The Universal Design For Learning Good Practices Inventory

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ABSTRACT
This paper presents the design principles and the development results of the UDLnet Inventory for Good Practices that follow the Universal Design for Learning (UDL) framework. It aims to bridge the gap between theory and practice in applying UDL. Good Practices included in this Inventory incorporate methods, techniques, approaches or lessons, which apply the UDL principles and guidelines. The basic selection criteria for an UDLnet Good Practice were: transferable, adaptable, flexible and effective. Media Resources complement the UDL Good Practices and relate to the pedagogical approach applied by the educationalist and the instructional material used. Collections provide the facility to gather, link, and organize different UDL Good Practices and Media Resources together. The UDLnet Inventory is not static. It is a growing and dynamic space whose main purpose is to stimulate new reasoning and practices and challenge existing ones.

INTRODUCTION
The increasing interest for inclusive education in the last decades mark out that students in a class have: a variety of academic *abilities*, different *backgrounds*, diverse educational *experiences*, different *learning styles*, a variety of *preferences*, different physical or cognitive capabilities (due to a possible *disability*) and are used to instruction at *different paces*. The average student is a myth, as individual capabilities in language, memory, reading, knowledge, perception, cognition, dexterity, etc. can be extended from low to high. The need to respond to learners' variability hasbeen related with the concept of differentiation (Blamires, 1999). A teacher who follows the differentiation approach, proactively plans and carries out a variety of approaches to content, process, and product in anticipation of and response to student differences in readiness, interest, and learning needs (Tomlinson, 2001). Thus, differentiation is a paradigm shift in pedagogical thinking from an approach that works for most learners, towards one that involves providing rich learning opportunities that are sufficiently available for everyone, so that all learners are able to participate in the classroom life (Florian & Linklater, 2010). From another point of view, Universal Design for Learning (UDL) has been proposed (Rose & Meyer, 2002) as an educational framework to guide development of flexible learning environments to accommodate individual learning differences. UDL seeks to increase access to learning by reducing physical, cognitive, intellectual and organizational barriers. UDL is much more complex than we originally thought (Edyburn, 2010). Only a few research studies have provided a comprehensive framework to put the UDL pieces together, in a practical, research

grounded and efficient way (Ketz, 2013). Thus, challenges and barriers for practice seem to be similar in many countries, where educators are not familiar with UDL (Cooper et al. 2008).

This paper describes the design and development of the UDL Good Practices Inventory to benefit the interesting users in the field (educationalists, teachers, professors, practitioners, etc.). This Inventory has been developed under the UDLnet project (Riviou, Kouroupetroglou & Bruce, 2014), which aims to bridge the gap between policies and practice in applying UDL and to face the associated obstacles. In the next paragraphs, first we present briefly the UDL approach and the UDLnet. Then, the design principles of the UDLnet Inventory, along with the main results of its development are presented.

UNIVERSAL DESIGN FOR LEARNING

Grounded on new research in neuroscience (Hall, Meyer & Rose, 2012) and the Design for All (D4All) principles (Stephanidis, et al.1998), Universal Design for Learning (UDL) constitutes an educational approach that promotes access, participation and progress in the general curriculum for all learners (CAST, 2015). Individuals bring a huge variety of skills, needs, and interests to learning. Neuroscience reveals that these differences are as varied and unique as our DNA or fingerprints. Three primary brain networks come into play: recognition networks, strategic networks and affective networks (Rose & Meyer, 2000; Rose & Meyer, 2002). The following UDL principles provide the underlying framework for the corresponding Guidelines (UDL Guidelines, 2011):

Principle I: Multiple Means of Representation (the "what" of learning). Learners differ in the ways they perceive and comprehend information that is presented to them. Moreover, learning and transfer of learning occur when multiple representations are used, because they allow students to make connections within, as well as between, concepts. The relative UDL Guidelines outline provisions for:
I.a) options of perception (e.g. alternatives to auditory or visual information),
I.b) options for language, mathematical expressions and symbols (e.g. through clarification of structure, text, multimedia, notations, and
I.c) options for comprehension (e.g. by providing guidance and background knowledge, highlighting ideas, patterns and connections, and maximising generalization).

