expression
√ Provide multiple means of engagement

AGE OF THE PUPIL(S)
LIFEtool’s original target audience consisted of children and young people with disabilities as well as of school starters without disabilities. However, experience showed that it is more reasonable to not focus on certain age groups.

Typically, the evaluation of cognitive abilities of people with disabilities is indicated in formative years. Thus, an adult in the cognitive developmental stage of a 5- or 6-year-old also needs exercises with similar contents like a preschooler. However, a person does not only develop cognitively but also socially and psychically even if the latter two might not be consistent with the first one. Because of that, adolescents and adults might perceive exercises requiring adequate intellectual skills as too childish concerning the design or the feedbacks.

LIFEtool makes sure that the appearance, the design and the acoustic feedbacks of its programs are both motivating and as little age-dependent as possible. However, most users are still in kindergartens and schools and are aged 4-10 years.

CONTEXT

By ratifying the UN Convention on the Rights of Persons with Disabilities, Austria has committed to introducing inclusion as one of the guiding principles of educational policy. This requires the expansion and adaptation of teaching methods to work successfully with heterogeneous groups. In 2005, the so-called “Schulunfähigkeit” (unschoolability) was abolished making it impossible for educational authorities to exclude a child from compulsory education.

Inclusion includes the request for the best possible education for all children and the guarantee that each child’s need for individual support is met as much as possible. In Austria, about half of the students with special needs attend a mainstream school (primary or lower secondary school). It is very challenging for their teachers to teach groups of children with a very wide range of abilities and competencies – after all it is not only necessary to teach them subject matter but also to foster social learning and to motivate the individual opportunities to participate actively in class.

PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

The following things can make participating in class more difficult for the students:

- A physical disability which makes it impossible to hand in written assignments or to take notes within a reasonable period of time. In addition, exercises with physical activity such as setting tiles, experiencing letters kinesthetically, stacking, sorting,... can be problematic.
- A learning disability which requires the creation of small portions of the taught content. On the one hand, this strategy gives the students the feeling of success; on the other hand, they will only be given more difficult tasks once they have mastered the easier ones successfully.
• Impairments of perception which require the delivery of content in various media formats such as audio, video (in appropriate size, clarity and coloring, in a non-written format) and others.

A speech impairment which makes it impossible for non-speaking students to contribute to class directly in a verbal way.

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**PEDAGOGICAL SITUATION - DESCRIPTION OF TOOLS AND RESOURCES USED IN SPECIFIC PEDAGOGICAL ACTIVITIES, EDUCATIONAL SETTING, ASSESSMENT ADAPTATIONS (IF ANY)**

- IT-competency is one of the key competencies which are of course taught by schools. The IT educational offensives eFit and eFit2 of the Austrian Ministry of Education, the Arts and Culture laid the foundations for the establishment of IT in the Austrian educational system in terms of technology, infrastructure and methodology (Cf. link #1). Thus, all schools should have the chance to use the possibilities of ICT in education.

- Students with a motoric impairment might need special input devices to work with a computer. Operating a computer mouse can be made possible by a variety of special mice, joysticks, trackballs, multi-button mice, head mice or even simple switches which only require a single muscle to be operated. In addition, there’s also a large variety of special keyboards available – there are mini keyboards and large key keyboards with simple or more complex layouts (link #2). In Austria, the legal implementation of the UN Convention on the Rights of Persons with Disabilities has not advanced so far that children who have problems accessing education without assistive technology get financial support. However, in Upper Austria there’s the so-called “Hilfsmittelpool” (Pool of assistive technologies). It fosters and supports the inclusion of children with special needs in Upper Austrian mainstream schools, kindergartens and after-school care by providing the children with assistive technology for the duration of them attending one of these institutions.

- All programs which have been developed by LIFEtool are approved by the Austrian Ministry of Education, the Arts and Culture and can be requested by schools within the framework of the so-called “Schulbuchaktion” (school book scheme). There is teacher training offered concerning the use of the programs and individual training is also available upon request.

- The programs cover very simple mathematical operations, studying letters, learning how to read or write or also simple general knowledge. They can all be operated by a large variety of input technologies. This does not only include the ones mentioned above but also touch technology or eye-tracking. Some of the programs are also available for iPhone/iPad.

The programs also include a comprehensive settings dialogue which make it possible to include own (and thus motivating) media (pictures, audio, video). To make working with the program easier, profiles can be set up for each student. These include information about the controls and the individual cognitive skills and make the documentation of the learning success easy.

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**TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)**
Software is categorised as follows:

- early education and games
- cultural techniques: reading/writing, mathematics, IT skills
- concentration and working memory
- “true-to-life” content

Development of learning software requires the collaboration of the developers and pedagogical and psychological experts. In addition it is also necessary to involve future users, their families, caretakers and educators in development and evaluation of the program.

The 1st betatesting is done internally by skilled employees of LIFEttool who are asked to elaborate on the content and the design of the program. In the 2nd betatesting, schools and learning groups as well as future users are asked to test the program in their everyday work and to provide feedback. For this, questionnaires and interviews are used. Of course, the user feedback is considered when finalising the development of the software.

TEACHING TOOLS/MATERIALS (BOTH ONLINE AND OFFLINE)

The criteria for the development of learning software according to UDL guidelines apply to all programs released by LIFEttool. Please check the softwareportfoliofor details (link #3).

THEORETICAL REFERENCES AND IN-SERVICE TEACHER TRAINING

LIFEttool offers free basic training for their learning software at all counseling centres. However, the design of each program is very simple thus usually not requiring any initial training. Usability and intuitive operability are crucial.

Each program comes with a comprehensive digital manual which includes information about the pedagogical and psychological background of the development of the software and of its use in class.

In general, computers and pedagogically sound software can be very helpful when being used in class by students with physical disabilities, by students with impairments concerning perception or action planning or by those with learning impairments which cause reduced learning speed or require learning in very small steps. Computers can make actions such as writing or laying tiles very simple and little strenuous for the students. Thus, they save cognitive resources for the actual learning process (cf. link # 4). The actions can be linked to the learning contents more closely, the students learn how to use the computer and the contents can be presented in various ways. Finally it is also possible to visualise actions which cannot be put into practice in an everyday classroom.
These aspects of valuable learning software make it possible to use the same contents in a heterogeneous group of learners.

Development of learning software requires the collaboration of the developers and pedagogical and psychological experts. In addition it is also necessary to involve future users, their families, caretakers and educators in development and evaluation of the program.

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EXTERNAL COLLABORATIONS (WHEN THEY EXIST)

When software is developed, a large number of experts – internal as well as external – are asked for input. This includes:

- Authors
- Lecturers
- Graphic designers
- Audio technicians
- Video technicians
- Speakers

LINKS ABOUT THE CASE STUDY (WEBSITE, VIDEOS, SLIDESHARE, MATERIALS, ETC.)

Link 1: Information about the programme “eFit2 Austria”: http://d.pcnews.at/_pdf/n950009.pdf


Link 3: LIFEtool-Portfolio http://www.lifetool-solutions.at/DE/?cwsstructure=10043&page=shopartikel

Link 4: http://www.lernsoftware-mathematik.de/cms/?p=953#more-953
BELGIUM FLANDERS

PROJECT ICT SUPPORT FOR PUPILS WITH LEARNING DISABILITIES

WHO CONDUCTED THE CASE STUDY

Jan Rottier of Eureka Die-'s-lekti-kus conducted the interview with the head master and the teacher who took the initiative.

We launched a call in our newsletter (9,000 subscriptions) for good practices of UDL in the classroom. We only got 2 responses. We see that teachers are not thinking in terms of UDL and that they don’t have a clue what UDL means. For instance, using Word-documents with styles is a good example of UDL.

In this example you see the other way around. They started with adjustments for pupils with learning disabilities, but now they are using Word-files, digital questionnaires and mindmapping for all their pupils.

