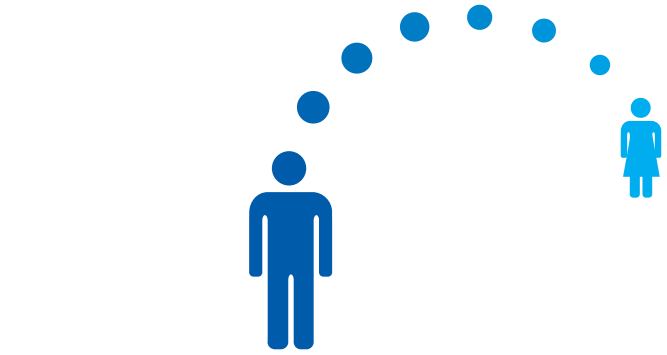


UDLnet

Universal Design for Learning

Pathway to Universal Design for Learning

UDLnet
Universal Design for Learning

N°. 528005-LLP-1-2012-1-GR-COMENIUS-CMP - UDLnet

The Pathway to Universal Design for Learning
(UDLnet_WP7_D7.4_The_Pathway_to_Universal_Design_for_Learning)

UDLnet Consortium

Ellinogermaniki Agogi	Greece
Universal Learning Systems	Ireland
National and Kapodistrian University of Athens	Greece
Angalia Elpidas	Cyprus
NHL University of Applied Sciences	Netherlands
Confederación Española de Centros de Enseñanza	Spain
Centrum für angewandte Systemlösungen e.V.	Germany
Enable Ireland Disability Services Ltd	Ireland
The Finnish Association on Intellectual and Developmental Disabilities	Finland

Editor:
Nikos Zygouritsas
Contributors:
Alan Bruce, Ron Barendsen, Stephanie Cloonan, Georgios Kouroupetroglou, Gabi Lau, Yioula Pitsali, Sisko Rauhala, Marian de Villanueva, Roelien Wierda, Nikos Zygouritsas
Artwork:
Anna Mavroeidi

Printed by EPINOIA S.A.

The UDLnet project is co-funded by the Lifelong Learning programme of the European Union.

Table of contents

Introduction

The "Pathway to Universal Design for Learning" is the outcome of the "UDLnet-Universal Design for Learning: A Framework for Addressing Learner Variability" project and it aims to support the deployment of accessible educational e-content and to make available our findings, which may be used at regional, national and transnational level.

Article 24 of the UN Convention on the Rights of Persons with Disabilities states that persons with disabilities should be guaranteed the right to inclusive education at all levels, regardless of age, without discrimination and on the basis of equal opportunity. State Parties should ensure that children with disabilities are not excluded from free and compulsory primary education, or from secondary education. Still, there is a long way ahead before reaching a society where equal opportunities are guaranteed for all.

Inclusive and quality education is a key means to achieve this goal. In many special as well as mainstream schools, however, there is still much uncertainty and a lack of knowledge. Though the policy context supports a shift to inclusion, professionals need more support to develop their practice. In order to bridge the gap between policy and practice the UDLnet network aspires to address this necessity collecting and creating best practices under the framework of Universal Design for Learning (UDL) on the following envisaged themes: inclusive learning environments, accessible resources, teachers' and school leaders' competences, examination of barriers and identification of opportunities. Moreover, current needs related with the use of mobile devices will be investigated, and the proposed network will cater for the delivery of accessible educational resources through wireless and mobile devices along with the application of the UDL framework in real inclusive educational practices.

UDLnet building upon experience of previous and current projects aimed at exchanging/creating good practices on inclusive education for students with disabilities, and not only, across Europe, in order to cater for their wholesome development, smooth transition in the next grades and consequently for employability, working inclusion and for active European citizenship.

Why UDL?

The rationale for re-designing learning to accommodate and include difference

Setting the context

We are living through times of fundamental change and profound crisis in all of our social and economic systems. The scale of the transformative change coming had been sensed for many years, but usually seen as a by-product of advanced technologies and the massive change involved in digital dimensions and instantaneous global communications. Behind this awareness of impending total change therefore was an assumption of continuing growth and economic expansion. This expectation was totally ruptured with the financial crisis of 2008. Instead of constant growth, we now have mass unemployment (particularly affecting youth), severe reductions in public expenditure in most economically advanced societies and emerging policies that now seem to demand sustained austerity.

It is not surprising that this crisis, the largest and most long-lasting since the Great Depression of the 1930s, has affected all areas of society - and not least of these is education. The dramatic spread of access to education, enhanced quality in educational provision, technological advances in e-learning and open educational resources, and the recognized value of academic qualifications in gaining employment have been among the most important advances in all countries since the end of the Second World War. Mass education opened vast new levels of opportunity to countless millions. The spread of literacy and numeracy, the development of vocational competences, the deepening of scientific research, the initiation of critical thinking and innovation have all been part of an educational revolution linking all parts of our world.

While this is still a highly valued objective for educators and policy makers, the realities of economic change and fiscal constriction make achievement of previous goals more problematic. Paradoxically, the crisis has also prompted a re-think about the aims and purposes of education in this vastly altered world.

Globalization has become one of the most used words today when describing economic, social and commercial trends. The impact of ever more sophisticated information and communications technologies means that people can discuss and contact each other over vast distances almost instantaneously. It also means that the reach and scope of such technologies is now available across the planet. Such a transformation (and in such a relatively short time) poses both opportunities and challenges for traditional structures and institutions operating within the education system. People now have the means to compare and contrast issues, to debate and assess different situations and to have access to examples of other, diverse approaches and standards practically at the push of a button.

The impact on education and learning of the globalization process is equally contradictory. On the one hand, learning resources (such as course materials, accepted terminology, subject range and internet-based learning) have been criticized for being overwhelmingly centered on US or European models and norms – and, in particular, by being dominated by exclusively English language orientations. On the other, globalization opens up real possibilities for transformative learning, where knowledge exponentially grows without constraints of national curricula or vested self-interest.

Creative synergy demands that innovation be constantly applied to the world of learning. The technologies that drive globalized learning can also open profound opportunities and new levels of access for those traditionally excluded by reason of geography, social class or marginalization. Workers employed in peripheral jobs are vulnerable to redundancy, may lack promotional outlets and suffer great educational disadvantages. If globalization is about global markets it is equally about global learning. This simply cannot be achieved without maximizing access, learning and human development. This raises the question of meaningful inclusion.

All accept that technology is having an increasing impact on our lives. Information and communications technologies evolve at a rapid pace. They affect the way we live, how we work, how we communicate and how we learn. Globalization is a powerful driving force and takes this process of technological change - and how we learn - to an entirely unprecedented level of global contexts.
Individuals must be able to make themselves available to a globalized labor market not just once in a lifetime but constantly – because of volatility, ongoing change and what has been termed the process of permanent insecurity. This enhanced emphasis on competitiveness also has a direct bearing on the understanding of the importance of standards and quality. Globalization places constraints not just on individuals. It also constrains companies, groups and national governments to conform to international standards and an unremitting emphasis on quality.

Approaching Social Inclusion

Social inclusion is not about halting the irreversible. It is about ensuring that alternative aspects of the human experience are fostered and vindicated. This in itself calls for communities of the marginalized to better define their needs and their potential contribution to the wider societies and communities of which they are part. Rather they should be seen as integral components of a global effort to ensure that the world passed on to subsequent generations is not a uniform, suburbanized market place but a living and diverse collection of richly different communities.
Social inclusion can be therefore seen as an integral element in a reassertion of the primacy of human values in teaching, research and best practice. Overcoming exclusion and marginalization means equipping students and educational stakeholders alike not simply with the mechanisms to understand social challenges - but also, and more fundamentally, to be able to do something about them. Social exclusion implies both a *structure* and a *process* in the ordering of human relations.
Social exclusion concerns itself therefore with:

- Groups that can be defined as excluded
- The nature of the exclusion experienced
- The attitudes of those who maintain exclusionary practices
- The knowledge, skills and attitudes of officials in developing policies in these areas
- The body of knowledge and practice regarding equality legislation and practice.

What is important is that conceptual clarity needs to be be used from the outset in approaching issues around social exclusion. What is important is that a rigorous analysis of the existing conditions and characteristics of the presenting society be employed to make sense of the discrimination in practice and attitude that undoubtedly exists.
Two issues emerge strongly from this. One is the question of *equality of opportunity*. Embedded firmly in the thinking and values of the French Revolution, equality as a concept has been a highly contentious issue in Europe ever since. From Napoleon to Thatcher, equality has been often derided and demeaned as a concept. From securing the franchise to ensuring a documented Bill of Rights in Northern Ireland, equality has been at the coalface of resistance and opposition from vested social interests. In the United States there is a richer tradition of the acceptance and assertion of rights but a corresponding marginalization of the need to accept any underlying a priori equal status between human beings, except in the context of the obligations of citizenship. Equality should not be seen therefore as axiomatic and widely accepted in all western societies.
Second is the question of the *norm* against which exclusion is judged. In charting the poor levels of access for those experiencing social exclusion, the literature of the European Union for example refers constantly to 'average' persons. In a context where the average is never defined or the normal spelled out, it is difficult to see social exclusion as anything other than that which is variably defined at any one time by individuals and structures which envisage themselves as average or normal.

Clearly this value-ridden concept is less than useful. The norm clearly does not refer to a statistical average. Nor does it refer to a historical constant. Its very use excludes. Its very use contains the bias against which equality approaches must engage.
Although there has been a considerable increase in participation rates and schooling during the last ten years or so, many young people still leave school without the requisite qualifications, knowledge or skills for open, competitive employment. In addition, they often do not have that love of learning and motivation to learn that is essential for further learning and growth in the rest of their lives. The emphasis on learning for all recognizes that education and training are prerequisites for not simply employment (or, even more rudimentary, a 'job') but for equitable participation in society.
This is why the principles and methods of lifelong learning have had such a resonance in the disability community - especially in the United States among the independent living movement. Concepts of empowerment, autonomy, ease of access, flexibility and innovation are central to lifelong learning and fit well with the structures and objectives of the disability rights movement. These issues are pointers to strategies and policies central in the forthcoming approach to education and training for social inclusion.

Origins of Universal Design

Among the earliest manifestations of awareness of the link between access, inclusion and worker productivity in a holistic human-centered paradigm was the science of *ergonomics*. Ergonomics is nothing more than the design of products, systems and processes to factor in the relationship between them and the people that actually use them. This field of analysis and practice was based in the rapidly changing labor market and industrial processes. It focused on the design of equipment and devices that could fit both human physical attributes and functional aspects as well as cognitive (thinking and learning aspects). Effectively, ergonomics lies at the frontier between occupational health (and safety) and productivity.
A key task therefore of effective ergonomics, occupational safety and learning systems was the removal of *barriers* to work and the elimination of obstacles by designing for maximum inclusion of all those who have the requisite skills and competencies to undertake the task at hand. In time these barriers were viewed not merely as impediments to smooth operational efficiency but as mechanisms, largely artificially created by social structures, which acted as powerful and sustained exclusionary agents to full human participation as of right in both work and learning contexts.
The need to develop relevant and practical techniques and methods and learning frameworks for learners and practitioners at the interface of cultural, ethnic, economic, social and religious difference is a key driver for innovative diversity competence development. The development of skills, knowledge, behaviors and attitudes to cope with and derive mutual benefit from a time of crisis and diversity is critical for modern European employment systems. The severe current economic crisis and deterioration has produced unprecedented difficulties for meaningful integration strategies and policies.
The nature and scale of this has a direct impact on learning for those working in the creative learning and education sectors. In addition to new challenges in equality related employment issues, old issues have re-asserted themselves in new - and sometimes menacing - ways. These encompass:

- Ethnic demographics
- Ongoing discrimination regarding disability
- National frameworks and policies
- Socio-cultural structures and norms
- Flexibility and adaptability
- Problem identification and resolution

- Educational systems and the ownership of learning
- Best employment practice.

Universal Design has often been defined as a concept whose roots are grounded in three areas.
These are:
1. Design of physical environments (residential and commercial space)
2. Web development and most recently,
3. The field of teaching and learning (Universal Design for Learning, UDL). This is the most recent iteration of the concept of Universal Design.

Universal Design for Learning is the application of UD to learning.

The evolution in the understanding of learning in today's world and its evolving role in work and education has also indicated an important cultural change around cooperation, collaboration and collective creation in widely different contexts and circumstances. In this new culture, community and its relational meanings take on transcendental value. Along with the idea of community is the goal of union between sets of different communities shaping communicative networking processes. This issue lies at the heart of inclusive education approaches, particularly in contexts where human diversity has increased or accelerated. The emerging communities are not the rigid ones of a static and hierarchic linear production system as in the 19th century. Rather these communities are diffuse, complex and mutating, and they form and re-form in complex ways.
This raises many issues in relation to the extent to which good practice examples develop a community of learners and overcome traditional barriers to learning. It also raises issues concerning power relations in the learning process and the extent to which learning opportunities are collaborative or characterized by continuing hierarchical boundaries. It finally creates the question of who builds the learning process and the extent to which processes that promote creativity and innovation also promote equity.

Who benefits from UDL?
UDL is an educational extension of the universal design movement in architecture. Originally formulated by Ron Mace at North Carolina State University, Universal Design had a key objective: to build innately accessible structures by addressing the mobility and communication needs of individuals with disabilities at the design stage, a practice that eventually spread to areas such as civic engineering and commercial product design. Designs
that increased accessibility for individuals with disabilities—those who are typically "in the margins"—tended to yield benefits that made experiences better for everyone.
Universal Design for Learning is based on decades of research into the nature of learner differences, the capacities of new media, the most effective teaching practices, and assessments that, while based on high standards, are fair and accurate measures of student learning. This research was centered in CAST (*Center for Applied Special Technology*).
At the Center for Universal Design in the University of North Carolina, a group of architects, product designers, engineers and environmental design researchers established seven principles of Universal Design to provide guidance in the design of products and environments.
The CUD principles of UD are:
- *Equitable use*. The design is useful and marketable to people with diverse abilities. For example, websites designed to be accessible to everyone, including people who are blind and use screen reader technology.

- *Flexibility in Use*. The design accommodates a wide range of individual preferences and abilities.
- *Simple and intuitive*. Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- *Perceptible information*. The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- *Tolerance for error*. The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- *Low physical effort*. The design can be used efficiently, comfortably, and with a minimum of fatigue.
- *Size and space for approach and use*. Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility.

Since its founding in 1984, CAST has stimulated and developed the field of Universal Design for Learning through creative research and development, strategic partnerships, teacher preparation and support, and international outreach. It provides a research-based framework for applying insights about students "in the margins" to the design of curriculum. UDL's basic premise is that barriers to learning occur in the interaction within the curriculum—they are not inherent solely in the capacities of the learner. Thus, when education fails, the curriculum, not the learner, should take responsibility for adaptation. With the UDL framework, curriculum designers anticipate and reduce or eliminate barriers by making curricula flexible.

This is a critical departure from orthodox learning and teaching strategy. In the traditional model it was assumed that the curriculum was based on inherent and timeless certainties which could be proved and demonstrated as orthodox truth. Bodies of knowledge could be accessed through strategies of assimilation of key facts and methodologically by processes of memorization, comparative analysis and recall in standardized testing environments. This method facilitated an 'objective' analysis of human capacity and intelligence and was highly valued as a means of selection for access to higher levels of education (for example university or professional entrance) as well as an indication of inherent academic ability. This learning system was even replicated in the fields of psychometric evaluation with the design and implementation of 'objective' measures of intelligence or inherent aptitude.