Principle II: Multiple Means of Action and Expression (the "how" of learning). Learners differ in the ways they can navigate a learning environment and express what they know. Some may be able to express themselves well in writing text, but not with speech, and vice versa. It should also be recognized that action and expression require a great deal of strategy, practice, and organization, and this is another area in which learners can differ. The corresponding UDL Guidelines propose to provide:
II.a) options for physical action (e.g. access to a variety of methods, assistive technology and tools),
II.b) options for expression and communication (e.g. multiple media and alternative communication), and
II.c) options for executive functions (e.g. support and facilitation for planning, organising, and managing information and progress).

Principle III: Multiple Means of Engagement (the "why" of learning). Learners differ markedly in the ways in which they can be engaged or motivated to learn. Some learners are highly engaged by spontaneity and novelty. Others are disengaged, even frightened, by those aspects, preferring strict routine. Some learners might like to work alone, while others prefer to work with their peers. The relative UDL Guidelines specify the importance of providing:
III.a) options for recruiting interest,
II.b) options for sustaining effort and persistence (e.g. by varying demands and resources, promotion of collaboration and increase in focus to goals and feedback), and
III.c) options for self-regulation (e.g. by promoting expectations, facilitating personal skills, and developing self-assessment and reflection).

In the first decade of its development, the emphasis in the domain of UDL was on the use of technology to inclusive education and accessibility for the disabled. Rose and Meyer (2002) proposed that UDL is a research-based set of principles that forms a practical framework for using technology to maximize learning opportunities for every student. Thus, when educators hear the term UDL, most associate it with the technology (Zascavage & Winterman, 2009). However, UDL is not solely about the use of technology in education. It is also about the pedagogy, or instructional practices, used for students with and without disabilities (King-Sears, 2009). New developments on the theory and practice of UDL that have emerged underline the importance of instructional pedagogies that facilitate accessibility for diverse learners (Burgstahler, 2012). Recent research findings have proved that UDL can support access, participation and progress for all learners (King-Sears, 2009; Jimenez, Graf & Rose, 2007; Kortering, McLannon & Braziel, 2008; Meo, 2012). However, few have provided a comprehensive framework to

put the UDL pieces together, in a practical, research grounded and efficient way (Ketz, 2013). UDL is much more complex than originally was thought (Edyburn, 2010). Understanding the potential of UDL is seductively easy. Its exponential growth indicates that it may be the right idea at the right time. However, it has proven far easier to help the various stakeholders understand the potential of UDL than it has been to implement UDL on a large scale. Now that more people are "doing UDL," it is not clear what the outcomes are. Udvari-Solner et al. (2005) illustrate ways to apply UDL principles to provide all students with multiple means of representation, multiple means of engagement, and multiple means of expression. To initiate a universal design approach, they advise secondary educators to think about three distinct curriculum access points: content, process, and product. UDL requires collaborative planning amongst teachers with different curriculum knowledge and skills (Nevin, et al., 2004). Complaints that are often raised include lack of time to co-plan and lack of resources to teach a differentiated curriculum.

Web 2.0 constitutes a broad spectrum of digital tools to create, edit, share, discuss, engage, collaborate, and communicate in online media sharing spaces (Solomon & Schrum, 2007). These tools are used to edit, mix, remix, record, and publish content. Web 2.0 tools are interactive and multisensory. These technologies, therefore, are ideal for teachers wishing to apply UDL, i.e. craft flexible, scalable, differentiated activities that are accessible and engaging for reluctant and eager learners alike (Kingsley & Brinkerhoff, 2011). CAST UDL Exchange (CAST UDL Exchange, 2015) is a Web 2.0 base place to browse and build resources, lessons and collections. These materials can be used and shared to support instruction guided by the UDL principles. UDL Exchange facilitates the power of networking to create, remix, and share UDL-informed lessons and activities. According to Edyburn (2010) "as we head into the second decade of doing UDL, it is time for a new generation of thinking about UDL. We need to clarify the core stakeholders (developers or teachers) who will be trained to create UDL products. We need to understand what it means to implement UDL. We need to understand how to measure the outcomes of UDL. Finally, we need to renew our commitment to equitably serving all students in the event that our UDL efforts fall short".