INSTITUTION WHERE THE PRACTICE WAS CONDUCTED

The primary school at Hansbeke.

DATE (BEGINNING AND END OF THE PRACTICE)

The project started in 2008. The preparation of the project took some time. There was not only the question of which materials to use (computer-laptop, Kurzweil-Spint, …), but there were also the financial implications of the project.

PERIOD OF OBSERVATION (BEGINNING AND END)

The interview took place at 26 June 2013.

UNIVERSAL DESIGN FOR LEARNING PILLARS

√ Provide multiple means of representation
√ Provide multiple means of action and expression
√ Provide multiple means of engagement

AGE OF THE PUPIL(S)

The pupils are between 9 and 12 years old.

CONTEXT

The school is a primary catholic school in a rural environment. The town has 2,059 inhabitants. The school is located on two sites, 150 meters apart. It has around 170 pupils.
between the ages of 9 and 12. 15% has special educational needs. It consists of pupils with learning disabilities and motor disabilities. The presence of pupils with special educational needs is stronger than in a similar school, but the results of their pupils in secondary education is above the average (conclusion of the inspection of the Flemish government).

They consider their own strength to be the support for all pupils. They make extensive use of the possibilities to differentiate with respect to pace and level. They also use curriculum differentiation. The communication to parents and other participants is very open.

PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

The motivation why the school started with the project was threefold:
- The vision of the school on support for pupils with special educational needs,
- a pupil with severe dyslexia,
- the offer of VSKO (the union of catholic schools in Flanders).

The objective was to make a school for ALL children AND teachers. The starting point is the totality of the child whereby well-being is an important parameter. Every child should be stimulated to grow during his own development at his own pace and based on his own talents.

TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)

In general, teachers start with a functional analysis of observations, class tests, socio-emotional screening and, if possible, diagnostic tools. This is the starting point to determine the educational needs of every pupil. The pedagogical possibilities are screened in light of the capacity of the class and teacher.

They used the following aspects as framework:
- HGW (Action-oriented working)
- Pyramid of support: general support and specific support.
- ICT-goals (from the government)
  - Pupils have a positive attitude towards ICT
    - ICT is used to support children with learning, remediation and compensation.
  - Pupils can exercise independently in an environment supported by ICT.
    - During ICT lessons the child is taught to use Word and Sprint (text-to-speech) and ADIBooks to compensate their learning disorder.
    - In agreement with the teacher and in concordance with the means at hand, they apply this knowledge in lessons, task and tests.
  - Pupils can learn independently in an environment supported by ICT.
    - By using the computer as a support, these children increase their independence during the acquisition and processing of new content.
INDIVIDUALIZED PATH WAS USED BY THE WHOLE CLASSROOM AND HOW, I.E. FOR THE SAME OBJECTIVES? FOR DIFFERENT ONES?)

The project was spread over several years and during the process you could see changes they didn’t take into account at first. The most important one is that they started for specific students but after a while they had the reflex that what they were doing for the pupils with special educational needs could also be used for normal pupils.

When they see new applicants, one of the important requirements is that they can work with digital resources like Word, PowerPoint … and are interested to learn more about using ICT in their own classroom.

- At first the text-to-speech software was used in the language lessons (Dutch and French) in the 4th year for pupils with reading disorders. Now it is used in all lessons for these pupils.
- After two years they introduced it in the 3rd year. Here it is only used for reading.
- They noticed that typing skills are very important for pupils who work with the computer. Pupils in the 4th year didn’t have enough skills to follow the lessons. So they started a typing course (Typ tien) in the 3rd year. At first, it was only for the pupils who used text-to-speech software and they were taken out of the classroom for specific typing training. After a year the realized that typing was a competence every pupil should have. So now all pupils follow typing lessons at the same moment. Only the pupils who learn slower than the rest get extra training.
- We see the same happening in the fifth year. At first they started with Overhoor (questionnaire) and digital mindmaps for the pupils with learning disabilities, but they very soon started using these tools for all pupils.
- Another effect they witnessed was that teachers started to use more and more digital files (like Word) for all the pupils.

TEACHING TOOLS/MATERIALS (BOTH ONLINE AND OFFLINE)

They chose for laptops, BYOD or from the school. If the laptop was of the school, pupils couldn’t take them home. The choice for laptops was very easy to make because of the flexibility and the possibility to let pupils use their own devices.

The digital books were acquired from ADIBib.

For text-to-speech they chose SprintPDF. The learning path was shorter and it was not so expensive.

In meetings with the teacher, the possibilities of text-to-speech software were explained and demonstrated. The expectations were kept realistic: it is a learning process for everyone and a lot of evaluation and adjustment will be necessary.

There was a parent-teacher evening to explain the purpose of the project and to give the parents the possibility to use the text-to-speech software. The index cards from ‘De computer, mijn surfplank bij het leren’ (The computer, my surfboard when learning) were distributed. It was also explained that the school expected the cooperation of the home front to motivate the pupils to work digitally.
The pupils were informed about the possibilities of using the computer.

They also stressed the importance of cooperation between teachers, teacher-pupil and teacher-ICT-coordinator so that there is clarity about the expectations but also about the possible solutions for practical problems (like a computer that crashes).

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**THEORETICAL REFERENCES AND IN-SERVICE TEACHER TRAINING**

The in-service training of the teachers for Sprint was given by the ICT coordinator.

**CASE STUDY METHODOLOGY /DOCUMENTATION ANALYSIS /OBSERVATION/DISCUSSION-INTERVIEWS WITH TEACHERS/HEADTEACHER/PARENTS/PUPILS**

Interview with the head master and the teacher who introduced the concept.

**EXTERNAL COLLABORATIONS (WHEN THEY EXIST)**

Due to limited finances (renovations) and limited resources from the government, they searched for external resources like the Cera foundation for extra laptops and parents who were in the computer business.
## DENMARK

### SPECSpace - Learning in an Inclusion Perspective

| WHO CONDUCTED THE CASE STUDY |
| Teachers at Vorrevangskolen and research staff at Future Laboratory and Innovation Lab. |

| INSTITUTION WHERE THE PRACTICE WAS CONDUCTED |
| Vorrevangskolen, Aarhus, [www.vorrevangskolen.dk](http://www.vorrevangskolen.dk). |

| DATE (BEGINNING AND END OF THE PRACTICE) |
| August 2013- |

| PERIOD OF OBSERVATION (BEGINNING AND END) |
| August 2013-September 2013. |

| UNIVERSAL DESIGN FOR LEARNING PILLARS |
| ✓ Provide multiple means of representation |
| ✓ Provide multiple means of action and expression |
| ✓ Provide multiple means of engagement |

| AGE OF THE PUPIL(S) |
| 6 years-14/15 years. |

| CONTEXT |
| Vorrevangskolen is a public school with currently 529 pupils. |

The school district is a rectangular area in the North-West area of the city of Aarhus bounded by a number of major roads. In this area the ownership structure is housing associations, cooperative housing, and private residences.

In addition to classes for the district's pupils, the school has 7 municipal special classes for students with reading difficulties, specific learning difficulties and socio/emotional difficulties. The classes are naturally integrated into school life.

25% of students have a different ethnic background than Danish.
In the school year 2005/2006 88 staff members count: 52 teachers/pre-school head teachers, 20 nursery teachers, 11 technical/service staff, 5 persons in management and administration.

The school is organized into autonomous teams and has a new management structure.

PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

The SEN pupils have reading difficulties, specific learning difficulties and socio / emotional difficulties.

PEDAGOGICAL SITUATION - DESCRIPTION OF TOOLS AND RESOURCES USED IN SPECIFIC PEDAGOGICAL ACTIVITIES, EDUCATIONAL SETTING, ASSESSMENT ADAPTATIONS (IF ANY)

In August 2013, the Future Laboratory and Innovation Lab visited Vorrevangskolen. On the agenda was a total renovation of "The Club", a room at Vorrevangskolen, which needed a shining up.