Such an understanding of the processes of human learning was deeply flawed in terms of its ability to measure human ability through anything other than measures which themselves contained significant elements of bias, stereotype, subjectivity and discrimination. It is not surprising therefore that CAST emerged among a group of professionals working with people who had experience of disability, itself a set of conditions that reflected the bias and fears of external society rather than the innate skills or aptitudes of those with disabilities themselves. The advent of new, radical, innovative and emancipatory technologies made possible a dynamic reassessment of capability and innovation. By indicating that the limitations to academic progress and emancipatory learning lay in the barriers inherent in flawed curriculum design (rather than in the individuals affected by specific medical, psychological or physical conditions) was a radical departure.

The second key issue in the understanding and application of UDL is the emergence and impact of new technologies that make a whole new range of educational initiatives possible. The application of these technologies and advanced digital applications has completely transformed what is possible in the field of learning. As an example, the provision of customized, multimedia content—or even just digital text as an entry point—can reduce barriers to learning for many students. Beyond reducing barriers, it can also improve learning by allowing for multiple representations of meaning that may be used redundantly for clarity, complementarily for enhanced meaning, or even discordantly for multiple meanings (e.g. multiple soundtracks carrying dramatic content as well as directors' narrations that offer alternate links to background knowledge or points of view).

Digital media's tremendous flexibility enables teachers to differentiate their approaches in a way that is simply not feasible when restricted to traditional media such as print, speech, and images. With traditional media teachers would have to create or assemble a huge assortment of materials. With digital media one piece of curriculum can be designed with built-in customization features so that it can be adapted to suit many different students. The capacity to use multiple media leads to a more diversified, flexible framework for communication—a framework that takes advantage of the varied strengths and weaknesses of each medium and enables teachers to select the medium best suited to a particular student and learning task.

The needs of diverse learners who have until now been disenfranchised in a print-centric world can drive us to discover, develop, and apply the astonishing power of new media to expand educational opportunities. Learning is supported and facilitated by the interaction between the learner and the curriculum. When that support and facilitation is missing, "learning disabilities" arise. If the curriculum can be flexibly designed, it can meet more learners where they need to be met. It can challenge and support the vast variety of needs, skills, and interests arrayed in a diverse classroom. Using new tools to support traditional, print-based curriculum has taught us some important things. But like other early-stage uses of new technologies, this approach has not really taken advantage of the true power of digital tools and media, nor has it provoked fundamental and significant change in education. With the early stages of educational technology adoption behind us, we are ready to take full advantage of the power and flexibility that digital tools and content offer, and to envision new ways for teachers to teach and learners to learn.

Innovations in educational technologies are driven by the needs of students in the margins, those for whom present technologies are least effective—for example, students with disabilities or exceptional talents. These more conspicuous needs highlight the curriculum's failings. However, as new technologies help us to appreciate the full extent of learners' diversity and the variety of ways in which they can be unique, it will become apparent that the curriculum itself can be improved to the benefit of all students.

This will require a significant change in mind-set about the possibilities of new technologies for education and ultimately about our educational goals. There is understandable resistance to change, as entrenched approaches to curriculum design, assessment, teaching, and even the structure of schools and classroom practices are firmly rooted in the venerable and powerful traditions of printed text. While the hegemony of this medium has already disappeared in such high-impact fields as advertising, entertainment, and communication in the culture at large, the legacy of print continues in schools. While computers offer tremendous power for learning with text, their capacity reaches well beyond text to facilitate teaching and learning with varied media and to offer customizability.

Students in the margins must be served, and the technology is here now to serve them effectively. UDL—including its framework and tools for learning—transforms the pressures of diversity into opportunities for all learners because it does not resist diversity, as traditional curriculum centered around printed text does—insisting that all learners "fit the mold." Rather, UDL recognizes the fact that diversity in learning abilities and styles can be a tremendous asset if we are willing to reconsider the way curricula are designed and the way schooling is practiced from the "margins" perspective.

Universal Design for Learning (UDL), both as a field of inquiry and practice, proactively designs course content in a manner that is intended to be as accessible to as wide an audience as possible.

The approach is one where the instructor pre-emptively addresses course content, structure and delivery that targets defined (or undefined) accessibility issues. In this way the benefits of improved accessibility are available to the entire class cohort rather than just those seeking the specific accommodation.

UDL has as its basis the idea that designing in a way that is more accessible to a target group is also likely increasing the accessibility for others. One of the challenges for UDL is that innovations introduced to improve accessibility for one group may actually impede accessibility for another group. As a transdisciplinary approach that synthesizes insights from various academic fields (developmental psychology, neuropsychology, neuroscience, sociology, education theory and practice), UDL is well positioned to serve as a catalyst to spark deeper connections between research, practice, and policy. CAST itself has been pursuing several areas in research on UDL applications. These include Supports and Scaffolds in UDL; Learning Analytics and Progress Monitoring; Authoring Platforms; UDL in Literacy, Science and Math; Smart Images; Online Learning; Implementation of UDL to Improve Teacher Effectiveness.

As all educators know, students come to the classroom with a variety of needs, skills, talents, and interests. For many learners, the typical curriculum—which includes goals, instructional methods, classroom materials, and assessments—is littered with barriers and roadblocks, while supports often are relatively few. Faced with an inflexible curriculum, students and teachers are expected to make extraordinary adjustments. UDL turns this scenario around, placing the burden to adapt on the curriculum itself.

This shift in emphasis—from access to learning environments to access to learning itself—is a key tenet of UDL. In a sense, it is the bridge between special education and general education: a concern that all learners get a high-quality education. One of the challenges faced in education is to reach students who have not traditionally done well in the education system, including students with disabilities, migrants, language learners, and children from lower deprived socioeconomic backgrounds. Currently, most learning environments and curricula are too restrictive to support effective and efficient learning for all students. UDL creates a framework to reduce the barriers in education, anticipate the diversity in everyday mainstream classrooms, and embed support into national curricula. The implementation of a UDL framework has the potential to open doors in education to all students, especially those not effectively served by current systems and structures.

Change takes place slowly in education. An important precondition is that teachers are receptive to the idea of change. More students with disabilities are being educated in the general education classroom now than fifteen years ago. Along with this change has come an attitudinal shift. This shift has led to questioning why groups of learners were segregated in the past. We now know that many students were taught differently and in different places based on common assumptions about supposed inherent difference. This boys and girls had separate schools (if girls had schools) with significantly different curriculums. Or different religions, ethnic groups or language speakers were sent to different schools. The less academic were separated from the more academic – as they are still streamed separately in countries such as Germany and England. Above all, disability saw a plethora of segregated schooling and institutional examples – with separate educational provision for the deaf, the blind, the physically impaired etc.

We now know that these segregated responses had nothing to do with the pupils themselves but the attitudes of the society of which they were a part – marginalized and discriminated against but nonetheless a part. UDL is a practical and proactive response to difference. It allows educators to assert that all learning is possible based on only way criterion for participation – the learner must want to learn. Given that motivation is possible, we can then construct models of participative engagement which do not inherently discriminate or exclude.

UDL uses technology and innovation to explore alternatives, to test curriculum design and to provide spaces for inclusion for as broad a range of students as possible. It is a practical tool to ensure more vibrant and creative educational offers. It is also a key resource in designing a more participative and social inclusive society buy addressing the rights of all to learn as they wish. This contains huge benefits for teachers, students and families as well as educational policy makers.

How UDL

UDLnet Inventory

The UDLnet Inventory is a user-centred Web 2.0 Portal with underline services and repository of content. There is an interest to encourage community ownership, and promote a locally sensitive and relevant use of the technology – and this is mainly achieved by conducting participatory research and by involving community stakeholders in the design and operations of the network.
The Inventory of UDL Good Practices 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, are shaped and altered and results from increased participation and successes are fed back into the qualitative learning loop. Teachers need to engage and use the UDL Inventory to evoke accepted practices and methods, which hinder full participation and access. 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. UDL works and evolves best when located in a community. The benefits for teachers and other educational stakeholders participating in 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

Inventory Facilities:

- **Good Practices** included in this Inventory incorporate methods, techniques, approaches or lessons, which apply the UDL principles and guidelines proposed by CAST. 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 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. The Media Resources may also be the outcome of a particular lesson or scenario.
- **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.

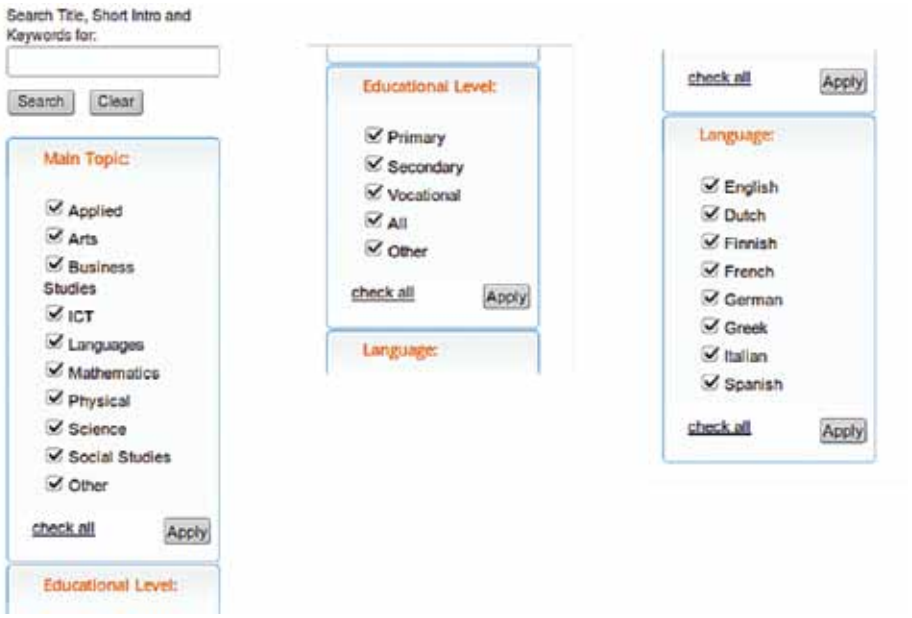
Good Practices

Good Practices in the Inventory incorporate methods, techniques, approaches or lessons, which apply the UDL principles and guidelines [2] proposed by CAST[3]. 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 were: transferable, adaptable, flexible and effective.
The user can browse the "Good Practices" of the Inventory by clicking the menu "Browse Good Practices": "Good Practices" → "Browse Good Practices". A list of "Good Practices" appears on the screen:

Browsing "Good Practices"

To help minimize the number of "Good Practices" shown in the window, filtering service is available on the left side of the window.
Four (4) types of filtering are available:
Search Title, Short Intro and keyword: the user can search between "Good Practices" by a keyword contained in the "Title" or in the "Short Intro" or in the "Keywords" section of the "Good Practices".
Search by Main Topic: user can select among the topics: Applied, Arts, Business Studies, ICT, Languages, Mathematics, Physical, Science, Social Studies and/or Other.
Search by Education Level: Primary, Secondary, Vocational, All and/or Other.
Search by Language: English, Dutch, Finnish, French, German, Greek, Italian and/or Spanish.



a) Keyword and Main Topic filter, b) Educational Level filter, and c) Language filter

Media Resources

"Media Resources" are used as a support content to the "Good Practices". **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.

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.

Browsing "Media Resources"

The user can browse the "Media Resources" in the Inventory by clicking the menu "Browse Media Resources" ("Media Resources" → "Browse Media Resources"). To help minimize the number of "Media Resources" shown in the window, filtering services are also available on the left side of the window.

Three types of filtering are available:

Search Title and Description: the user can search between "Media Resources" by a keyword contained in the "Title" or in the "Description" of the "Media Resources".

Search by Resource Type: the user can select the type of the "Media Resources": Video, Image, Document, Presentation, Software and/or Other.

Search by Languages: English, Dutch, Finnish, French, German, Greek, Italian and/or Spanish.

Filters used for Media ResourcesCollections

"Collections" provide to the 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.

Browsing "Collections"

The user can browse the "Collections" in the Inventory by clicking the menu "Browse Collections" ("Collections" → "Browse Collections"). To help minimize the number of "Collections" shown in the window, filtering services are available on the left side of the window.

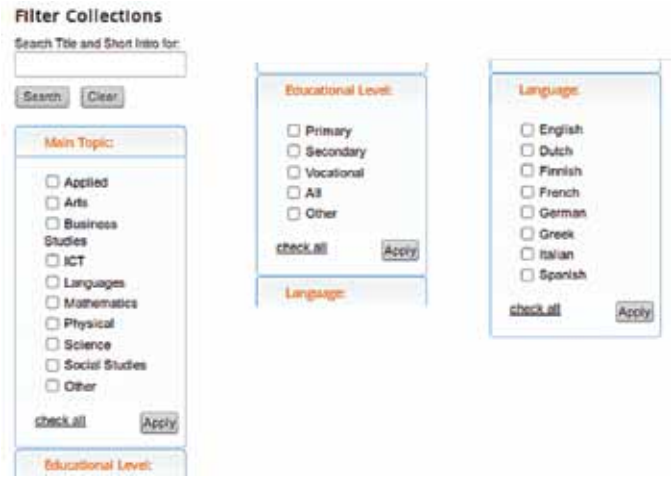
Four (4) types of filtering are available:

Search Title and Short Intro: the user can search among the "Collections" by a keyword contained in the "Title" or in the "Short Intro" of the "Collections".

Search by Main Topic: 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.



Filtering Collections

Users

There are two types of users: guest user and registered user. The guest user has limited access to the site. This type of user can only see specific pages of the UDLnet inventory, but can not browse the content of the site (e.g. browse "Good Practices", upload content, e.t.c.). These actions are only available to register users.

Registering process

In order to create an account, a user should follow the steps below:

1. Press the register button on the top right corner of the screen.
2. A new window appears with a form where the user can fill his/her information (figure 20).
3. Press Register button on the bottom of the screen to save the information.

Registration button

Registration screen

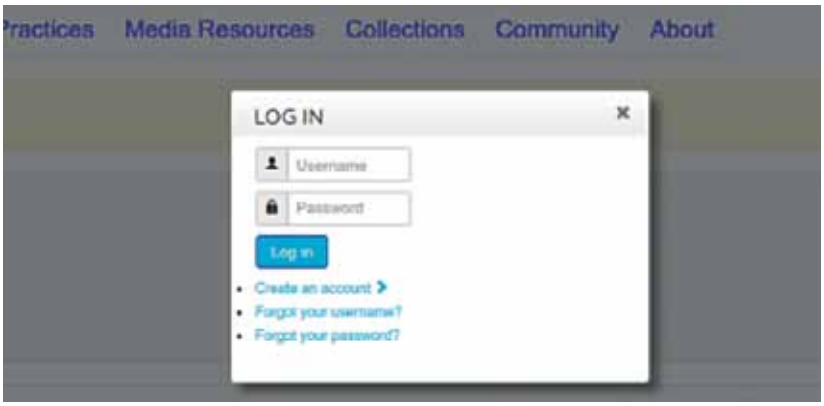
Log in process

A register user should first log in in order to continue the browsing of the UDLnet Inventory:

1. Press the "Log in" button on the top right corner of the screen.
2. A new window appears where the user can fill the username and the password selected from the registration process.
3. Press the "Log in" button.

After this process the user can have access to the whole content of the UDLnet Inventory.