THE UDLNET NETWORK
In order to bridge the gap between policies and practice in applying UDL and to face the associated obstacles identified above, the UDL Network - UDLnet was established (Riviou, Kouroupetroglou, Bruce, 2014). UDLnet (UDLnet, 2015) aspires to address the necessity of collecting and creating good practices under the framework of UDL from a wide range (generic guidelines down to more specific ones) of four envisaged themes: inclusive learning environments, accessible resources, teachers' and school leaders' competences, examination of barriers and identification of opportunities. UDLnet targets 3.500 users in seven countries across Europe (Greece, Ireland, Cyprus, Finland, Netherlands, Germany, Spain) and in six languages.

UDLnet aims to improve teachers' practice in all areas of their work, combining ICT skills with UDL-based innovations in pedagogy, curriculum, and institutional organization. It is also aimed at in-service and pre-service teachers' use of ICT skills and resources to improve their teaching, to collaborate with colleagues, and perhaps ultimately to become innovation leaders in their institutions. The overall objective is not only to improve classroom practice, but also to raise awareness of the European educational community on the need for UDL based teaching and learning practices. The innovation of UDLnet lies within the connection of best practices from various European countries on school/university education and training, open to wide teacher and student communities who will then effectively provide UDL in education.

The UDLnet approach includes the following steps:
- Development of a detailed and systematic methodology to define the criteria for identifying good UDL practices and then operate as the frame for collection and formation of exceptional UDL based teaching and learning approaches
- Design and development of the Web 2.0-based UDLnet Inventory with a collection and categorization of UDL good practices that can support a learning community where users will be able to find, exchange and adapt inclusive teaching and learning practices and exchange ideas and good practices.
- Establishment of a constantly expanding network of educational communities informed on the necessity of UDL based innovative teaching and learning practices and trained accordingly. This network will operate in an independent way, with teachers supplying the educational material and ultimately being responsible for the preservation and further enhancement of the inventory and through Web 2.0-based approaches and tools.
- Collection and development of innovative, relevant and multilingual content that will support the UDL approach, which is described and stored in the UDLnet Inventory.

- Development of teachers, school leaders, school staff skills and attitudes to ensure the access to and use of UDL based teaching and learning practices under the umbrella of community building. Community building is critical component that enables their success in learning programs by reducing isolation, mentoring success, transforming experiences of exclusion to ones of inclusion, offering encouragement and hope, and fostering group dialogue and peer learning.

UDLnet INVENTORY DESIGN PRINCIPLES
The Inventory developed under the UDLnet is based on the following basic design principles:
- include a collection and categorization of UDL Good Practices, Media Resources and Collections,
- allow for browsing and searching UDL Good Practices with the use of selected criteria or filters,
- allow creating and modifying UDL Good Practices, Media Resources and Collections for the register users,
- support all the target user groups (teachers, teacher educators, educationalists, professors, practitioners, policy makers, etc.),
- apply the criteria for identifying good UDL practices developed in UDLnet,
- be based on Web 2.0 technologies,
- follow the W3C Web Content Accessibility Guidelines (2015),
- designed not as a destination, but as a forum for self-reflection and critical thinking,
- interconnected with the UDL community building which offers facilities for discussion, polls, group creation, activities, events, blogs, etc.