First I Lab (Innovation Lab) presented inspirational ideas on how the process could be approached. The goal was to reduce initially seven themes to four, one theme in every corner of the room. Teachers followed up with creative ideas, and before long the plan was four corners containing the themes: Pacman, Mad Scientist, Nature and Upcycling. Based on these four themes work began. Equipped with vigor and tools teachers and lab's threw themselves into creating the room. For two days they hammered, sawed, painted and varnished. After the two days the room was ready: SpecSpace had been born; "Spec" for special classes and "Space" for space (learning arena).

The practical details of using the room lie with the special students to become familiar with tools such as LittleBits, MaKeyMaKey and Sugru. These remedies are embedded in planning the learning material the Future Laboratory has developed. The purpose of the room is namely that also guest classes may visit Vorrevangskolen, and they will be guided by the special students in SpecSpace, and subsequently work with the learning programmes developed for the purpose.

Tasks have also been developed for secondary classes with more or less open tasks depending on the guest class. Usually work assignments will result in a kind of prototyping, which is to be pitched for the class mates. Then the students rotate so everybody has tried hands-on the four corners of Pacman, Mad Scientist, Science and Upcycling.

As one of the country's first schools, Vorrevangskolen was granted a 3D printer, which is ideal working with prototyping. In other words, an extremely exciting inclusion project on the basis of what the future of learning may offer.

TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)

The classes are naturally integrated into school life from an inclusive perspective. This means that they are to learn the same as their fellow pupils.
SpecSpace is about creating a room targeting tangible tools and creating a set of teaching materials that pupils can “master”.

**TEACHING METHODOLOGY (IN THE UDL PERSPECTIVE, PLEASE SPECIFY THE INDIVIDUALIZATION PATH APPLIED TO THE LEARNING DISORDER PUPIL AND, IF THIS IS THE CASE, HOW THE INDIVIDUALIZED PATH WAS USED BY THE WHOLE CLASSROOM AND HOW, I.E. FOR THE SAME OBJECTIVES? FOR DIFFERENT ONES?)**

“Spec” for special classes and "Space" for space learning arena. The purpose of the room is to dedicate it to Vorrevangskolen’s SEN students, at present approx. 115 students, in order to give them a sense of ownership to the room and its features. The Future Laboratory have worked with the content of the room, in parallel with the teachers completing the room.

It will be a space with a focus on tactile learning (for the sense of touch), as various technological advances will be implemented that are suitable for education.

In some of the classes (not only in the SpecSpace) teachers also experiment with individual learning styles of the SEN pupils.

**THEORETICAL REFERENCES AND IN-SERVICE TEACHER TRAINING**

Some of the (SEN) teachers have participated in in-service training on learning styles.

**EXTERNAL COLLABORATIONS (WHEN THEY EXIST)**

The room is funded by a grant from the Municipality of Aarhus as part of the municipality’s inclusion strategy.

**LINKS ABOUT THE CASE STUDY (WEBSITE, VIDEOS, SLIDESHARE, MATERIALS, ETC.)**

Vorrevangskolen, [http://vorrevangskolen.skoleporten.dk/sp](http://vorrevangskolen.skoleporten.dk/sp)
SpecSpace – Learning in an inclusion perspective (press release), [http://fremtidslaboratoriet.dk/blog/specspace-laering-i-et-inklusionsperspektiv](http://fremtidslaboratoriet.dk/blog/specspace-laering-i-et-inklusionsperspektiv)
VorrevangsskolenSpecSpace (in Danish; Prezi and Transcript), [http://prezi.com/lzl6wbelbnar/vorrevangsskolen-specspace/](http://prezi.com/lzl6wbelbnar/vorrevangsskolen-specspace/)
UNIVERSAL DESIGN AND LEARNING DISORDERS: THE CASE OF RISTIKU BASIC SCHOOL

CASE STUDY VIDEO: HTTP://WWW.AMARA.ORG/EN/VIDEOS/K54HZ5AAFANL/INFO/UDL-IN-ESTONIA/?TAB=VIDEO

WHO CONDUCTED THE CASE STUDY

- Pille Tina-Kuusik, speech therapist, special education teacher and composer of teaching and learning material at Aruküla kindergarten “Rukkilill”.

INSTITUTION WHERE THE PRACTICE WAS CONDUCTED

Ristiku Basic School, Tallinn, Estonia.

DATE (BEGINNING AND END OF THE PRACTICE)

24.05.2013 - 05.06.2013.
24.05.2013 Maths teacher Irja Rebane gave an interview; we also conducted an observation of maths classes in 7th and 9th grade.

05.06.2013 The headmistress Katrin Luhaääär gave an interview

UNIVERSAL DESIGN FOR LEARNING PILLARS

√ Provide multiple means of representation
√ Provide multiple means of action and expression
√ Provide multiple means of engagement

AGE OF THE PUPIL(S)

● 9th grade (15–16 years old)
● 7th grade (13–14 years old)

CONTEXT

Ristiku Basic School is a municipal school for children with learning disorders. The catchment area of the school is Tallinn. In the school year 2012/2013, 277 pupils attended the school, ten of whom were studying on a one-to-one basis and 72 in small classes.

PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

The school is aimed at children with special needs who are able to acquire education based on the national curriculum for basic schools. Special needs mean learning difficulties and various developmental disorders. The school gives children with learning disorders the necessary knowledge, skills and competences according to their abilities. It also shapes their value system and behavioural norms. For this, the necessary support systems and differentiated instruction are used. (Source: the school’s website).

There are three different class types at the school:

1) Classes for children with learning disorders. The pupils attending this class have been diagnosed with a specific developmental disorder that is the reason for learning difficulties. Twelve pupils study in one class.

2) Small classes of four are aimed at children with autism spectrum disorders and attention deficit disorders.

3) One-to-one teaching. This is for children who cannot cope in small classes.

In small classes, most of the students have their own individual study programme. The teachers may apply individual study programmes with lower demands recommended by the counselling commission as well as an individual study programme with higher demands in
some fields recommended by the school for some talented children with autism spectrum disorder. The individual study programme with lower demands is mainly used in maths.

**PEDAGOGICAL SITUATION - DESCRIPTION OF TOOLS AND RESOURCES USED IN SPECIFIC PEDAGOGICAL ACTIVITIES, EDUCATIONAL SETTING, ASSESSMENT ADAPTATIONS (IF ANY)**

Maths teacher Irja Rebane (pictured above) makes a lot of use of Information and Communication technology in her classes. In every lesson she uses a **Smart Board**. She says that the **software** of the Smart Board is a lot more valuable than the board itself. What makes it useful is the fact that all this can be controlled by the computer. Irja finds that, “If the topic is technical drawing and I’m using blackboard and chalk in the class, then I have to hold the ruler and setsquare, speak and look at the children over my shoulder at the same time. When using the interactive board, I am able to put the drawing on hold and help the children. If I ask the pupils to look at a diagram in the book, then some weaker ones may not understand, which line I meant – which one is the baseline and which line marks the height. If the same figure is on the board, then I can show them the exact line.”

Irja likes to compile teaching material. The scanner is a great tool for copying pictures from the textbook to the computer in order to make feasible study material for pupils. She explains that, “With every year the material is getting more and more comprehensive and it can never be completely finished.”

After the students have got to know the material, practice takes place in the computer lab. But the teacher doesn’t think it is effective to have the whole lesson in the computer classroom. There should also be some written work in the class.

The programme most used is **GeoGebra**. Also, **Excel worksheets** are valuable, because there one can get direct feedback. Of course, the children enjoy games and Irja Rebane is using the Quia environment to create them.
The teacher uses a textbook in classes, worksheets are used relatively seldom. Since the tempo is slower, there is no problem with lack of exercises. Sometimes there is too much material and it is difficult to choose from it.