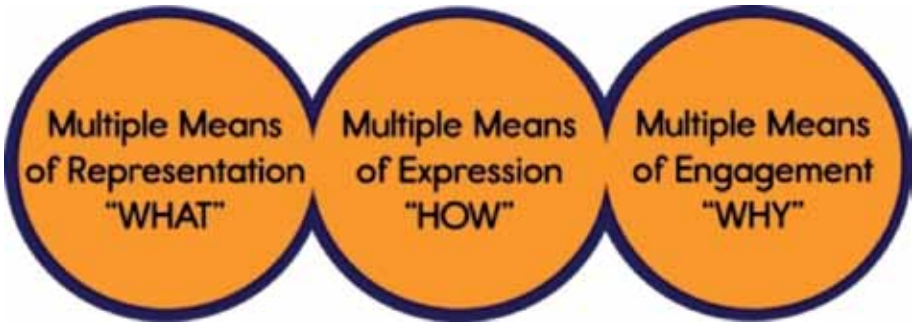
"Log in" button



"Log in" screen

UDL Course

The online course can be found at: http://innovationlab.nhl.nl/projects/udl-on-the-fly
The online course has been developed to provide teachers and student teachers with an opportunity to become acquainted with the principles of Universal Design for Learning and its application.
The workload for the course is 25-30 hours (-1 ECT)
The course has been developed within the framework of UDLnet, an EU-funded network.



Learning outcomes

Learning Outcomes of the course:

- You have acquainted yourself with the principles of UDL so that you can assess to what extent lessons or modules are UDL-proof. For this you can use the UDLnet Quick Reference Card and examples from the UDLNet repository.
- You have formed a well-founded opinion as to what extent UDL may supply you with concrete and accessible tools to cater for all pupils in your class individually, irrespective of their talents, learning styles, challenges and circumstances.

Express your views on the above in any way you like: you can think of:

- a video
- a drawing
- a mindmap
- a presentation
- a weblog or vlog
- a short article or essay
- a case study
- .....

In order to get the UDLNet certificate upload the required "Learning Outcomes" via the button «Results". The certificate (worth 1EC) will be awarded after the required LO evidence has been assessed and approved.

Rubric

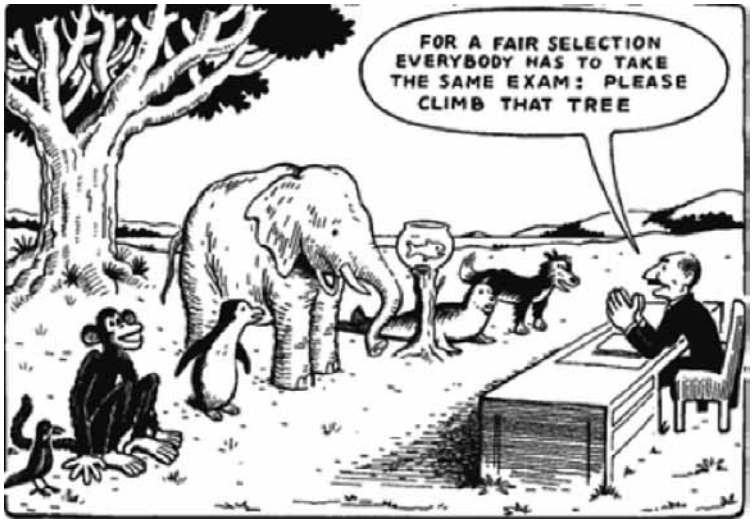
Rubric 1 EC UDL module

Indicator	Good	Sufficient	Insufficient/absent
You demonstrate that you are aware of and familiar with the nine UDL principles			
You demonstrate that you can trace presence/absence of UDL principles in existing educational materials			
You demonstrate that you can reflect critically on what UDL has to offer you in your daily educational practice			

In order to complete this course successfully all three subsections in the rubric must at least be «sufficient».

Baseline test

Take this ***test*** to discover where you stand with respect to the application of UDL in your curriculum



UDL: Why and What.

Step 1

In order to develop an initial idea as to the necessity of Universal Design, watch the following video:

The myth of the average:

The Myth of Average: Todd Rose at TEDxSonomaCounty

https://www.youtube.com/watch?v=4eBmyttcfU4

Step 2

The following video gives a brief outline as to what UDL is all about:

Universal Design for Learning (UDL)

https://www.youtube.com/watch?v=aaSZqgr2eUM

Step 3

The following video also summarizes what UDL is; in particular, it focuses on the three brain networks - the recognition network, the strategic network and the affective network - that together allow the learners to learn, to plan and to be and remain engaged.

UDL At A Glance

https://www.youtube.com/watch?v=bDvKnY0g6e4

Assignment UDLnet database

This is a suggestion as to how you can deliver part of the required learning outcomes; if you have alternative ideas as to how you can produce the required learning outcomes you are free to do so. Share your thoughts and suggestions in the comment box below.

Step 1 - Surf to ***http://udlnet.di.uoa.gr/***

Step 2 - Choose the language you prefer

Step 2 - Register and login

Step 3 - Click on Good Practices - Browse Good Practices

Step 4 - Find a good practice that appeals to you: some suggestions:

- Adventure in India
- Taaldorp Frans
- Grammar through flipping the classroom

Step 5 - Open the Good Practice
Read the tab Overview and click on the hyperlink behind References.
Use ***the checklist*** to give well-founded comments.
Select the tab **Evaluation/Comments from Users** and give (in *at least 20 words*)
your overall evaluation
Rate this Good Practice using the 5 star scale (left part of the next line to the title of the Good Practice).

UDLnet reference card

Grounded on new research in neuroscience and the Design for All (D4All) principles, Universal Design for Learning (UDL) constitutes an educational approach that promotes access, participation and progress in the general curriculum for all learners (CAST, 2014). 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	Affective Networks
The "what" of learning	*The "how" of learning*	*The "why" of learning*
		
How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.	Planning and performing tasks. How we organize and express our ideas. Writing an essay or solving a math problem are strategic tasks.	How learners get engaged and stay motivated. How they are challenged, excited, or interested. These are affective dimensions.
Present information and content in different ways	Differentiate the ways that students can express what they know	Stimulate interest and motivation for learning

UDL recognises the need to create opportunities for the inclusion of diverse learners through providing curricula and instructional activities that allow for multiple means of representation, expression, and engagement. Three primary principles, based on neuroscience research, guide UDL and provide the underlying framework for the Guidelines:

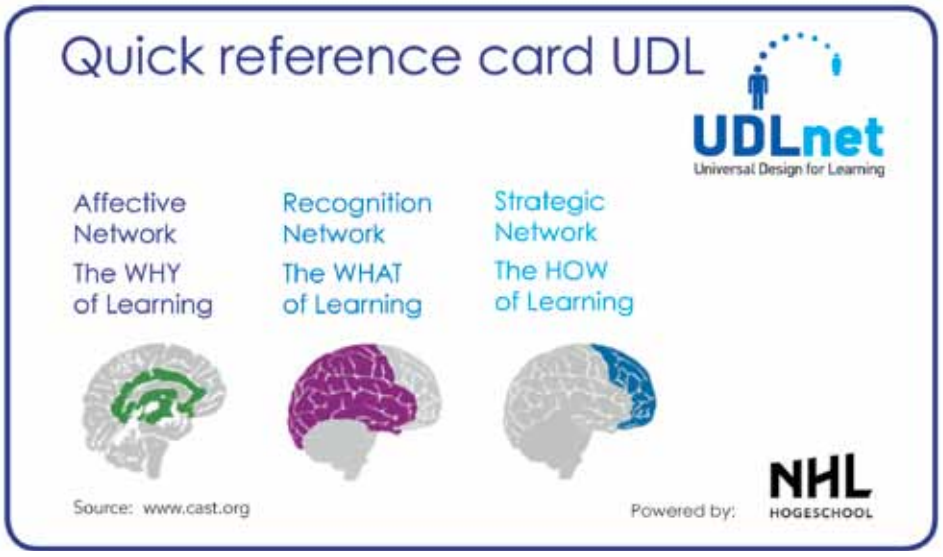
- Principle I: Provide Multiple Means of Representation (the "what" of learning).
  Learners differ in the ways that they perceive and comprehend information that is presented to

them. For example, those with sensory disabilities (e.g., blindness or deafness); learning disabilities (e.g., dyslexia); language or cultural differences, and so forth may all require different ways of approaching content. Others may simply grasp information quicker or more efficiently through visual or auditory means rather than printed text. Also, learning and transfer of learning occur when multiple representations are used, because it allows students to make connections within, as well as between, concepts.

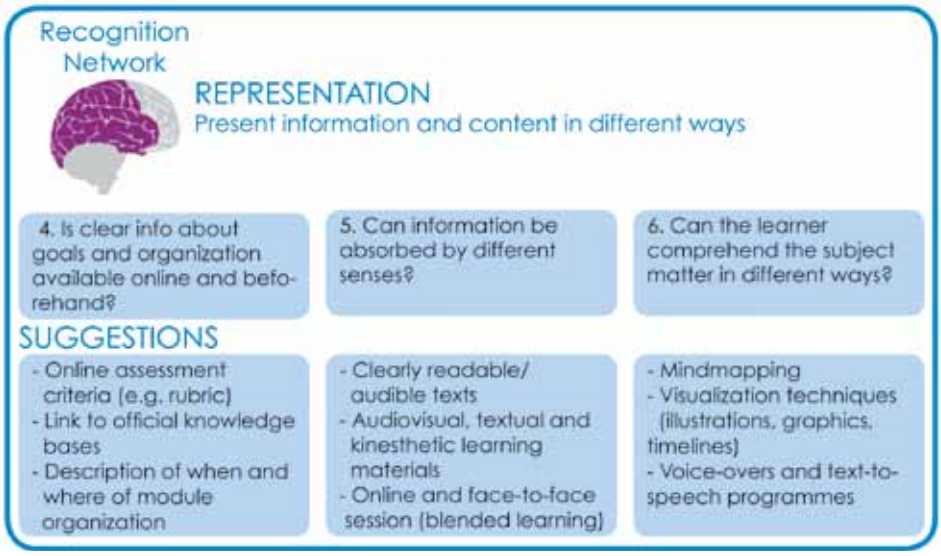
- Principle II: Provide Multiple Means of Action and Expression (the "how" of learning). Learners differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant movement impairments (e.g., cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders), those who have language barriers, and so forth approach learning tasks very differently. Some may be able to express themselves well in writing text, but not 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.
- Principle III: Provide Multiple Means of Engagement (the "why" of learning). Affect represents a crucial element to learning. Learners differ markedly in the ways in which they can be engaged or motivated to learn. There are a variety of sources that can influence individual variation in affect including neurology, culture, personal relevance, subjectivity, and background knowledge, along with other factors presented in these guidelines. 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.

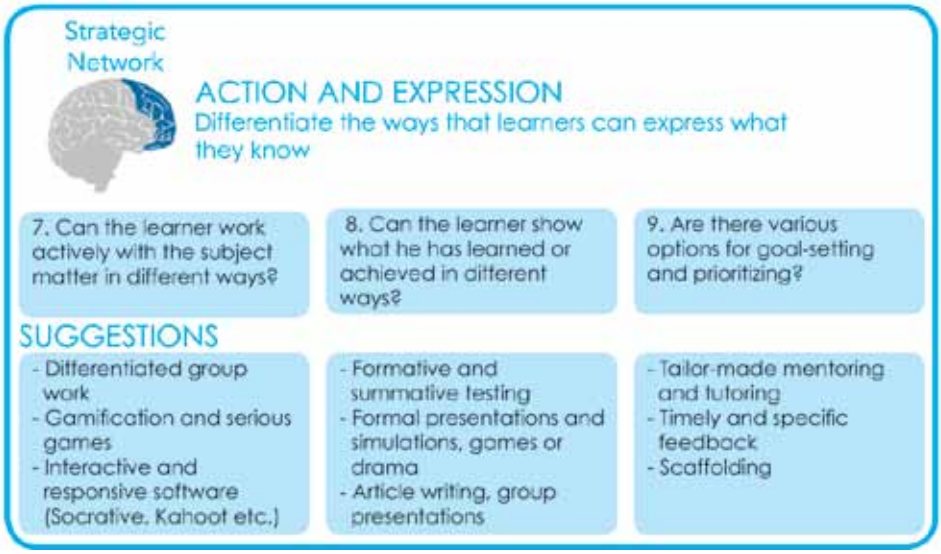
The UDL Guidelines are organized according to the three main principles of UDL (representation, action and expression, and engagement). These are arranged differently depending on the purpose of the representation, but the content is consistent. To provide more detail, the principles are broken down into Guidelines, which each have supporting checkpoints.

In order to make the application of these guidelines easier in every day school practice, UDLnet has developed the following reference card:




Affective Network
ENGAGEMENT
Stimulate interest and motivation for learning in different ways
1. Are there different options to recruit the learner's interest?
2. Are there different options for self regulation?
3. Are there different options to sustain the learner's efforts to achieve his goals?
SUGGESTIONS
- Choices in challenge, reward and context
- Personal development plan
- Authentic tasks
-
- Helpdesk with generous opening hours
- Peer tutoring
- Tailor-made formative assessments
-
- Intake assessments
- Progress tracking
- Communities of practice (learners and experts)
-


Recognition Network
REPRESENTATION
Present information and content in different ways
4. Is clear info about goals and organization available online and befo-rehand?
5. Can information be absorbed by different senses?
6. Can the learner comprehend the subject matter in different ways?
SUGGESTIONS
- Online assessment criteria (e.g. rubric)
- Link to official knowledge bases
- Description of when and where of module organization
- Clearly readable/ audible texts
- Audiovisual, textual and kinesthetic learning materials
- Online and face-to-face session (blended learning)
- Mindmapping
- Visualization techniques (illustrations, graphics, timelines)
- Voice-overs and text-to-speech programmes


Strategic Network
ACTION AND EXPRESSION
Differentiate the ways that learners can express what they know
7. Can the learner work actively with the subject matter in different ways?
8. Can the learner show what he has learned or achieved in different ways?
9. Are there various options for goal-setting and prioritizing?
SUGGESTIONS
- Differentiated group work
- Gamification and serious games
- Interactive and responsive software (Socrative, Kahoot etc.)
- Formative and summative testing
- Formal presentations and simulations, games or drama
- Article writing, group presentations
- Tailor-made mentoring and tutoring
- Timely and specific feedback
- Scaffolding

What UDL

Word and accessibility

Title: ***Creating Accessible Documents with MS-Word***
Author: Georgios Kouroupetroglou, University of Athens, Greece
Intended Objectives / Outcomes: To provide to the authors (teachers, professors, educators, etc.) practical guidelines in various forms (short, long, slides, videos) for the creation of accessible educational documents using MS-Word (version 2007, 2010, 2013, or 2011 for MAC).
Ten myths on the accessibility pf educational documents:
1. Every electronic file (e.g. MS-Word, PDF) is accessible.
2. Accessibility refers only the students with disabilities.
3. It is hard and complex to achieve accessibility in documents.
4. Accessible documents are boring and low aesthetics.
5. Students with disabilities will not read my documents.
6. I have to target on the majority, most of the students are not disabled.
7. There is not one to force me to produce accessible documents.
8. I have to create another version of my documents which will be accessible.
9. I have to put a lot of effort to create accessible documents.
10. Finally, I would not have any benefit from the accessibility of my documents.

A study of Forrester Research, Inc. ordered by Microsoft, showed that 57% of the computer users benefit directly or indirectly when accessibility has been applied.