RESULTS
The main UDLnet Inventory (2015) facilities are (Figure 1):
- *Good Practices*: it incorporate methods, techniques, approaches or lessons, which apply the UDL principles and guidelines proposed by CAST (UDL Guidelines, 2011). They have proven, through experience and experiment, to maximize learning opportunities for every individual student in order to secure inclusive and quality education for all. The basic selection criteria for a UDLnet Good Practice are: transferable, adaptable, flexible and effective.
- *Media Resources*: complement the UDL Good Practices and relate to the Pedagogical Approach applied by the educationalist and the Instructional Material used. The Media Resources may also be the outcome of a particular lesson or scenario (Riviou & Kouroupetroglou, 2014). *Pedagogy Media Resources*: Good Practices require information to be presented in multiple formats (e.g. extra lesson text, graphics, audio, videos, and online games). *Instructional Materials* describe the content and outcomes of a Good Practice or a lesson, specifically or in broad terms. Examples include: online reading materials (other than the textbook), instructional technologies (e.g., Open Education Resources or Learning Management Systems) and course materials (other than the textbook) such as: Web content, documents (MS-Word, PDF), presentations (MS-PowerPoint), multimedia files (video, audio), games, artifacts and hand-outs.
- *Collections*: provide UDLnet users with the facility to gather, link, and organise different Good Practices and Media Resources together to meet their specific needs around a particular topic, theme, or class.
- *Community*: is a portal (UDL Community Portal, 2015) that provides the following facilities to the user: a) join the UDLnet online community and collaborate, b) gain full access to UDLnet online Courses and Workshops and c) obtain full access to UDLnet Training Resources.
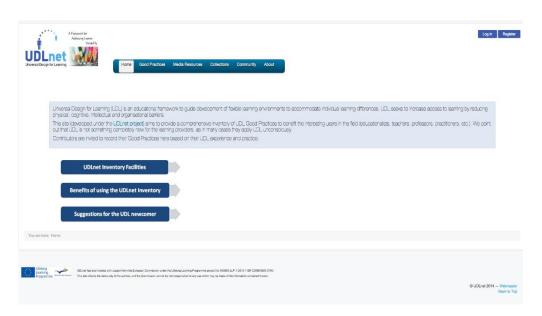
Figure 1: The main UDLnet Inventory facilities.

The UDLnet Inventory provides four types of filtering (Figure 2):

Search by keyword: the user can search between "Good Practices" by a keyword contained in the "Title" or in the "Short Intro" or in the "Keywords" of the "Good Practices".

Search by Main Topic: the user can select among the topics: Applied, Arts, Business Studies, ICT, Languages, Mathematics, Physical, Science, Social Studies and Other.

Search by Education Level: Primary, Secondary, Vocational, All and Other.

Search by Language: English, Dutch, Finnish, French, German, Greek, Italian and Spanish.
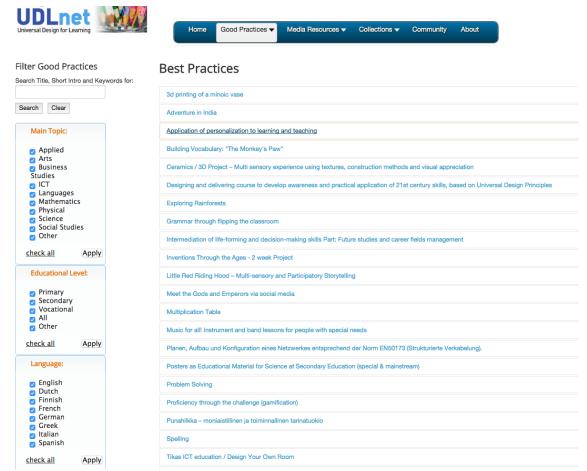

Figure 2: Types of filtering in the UDLnet Inventory.

The fields of the UDL Good Practices include seven sections (Figure 3): Overview, School Context, UDL in Action, Media Resources, Skills & Competences, Assessment and Evaluation/Comments from users. Among them, UDL in Action is the most important: its sections are colour coded according to the CAST guidelines. Each UDL Principle and guideline is listed as a statement with checkboxes to prompt the user to select appropriate options used (users may choose more than one option). Moreover, there is a text box to allow the user to add more details about how each guideline has been implemented. The UDL in Action tab is structured as follows:

Principle I: Information/Instruction offered in different ways
1st Guideline: Relevant information available on the learning objectives and outcomes:
  ☐ in advance ☐ at any time ☐ temporarily ☐ on demand