Graduates in 9th grade take the same exam as regular schools. Those who study according to the individual study programme with lower demands recommended by the counselling commission take an exam that is designed for them by the teacher.

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**TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)**

The aim of the school and teaching is to shape an individual who:

- is kind to others, respects their freedom and dignity;
- wishes and is able to cooperate constructively;
- respects and obeys the law, is aware of his/her duties and responsibilities as a citizen;
- feels him/herself as a member of the country, a citizen, feels a connection with Europe and the whole of mankind;
- knows and respects the culture of his/her nation, has knowledge and perception of the cultures of other countries and nations, his/her attitude towards other cultures is respectful and free of prejudice;
- protects nature, lives and acts in a way that maintains the environment and natural resources;
- can cope socially, is led by moral and ethical core values;
- takes responsibility for his/her life;
- can appreciate beauty and art and is caring towards nature;
- values a healthy lifestyle, develops his/her body and mind;
tries to understand the meaning of things, the reasons behind them, is motivated to study and knows how to study;

- can manage in changing studying, living and working environments;

- understands the importance of work in the development of humans and society, is ready to look for a suitable job.

The school has also phrased its objectives as follows:

- Give the students the main knowledge, skills and habits that have been set out in the curriculum and are necessary for coping in life.

- Develop general competences and subject competences; support the development of cross-curricular competences by integrating the general and subject competences and teaching.

- According to the student’s level, special needs and interests, create possibilities for diversified education by offering them help (individual study programmes, support group for speech therapy, support group for students with special needs, small classes, one-to-one teaching).

- Encourage students to take responsibility. Develop their ability to set goals, plan their actions, draw conclusions, think critically about their behaviour and correct it if needed.

(Source: the school's website)

**The goals of the maths lessons observed:**

In 7th Grade:

1. the student differentiates between rectangles, knows and is able to use their characteristics when solving tasks;

2. the student knows how to use formulas to find the surface area and perimeter of the rectangles;

3. the student can construct the rectangles he/she has studied;

In 9th grade:

1. the student differentiates between linear functions and quadratic functions;

the student is able to study a linear function and draw the graph of a linear function according to the values in the table and according to the angle of the slope.

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TEACHING METHODOLOGY (IN THE UDL PERSPECTIVE, PLEASE SPECIFY THE INDIVIDUALIZATION PATH APPLIED TO THE LEARNING DISORDER PUPIL AND, IF THIS IS THE CASE, HOW THE INDIVIDUALIZED PATH WAS USED BY THE WHOLE CLASSROOM AND HOW, I.E. FOR THE SAME OBJECTIVES? FOR DIFFERENT ONES?)
When preparing and giving the classes the teacher is constantly keeping the principles of the universal design for learning in mind. Presenting the tasks is adjusted for students with slower understanding. These pupils need the material to be repeated several times. The teacher speaks in a way that is clearly understandable to the pupils: short sentences, frequent pauses, clear speech. All this helps the students to understand the material better.

The teacher presents the material both visually and aurally. The teacher is constantly explaining symbols, recalling important information, repeating associations and terms and paraphrasing mathematical expressions if needed.

The teacher repeats important information and illustrates the topic by using different colours. Often, the teacher asks the students to explain the process of reaching the solution and what should be done, why, how, and what order, and where else the same kind of method could be used. A lot of emphasis is put on step-by-step practising and performance. The teacher chooses the kind of exercises that can be divided into several parts, so that every part can be practised separately. For example, the first step is to practice reading the line, then creating the line; sometimes the whole objective of the task is not completed. After practising every part, the whole is put back together.

The teacher knows that the students have trouble differentiating between important and unimportant matters and the attention diffuses easily. It is essential to avoid stimuli that could draw the students’ attention to irrelevant matters and lead them in the wrong path. This is the reason why the teacher prefers to choose the kinds of schemes and exercises from the textbook and exercise book that help to understand the material rather than having illustrative value only. “Sometimes there are too many illustrations in textbooks and exercise books,” explains Irja Rebane, “There should only be informative pictures and graphs. The kind of illustrative pictures – where a rat is looking at something to entertain the pupils – can distract the student’s attention from what is important. An illustration should be relevant;
meaningless pictures should not be added to the study material. The pupil forgets studying and starts to look at the pictures, counting the rat’s whiskers for example.”

As the students’ level of independence is low, they are allowed to use support material. Their motivation is higher when they realise that “I have done it, it was not that complicated”. When completing the tests, the students are able to choose whether they wish to use support material or not – whether they will settle for grade “3” or try for a better result. The students receive regular feedback on their answers to see if they were correct. Also, additional hints are given when needed. Direct feedback is also available for computer games and tests that the teacher is often using in classes.

The students studying according to an individual study programme use more or less the same study materials as the others. Weaker students solve only easier tasks, whereas the rest of the students also solve more complex tasks according to their abilities. For example, they do solve more difficult equations that also involve regular fractions. “The level of independence is really low for those children studying maths according to an individual study programme. If they have learned something then they are able to repeat it after long practice, but they are not able to learn something new on their own,” explains Irja. Therefore, they couldn’t study another topic at the same time with the other students.

Competition can also be a driving force in studying, if used sensibly. Only the winners, for example the first three, should be highlighted. The teacher shouldn’t rank the results of other students since no one has to know who was last. If the competitions are constantly won by the same students, they should be organised into different groups. “Competition is only motivating when everyone has a chance of winning. The stronger ones should compete against each other and the same goes for the weaker ones. Participation should be optional; a timid student should always have the opportunity not to take part. The student should still be obliged to finish the task, but his/her result is not included in the competition. The competition should be more like a game, where it is common to win and lose. This keeps the children from getting too emotional,” she thinks.

Group tasks are a good way to develop cooperation skills. The teacher uses group work to let the stronger pupils help the weaker ones in solving the exercises or carrying out practical work. The best motivator is success. If students see progress in their work, they are motivated.

The aim of younger students is often to pass a certain test successfully or better their grade. Older students (third school level) are able to see further goals such as graduating with good results and fulfilling the prerequisites for continuing their studies in a chosen field.
ASSESSMENT

The semester’s average grade is calculated on the basis of test results. Those with individual study programmes are required to do only one part of a test. They need more time to complete the test and if they only write one part, the result can be no higher than “3” (out of 5). Some students are allowed to use formulas and consult teaching material while doing the test. If a student decides to use teaching material, he/she is able receive a grade no higher than “3”. “It is very positive if students try to take the test without using the formulas first. It shows that their goals are higher,” Irja thinks. To get a “3”, one has to gather 50% out of the total points. For students with lower abilities, a different evaluation system is used, where they can receive the grade “3” with 35%. When it comes to the final test, the 35% rate cannot be used. In this case, for the student who studies according to an individual study programme with lower demands recommended by the counselling commission, a test is designed where the student’s abilities are taken into consideration.

THEORETICAL REFERENCES AND IN-SERVICE TEACHER TRAINING

Irja Rebane studied to become a class teacher. Later, by distance learning, she has obtained a specialty in teaching maths. In 2010 she graduated from Tallinn University with a degree in special education and counselling. ICT is a great hobby of hers. Iris Rebane likes to compile teaching and learning material and she is happy to share her knowledge with other teachers.

Irja is also a member of the ICT development council of the Ristiku Basic School and in 2008 she was one of the laureates of the e-teacher competition held by the Tallinn City Education Department.
Interviews with the teacher and headmistress, observation of classes.