Main Topic: Other
Secondary Topic: Generic or horizontal (can be applied in all topics)
Target Groups: The accessible educational documents targets mainly students with sensory, physical, mental or learning disability of all ages or educational levels in all forms of learning (education, training, etc.).
Keywords: accessible educational documents, MS-Word, accessibility, design for All
Educational Level: All
Language: English
References:
1) Short Guidelines:
   Creating accessible docs with Word 2007-2010 link
   Creating accessible docs with Word 2013 link
   Creating accessible docs with Word 2011 for MAC link
   How to make a Word document accessible link
2) Guidelines for creating Accessible Documents:
   Creating accessible docs with Word 2007 link
   Creating accessible docs with Word 2010 link
   Creating accessible docs with Word 2013 link
   Creating accessible docs with Word 2011 for MAC link
3) Slide presentation: Eight Steps To Accessible Word Docs link
4) Tutorial videos:
   Creating Accessible Documents with Microsoft Word 2013 link

Creating Accessible Documents with Microsoft Word 2010: Part One link
Creating Accessible Documents with Microsoft Word 2010: Part Two link

School Context

Resources / Environment:
For this Good Practice users must have access to a personal computer with the MS-Word word processor (version 2007, 2010, 2013, or 2011 for MAC).
Barriers and Opportunities:
Applying the MS-Word accessibility guidelines in existing documents, may be time consuming. In contrast, when the MS-Word accessibility guidelines are applied during the creation of new documents the required extra time is substantially shorter.
The 2010 and 2013 versions of MS-Word include an accessibility checker tool.
UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...
- choice in context

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...
- practical relevance

Guideline: There are opportunities for self-regulation provided ...
- creative freedom
- organizational flexibility

UDL Principle: Information/Instruction offered in different ways

Guideline: Relevant information is available on the learning objectives and outcomes
- in advance
- at any time
- on demand

Guideline: Information can be assimilated in various ways
- visual

Guideline: The understanding/comprehending of information is supported by providing various options
- illustrations
- practical demonstration

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways
- individual work
- group work

Guideline: Learners can show the results of work as ...
- textual description
- practical demonstration

Guideline: There are different forms of support provided such as ...
- formative (self) assessment

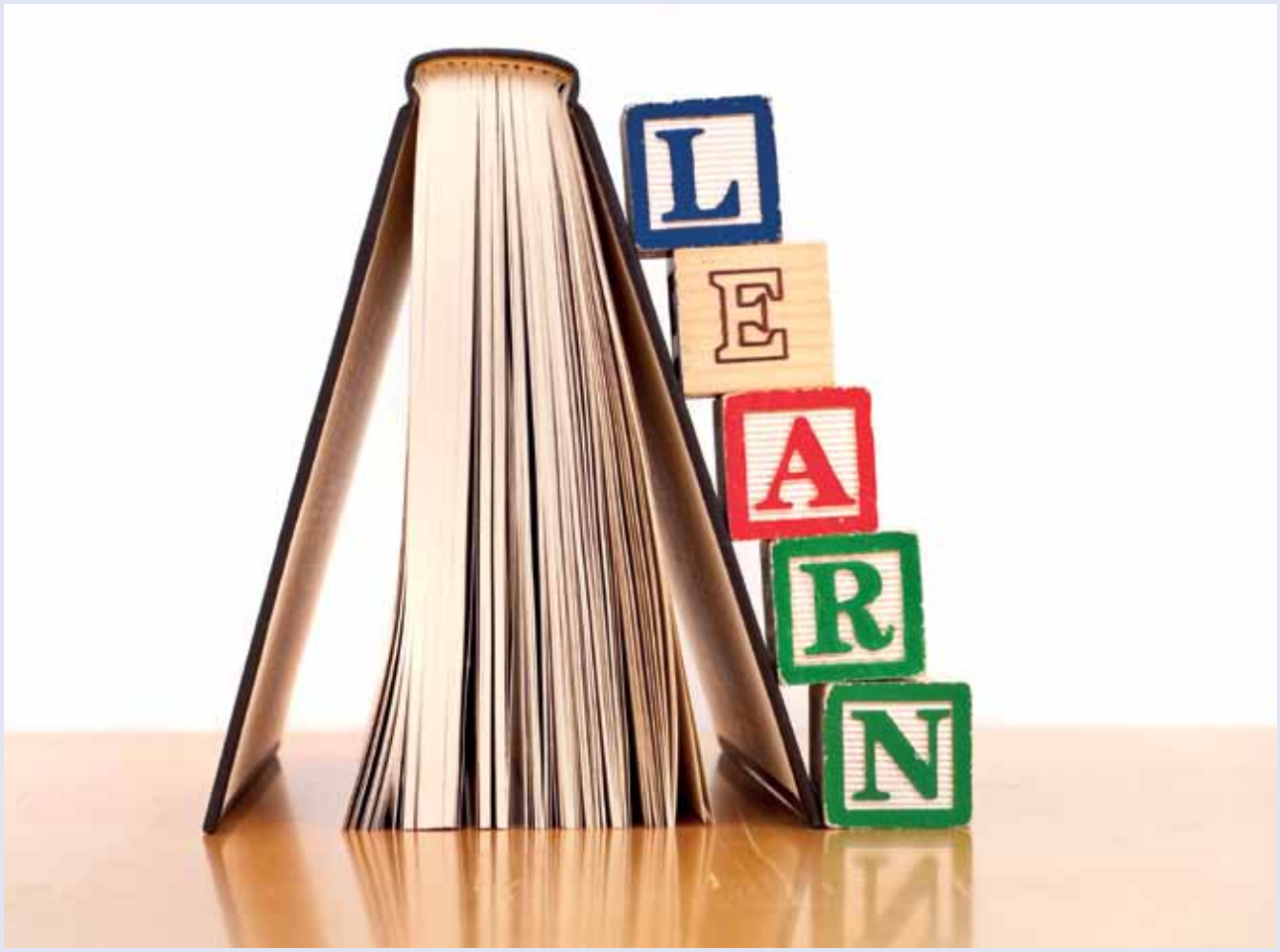
Media Resources

Title: ***Creating accessible docs with Word 2007-2010***
Media type: Document
Description: Short guidelines for creating accessible documents with Word 2007-2010

Title: ***Creating accessible docs with Word 2013***
Media type: Document
Description: Short guidelines for creating accessible documents with Word 2013.

Title: ***Creating accessible docs with Word 2011 for MAC***
Media type: Document
Description: Short guidelines for creating accessible documents with Word 2011 for MAC.

Title: ***Eight Steps To Accessible Word Docs***
Media type: Presentation
Description: Slide presentation on the Eight Steps for creating accessible MS-Word .documents.


L
E
A
R
N

Good practices

Ceramics / 3D Project – Multi sensory experience using textures, construction methods and visual appreciation

Author: Kate McMahon, Enable Ireland, Ireland

Overview

Author: Kate McMahon, Enable Ireland, Ireland
Date Modified: 2015-05-06
Short Intro: This project is designed to help students with multiple learning abilities to complete and translate a 2D drawing into a 3D piece using various textures and skills.
Intended Objectives / Outcomes: Ceramics / 3D Project – Multi sensory experience using textures, construction methods and visual appreciation. Various ways of interpreting art, 3D studies and construction.
Team Work – multiple learning level class using their various strengths and weaknesses to accomplish an overall goal.
• Each student understands and completes a solo piece be it paper maiche or clay.
• Understand construction techniques with each material involved
Main Topic: Applied
Secondary Topic: Exploring various media in relation to construction qualities i.e. paper maiche versus clay.
Target Groups: Multiple learning levels including students with physical disabilities in both first and second year
Keywords: Feel / interpret / construct / respond / review.
Educational Level: Secondary
Language: English
References: YouTube, PDST Professional Development Service for Teachers link

School Context

Resources / Environment: There are 18 children aged between 12 and13 years old with various learning difficulties including a visually impaired student and a student diagnosed with aperts syndrome (the fusing / under development of joints in the hand). These students obviously had special requirements.
Numerous You Tube demonstrations on high relief ceramics videos, Professional Development Service for Teachers (PDST) website link, the Special Educational Support Service website link and department of education website.
Barriers and Opportunities: IT – Limited access and reliability issues in school meant the students did all of their research at home.

UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...

• choice in context

How this guideline was implemented: Visual, verbal, group discussion (connecting / jigsaw pieces) team work.

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...

• clear goals

• practical relevance

How this guideline was implemented: Previous class results used to compare and contrast.
Discussion with other teachers on results.
All recorded and evaluated regularly at subject planning meetings.

Guideline: There are opportunities for self-regulation provided ...

• creative freedom

• realization of learning goals by independent learning processes

How this guideline was implemented: Group discussion, one to one discussions / evaluation or presentation to the class of their piece.

UDL Principle: Information/Instruction offered in different ways

Guideline: Relevant information is available on the learning objectives and outcomes

• on demand

How this guideline was implemented: Visual examples pre-prepared.
Online videos of similar projects shown.
Printed pictures of similar projects by famous artists.

Guideline: Information can be assimilated in various ways

• audio

• visual

• textual media (hypertexts, multimedia, digital art, email, instant messaging, web content, etc.)

• printed media (books, hand-outs, newspaper articles, etc.)

How this guideline was implemented: Steps written and outlined on the board.
Hand-outs provided to students.
Examples of various stages of the project can be seen and held by the students.

Guideline: The understanding/comprehending of information is supported by providing various options

• illustrations

• practical demonstration

How this guideline was implemented: Dialogue between teachers.
Dialogue between teacher and student.
Discussion between peers.
Compared examples shared within class.

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways

• discussion

How this guideline was implemented: Different clays and papers used.
Different construction and mark making techniques used.
Different glues and glazes used to achieve different finishes.

Guideline: Learners can show the results of work as ...

• individual oral report
• group presentation

How this guideline was implemented: At intervals pieces were swapped.
Discussion with peers and teacher to identify what was working and what required improvement.

Guideline: There are different forms of support provided such as ...

• online mentoring
• feedback on demand
• formative (self) assessment

How this guideline was implemented: Students with different learning abilities set their own goals and some achieved better results than they expected.
Overall learning outcomes can no longer be outlined for a group based on their learning ability.

Skills and Competencies

Demonstration of partnerships and collaboration: High
More detail: By facilitation of school show
Facilitation of student learning: Low
More detail: Restrictive given the current economic climate
Assessment and reporting student learning outcomes: Medium
More detail:
Demonstration of continuing professional development: Medium
More detail: Whole school evaluation sets objectives

Assessment

Assessment:
The benefits of the use of this UDL best practice were the following:
A much broader spectrum for self-evaluation, reflection and improvement.
Outcomes and outputs evaluated by
Comparing to past results and looking at individual students before and after the project
Feedback / Reflection:
Projects like this while beneficial; in the present client could be improved in a cross curricular environment. Weak students thrive in the art room but are seen as disruptive in other subjects. Art allows the students a level of expression and freedom which motivates them to achieve their goals. Cross curricular learning should be encouraged more to ensure that these students achieve their goals in other subjects outside of art.

Exploring Rainforests

Author: Kate McMahon, Enable Ireland, Ireland

Overview

Author: Kate McMahon, Enable Ireland, Ireland
Date Modified: 2015-10-28
Short Intro:
Pupils are able to distinguish between tropical and temperate rainforests. Pupils will learn about plant life, animals, insects and mamals of the rainforests. Core example will be the Amazon rainforest. The theme of rainforest will cross reference across the entire curriculum namely english, history, geography, social personal and health education, science and art.
Intended Objectives / Outcomes:
• Learn about Rainforests inhabitants
• Core example Amazon Rainforest
• Difference between temperate and tropical rainforests
• Study history of ancient tribes
• Study of natural environment four layers of rainforest
• Devastation of deforestation
• How the rainforest relates to pupils?
• Plant life, anaimals who lives in the rainforest?
All of the above will be facilitated through multiple means of representation

Main Topic: Applied
Secondary Topic:
Target Groups: Pupils of mixed abilities 7-12 years
Keywords: Rainforest, natural environment, rainforest layers, temperate, tropical, Amazon, deforestation, plants, animals
Educational Level: Primary
Language: English
References:
Rainforest Tropical and Temperate Ecosystems 2006 Primary Ed Publishing
Rainforest Survival Challenge –IPad game- Designed to educate children ages 8 through 12 about the interconnection between plants and animals in the Amazonian rainforest, "Rainforest Survival Challenge" offers thought-provoking information about a variety of native species that live in one of the Earth's most fascinating and delicate ecosystems.Created in collaboration with Stepping Stones Museum for Children and Ruckus Mobile Media. 9download for free from itunes)
10 Facts about the Amazon Rainforest- link
Interesting Facts about Rainforests- link
Rainforest Explorer Accounts-link
Rainforest cards- Did you know? - link
Rainforest animals without labels-link
Rainforest animals with labels- link
link

School Context

Resources / Environment:

Main activity:

1. Class teacher explains exactly the objective and goal of the lesson.
2. Set up a display table that centers around the theme of Rainforests
3. Share one fun fact and interesting fact each day with pupils – Display them in large font on display table
4. The 'Rainforest cards: Did you know?' show twenty different facts about rainforests and the plants and animals that live there. Teachers can use them in their classroom in a variety of ways:
   - Print the cards and put them on a display about rainforests in classrooms.
   - Challenge children to find out their own facts about rainforests and make their own cards. Add these to your classroom display too!
   - Use the cards as part of guided reading activities. Ask children to discuss the information that the cards show, point out any important / technical vocabulary and talk about the meaning.
   - Use any cards that feature mathematical terms as part of Maths activities.
   - Share one fact each day that your class are learning about rainforests. Challenge them to remember as many as possible!
5. The rainforest is home to a wide range of animals. The rainforet animal posters can be used to help pupils to think about the different animals that live there. The posters can be used in the classroom in a number of ways:
   - Give children a copy of the poster with blank labels and challenge them to name the animals. Could they use research materials to find out any names that they are unsure of?
   - Ask children to use the pictures as inspiration for their own drawings of different rainforest animals.
   - The animals are not shown to scale on the posters. Ask children to find out how large they actually are and how they compare in terms of size.
   - Make a food chain using some / all of the animals on the posters.
   - Discuss the lives / features of each creature shown on the poster. How are they adapted to living in the rainforest? Which part of the rainforest do they live in?
   - Print the labelled poster and use it on a display table
6. Power Point – Rainforest Explorer- Encourage children to create individual accounts (written reports can also be doen in groups)
7. Rainforest- Cross Curricular Extenstions
   - English: written reports on rainforest animals, diary entries from rainforest explores, comprehending texts explaining the difference between temperate and tropical rainforests.
   - History: Studied ancient tribes of the rainforest and created posters in groups based on tribes
   - Geography: Studied the natural environment of the rainforest i.e. four layers of the rainforest
   - Social Personal & Health Education: How deforestation is affecting rainforests
   - Science: We studied plant life in the Amazon rainforest
   - Art: Collages free reign of art supplies

Necessary resources were as following:

- Access to internet/whiteboard- to show pictures and websites
- Corresponding media links:
  1. 10 Facts about the Amazon Rainforest- link
  2. Interesting Facts about Rainforests- link
  3. Rainforest Explorer Accounts-link
  4. Rainforest cards- Did you know? - link
  5. Rainforest Animals with labels- link
  6. Rainforest Animals without labels-link
- Arts and crafts supplies

Barriers and Opportunities:
Access to resource teacher if not applicable, enable peer support within group

UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...

- personal interests
- authentic tasks
- choice in context

How this guideline was implemented: Yes topic can relate back to everyday lives of pupils

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...

- clear goals
- practical relevance

How this guideline was implemented: Yes assessed via compression texts and written reports as well as visual and verbal assessments

Guideline: There are opportunities for self-regulation provided ...

- creative freedom
- organizational flexibility
- beneficial learning environment
- independent diagnosis and assessment of the finished learning process

How this guideline was implemented: Yes via group work and art work

UDL Principle: Information/Instruction offered in different ways

Guideline: Relevant information is available on the learning objectives and outcomes

- on demand

How this guideline was implemented: Visual via white board
Display table
Posters
Vocabulary cards
Websites- including videos and audio

Guideline: Information can be assimilated in various ways

- audio
- visual

How this guideline was implemented: Yes all resources can be adapted dependent on need

Guideline: The understanding/comprehending of information is supported by providing various options

- illustrations
- practical demonstration

How this guideline was implemented: Yes many ways via group discussion, practical application, quizzes, poster display, table display

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways

- individual work
- group work

• discussion
• games
How this guideline was implemented: Yes via group work, games, quizzes, storytelling

Guideline: Learners can show the results of work as ...