2nd Guideline: Information can be assimilated in various ways:
  ☐ audio ☐ visual ☐ interactive ☐ textual media ☐ printed media

3rd Guideline: The understanding / comprehending of information is supported by providing various options:
  ☐ mind mapping ☐ illustrations ☐ gamification ☐ practical demonstration

Principle II: Allow the learners to express what they Know in different ways.
4th Guideline: Learner can actively process the necessary information:
  ☐ individual work ☐ group work ☐ discussion ☐ games

5th Guideline: Learners can show the results of work as:
  ☐ textual description ☐ individual oral report ☐ group presentation ☐ practical demonstration

6th Guideline: There are different forms of support provided such as …
  ☐ face-to-face mentoring ☐ online mentoring ☐ feedback on demand ☐ formative self-assessment

Principle III: Learners are engaged and motivated in different ways.
7th Guideline: Different known interests and motivators are addressed such as
  ☐ personal interests ☐ authentic tasks ☐ choice in context

8th Guideline: Interests and goal attainment as well as resilience are stimulated actively by:
  ☐ clear goals ☐ practical relevance

9th Guideline: There are opportunities for self- regulation provided:
  ☐ creative freedom ☐ organizational flexibility ☐ beneficial learning environment
  ☐ realization of learning goals by independent learning processes
  ☐ independent diagnosis and assessment of the finished learning process

Other facilities of the UDLnet Inventory allow the user to specify or select: My Good Practices, My favorites Good Practices, My UDL Media Resources, My favorites UDL Media Resources, My Collections of UDL Good Practices and My favorites Collections of UDL Good Practices.

Currently our effort is focused on the collection of innovative, relevant and multilingual UDL content that will feed the UDLnet Inventory. So far 32 Good Practices, 88 UDL Media Resources and 4 UDL Collections are available to the UDLnet community.
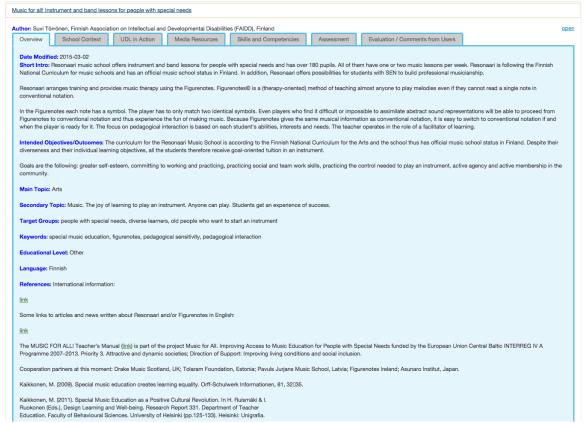
Figure 3: The fields of the UDL Good Practices.

CONCLUSIONS

We have presented the design and development of the UDL Good Practices Inventory to benefit the interesting users in the field (educationalists, teachers, professors, practitioners, etc.). Good Practices included in this Inventory incorporate methods, techniques, approaches or lessons, which apply the UDL principles and guidelines. They have proven, through experience and experiment, to maximize learning opportunities for every individual student in order to secure inclusive and quality education for all. The Inventory supports also UDL Media Resources and UDL Collections. The UDLnet Inventory is not static. It is a growing and dynamic space whose main purpose is to stimulate new reasoning and practices and challenge existing ones. The benefits of using the UDLnet Inventory include:

- Diverse UDL techniques, methods and resources available as a comprehensive and growing repository.
- Users can access and modify concrete examples of UDL Good Practices on a range of topics.
- Support and supply enough scaffolding to newbies in the field of UDL and inspire more advanced users
- Users can be connected and collaborate with peers on UDL, even for a specific Good Practice or at a national level.
- Decreasing preparation time for UDL based lessons, while keeping high quality.
- Bottom-up Continuing Professional Development.

The UDLnet Inventory has not been designed as a destination but as a forum for self-reflection and critical thinking. It is rather an evolving space where practices mutate, shaped and altered and results from increased participation and successes are fed back into the qualitative learning loop.

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