Study material created by Irja Rebane:
[http://www.oppekava.ee/index.php%C3%95ppematerjalid_%C3%B5piraskustega_%C3%B5pilastele._Matemaatika_7._-_9._klass](http://www.oppekava.ee/index.php%C3%95ppematerjalid_%C3%B5piraskustega_%C3%B5pilastele._Matemaatika_7._-_9._klass)
PLAYING WITH NUMBERS: FORECASTS AND SOUNDS

CASE STUDY VIDEO:
HTTP://WWW.YOUTUBE.COM/TIMEDTEXT?VIDEO_REFERRE=WATCH&V=0N2_SOYN9GU&ACTION_VIEW=1

WHO CONDUCTED THE CASE STUDY

Observation and documentation by teacher Veronica Cavicchi, Local professional training centre “G. Zanardelli”, Brescia (BS).

Interviews with the teacher and documentation adaptation by INDIRE SENNET research group: Silvia Panzavolta, Patrizia Lotti and Antonella Turchi.

INSTITUTION WHERE THE PRACTICE WAS CONDUCTED

Local professional training centre “G. Zanardelli”, Brescia (BS)

DATE (BEGINNING AND END OF THE PRACTICE)

School year 2011-12

PERIOD OF OBSERVATION (BEGINNING AND END)

Year 2011-2013

UNIVERSAL DESIGN FOR LEARNING PILLARS

√ Provide multiple means of representation
√ Provide multiple means of action and expression
√ Provide multiple means of engagement

AGE OF THE PUPIL(S)

17 – 18 years

CONTEXT
Upper secondary school, third year at the Institute for vocational training, sector Hairdressing, Local Professional Training Centre “G. Zanardelli”, Brescia (BS).

The Centre is a public institution, created in 2004 with the aim of fostering vocational training and it is made up of nine institutions covering the whole province area. It provides guidance and support to students and manages training courses within the national education system, but with a stronger accent on professional development than general education courses.

There were 24 students in the class, object of this case study, but 2 students left the school before the end of the school year.

Generally, the students attending this kind of course are students at risk or students with poor socio-economic backgrounds, encountering difficulties with the traditional school settings and methods.

PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

The students profiles were varied: two failed students (among which one was Albanian), 4 foreign students (from Ethiopia, Albania, Algeria and Serbia), many students with family disadvantages, two with health problems, often not attending the lessons because of hospital recovery and two with severe specific learning disabilities. Finally, there was a very unsecure girl who had changed school, with low self esteem, presenting behavioral and relational problems.

Therefore the students can be defined as special needs students, according to the multifaceted definition of disability by ICF, even though none of them, according to Italian legislation on disabled students, deserved a health disability certification that would guarantee them some special teachers or interventions by the Handicap group of the Health System. In fact, also in case of specific learning disorders such as dyslexia or dyscalculia, students are not supported by a SEN teacher or by other professionals provided by the State. They are “certified” but the only get the possibility to be given different tools to perform a task.

PEDAGOGICAL SITUATION - DESCRIPTION OF TOOLS AND RESOURCES USED IN SPECIFIC PEDAGOGICAL ACTIVITIES, EDUCATIONAL SETTING, ASSESSMENT ADAPTATIONS (IF ANY)

Physics and Mathematics were among the most disregarded school subjects but the way they were taught in a way to transform them in a kind of “toolkit” to read other theoretical issues and to learn how to research. The main class work methodology was cooperative learning, with randomized clusters of 4-5 students.

The main teaching scenario was the lab, thus allowing the students to use mathematical models and the scientific method, in conjunction with a very special narrative: forensic sciences.

The teacher gave the group specific tasks in a kind of simulation mode, like in crime scenes where investigators have to answer specific questions by using physical laws and formulas. Some of those questions are for instance: “How can I identify people according to voice
analysis?” Or “How can I say that there are correlation between two sets of data apparently different?”. The topics of physics that were mainly investigated are acoustics, and as for Math, statistics (correlations, means, proportions).

The class also participated in a contest by the Museum of Science and Technology of Milan on the analysis of sound waves.

**TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)**

Students were actively engaged in learning activities and were able to describe quite well facts and phenomena through mathematical models and by using the scientific approach which could be confirmed by experimental measurements.

At the beginning, the teacher explained concepts (such as what a mathematical model is, the nature of sound, how electrical instruments work etc.) but after a concept was introduced, students were asked to work in group and to make some experiments. Then each of them had to write or report individually on what they observed and then a group report had to be produced and hand out to the teacher as a synthesis of what all the students in the group had written/observed.

The two main topics in physics where: 1. the modeling process in physics and the use of statistics in physical phenomena; 2. Acoustics and the connection between music and science.

During the last phase of the project, the class visited the Museum of Science and Technology of Milan because they participated in a contest on applied physics (in particular on the analysis of sound waves for forensic purpose).

The last activity within the school year was about the connection between music and science.

**Results**

All students were able to find solutions to problems and correlations between phenomena. They were not given any help even though they had access to the relevant materials to solve the problems, in extra school time as well.

Even though the school course was about hairdressing, they chose scientific topics as the main focus for their final dissertations, such as: The science of sound, Maths in the Ancient Egypt, Eye illusions, The concept of time and so on. Their score was very good, the mean was over 8 out of 10. Some of them decided to continue with higher education and some of them expressed the will to enroll for university.

**TEACHING METHODOLOGY (IN THE UDL PERSPECTIVE, PLEASE SPECIFY THE INDIVIDUALIZATION PATH APPLIED TO THE LEARNING DISORDER PUPIL AND, IF THIS IS THE CASE, HOW THE INDIVIDUALIZED PATH WAS USED BY THE WHOLE CLASSROOM AND HOW, I.E. FOR THE SAME OBJECTIVES? FOR DIFFERENT ONES?)**

The teaching methodology was a mixture of interactive sessions and peer tutoring activities, with the students working in randomized small groups. Maths and Science were presented in a way that procedural memory and calculus was very peripheral, thus switching towards a
more problem-oriented approach and discovery learning methodology. The groups could use a variety of modes to represent, play and express their knowledge and skills, through hands-on activities, visual representation, auditory tools, lab experiments etc (UDL principles).

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**TEACHING TOOLS/MATERIALS (BOTH ONLINE AND OFFLINE)**

Some technologies and software were provided by Casio and the Museum of Science and Technology of Milan.

Some of those tools are: CmapTools, Word, Powerpoint, measurement instruments, chronometers, data analyzers EA-200 connected with a graphical calculator Casio fx-CG20-L, 3 tuning forks, metal pipes, rulers, stethoscope, vibration plate, resonance box, hammer, cardboard 40 x 40, meter.

Other specific and scientific tools were also provided.

Even though an optimal condition is to have all Casio tools, some of those can be built with raw materials as well and can be integrated with the Casio software for the analysis of data and with the Excel worksheet.

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**ASSESSMENT**

In order to assess bias in students knowledge representations, some pre-tests were administered to students so to compare those with post-test data. The following one is an example of pretest activity.

*******************************************************************************

Activity title: *“It happened one night”*

It was February 17th at night time. It had been snowing all night and the ground was covered with snow.

Veronica had been at Anna’s and after spending the evening with her girlfriend she was crossing a square to reach home. Her flat was situated on the second floor of a building located on the other part of the square, in front of Anna’s house. Luckily it had stopped snowing at that time.

Unfortunately, Veronica never reached her flat. Her corpse was found in the square some hours later. The police ordered the square to be isolated and nobody was allowed to trespass.

These are the evidence gathered so far:

- Veronica’s corpse
- People living in the houses close to the square are the following ones:
  - Samuele, newsagent, 45 years old, tall 165 cm
  - Sonia, physician, 38 years old, tall 175 cm
  - Vittorio, bank employer, 54 years old, tall 169 cm
  - Tommaso, square bell tower responsible, 50 years old, tall 178 cm
- Map of the houses
The policemen talked with everyone, separately, and gathered the following pieces of information on what they did that night:
Samuele left home (A) to go to his shop (AA).
Sonia left home (B) in the direction of Lancillotto street to go to work to the hospital.
Vittorio left home (C) to reach Martona street.
Tommaso left home (E) to reach the bell tower (EE).
Because of fog, their walks had been roundabout and nobody reported having seen something strange. Moreover, nobody had seen other people’s footprints in the snow but their own, so apparently they did not meet, not even with the victim.
Nobody had crossed the square more than once.
Footprints shapes suggest that the killer had not run afterward the murder.
Among the suspects, who’s the more likely to be the killer? Please explain your thoughts.