• group presentation
How this guideline was implemented: Yes art and craft activities, play activities

Guideline: There are different forms of support provided such as ...

• face-to-face mentoring
• online mentoring
• feedback on demand
• formative (self) assessment
How this guideline was implemented: Teacher and resource teacher can help pairs that may need extra support

Media Resources

Title: Inclusive Classrooms using Technology
Media type: Video
Description: Here are some nice examples of inclusive classrooms using technology for support and scaffolding.

Title: 10 Facts about the Amazon Rainforest
Media type: Document
Description: Details fun facts about the Amazon Rainforest including pictures

Title: Interesting Facts about Rainforests
Media type: Document
Description: Interesting facts and resources about rainforests

Title: Rainforest Cards- Did you know
Media type: Document
Description: cards to be used in class cut out individually

Title: Rainforest Animals with Blank Labels
Media type: Image
Description: This poster provides pictures of the animals within rainforests including labels of each

Title: Animals of Rainforest with Labels
Media type: Image
Description: Includes pictures of rainforest animals with individual labels

Title: Rainforest Explorer Accounts
Media type: Presentation
Description: Power Point Presentation -Rainforest Explorer Example

Skills and Competencies

Demonstration of partnerships and collaboration: Medium
More detail:
Facilitation of student learning: Medium
More detail:
Assessment and reporting student learning outcomes: Medium
More detail:
Demonstration of continuing professional development: Medium
More detail:

Assessment

Assessment:
Pupils are able to understand what rainforests are? Who inhabits them? How they relate to their daily lives? It also focuses on the historical and environmental elements of the rainforests and touches upon human interventions which have caused harm e.g. deforestation.
Assessed via:
Via comprehension texts
Written reports
Verbal presentation
Art work
Display table contribution
Feedback / Reflection:
Via practical examples given by teachers and performed by students
Group work and and all resources being adaptable resulted in the theme being accessible for all learners
– Need for consistent repetition of vocabulary
– Need for story based examples

Little Red Riding Hood – Multi-sensory and Participatory Storytelling

Author: Suvi Törrönen, Finnish Association on Intellectual and Developmental Disabilities (FAIDD), Finland

Overview

Author: Suvi Törrönen, Finnish Association on Intellectual and Developmental Disabilities (FAIDD), Finland
Date Modified: 2015-10-23
Short Intro: In this learning task pupils explore the classic story of Little Red Riding Hood via active participation. The storytelling is carried out together by the students, who all take an active role. A video of the story is screened, and every student has a particular task in the storytelling, i.e. they are in charge of mediating different elements of the tale. The learning is supported by means of multi-sensory teaching, i.e. using visual, auditory and tangible methods in engaging the students´ interest. All the used materials are easy-to-read (e.g. a video and a book). The shared storytelling is repeated, while the students are encouraged to transform the story in creative and self-expressive ways.

Intended Objectives / Outcomes:
The intended outcomes were the following:
1. A heterogeneous class gets to know the classic story of Little Red Riding Hood. It´s possible to engage in the storytelling in different ways depending on a student.
2. Every student takes on an active role in experiencing and creating the story.
3. The students gain every day skills, such as self-sufficiency, the ability to concentrate and listen and to take turns with the others.
4. Being, feeling and sensing together as a group is emphasized.

Main Topic: Arts
Secondary Topic: Social studies, Exploring a classic story via active participation
Target Groups: 7–10-year-old students with profound developmental disabilities, hearing problems and/or visual impairment
Keywords: multi-sensory experiences, self-expression, storytelling, the Papunet website
Educational Level: Other
Language: English
References:
Information about the Papunet Website link
The Papunet Games Website link

School Context

Resources / Environment:
There were six 7–10-year-old students with profound developmental disabilities and severe learning problems. Some of the pupils had hearing problems and/or visual impairment. The storytelling exercise took 45 minutes and the lesson was held by a special education teacher. There were also three special needs assistants present providing help when needed. No additional budget was required.
Necessary resources were as following:
– a special education teacher and special needs assistants
– a peaceful room with an internet access
– an interactive whiteboard or personal tablet computers for screening the Papunet version of Little Red Riding Hood
– learning material, e.g. instruments and sensed objects
– easy-to-read book version of Little Red Riding Hood

Barriers and Opportunities:
It´s possible to encounter technical problems, e.g. disconnections in the internet access. When using a tablet, the Papunet web materials may run poorly with touch control. Some function keys may not work as intended, because the material is designed to be operated with PC computers.

The space may also create barriers for learning. It´s crucial that the storytelling takes place in a relatively peaceful space with no distracting noises.

On the other hand the task offers an opportunity for all the students to participate actively in the storytelling, to understand the plot and the content of the tale.

UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...

- personal interests
- authentic tasks
- choice in context

How this guideline was implemented: Mastering different sound effects motivates the students. The students´ individual needs are considered when preparing the task beforehand.

Grouping is also emphasized, i.e. first the students form a circle in order to make an eye contact with each other and to build shared feeling of belonging. They choose whether to sit, lay or stand. The idea is to place oneself for sensing the story and participating in it.

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...

- clear goals

How this guideline was implemented: During the lessons the students are offered one-to-one support and guidance by the special education teacher as well as the special needs assistants. The students´ motivation is maintained by their individual and active roles in the storytelling.

Guideline: There are opportunities for self-regulation provided ...

- creative freedom
- beneficial learning environment
- realization of learning goals by independent learning processes

How this guideline was implemented: When needed, the students receive face-to-face support enhanced by AAC materials. The AAC pictures and the story itself help the students to time their performance during the storytelling, i.e. they serve as tools for gaining self-sufficiency.

UDL Principle: Information/Instruction offered in different ways

Guideline: Relevant information is available on the learning objectives and outcomes

- temporarily
- on demand

How this guideline was implemented: The story is introduced to the students by using the easy-to-read materials (a video and a book) and AAC pictures. The special education teacher decides which version of Little Red Riding Hood video fits the students´ individual needs best, i.e. he/she chooses between Blissymbolics, colored and black and white pictures. The outline of the story is emphasized visually with the aid of AAC, e.g. photographs, pictures or line drawings are used to mark the main characters appearances and highpoints as well as the beginning and the end of the tale. Suitable AAC pictures are selected in advance from the Papunet website. The simultaneous use of an easy-to-read book version of the story benefits some students.

Guideline: Information can be assimilated in various ways

- audio
- visual

How this guideline was implemented: In addition to audio-visual and AAC materials, the learning barriers are reduced also by auditory means. At first the group watches the lucidly narrated video of Little Red Riding Hood offered by the Papunet. The video is then combined with sound effects made by the students. The third way of mitigating learning barriers is to offer students tangible elements. The teacher or a frisky student can play a role in creating liveliness to the story by touch, i.e. the pupils are tickled or stoked with a material associated with the story´s main characters or events (a piece of red cloth as a symbol of Red Riding Hood´s cloak). Because the story is acted in a circle, the sensed materials are also effortlessly given from person to person.

Guideline: The understanding/comprehending of information is supported by providing various options

• practical demonstration

How this guideline was implemented: Multi-sensory teaching methods provide an ample selection of opportunities for understanding.

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways

• individual work

• group work

How this guideline was implemented: Each student is individually in charge of creating sound effects supporting the video, e.g. motions (suspense, excitement, surprise) or characters (Littele Red Riding Hood, the Wolf, The Forester). Ensuring student participation is crucial, so it´s also advisable to pause the video. The narration can be muted, so that when possible, a student can act as the narrator instead of the recorded one. The effects can be created manually (knocking) or by using instruments (a drum). Sounds recorded beforehand can also be played from an AAC device or speech synthesiser (lines). The Papunet website offers a useful collection of sound effects.

As the storytelling process proceeds the students are to create different versions or interpretations of the story. During this phase the students are encouraged to make their own artistic decisions.

Guideline: Learners can show the results of work as ...

• textual description

• individual oral report

• group presentation

• practical demonstration

How this guideline was implemented: The storytelling is repeated from three to four times in order to increase the students´ self-sufficiency and self-expression skills. The students are encouraged to experiment with the story, e.g. they alternate the scenes to see how surprises affect the audience.

Advanced students can write stories of their own or prepare a play using Little Red Riding Hood as an inspiration. It´s also possible express in other creative ways, e.g. painting.

Guideline: There are different forms of support provided such as ...

• formative (self) assessment

How this guideline was implemented: The one-to-one support given to the students is to be directed correctly, i.e. the individual needs and abilities are to be considered when giving instructions and "casting" the students.

Media Resources

Title: Information about the Papunet Website
Media type: Other
Description: Short description of the Papunet Web Service Unit. The Papunet website is part of of The Finnish Association on Intellectual and Developmental Disabilities (FAIDD) that is a non-profit, non-governmental organisation.

Title: The Papunet Games Website
Media type: Other
Description: An accessible website for people who communicate and use the computer in a different way, offering games, exercises and tools.

Skills and Competencies

Demonstration of partnerships and collaboration: Other
More detail:
Facilitation of student learning: Other
More detail:
Assessment and reporting student learning outcomes: Other
More detail:
Demonstration of continuing professional development: Other
More detail:

Assessment

More detail:
The benefits of the use of this UDL best practice were the following:
– The students empathized with story wholeheartedly using all of their senses.
– The task was exciting and memorable.
– Instead of pure listeners the students participated as active agents throughout the storytelling process.
How were outcomes and outputs evaluated and/or assessed?
– Students´ active participation in the process of storytelling evolved and deepened throughout the task. This was observed by the special education teacher as well as the assistants observed. These insights made were discussed with the students.
– The artistic output, e.g. drawings, written or told stories and plays, were also used in the assessment.
– Assessment was given orally.
– The students´ parents were also informed about the task.
How were lessons learnt and competences obtained?
– The students obtained knowledge about the story by using different senses. The variety of communicating methods sensitized the students, i.e. they were able to concentrate and memorize the tale.
– The storytelling process required social skills as well. The students learnt to switch turns when timing their sound effects in the shared storyline. The students were considerate in giving and receiving multi-sensory experiences because of the joint storytelling method.

Feedback / Reflection:
The critical success factors were the following:
– Peaceful learning environment and functioning equipment facilitated the storytelling task.
– An interesting story combined with the active participation of the students maintained the groups´ motivation.
– Repeating the story reduced learning barriers and made it possible to obtain self-sufficiency and self-expression skills.
The key lessons learnt were the following:
– The storytelling task can be transformed in many ways, e.g. the content, length and the multisensory materials used.
– Repetition of the story is vital in order to strengthen existing skills and obtaining new ones.
– Similar storytelling tasks can be used to reinforce active participation in the class.

Building Vocabulary: "The Monkey's Paw"

Author: Katerina Riviou, Ellinogermaniki Agogi (EA), Greece

Overview

Author: Katerina Riviou, Ellinogermaniki Agogi (EA), Greece
Date Modified: 2015-05-08
Short Intro: Learners often struggle with classic literature because of the vocabulary demands--some words are archaic and some are above grade level for today's students. This vocabulary lesson is for use before students begin the short story, "The Monkey's Paw". The lesson uses words from this classic story to support vocabulary growth and increased reading comprehension.
Intended Objectives / Outcomes:
Students will be able to determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings.
Main Topic: Languages
Secondary Topic: Language Arts
Target Groups: Secondary education (14-15 age old students), could be adapted for use in primary as well
Keywords: vocabulary, classic literature
Educational Level: Secondary
Language: English
References:
CAST 2006: link
UDL Exchange: link

School Context

Resources / Environment:
PowerPoint slides of vocabulary words and printed copies for each student's reference
Paper copies of the Multimedia Self-Evaluation Rubric
Paper in different colors magazines for image and text resources glue sticks, markers, pencils, rulers
Flip camcorders digital audio recorders
Class blog
Barriers and Opportunities:
Difficult vocabulary in classic literature is a barrier for many readers. Traditional approaches to vocabulary instruction – having students
look up words, write definitions, and write context sentences – are not effective for building vocabulary or comprehension skills for most
learners. Learners, at best, retain the definitions temporarily and then forget them after the unit is over. At worst, learners do not learn the meanings of the words at all. How can instruction for key vocabulary words be more effective?

UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...

• authentic tasks

How this guideline was implemented: Any class will have varied levels of engagement toward learning new words and abilities in retaining this information; addressing this variability means that the lesson will need to find flexible and varied options and opportunities for learners to make their own meaningful connections with words. If the options provided effectively address this variability, when learners encounter these words in a new context they will be able to draw on the associations they have made with words to make meaning.

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...

• clear goals

Guideline: There are opportunities for self-regulation provided ...

• creative freedom

UDL Principle: Information/Instruction offered in different ways

Guideline: Relevant information is available on the learning objectives and outcomes

• in advance
• at any time
• on demand

How this guideline was implemented: Learners vary in the optimal way each receives information; addressing this variability means that the lesson must include options for how information is represented and presented. This lesson will focus on ways to engage learners through multiple means of representing words: it should include options for how to find word meanings (computer searches, dictionary, contextual usages), multiple representations of words (including visual and audio representations), and options for learners to express meaning. The lesson will also address this variability by including multiple teaching methods to broaden the reach of instruction, and will definitely include modeling, guided practice and independent practice with feedback.

Guideline: Information can be assimilated in various ways

• audio
• visual

Guideline: The understanding/comprehending of information is supported by providing various options

• mind mapping
• illustrations

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways

• individual work
• group work
• discussion

How this guideline was implemented: Providing flexible options for action and expression addresses the variability in how learners express what they understand and can do,
and results in a more accurate picture of student learning. This lesson will include multiple and varied options for learners to express word
meaning and their own connections with the words. These options should motivate a wider range of learners to participate meaningfully in
the activities and grow in vocabulary understanding.

Guideline: Learners can show the results of work as ...

- textual description
- individual oral report
- group presentation

Guideline: There are different forms of support provided such as ...

- face-to-face mentoring
- online mentoring
- feedback on demand

Media Resources

Title: Building Vocabulary (lesson plan)
Media type: Document
Description: Building Vocabulary "The Monkey's paw" (lesson plan)

Title: Monkey 's Paw - tiered vocabulary
Media type: Document
Description: Monkey 's Paw - tiered vocabulary

Title: Multimedia_Glossary_term_self_evaluation_rubric
Media type: Document
Description: a rubric for students' self-evaluation about glossasy terms

Title: Power_Point_Glossary_Template
Media type: Presentation
Description: Power_Point_Glossary_Template by CAST

Title: The Monkey's Paw, by W.W. Jacobs (vocabulary terms)
Media type: Document
Description: Story used for teaching vocabulary terms

Title: The Monkey's Paw, vocabulary instruction
Media type: Presentation
Description: Supportive instruction materials regarding teaching "The Monkey's Paw" vocabulary (CAST)

Skills and Competencies

Demonstration of partnerships and collaboration: High
More detail:
Facilitation of student learning: High
More detail:
Assessment and reporting student learning outcomes: High
More detail:
Demonstration of continuing professional development: High
More detail:

Assessment

Assessment:
Review 5 key words as a group; ask for volunteers to each present one word to the class Clarify misconceptions and model how I (teacher) discovered and clarified a wod misunderstanding. Prompt students to share their strategies for clarification.
Feedback / Reflection:
I chose these options for materials to, first, complement the instructional methods I had set out in the Methods section of this lesson. Then, after I included the materials and resources that I knew I wanted to use, I considered additional options that I could provide for students. That led me to discover that my class has access to flip camcorders and digital audio recorders, too. And, of course, many students have smart phones that they can use to take pictures and short videos to use for this lesson. I think they will love these options and, hopefully, this will engage and motivate them during this vocabulary lesson.

Whole class participation in a pancake cooking task and sequencing the steps involved

Author: Neil O'Sullivan, Universal Learning Systems, Ireland

Overview

Author: Neil O'Sullivan, Universal Learning Systems, Ireland
Date Modified: 2015-10-02
Short Intro:
In this lesson pupils participate in and follow the sequence of steps involved in a pancake cooking task. Having the teacher act as scribe, the pupils observe and orally offer suggestions in formulating an instructional text (pancake recipe). Therefore, the pupil's will engage actively and through observation. Depending on the individual abilities within the class, All students are encouraged to become familiar with the ingredients required. While some students list/label the pancake ingredients, and describe the method for preparing and making pancakes in the correct order. Following this, the pupil's individually engage in a sequencing task whereby all children create a pictorial sequence of the steps involved in the recipe and some children will include writing in their recipe sequence.
Intended Objectives / Outcomes:
1. All children verbally list the ingredients required for making pancakes.

2. Most children use words such as crack, mix, pour, flip, toss, and add in the description of how to make pancakes.
3. Some children describe the method for preparing and making pancakes in the correct order.
4. All children participate in an individual pictorial sequence of the cooking task.
5. Some children write a short description of each step in the sequence.
6. All students take on an active role in experiencing and creating the instructional text.
7. Being, feeling and sensing together as a group is emphasized.

Main Topic: Applied
Secondary Topic: Communicating
Target Groups: Children Aged 4 to 6
Keywords: Instructional writing, shared literacy through the Language Experience Approached (LEA), teacher-modelling and active learning methodologies.
Educational Level: All
Language: English
References:

– Recipe sequence task link
– First Steps procedural genre link
– English Language Primary School Curriculum (NCCA)
– National Council for Curriculum and Assessment.(2009). Aistear: the earlychildhood curriculum framework. Available from: <link > [accessed February 10 2015]

School Context

Resources / Environment:
There were 17 4-5year-old students within a mixed ability junior infant class in a DEIS Band One context. The cooking exercise took 30 minutes and the lesson was held by the class teacher. Teacher funded the ingredients and certain utensils (eggs, milk, flour, jam, whisk, ladle,pan) . The school provided the necessary equipment (Hot plate, bowl, plates, kitchen roll).
Necessary resources were as following:
– a class teacher
– a well ventilated peaceful room
– Chart paper and a marker for modeling the writing of a recipe.
– Large laminated pictures of the steps involved in preparing and making pancakes.
– Individual work sheets containing pictures to sequence of this cooking process.
– Stationary: scissors, glue, 17 sheets of A4 paper.
– Internet access.

Barriers and Opportunities:
Financial restraints: Due to the school's limited budget, the teacher must fund the ingredients and a number of utensils. Furthermore, the sequencing tasks would be more stimulating and attractive if there was access to a colour printer.
On the other hand the task offers an opportunity for all the students to participate actively in a procedure, and feel as sense of belonging and being valued as an individual within a whole group setting.

UDL in Action

UDL Principle: Learners are engaged and motivated in different ways

Guideline: Different known interests and motivators are addressed such as ...

- personal interests
- authentic tasks
- choice in context

How this guideline was implemented: During the procedural writing, the children take ownership of their learning by being asked to provide the steps involved in the cooking process in order for the teacher to scribe. The more" hands-on " and active approach (song/action/cooking/cutting/pasting) underlying the lesson sustains the interest level of 4-5 year olds more. Many children are encouraged to share their own experience of cooking pancakes at home-sense of value.

Guideline: Interests and goal attainment as well as resilience are stimulates actively by ...

- clear goals
- practical relevance

How this guideline was implemented: students are offered one-to-one support and guidance by the class teacher. The students´ motivation is maintained by their individual and active roles throughout the process and tasks thereafter.

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

How this guideline was implemented: Effective questioning methods: By using the NCCA Aistear Framework's "How do I help children to self-assess?" (link) guidelines for questioning, the children are encouraged to reflect/impove on their efforts and creations.

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Relevant information is available on the learning objectives and outcomes

- in advance
- at any time
- on demand

How this guideline was implemented: The procedure is introduced to the students by using the easy-to-read version of "The Big Pancake" story available on the TES website (link) The teacher decides on this version of story as it fits the students´ individual needs best. The clear pictures provide all children access to the pancake making process through story and follow the story's plot. While Some learners are also being challenged to read the accompanying sentence on each page/slide.

Guideline: Information can be assimilated in various ways

- audio
- visual

How this guideline was implemented: The child-friendly, visually attractive and stage appropriate story of "The Big Pancake" (link) stimulated interest amongst the group to make pancakes. During the making of the pancakes, the children sang each step involved and provided actions (to the familiar tune of "Here We Go Round the Mulberry Bush",(e.g This is the way I pour the flour, pour the flour, pour the flour etc...) This approach recognises the short concentration span and energy levels of the age group involved.

The clarity of the individual picture-sequence task provided all children with the best chance of gaining a sense of achievement.

The fun and active element of the lesson stimulates the EAL (English as an additional language) learner to communicate as effectively as possible.

Guideline: The understanding/comprehending of information is supported by providing various options

- illustrations
- practical demonstration

How this guideline was implemented: Multi-sensory teaching methods provide an ample selection of opportunities for understanding.

UDL Principle: Allow the learners to express what they know in different ways

Guideline: Learner can actively work with the learning materials in different ways

- individual work
- group work
- discussion
- games

How this guideline was implemented: Each student benefits from whole group and individual work. Student participation is crucial, and they are encouraged to share their home experiences of cooking and offer the cooking steps involved during the procedural writing process. During the lesson, time was awarded for discussion/ prediction i.e what do you think might happen when we add the milk to the flour/mixture to the hot pan? "

Through the Aistear play areas set up in the classroom, the children's knowledge and experience is further extended in the role-play cafe set- up, sand pit, clay area, small world-dolls house. Hence, the children work at an imaginative level within small groups by using the cooking procedural lesson as the impetus for this.

Guideline: Learners can show the results of work as ...

- textual description
- individual oral report
- group presentation
- practical demonstration

How this guideline was implemented: The pictorial sequence enables the visual learner to access knowledge more readily. The children sing the pancake cooking sequence to the tune of "The Mulberry Bush" traditional song (e.g This is the way I pour the flour, pour the flour, pour the flour etc...) and use their bodies to provide the corresponding actions. This appeals to the more kinesthetic learner and provides repetition to aid those with limited retention and concentration.

Advanced students can write their own imaginative pancake recipes/create a short cookbook.

It´s also possible to express their learning in other creative ways, e.g. rein act the cooking process through painting or in sand play, malleable play (playdough/clay). This offers a more multi-sensory approach which appeals to over-active/limited language learners - allowing them to self-express more effectively.

Guideline: There are different forms of support provided such as ...

- face-to-face mentoring
- feedback on demand
- formative (self) assessment

How this guideline was implemented: The one-to-one support given to the students is to be directed correctly, i.e. the individual needs and abilities are to be considered when giving instructions and "casting" the students.

Demonstration of partnerships and collaboration: Medium
More detail:
Lesson and media resources were accessed for school resources. Extra resources were returned to central resource area after lessons.
Facilitation of student learning: High
More detail:
This lesson achieved its goals form a UDL perspective.
Assessment and reporting student learning outcomes: High
More detail:
The feedback both form formative and summative assessment was satisfactory.
Demonstration of continuing professional development: Medium
More detail:
The teacher found the process useful and shared her experience with other teachers in the school.

Assessment

Assessment:
The benefits of the use of this UDL best practice were the following:
– The task was fun and active.
– The children engaged all of their senses during the lessons.
How were outcomes and outputs evaluated and/or assessed?
– Through observing the children engage with this lesson topic thereafter (e.g through play/SESE) enabled the teacher to gain access to the pupils' understanding of the topic.
– Assessment was given orally.
– Differentiated questioning e.g
Higher Order Questions:
– Why do you think the pancake batter thickens when I add flour?
– What do you think would taste really nice with the pancake?
Lower Order Questions:
– What steps do I take to make the pancake mix?
– What do I put in next?
How were lessons learnt and competences obtained?
– The students obtained knowledge about the procedure by using different senses. The variety of communicating methods sensitized the students, i.e. they were able to concentrate and memorize the sequence.
– The process required social skills as well. The students learnt to take turns in providing suggestions for instructional writing and tasting pancakes, share resources, respect each other's individual efforts. Language and communication skills were extended too (e.g speaker/listener respect, exploring the genre of procedural literacy).

Feedback / Reflection:
How was reflection on this best practice shared?
– Mediation to whole staff through the school's main staff server (in English resource file).
– Staff planning meetings.
The critical success factors were the following:
– Peaceful, and well ventilated learning environment and functioning equipment facilitated the cooking task.
– Engaging in the cooking process combined with the active participation of the students maintained the groups´ motivation.

– This lesson provided huge scope for integrated learning across subject areas and during Aistear play. Therefore enabling each individual to express his/her knowledge in a variety of ways.

The key lessons learnt were the following:

– Cookery/procedural activities develop children holistically (Socially,cognitively, physically, linguistically and emotionally).

Teachers tell their stories

Karl O'Keeffe

Organisation: Enable Ireland AT Service
Country: Ireland

Introduction
This short paper (primarily aimed at educators) will examine the changing relationship between Assistive Technologies (AT) and Universal Design for Learning (UDL). As UDL evolves and new AT is developed it is suggested here that fields a decade ago referred to as "Two sides of the same coin" (Rose, Hasselbring, Stahl, & Zabala, 2005) have become yet more closely intertwined making it essential that modern educators have not only an awareness of the technologies available but also a practical understanding of how and when they should be implemented. On one hand technologies traditionally considered AT have become mainstream and ubiquitous on smart devices whereas on the other "the goal of education has shifted from knowledge acquisition to learner expertise" (Anne Meyer, Universal Design for Learning: Theory and Practice). By examining the UDL Checkpoints from an AT perspective we will clearly see that there are areas learners can support themselves through the proper use of available technologies and it is suggested that this approach is preferable as it will provide them with tools and expertise which will then be available to them throughout education and into employment. Looking at the Checkpoints from an AT or user perspective also highlights where technologies are useful but might require additional support from the educator as well as where the educator needs to concentrate their efforts, areas not supported through the independent use of technology.

Assistive Technology & Universal Design for Learning
UDL is a relatively new pedagogical framework first proposed by Dr David Rose and Anne Meyer in the early 1990. Both original authors have continued to develop their ideas on UDL through the organization they cofounded; CAST (http://www.cast.org/). In 2014, along with David Gordon they published the most recent iteration of their ideas on ULD in Universal Design for Learning: Theory and Practice which is available online at http://udltheorypractice.cast.org/. UDL seeks to inform educators and those responsible for the design of curricula and learning environments on how to make them accessible and effective for the widest range of students. AT on the other hand looks at the barriers faced by individuals and seeks to overcome those barriers through the use of appropriate tools. Edyburn's analogy which appropriately reflects universal design's architectural roots explains this relationship perfectly "If, for example, a building has an electronic door sensor to open the front door automatically, is it reasonable to conclude that wheelchairs will no longer be needed?" (Edyburn: 2010). While this acknowledges that some learners will always need specialist supports to also highlights the fact that UDL content must be designed to consider AT; its capabilities and limitations while AT should be able to fully utilise rich UDL content. As observed by Rose et al in their paper, Assistive Technology and Universal Design for Learning: Two Sides of the Same Coin "When UDL and AT are designed to co-exist, learning for all individuals is enhanced." The paper outlines the thinking at the time on the relationship between AT and UDL and is still relevant. AT and UDL while different can be seen as complementary or "Two sides of the same coin" as the title states. They have similar goals of making learning accessible to the widest possible range of people but approach them from different directions. When implemented correctly they are co-dependent and

should seamlessly work together, reducing the barriers to learning because accessible curriculum content increases the efficiency and effectiveness of AT while AT can help support students for whom the accessible curriculum still poses a difficulties.
Since the above mentioned paper was written technology has progressed and the UDL approach has evolved to reflect this changed educational environment. "Essentially, the goal of education has shifted from knowledge acquisition to learner expertise" (Anne Meyer, Universal Design for Learning: Theory and Practice). This shift has resulted in a more central role for AT and in many cases has led to the mainstream adoption of what were once considered specialist Assistive technologies. This change in attitude towards using technology as a tool for learning is extremely positive and is proving beneficial to students of all ability levels. Technology empowers the student and offers them tools to support independent learning. Knowing what tools to use and how to use them can therefore be seen as a pivotal step in becoming an expert learner.

UDL Checkpoints from an AT Perspective

The Universal Design for Learning Checkpoints reference tool through which educators can examine their curriculum according to the principles of UDL. In the accompanying PowerPoint this intended use has been flipped to examine the checkpoints from an AT perspective which is also that of the end user because as has been illustrated above AT approaches barriers from an individual user's point of view. By examining the checkpoints from a user's perspective the potential and limitations of the current range of technologies becomes easier to identify. By the identification of what learners can achieve independently through proper use of the appropriate technologies we will also see where the boundary lays between what the learner can achieve independently and where support is required. The questions the accompanying presentation hopes to answer are:

- What Checkpoints can the learner achieve independently through proper use of the appropriate technology?
- How can educators facilitate learner independence through an understanding of the available technology, its capabilities and limitations?
- What checkpoints are poorly served by current technology (from the learner perspective) and rely on the educators creative use digital/web technologies and innovative class based activities?

What becomes clear from taking this approach to the checkpoints is that technological tools serve the user much better in the areas of **Representation** and **Action and Expression**. In the areas of higher learning, the **Multiple Means of Engagement**, we see that more responsibility rests on the educator, their creative use digital/web technologies and innovative class based activities. There are however technologies that will provide assistance in this area also.

Conclusion

While text is the dominant medium for both educational content and deliverables, AT for literacy support will be essential for some and useful many learners. This means educators need to be aware of Literacy, Productivity and Organisation technologies, their limits and capabilities. Although not part of the curriculum, training in the use of assistive software will be key in some learners' success. Giving learners the tools to adapt content to their own needs and preferences should be seen as preferable to adapting the content for them.
If current UDL thinking puts emphases on learner expertise then a UDL curriculum should include training in the tools the learner requires to succeed. Cloud based WebApps, Chrome/Firefox/Edge/Safari Extensions and Apps, Smartphones and tablets are all tools that can be available to the user at all times and where appropriate their use should be encouraged and supported. Universal Design for Learning's embrace of technology as a tool for learning alongside the increase in availability of

support tools based in the cloud and on mobile devices have all contributed positively to the role of AT in the classroom by normalising the use of technology as a tool for learning. This apparent paradox where AT becomes more central while at the same time less conspicuous is a common phenomenon in technology (Weiser: 1991). But as UDL subsumes many traditional AT (Speech Recognition, Text to Speech, Word Prediction) it's important to be mindful that there will always be a need for specialist supports.

Annexes

The accompanying PowerPoint lists many mainstream and specialist software applications that might be useful in an educational context and attempts to catigorise them based on their functionality in line with UDL Checkpoints.

Bibliography

- Rose, D. H., Hasselbring, T. S., Stahl, S., & Zabala, J. (2005). Assistive technology and universal design for learning: Two sides of the same coin. In D. Edyburn, K. Higgins, & R. Boone (Eds.),Handbook of special education technology research and practice (pp.507-518). Whitefish Bay, WI: Knowledge by Design.
- Meyer, A., Rose, D.H. and Gordon, D., 2014. *Universal design for learning: Theory and practice*.
- Edyburn, D.L., 2010. Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL. Learning Disability Quarterly, 33(1), pp.33-41.
- Weiser M. 1991 The Computer for the 21st Century, Scientific America 265(3):94-104

Division with remainder: A lesson plan developed with the application of UDL learning principles

Gabriella Theodosiou
Dasoupolis Elementary Public School
3rd Grade
Maths

Introduction
I was informed about UDL and its learning principles at a conference in Cyprus organized by Agalia Elpidas, a non-profit organization supporting children with cerebral palsy and their families.
After the conference, I went through UDL webpage and materials and decided to try implementing its principles in my third grade glass. Following it's an example of my work. Specifically, is a lesson plan for math, which was presented to a group of special education professors from the United States and Australia. The variety of manipulatives and activities used, aimed to engaged all student in the learning process and help them reach the lesson goal.