*********************************************************************************************************

Another example is the activity the teacher assigned to students during the school year. The example is provided below.

*********************************************************************************************************

Activity title: “An unknown number”

They had been controlling him for 15 days. They had placed bugs in his office and home and they had audio recordings of all 15 days. The famous jewelry dealer Franco Derenzi was suspected of cocaine trafficking and of covering it with his jewelry activity. Investigators had come to him and his 4 accomplices after an intensive investigation activity over a very large number of mobile recordings, thanks to which they came to the conclusion that in Derenzi’s office cocaine negotiations took place regularly. They knew the mobile numbers of the 4 of them:
Dino 328 3138786
Ezio 394 6828173
Fabio 328 4618653
Fausto 333 5400967
But this was not enough. They needed evidence to bring them in prison. Thus, they had kept controlling their movements by using bugs. The marshal working time was almost over. It
was 23.15 and by less than one hour a colleague would take over him. That night nothing special had happened: from bugs he heard only some background noise, so he thought that Derenzi should be out and not yet come back home. There had been some noise at 19.30 but nothing suspicious so he thought that some cleaning lady had been there and that was what he reported in the diary: “Housework”. He decided to have a coffee break, even though it was not allowed but he was bored and was about to sleep. Once he got inside the room again with a cup of coffee, he heard voices speaking very quickly and in an anxious mode:

“… I will inform the other three…”
“… no way… you’re not gonna do that…”
“DON'T DO IT!”

Then some shooting and then some noise as if somebody was searching for something. Then a door shut, somebody running away. Then silence. Soon the marshal alerted his colleagues and called the patrol parked close to Derenzi’s house to tell them to get in. However, when they arrived it was too late: the man had run away and Derenzi was laying on the floor already dead. He was still holding his mobile…

Who killed Derenzi?

The latter example is an activity proposed by the Museum of Science and Technology of Milan and it is based on the analysis of sounds.

The scientific material and tools have been provided by Casio, such as: Casio calculator, CmapTools, Word, Power Point, measurement instruments, chronometers, data analyzers EA-200 connected with a graphical calculator Casio fx-CG20-L, 3 tuning forks, metal pipes, rulers, stethoscope, vibration plate, resonance box, hammer, cardboard 40 x 40, meter.

The sound signal relating to the problem solving activity presented above, where the sounds of the mobile buttons can be heard, on the crime scene, were analyzed by the EA – 200 device and processed by the calculator provided to the students. The manuals of the tools are in English, so this was a way to train the students in English too, in particular on a technical vocabulary.

Theoretical References and In-service Teacher Training

Three days of in-service training, in November 2011, at the National science and technology museum of Milan “Leonardo da Vinci”, on the topic “The numbers world”, sponsored by Casio Italy to which two teachers attended:

- Veronica Cavicchi;
- Mariapia Rossini.

The training course has given the teachers the opportunity to set up experimental activities where mathematical models can be used to solve forensic problems. The fact that TV series and programs (such as CSI, NCIS, etc.) on crime are very popular in Italy was also a driver. Teachers were able to prepare problem solving tasks where students were meant to identify with the investigators and try to solve questions such as:
- Do relations exist between two series of data apparently unrelated? (linear correlation between data)

How can I do to identify people through the analysis of their voices? (analysis of sound waves)

CASE STUDY METHODOLOGY - CASE-STUDY /DOCUMENTATION ANALYSIS /OBSERVATION/DISCUSSION-INTERVIEWS WITH TEACHERS/HEADTEACHER/ PARENTS/PUPILS

- teacher documentation (individual and in team)
- discussion in a thematic workshop on inclusive effective experiences as to 14-18 year old students
- interviews with teachers

EXTERNAL COLLABORATIONS (WHEN THEY EXIST)

- CASIO Italy
- Museum of Science and Technology “Leonardo da Vinci” of Milan
- The Research Centre on Informal Education (CREI)

LINKS ABOUT THE CASE STUDY (WEBSITE, VIDEOS, SLIDESHARE, MATERIALS, ETC.)

http://media.wix.com/ugd/0be9c2_815bcea88ca81a4d772acbbb638e91d9.pdf
http://media.wix.com/ugd/0be9c2_be84b3e381496505ac634e219978700d.pdf
http://media.wix.com/ugd/0be9c2_03c37ff7287495fe062e0204e80df088.pdf
APPLICATION OF DIFFERENT METHODOLOGIES IN THE SCHOOL CAREER OF A PUPIL WITH DYSLEXIA

This case study falls within the framework of the European Project SENnet and was carried out at the Emídio Garcia Secondary School in Bragança, Portugal.

Its aim is to assess the impact of the implementation of educational measures on the academic success of a student with dyslexia, in terms of skill development, motivation and love of learning.

It looks at the functioning profile of the pupil, her interests, needs and expectations, and makes a brief description of the physical and geographic space in which she finds herself.

A statement by the pupil in which she mentions the methodology of her daily work is also included.

CASE STUDY VIDEO: HTTP://WWW.YOUTUBE.COM/WATCH?V=Z4DA8KMKA60&FEATURE=YOUTUBE

WHO CONDUCTED THE CASE STUDY

The Mirandela ICT Resource Centre for Special Education (Mirandela CRTIC) covers the province of Trás-os-Montes and Alto Douro, one of the regions in Portugal that has managed to preserve the cultural traditions that reflect the Portuguese identity.

The basic activities carried out by those living in the area covered by the Mirandela CRTIC are agriculture, animal husbandry and traditional commerce.

Mirandela CRTIC is based in the Mirandela School Cluster, in the district of Bragança. It is a pleasant space with a good geographical location, good access, good lighting and heating and suitable furniture.

It is open to the entire educational community within its large catchment area and its aim is to, among other things, respond in an appropriate and personalised way to the specific needs of the population it serves, through the human resources and diversity of material resources it has at its disposal.

The target population of Mirandela CRTIC comprises all students in the catchment area with "significant limitations in their activity and participation in one or more areas of life, due to functional and structural changes of a permanent nature, resulting in continuing difficulties in communication, learning, mobility, autonomy, interpersonal relationships and social participation" from Early Intervention to Secondary Education. The Centre also works with the families of these students and members of the whole school community with whom they interact, including teachers at various levels of education and special education, other technicians and assistant staff.
The team that conducted the study included two teachers at Mirandela CRTIC: Maria Luisa de Almeida Correia Pinto Pratas, who specialises in severe motor difficulties and has worked in special education for 28 years, and Maria Irene Machado Miranda, who specialises in the area of mental/motor disability and has worked in special education for 26 years. These teachers established, developed and promoted the Mirandela CRTIC during the 2008/09 academic year, and they continue to work there.

Among the teachers' social skills and competences, particularly important are their ability to adapt and organise and their team spirit, developed during their vast professional experience. Their excellent communication skills have been honed through various events, including exhibitions, meetings, workshops, seminars and lectures.

Their technical skills are evident in the construction, manipulation and adaptation of support technology in Mirandela CRTIC for the assessment of pupils with special educational needs (SEN) and their use in different contexts.