Lesson plan
Objective: Division with remainder
Classroom setup: Student working in pairs

Activities
1st Activity: Each pair of students chose a number from a box, which was the product of a multiplication. They were asked to write on a big card a multiplication equation with their number as a product and a division using that number as a divided. Each pair posted their card on the board.

2nd Activity: Each pair got a box with Dienes material and plastic plates. On the board a division equation with a remainder was written.

21:2

Children were asked to solve it using their materials and concluded that on cube was left out of the plates. The solution was written on the board:

21:2=10, remainder 1

3rd Activity: Students were then asked to choose a division card from the board that was closer to the one above. They all choose

20:2=10

We then decided that we were going to use this division as our safety net to solve the division with a remainder.

21:2=10, remainder 1
20:2=10

Many more examples followed.

4th Activity: A problem from the math book was projected on the board. A student and then the teacher read the problem focusing only on the first three questions. All the given information was highlighted both on the board and in the books by each student.

5th Activity: The given information of the problem was presented with pictures on the board and divided into smaller parts. The problem involved three different recipes (apple tart, apple pie and apple jam) that each required a different number of apples. The first focus question was: How many desserts can the lady of the problem make if she has 29 apples?

Each pair was given 29 cut out apples and they work in three different steps to figure out the number of desserts. Next to the picture of each dessert the appropriate division equation was written as well as the remainder.

6th Activity: At the end of the lesson a computer application was used, for which the students had to place a different number of aliens in their spaceships and see how many were left behind each time.

Douwe van der Leij

29 years old

School: NHL Hogeschool, Leeuwarden
Country: The Netherlands
Interview date 13th September 2016

Introduction

Douwe, can you tell us something about yourself and how you view the role of education? Why you are interested in UDL, experiences as a youth worker, experiences as a teacher, what do you do on a daily basis?

As a youth worker:

"I currently teach educational technology at NHL University of Applied Sciences and their World of Work. In the past I was a youth worker in my home town. In my experience kids and youngsters appreciate being addressed on their own terms and level. We need to allow them to make mistakes and learn from them.; Make them responsible for what they do. Actively engage youngsters in their own projects. Pay attention to those kids that are generally seen as "misfits" because they do not conform to average standards".

As a teacher:

"My daily focus in on e-pedagogy and innovation in teaching. Make education accessible to all learners. UDL fits perfectly in my approach and has brought me new and useful insights. As a student I was greatly hampered by the fact that there was just one way to go through the program to become a qualified teacher. There was no room for a personalized approach that best suited my individual needs and talents and previous experiences. Drawing on that experience and inspired by the UDl guidelines I like to give my students room to use their own creativity and motivation to reach their and/or the given goals. And if they are experiencing problems and obstacles there are different ways to support and engage the students. This support structure should be clearly described; is important that this information is offered in different ways, via text, video, audio, graphics etc. In this way students with different learning styles and needs can fully participate while at the same time it is unnecessary for me as the teacher to have 20 different lesson plans for all the different needs and backgrounds. This approach gives me time and space to give special attention to students that really need it".

Douwe, what is the main purpose of education in your opinion?

"I believe education should inspire and motivate, should allow access to learning experiences without obstacles. As a teacher you do not just teach; you tutor and mentor on the basis of individual needs and learning styles. This ties up nicely with new educational developments in the Netherlands under the title *Education 2032*. Key phrases in this plan are :

– the student develops knowledge and skills by deploying his creativity and curiosity
– the students learn to develop their personality
– students learn to deal with freedom, responsibility and learns to look across borders
– students learn to fully us the potential of the digital, online world
– students have a right to receive relevant and personalized education

In my view student creativity is crucial in the learning process. When there is room for creativity and flexibility in the learning process, students learn faster and more effectively. Curiosity is a natural

human characteristic that all learners share. It is my task as a teacher to stimulate that curiosity and to make sure that that curiosity is translated into and enquiring mindset. UDL principles are a perfect match with this conviction"

Dealing with freedom and responsibility

"My students are free to decide whether they attend classes or not. I give them the advice to show up regularly but this is not compulsory. In spite of this unusual freedom 90% of the students always attend my classes. The 10% that don't have very good reasons not to show up. E..g. they are already familiar with the subject matter. We have a flexible UDL-based classroom where students can work and engage in various ways. They can work with Apple, Windows or Android devices. Besides, they can work with Robots, 3D printer, Tablets, virtual and augmented reality. Students are responsible for keeping the classroom tidy and in good repair. This responsibility is taken seriously by the students".

Potential of the online and digital world

"ICT has great potential when it comes to personalized learning. In my work I try to point these possibilities both implicitly and explicitly to students and colleagues. Examples of this are online base-line and formative tests to ascertain where an individual student stands so as to give them tailor-made advise as to the follow-up trajectory. Some of my students are very able to follow their own route to successfully complete a course or program. Other students need just a bit of tutoring. Finally I have students that really need a lot of attention and mentoring in order to reach the desired learning outcomes. By applying UDL principles I can cater for the needs of all these students. All relevant info is online, together with base-line tests, tutorials and flipping-the-classroom instruction. Besides the online course we have a UDL-lab where students can drop by for personal advice and instruction. On the basis of student-requests I organize workshops on relevant themes.

Case Study: Cool tools circuit

Douwe, can you give some examples of how you include Experiential Learning, Design Thinking and computational thinking in your classroom?

"One of the activities I organize for younger and older learners is the Cool Tools Circuit. Pupils hop from activity to activity in our Experience Lab. The activities involve gadgets, robots and tools that can be deployed to stimulate learning. The amazing thing is that I receive primary and secondary school pupils, students teachers, staff and professors to experience the potential of VR, AR, coding and robotics and they are all, without exception, enthusiastic and surprised at the accessibility of these innovative tools. After a short introduction the class splits up in groups of two or three to work with the different tools on the basis of an assignment. The interesting thing is that especially the very young ones hardly need any support or explanation and are extremely clever using the latest technology. I am always thrilled to see how pupils create beautiful and interesting things, using their own creativity and inventivity".

On the photographs you can see pupils designing 3-D objects, pupils coding, pupils listening to Douwe explaining the workings of the 3D-pen and pupils creating their own augmented reality experience.

Conclusion

Photographs showing a group of 8-9 year olds doing the cool tools circuit.
Video showing Douwe doing the Cool Tools Circuit with students

Helga Schuster

School: Pierre-de-Coubertin Gymnasium, Erfurt
Country: Germany

Introduction

Teachers face many challenges today but the most prominent is trying to motivate students. Motivating students can be done by recreating learning processes that are driven by a central vision. I had the pleasure of witnessing the awakening of students' curiosity and happiness whilst learning and discovering new things that were going to be beneficial in their future life. I feel education should not represent the 'Nuremberg Funnel' meaning education should not be thought or learned mechanically. I began to think about approaches to make learning more enticing without losing sight of the required results. The idea of individualisation in learning processes crossed my mind and the more I followed this vision the more it encouraged me to redesign the structure of my lessons. I was motivated to devise a plan that facilitated my ideas. My first approach focused on allowing students to illustrate their learning in different forms. I began to introduce various types of mechanisms for students to demonstrate the learning process and results and I took one step at a time. At this stage I was unaware of the Universal Design for Learning (UDL) framework. After being introduced to the aims, objectives and project partner of the UDLnet project a fruitful collaboration began that enabled me to structure my lessons in a more holistic manner that incorporated the WHAT, the HOW and the WHY of learning.
I am going to share my new way of teaching below and make it clear by providing examples.

New Ways of Teaching and Learning

First of all, there is no direct route to embedding new ways of teaching and learning. You have to think about the redesign carefully and be learner-oriented. Learner-oriented or individualised means that you must know the interests, abilities and skills of each individual learner. Simply put, in order to manage diversity you must know your class. The question is how do you do that? After the exploration phase students were given the opportunity to decide how they wanted to present the topics they had learned. I had provided many different means but they decided what option to choose. There was the option to work individually or as part of a group. The decisions that were made at this stage provided me with cues related to individual preferences. Questions such as "what can I do best" and "in what learning formation and setting can I contribute my strengths in a successful way" should be answered.
The first lesson I implemented utilising said approaches was a history lesson, more precisely a unit of lessons about the role of the king in the French Revolution. At the beginning of the learning unit the learners were informed about pending tasks and the goals. They know that they would have to choose one of the tasks according to their interests (topics) and abilities of speaking, writing or role playing (presentation of learning results). Choice was given to the students to decide how they wanted to present their learning as shown below:

- Create a fictional dialogue between Louis XVI and his wife Marie Antoinette in prison reflecting and assessing their political lives and actions – **role play**
- Make a timeline showing the major events in king's life – **poster or power point**
- Write an article for a wide spread newspaper the day before the execution – **text on paper**
- Act out a talk between a peasant, an aristocrat, a rich citizen, a clergy man – **hosted talk show**
- Work out a profile of Louis XVI based on your knowledge and written sources of biographical information (Template) – **structured description**

All tasks and lesson goals are discussed during the first lesson. The students repeated the goals they understood were required to reach. This activity was completed so I was certain the class understood the correct method to complete the tasks and achieve the required outcomes.

It was essential that each student had chosen an individual (poster, power point, text, template) or group task (role play, talk show or in case of PowerPoint) at least after the first two lessons of the unit. This was a compulsory element so students had enough time to collect material, make notes, have discussions with others and prepare their chosen presentation. Students were given the autonomy to form their own groups. To avoid groups that may prove ineffective, I assumed responsibility of giving final approval. I saw my role as a manager, mentor and coach for the class and each of the learners.
Individual needs of learners were considered when deciding what material to use and when preparing the corresponding materials beforehand. The success of this approach justified the efforts I made searching appropriate material and offers on the internet. An educational website "kinderzeitmaschine" helped the students become aware of their desire to explore topics they were interested in. This desire enabled them to play an active role in their own learning process. Students involved in group work had the independence to decide what materials were going to be used and delegate the division of work.

Feedback

While observing the students at work, my first impression was that they were all working quickly and in an enthusiastic manner. Seeing this process in action motivated me enormously not to give a traditional 'lecture' at the top of the classroom again. Students expressed that they enjoyed the whole learning process from the first to the last step. For instance, it was important for them to have a choice regarding their learning. Having a choice and not being compelled to fulfill rigid lesson plan requirements, minimalises the chances of a student meeting a difficulty that draws attention to their weaknesses.
On the other hand students that are brilliant speakers or entertainers feel much better showing what they have learnt through role play, talk show or various games. Nowadays, as students often interact with various modes of media for communication and information processes they welcomed the use of innovative media such as the internet, presentation software or graphic tools. I feel it is very beneficial for students and teachers to follow the UDL framework. This way students enjoy learning and have the ability to identify the benefit of learning for their futures. This approach creates less difficulties for teachers and makes us meet professional challenges, personal demands and ambitions more fruitfully.

Application of the Quick Reference Card –a product of the project work of the UDLnet

The Quick Reference Card was one product outcome of the European funded project UDLnet. This outcome is an instrument designed to introduce its reader to the concept of UDL. Teachers can use this instrument to compare their own teaching style while providing the opportunity to consider a framework that illustrates how to be innovative in relation to individual teaching and learning practices. The card underpins the WHAT, the HOW and the WHY of learning with questions to be answered on the front page. The other side of the card provides inspiration and proposals and how to implement. Advantages of this card are as follows: it summarises the necessary UDL details; it's presented in a manageable pocket size format; and the reader is guided easily throughout the tool. I was willing to engage with the Quick Reference Card and it motivated me to enhance my teaching, I am convinced that other teachers will also be similarly motivated.

Conclusion

The famous Greek philosopher Plutarch said in ancient times:
"The mind is not a vessel to be filled, but a fire to be kindled."
This could be a wonderful guideline for us, teachers. Freedom in the design of all learning processes, organisational flexibility, a learning environment that promotes a balanced relationship between teacher centered activities and active jobs for learners are steps toward innovative teaching, and individualisation. I feel it is by no means an easy path, but it is a path worth taking. Innovation also requires an open mind, a vision and the desire to follow these new paths on the part of each individual teacher and all school stakeholders.

César Martín Losa

37 years old.

School: Santa Elena, Villarejo de Salvanés.
Country: Spain.

Interview date: 27th September 2016
César, *can you tell us something about yourself and how you view the role of education? Why are you interested in UDL, experiences as a youth worker, and experiences as a teacher? What do you do on a daily basis?*

As a youth worker:
At present I teach primary in Santa Elena School, In the past I was a youth worker in Madrid. I learnt that young learners are happy when they are really involved in the learning process, You must take a distance when you teach, but you work with all kinds of people, They appreciate that you are interested in their lives, not only to teach them, you ask all types of questions, they fell that they are important, so they work with more interest, and actitude.

As teacher:
My point of view consist on develop childrens skills, all of them are different like the ways in they learn, we need to be focused in cooperative learning, they can learn more from equals, than sometimes from the teacher; Like teachers you must use the tools that you consider, new technologies and UDL can help us to develop and reach our students goals.
"Tell me and I forget,
Teach me and I remember,
Involve me and I learn"
Benjamin Franklin (1706-1790).
This quote shows the way to use with our students. It´s hard to find the rigth way and it´s easy to say. You must developed new ideas, resources, and tools; take care about your students different learning ways... With UDL you can show your own experiences with childrens, useful activities and give your colleages concrete cases and tools that works with different types of learners, tips to work with challenged students.
Share your good practice and experiences with others parts of the learning process (parents, colleages, students who study to be teachers...) is the main objective of UDLnet.

César *What´s the main purpose of education in your opinion?*
My opinion consists on developing our students at their maximum capacities, not only their intellectual capacities. Give an integral knowledge and preparation to prepare people for the future, next generations are in our hands, and it´s one of the most important tasks.

As teacher/School:
We prepare them learning other languages, we are part of the BEDA program, we show the importance of learning, like the UDL guidelines, we start from three years old students until eighteen years old. (Spanish, English and French).
We focused in cooperative learning, the successful society is one in wich their individual capacities are used to achieve our goals, we need people to be a successful group not only yourself; You can learn from others, students, parents, colleages, people in general that we can see in our way.

We work in projects, in wich we used other ways to learn and work, instead of the traditional way. They are in charge of their own learning, based on their interest; you can focus one task in one point of view, but your partner focus the same task in other point.
Not every child learns the same in the same way, everyone has got the same opportunities to achieve their goals, the difference in wich they achieve is only in the way.
The importance of new technologies (N.T) to be an active part of our learning, we can´t avoid society improvements, we must adapt and use N.T. To offer other forms to learn.
We are going to use flipped classroom methodology in wich you can give your explanations on video and text; and then put on the internet, after you give the URL direction or web page. The next step is that in wich our students see the video, at their own or with their parents to see the explanation, write doubts in the notebooks, if they don´t understand the video. They can see hundred times more if it´s necessary, they go to the classroom with doubts; we work with a cooperative learning method; they ask their group, and if they don´t know the answer, they ask to the teacher to solve doubts.
Traditional teaching methods are not the best at this moment, for everybody, as teachers we must adapt.

To sum it up:
A new time brings new ideas, ways of thinking, great advantages in some fields in our lives.
We must adapt to new times, new ideas, movements, innovations that our society and our students are able to manage and use (mobile phones, tablets, laptops, new technologies...).
We should take in consideration some facts; how our students learn, everybody has got different learning rhythms, they have different circumstances..
We need to use all resources, looking for our achievements, be able to prepare young learners in a better society.