Participants in the Study

- Pupil – Ana Luisa Preto Rodrigues
- Mother – Paula Cristina Preto Rodrigues
- Head teacher of Emidio Garcia Secondary School – Eduardo Manuel dos Santos
- Class Tutor for Form D, Year 9 – Maria das Dores Pires
- Teacher of Special Education – Albertina Raposo Marcos Pires
- Psychologist – Fernanda Maria Leal

Emidio Garcia Secondary School of Bragança

Date (Beginning and End of the Practice)

From 22/01/2013 to 28/06/2013

Period of Observation (Beginning and End)

From 20/03/2013 to 1/06/2013

Universal Design for Learning Pillars

Given the profile of the pupil functioning, it was necessary to develop various means of engagement in order to promote learning and achieve maximum efficiency.

Firstly, classes were structured so as not to exceed twenty pupils or have more than two pupils with permanent SEN, enabling the needs of the pupils to be met on an individual basis.

The use of suitable methodologies and strategies has provided the motivation for the pupil, Ana Luísa, to become involved in activities and has helped her to overcome her difficulties.
The determination and involvement of the pupil, together with certain accommodations to the evaluation process, enabled an improvement in her school results and encouraged her continuing love of learning.

**AGE OF THE PUPIL(S)**

14 years old

**CONTEXT**

**Origin and Brief Description of School**

The Emídio Garcia Secondary School, initially called the Bragança National High School, was established following the Decree of 17 November 1836, which provided for a national high school in various districts of the country.

In 1956 construction of a new building began, due to poor operating conditions in the school; the new school building opened in the 1968/69 academic year. Its architectural and pedagogical design was excellent. It was built on an area behind the Previdência neighbourhood, one hundred metres from the Vinhais road, and was described as follows: “It has four floors and thirty classrooms. There are also two rooms to be used as workshops, two drawing rooms, physics and natural science laboratories with their respective amphitheatres, a choir room, a museum, a library, two gymnasiums, one of them being simultaneously a gym and an assembly hall (Rataplan, May 1964).” (Nóvoa et al.: 2003, 144-159). Improvement works began in the 2010/11 academic year as part of the Parque Escolar Programme. This provided a substantial increase in the school's facilities, with the creation of spaces suited to the new requirements and providing exceptional functionality, making it one of the best schools in the country.

At the end of the last academic year (2011/12) the process of including this school in the Paulo Quintela School Cluster was completed, creating the Emídio Garcia School Cluster that covers the various levels of education: pre-school, primary, lower secondary and upper secondary. The headquarters of the school cluster is located in the Emídio Garcia Secondary School.

**Levels of education**

- Lower Secondary Education
- Secondary Education Courses: Languages and Humanities, Science and Technology, Science and Visual Arts.
- Vocational Courses: Laboratory Analysis, Sociocultural Animation, Civil Defense, Graphic Design, Sports Management Technical Support and Auxiliary Health.
- Education/Training Courses: Food Processing and Quality Control Technician T6.

**Socio-geographic description**

The Emídio Garcia Secondary School lies in the heart of Bragança, close to public institutions and services including the Sé Health Centre, Caloustre Gulbenkian Student
Residence, Bragança Polytechnic Institute, youth hostel, Northeast Local Health Unit, Institute of Employment and Vocational Training (IEFP), city market, cathedral, Bragança Shopping Centre and the town hall, with the city spreading outwards from this point.

The pupils who attend this school come from villages, towns and cities in the municipality of Bragança and other municipalities in the district. This school has students from various social and cultural backgrounds and a number of pupils come from Asian, African and Eastern European countries.

### Number of pupils

<table>
<thead>
<tr>
<th>School Year</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
<th>Year 11</th>
<th>Year 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pupils</td>
<td>132</td>
<td>70</td>
<td>96</td>
<td>147</td>
<td>130</td>
<td>111</td>
</tr>
<tr>
<td>TOTAL</td>
<td>686 pupils</td>
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PUPIL(S) CHARACTERIZATION – ICF (INTERNATIONAL CLASSIFICATION OF FUNCTIONALITY) - CONDITION OF FUNCTIONALITY AND PARTICIPATION, IEP (INDIVIDUAL EDUCATIONAL PROGRAMME), CURRICULA ADAPTATIONS

Ana Luísa is in year 9 at the Emídio Garcia Secondary School in Bragança. She is a keen and punctual pupil who displays a commitment and investment in school that is not reflected in her academic results. This disruption in her learning may be associated with the fragility of her working memory skills (auditory and visual) and her low comprehension and verbal expression abilities linked to her dyslexia.

With regard to oral expression, she presents a linguistic development appropriate to her age-level in terms of vocabulary, articulation of ideas and spontaneity in language production.

In mathematical operations she reveals difficulties in data transition and in the use of formulas and symbols. It has been noted that she omits, adds and inverts the order of some graphics (d172.2).

She knows the names of the letters and the sound of the syllables with direct consonants and simple sounds, with the exception of "c" and "s", which require her to think about the order in the alphabet. She makes errors in reading syllables with simple diphthongs, consonant clusters and diphthongs of a more complex character, namely: au; io; ci; ge; guê; aso; isso; fli; dru; pla; bri.

Ana Luísa has pronounced difficulties in reading; she finds letters that have a more or less similar shape particularly confusing, she omits letters, syllables or words, and omits and adds sounds. These difficulties prevent her from adequately recognizing words, forcing her to make repeated readings in order to decipher, and to hyper-analyse, which significantly limits her speed and reading comprehension (d166.3). She demonstrates difficulty in remembering
facts and details and in extracting the main idea, which interferes in related activities (interpreting the facts in context and synthesizing content), as well as in understanding the relationship between ideas, and differentiating between fact and fiction to capture the truth of the information and the subjectivity that have been instilled in her (d325.2).

In written expression, she omits letters, reverses letters in syllables, and confuses letters with similar sounds (d170.2). Despite conveying basic information through writing, confirming that she has acquired self-correction strategies (if in doubt she replaces the word with a synonym), she has difficulties when it comes to expressing complex ideas in a logical and coherent way (d345.2). These difficulties in reading and writing have an adverse effect on her educational performance in most disciplines (d1551.2), especially those that are based on a good knowledge of reading. Consequently Ana Luísa expresses an obvious sense of discouragement and failure in general learning (d2401.2). When exposed to the most problematic situations, such as reading in public or an activity involving reading (decoding and comprehension), Ana Luísa displays great anxiety, which she is unable to overcome. These factors have a significant impact on her school results (d820.2), making Ana Luísa fall short of the goals she sets herself, despite her huge engagement and commitment.

She has difficulty in focusing her attention while working and becomes distracted after a short period of time, which significantly interferes with her school performance (d160.2).

There are specific obstacles arising from dyslexia that she has clearly been trained to overcome, such as recognising laterality in the other, repeating a sequence of numbers, words or rhythmic cadences. The existing clinical information (Intellectual Assessment Report and Psychopedagogical Assessment Report) confirms that the changes to mental functions of a permanent nature displayed by the pupil, specifically with regard to short-term auditory and visual memory (b1440.3), attention and concentration, are factors that, when combined, influence the pupil's learning and application of knowledge, negatively affecting her participation and activity at school.

- “The clinical interpretation of the results obtained in the WISC-IV, enables us to consider the fragility of her working memory skills (auditory and visual) as the most significant and detrimental factor of her intellectual and cognitive efficiency, and the fragility of her MT skills is also implicated in her lower efficiency in learning”. – Intellectual Assessment Report by Dr. Acácio Espírito Santo, dated 9 April 2009.
- The deficits in the area of short-term memory (visual and auditory) "are significantly related to the demonstrations of disturbance in learning and application of knowledge - dyslexia (d166.2), dysorthographia (d170.2) and dyscalculia (d172.2)." – Intellectual Assessment Report. Furthermore, "they translate on a day-to-day basis into a great lack of attention, for example, not following the advice and information offered in the classroom." – Psychopedagogical Assessment Report by Prof. Helena Serra, dated 2 February 2011.

Ana Luísa lives with her parents and one brother, and there is a good relationship between the members of the nuclear family. She has always been helped at home, where her family understands her difficulties and gives her a lot of support, working with her and helping her to prepare in advance of assessments, as they recognise that in addition to dyslexia what aggravates the problem is her poor working memory (e310+3). The family is receptive to strategies proposed to compensate for the problem of dyslexia. The pupil studies music at the suggestion of the psychologist; and is in a band where she plays guitar and is the lead singer. She was recently advised to take classes in hip-hop
dance in order to develop her coordination and spatial orientation. She has not yet started these classes due to lack of time and is waiting for the school holidays (e410+2).

Ana Luísa has some difficulty in integrating into the class due to the way some of her colleagues discriminate against her and make fun of her, as a result of which she does not feel understood or accepted by them. (e325•1) - (e425•1).

The school has taken responsibility for the whole referral process in order to give a suitable educational response to this pupil's functioning profile. Since the beginning of the school year, the form tutor has implemented the educational measures proposed in the detailed report of the previous year and has monitored and evaluated their effectiveness (e330+3 and e430+3).

Ana Luísa has felt the support and understanding of friends who were with her in lesson breaks (e320+2 and e420+2). She has benefited from personalized support lessons in Portuguese Language throughout the year (e5850+2).

In order to tailor the teaching and learning process to her needs, Ana Luísa benefits from the following educational measures stipulated in Decree-Law no. 3/2008 of 7 January - Article 16 (a) and (d), as well as the following articles:

**Article 17 - Personalised Pedagogical Support**
Reinforcing the strategies used in class in relation to organization, space and activities, b) Encouraging and enhancing skills and abilities involved in learning c) Anticipating and reinforcing learning content taught in the classroom in disciplines that present difficulties, d) Strengthening and developing specific skills

**Article 20 - Adjustments to the assessment process**
The following changes will be carried out regarding the type of test and assessment tools in the disciplines in which she demonstrates more pronounced difficulties:
- Use of shorter tests or allocation of additional time;
- Giving the pupil the opportunity to read the test/form/text aloud;
- Formatted tests: larger characters (Arial 14), with 1.5 spacing.
- Diversification of the type of exercise: multiple choice, questions with direct answers, open questions with proposed guidelines; questions subdivided into points;
- Conditions for the assessment will take into account the pupil's capabilities, limitations and restrictions:
- Periodic written evaluation, without being penalized for errors in spelling or syntax;
- Possibility of taking the written knowledge assessments in a separate room when appropriate;
- Awarding of extra value to the assimilation process than the end result;
- Oral assessment.

**Composition of Class** - Taking into account this pupil's functioning profile, the class must not exceed 20 (twenty) pupils, or have more than two students with permanent SEN.
lessons are individual, allowing the pupil to express her doubts without the inhibition of possible value judgements.

The pupil demonstrates commitment and reveals very specific goals for her future, leading us to conclude that her effort and persistence will be central to her educational and social success.

The goals of the pupil and her family are to achieve greater independence in reading, without requiring the help of someone else.

TEACHING OBJECTIVES (GENERAL AND SPECIFIC OBJECTIVES)

**General objective**
To monitor the impact of the implementation of educational measures on the educational success of a pupil with dyslexia.

**Specific objectives**
- To apply different strategies that promote school success;
- To use support technology as an alternative means of communication for reading;
- To provide individualized support in the disciplines in which difficulties are revealed.

TEACHING METHODOLOGY (IN THE UDL PERSPECTIVE, PLEASE SPECIFY THE INDIVIDUALIZATION PATH APPLIED TO THE LEARNING DISORDER PUPIL AND, IF THIS IS THE CASE, HOW THE INDIVIDUALIZED PATH WAS USED BY THE WHOLE CLASSROOM AND HOW, I.E. FOR THE SAME OBJECTIVES? FOR DIFFERENT ONES?)

One of the educational responses implemented throughout lower secondary school was the reading aloud of the test questions in the context/class when physical conditions so allowed and when it did not interfere with other pupils, or in a separate room when the ideal conditions were not present. During this school year, it was considered appropriate to apply this measure in Portuguese, Mathematics, Geography, Physics & Chemistry, History, English and Natural Science lessons, in order to provide equal opportunities.

The pupil has personalized educational support, with teachers of the subjects in question, in disciplines that present particular difficulties (Mathematics, English, Portuguese).

Special education helps her to strengthen and develop her reading and writing skills.

The student has shown progress in written communication, but needs to continue with reading training, because she still has to systematically repeat messages two or three times in order to decode them. In the end, when the reading is "fluent", the pupil records it so that she can repeatedly listen to the recording in order to memorize the content. This strategy allows her to improve her reading and achieve some autonomy in the learning process.

Given the poor efficacy of this methodology, taking into account the large amount of content, the time available to conduct the training and the level of discouragement that it implies for the pupil, an evaluation by the CRTIC Mirandela was requested. The collaboration of a technician/trainer from the company Ataraxia was requested due to the lack of specific technologies to make this assessment.
This evaluation, which was held at the Emídio Garcia Secondary School in Bragança, was attended by the pupil, her mother, the class tutor, the special education teacher, the psychologist, the teachers and trainers of CRTIC Mirandela and the Ataraxia trainer.

The pupil interacted with various solutions, and "Zoom-Ex" proved to give the most appropriate response.

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### TEACHING TOOLS/MATERIALS (BOTH ONLINE AND OFFLINE)

- Audio recorder used by the pupil to listen to summaries of the subject matter being studied.
- The school is waiting for the DGE (Directorate-General for Education and Culture) to allocate the “Zoom-Ex” software, since it was considered to be the technology that responded best to the functioning profile of the pupil.

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### THEORETICAL REFERENCES AND IN-SERVICE TEACHER TRAINING


Decree-Law no 3/2008, of 7 January

International Classification of Functioning, Disability and Health- CIF-CJ

Translated and adapted by “Learning Disabilities Association of Canada”-Walcot-Gayda, Elizabeth Ph. D., Montreal, QC, Ex-President of LDAC “Compreender Dificuldades de Aprendizagem”

- [http://workspace.eun.org/web/sennet/home](http://workspace.eun.org/web/sennet/home)

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### CASE STUDY METHODOLOGY - CASE-STUDY /DOCUMENTATION ANALYSIS /OBSERVATION/DISCUSSION-INTERVIEWS WITH TEACHERS/HEADTEACHER/PARENTS/PUPILS

- Case study
- Documentary analysis
- Observations
- Image capture
- Meetings
- Interviews with those involved

EXTERNAL COLLABORATIONS (WHEN THEY EXIST)
Ataraxia – Estudos e Sistemas em Tecnologias de Informação, Lda

LINKS ABOUT THE CASE STUDY (WEBSITE, VIDEOS, SLIDESHARE, MATERIALS, ETC.)

Video – statement by pupil of 1 minute, 23 seconds (PT)
https://www.dropbox.com/s/fiwqsdpy50ttkp7/V%C3%ADdeo%20-%20Ana%20Lu%C3%ADsa.wmv

Power Point – alluding to this study and consisting of twelve (12) slides.

Slide presentation on YouTube (PT) - https://www.youtube.com/watch?v=uQPRamh6-7w

Slideshare (PT) - http://www.slideshare.net/idabrandao/ppt-estudo-de-caso-se-nnetcrtic-mirandela2013
CONCLUSION

Work by SENnet partners has shown that Universal Design for Learning (UDL) has much to offer in terms of improving access to learning for all. While widespread in the US, it is relatively unknown in Europe. In Europe, UDL principles are, to a great extent, not explicit but embedded in principles of inclusion, recognizing equity in access to education and life in society for all, including people with disability and disadvantaged minority groups. The country reports and case studies show how UDL principles are being applied in policy and practice to a varying extent depending on countries, but implicitly rather than explicitly. The time is perhaps right for raising awareness of UDL principles in Europe and to ensure that the use of technology in teaching and learning conforms to UDL principles.