I think that we are rise to the challenge

Hanna Fontell

School: Postipuu School, City of Espoo
Country: Finland

Introduction

"The Child at the Centre". This is a simple and even obvious thought, but very essential in all teaching. I had an opportunity to attend the UDL Seminar in Dublin, Ireland in November 2015, and one of the key thoughts of the seminar was the importance of every child. The UDL approach focuses on the concept of the student being in the centre and highlights the possibilities, instead of obstacles.
Schools have a very important role in building and strengthening students' self-esteem. I strongly believe that for each and every student it is possible to find individual ways of learning. As a teacher I need to find out students' strengths and offer different ways of learning and studying. It is important that every student gets positive learning experiences and a feeling that "I can learn" and "I am good".
My background is in the field of special education and perhaps that is the reason I strongly believe in the UDL approach of learning. Teachers within the Finnish special education system have already been implementing UDL based methods, without realizing it. I work as a teacher of a special education class with two special needs assistants. My students are aged between 13-17 and the class size is quite small, eight students in total. My students have different types of learning difficulties, such as challenges in writing, reading and comprehension.
This diversity in their ability means that I cannot only teach one way, but I must use various methods to ensure that every student of mine learns in class. Some students benefit of pictures being used, some benefit of learning by doing, and others benefit of traditional teaching methods. Many students are also encouraged and motivated by the use of technology in teaching.

New Ways of Learning and Studying

In Finland we currently face big changes in the field of education. The new Finnish National Core Curriculum from pre-education to the ninth grade is being introduced in the autumn 2016 and it will be rolled out in phases over the next three years.
The most significant change revolves around the move from traditional "teaching by subject" to "teaching by topic". This can also be described as "phenomenon based teaching" where the learning starts with the goal of understanding real world phenomena. For example, students might take "cafeteria" lessons, which would aim to improve their maths skills, language and writing skills and communication skills. This is something I have already successfully tried with my own students. We have our own cafeteria and pupils from the mainstream school can come and enjoy our cafeteria services. This gives our students a natural way of interacting with each other and also encourages inclusion in a very practical way.
Other examples of phenomenon based teaching include cross-subject topics, such as the European Union, which merge elements of economics, history, languages and geography. In Finland, teachers have a lot of freedom in how they deliver the curriculum, which introduces us with many possibilities, as well as responsibilities. We can implement the curriculum according to our own pedagogical views, taking advantage of our own individual strengths as teachers.
In my view, ICT should be embedded into all teaching so that students learn to use digital media to create and share information, as well as to interact within their peer groups and across communities. During the past 15 years I have been very interested in using ICT in my teaching. A few years ago I took part in Erasmus training *"Inclusive Education with Tablets"* and that was the starting point for my "iPad teaching era". Using tablet devices in teaching was a new concept for me and I very quickly

realized their potential and benefit in teaching. I started with only one iPad in my class and now every student of mine has an individual iPad in classroom use.
There are other changes in the national curriculum, too. The traditional format of the classroom sees rows of pupils sitting passively in front of their teacher, listening to lessons or waiting to be asked questions. Instead of this, the new approach is more collaborative, with pupils working in smaller groups to solve problems while improving their communication skills. Student centered learning and flexible study environments are key concepts of the new curriculum being introduced in Finland.
In this new context I feel that the UDL thinking is very relevant. Detailed "Why, What, and How" questions are essential tools for every teacher. I find the UDL Reference Card very useful; every teacher should frequently ask those "Why, What and How" questions - even if you have been a teacher for many years, like I have! Those questions make the teacher to think and even to question their own way of teaching. Do I really use different methods to deliver information and content in the classroom? Can my students find different ways to express what they have learned and know? How can I find different ways to motivate my students? I hope the UDL thinking will spread in Finland and become a part of our teaching practices: the key concepts of UDL fit very well together with the new curriculum 2016 in Finland.

Case Study: Growing Plants in the School Yard
Our project *"Growing plants in the school yard"* is a good example of how the UDL way of thinking goes into practice. I started this project over a year ago with my students. I teach in a cozy "cottage school" which is located beside the main school building, and this offers us a very good environment for learning by doing. My main idea was to utilize the surroundings, the area beside the school building. I also wanted for my students to have an opportunity to go out and experience learning in an environment outside of the classroom.
The learning objectives were to grow different kinds of plants, to learn to recognize weeds from plants and to understand why a weed is different from another plant. We also learned to identify the parts of a plant and what is needed for growing and looking after a plant. Students could choose the plants they wanted to grow and decide in what ways they took care of the yard. All the practical assignments were designed to motivate the students and keep them interested. When we started the project, students were given detailed learning objectives and encouraged to use different ways of studying and learning during the project.
So what were the outcomes of our project? The most tangible one was their own individual "Biology Book" which they compiled using iPad Book Creator. Students took a lot of pictures outside in the school yard and wrote their own text. They collected plant samples, pressed and placed them in to their notebooks. They also drew pictures of plants, resulting in a wide range of visual materials. Students were working at their own speed and sometimes individually, sometimes in a group, concentrating on areas that they were interested in. Help and support was made available throughout the project. Kahoot Quizzes were also created and they were great fun! A few of the students presented their biology book in front of the class. The main idea was that every student could choose the way in which they demonstrated what they had learned.
This project and its objectives support the new curriculum, as its aim is to study a topic ("phenomenon based teaching") instead of a certain subject. I also think that it aligns well with the core concepts of UDL thinking. Various approaches and different kinds of teaching methods were in use, and students were enthusiastic and proud of themselves and their work. They treasured their biology books and enjoyed working with iPads, enhancing their ICT skills. I could see that the students really enjoyed their tasks and practical work, they improved their social skills and collaborated with each other and as a teacher, I found that very motivating!

Overall, my students need a lot of guidance and help, especially when they are completing practical tasks and studying. I believe that many relevant topics can be found near or in the student's own life. This in turn will increase the level of their motivation, and they feel that they can relate to that topic. The success of our little garden project has encouraged me to carry on this type of teaching and learning and I am sure that our garden will continue to blossom for many more years to come!

Conclusion

As we teachers think about how to help our students learn, embracing the UDL approach means that we leave the concept of average aside and embrace diversity in people – in school, in community and in society in general. We hope to help our students to integrate and find their own place in society, to develop their potential and to shine and flourish with their own ability and strengths.
Everyone must be given an opportunity to learn and it is our duty as teachers to find the diverse ways and means. This is what UDL is all about to me.

Annexes (photos, ppt presentation, video)
Hanna's interview (video), pictures from school yard, powerpoint presentation

Nikolaos Nerantzis

Country: Greece

«*Because the only people for me are the mad ones, the ones who are mad to live, mad to talk, mad to be saved, desirous of everything at the same time, the ones who never yawn or say a commonplace thing, but burn, burn, burn like fabulous yellow roman candles exploding like spiders across the stars and in the middle you see the blue centerlight pop and everybody goes "Awww!"* » J. KEROUAC[1]

Introduction

Since 2009, our objectives of planning, implementing and evaluating educational activities, in Secondary Special Educational Schools in Greece, have been to active engage in learning process and to support students *with any kind of difficulties*[2], in order for them a) to be self-confided, b) to acquire decision making abilities and c) to be inspired from science curricula. Since then, various educational tools and repositories have been deployed in science education[3], providing a plethora of teaching material, helping maximizing students' educational outcomes. The involvement in projects and competitions, also led us to collaborate with other educational "frameworks and initiatives", such as Universal Design for Learning (UDL) and the UDLnet Network (Nerantzis, 2015 and Riviou, 2015). UDL is a key strategy for planning and implementing our educational activities, since it can be applied at all levels of schooling – and, in our opinion, at several types of schools – in order to ensure that learning opportunities and instructional practices are accessible to all students (King-Sears, 2009). UDL acknowledges the diverse ways in which students learn and facilitate this diversity by presenting the curriculum in a way that makes it accessible for all, while supporting and engaging students (Hornby, 2014). All students need alternative models – or a step by step plan – of how to achieve an objective, and a sense that all these steps are achievable (Meyer et al., 2014: 29).
The educational practices presented here were developed, implemented and evaluated at Special Vocational School of Serres (https://speduser.wordpress.com), at the Inclusion Classes of the 4th Junior High School of Stavroupoli/Thessaloniki (http://4gym-stavroup.thess.sch.gr) and at the Public Special Junior High School of Thessaloniki (https://eidgymthess.wordpress.com). In the Inclusion classes we are supporting students that can follow the mean stream national curriculum[4], while in Secondary Special Education Schools we support students whose attendance is particularly difficult in other frameworks[5].

What the problem/issue is

Teaching in Special Education is a very challenging task. We must take into account *each* student's difficulty in learning (Nerantzis, 2016). For example, students with autism spectrum disorder (ASD) are strong visual learners, so they may struggle to process information in a 'clear' verbal format (Goldstein et Naglieri, 2013), while verbal/audio format might be more preferable for students with

1. Jack Kerouac, *On The Road*, Part One \ 1.
2. We propose the term "students *with any kind of difficulties*" to be used instead of "students *with special education needs and/or disabilities*". See here http://wp.me/p3oRiZ-oQ for the etiology.
3. e.g. PATHWAY - http://pathway.ea.gr, ODS - www.opendiscoveryspace.eu, ISE - www.inspiringscience.eu, GoLab - www.golabz.eu.
4. e.g. students with mild learning difficulties, specific learning difficulties (eg dyslexia), autism spectrum disorder (ASD), visual impairment, social, emotional, and behavioral difficulties.
5. e.g. students with autism spectrum disorder (ASD), moderate learning difficulties, physical disabilities social, emotional, & behavioral difficulties, etc.

specific learning disorders (Rose et al., 2005) that may struggle to process written/visual information. Moreover:
a) our students can't easily connect core scientific ideas with mathematical formulation or use the knowledge gained in a different context (Padeliadou et Chideridou, 2013),
b) their representations are universal and not easily modifiable (Heywood et Parker ,2010 and
c) the significant difficulties regarding (short term, working, long term) memory function (Padeliadou et Botsas, 2007).
Another difficulty is in relation with the context of UDL: we have to focus on learning expertise[6] in order our students to become more motivated, knowledgeable and to enable them to become expert, developing interest, purpose, motivation and strong self-regulation as a learners. (Meyer et al., 2014: 135). In terms of Special Education[7] this very hard to be achieved. Although "the premise of UDL is that one approach cannot fit all" (Hornby 2014), in classes with relatively "homogenous learning capacity" – as ours, UDL Guidelines is a powerful tool for planning educational activities targeting active engagement with the learning tasks.
We know that active engagement with learning is gained through social processes. Every student needs alternative models and representations of how to achieve a goal, as well, a sense that the path to get there can be traversed (Meyer et al., 2014: 29). Moreover, with the use of (not only assistive) technology UDL can give solutions of enhancing learning for many different kinds of students (Rose et al., 2002). In fact, new technologies have changed our schools.
We had to notice that we had to support a significant number of students from low socioeconomic status backgrounds, a number that roused up because of the financial crisis (Vayanos et al, 2016). Those students, on average, enter school with lower levels of vocabulary and complexity of language and this influences their future success at school (Mellanby et Theobald, 2014: 13). Finally, there was a difficulty to "translate" scientific papers into practice, our practice, since usually "research article didn't provide examples or resources practitioners could use in a class" (MacLellan, 2016). In order to integrate evidence-based research we had to make modifications and amendments adjustments, regarding our students' needs.

Considerations (I am teacher: How taught?)
We have to note that the classes in Special Educational Schools have small pupils number (up to eight (8)) and – if it is possible – pupils with the "same learning potential". To teach science effectively students *with any kind of difficulties*, we take into account their needs for adjustments and we integrate educational practices such as:

i) The "7E" Open Inquiry Based Science Education (IBSE). The "7E" IBSE model has been used the following phases: *elicit – engagement – exploration – explanation – elaboration – evaluation – extend* (Eisenkraft A., 2003 and Levy etal., 2002). We consider the *extend* phase as a very important phase for deep understanding of core scientific ideas, for knowledge transfer and the development of everyday life skills. Two examples: In a lesson on shadow[8] we can extend with shadow puppetry and shadow economy. In a lesson on light[9] we can extend with planets' auroras and art.
ii) Big Ideas of Science, as they are presented at the GoLab project[10] (Rodrıguez-Triana et al., 2016). "The Big Ideas of Science are a set of cross-cutting scientific concepts that describe the world around us. They allow us to conceive the connection between different natural phenomena that

6. "everyone can become an expert learner" – Meyer et al., 2014: 45.
7. e.g. severe learning difficulties, profound and multiple learning difficulties, mental retardation, multiple disabilities, ASD, etc.
8. see www.golabz.eu/spaces/shadows
9. see http://wp.me/p3oRiZ-h9
10. www.golabz.eu

at a first glance may look irrelevant but in fact have their roots on the same principles and laws of nature" (www.golabz.eu/big-ideas). A crucial aspect on our science teaching is to highlight the unity of the phenomena around us. Humans "divided" this unity in order to study and specialised further, but *there are* "common factors among the diverse disciplines" (Pombo et al., 2012:1).

iii) Adding the Art (& humanities) component to STEM[11]. Moving forward, there is a need for our students (as future citizens) to be scientific literate in everyday contexts. So education calls for integrating STEM + A = STEAM (Ge et al., 2015: 39). For example, teaching theatre is a way of enhancing the self-image and the self-esteem of our students. Using embodied learning (Riopel et Smyrnaiou, (2016): 168 and Smyrnaiou et al., 2016), theatrical techniques and other innovative educational tools we help the learning process in a school of students *with any kind of difficulties*.

iv) Posters. Posters are a "drawn to the eye" visual tool that can be part of many lesson plans and activities (e.g. as an advance organizer, as a common reference content, a resumption material, a cross thematic material, etc.), fitting our students' educational needs, maximising the success of the educational objectives. Posters are suitable to teach core scientific ideas and a great tool for deep scientific understanding integrating cross thematic objectives. Moreover though posters we can activate our students to plan, to implement and evaluate a lesson (Nerantzis, 2014a).

v) Metamemory strategies. Metamemory is a part of metacognition – the ability to monitor, control and assess our (and others') thinking (Flavell, 1979). Metamemory is about monitoring and controlling our memory and some useful tools for doing that are *Ease of Learning Judgments* (EOLs) – judgments made by a learner before a task regarding how easy or difficult s/he a learning task will be, *Judgments of Learning* (JOLs) – judgments made during or after a task regarding how well the learner believes s/he will perform or has performed and *Feelings of Knowing* (FOKs) – the ability of a learner to recognize an item even if s/he may not be able to recall it (Karably et Zabrucky, 2009: 36). Here we must notice that students will show better strategy transfer when explicit instructions are provided and they are usually overestimate their memory ability (Karably et Zabrucky, 2009: 46-48). The crucial factor that determines initial feeling of knowing is the Familiarity with question terms – and not with the answer (Paynter et al., 2008). Moreover, the feeling of-knowing signal from our brain is given – maximum – within 550 ms (Paynter et al., 2008)! Seeing it through our lens, we can say that in a less than a second our students' brains have already decide if they 'know' and so, if it is preferred to be engaged or not with a specific task.

vi) Analogies. The use of analogies plays a vital role in the educational process in general and in particular to approach and build concepts. It has proven to be a valuable and direct tool offering, for example, directs import of abstract concepts' images (Zisimopoulos et al, 2002). The analogies and the models are useful tools of thought, representing (not copying) a piece of reality. The successful use of analogies requires adequate preparation of the students (Aubusson 2006).

vii) Peer instruction. Debates and arguments among students (eg as part of the team) is something to encourage, as the interaction among peers (peer instruction) has proven to contribute to a deeper understanding of the concepts we negotiate, since all students are activated. This method consists in formulating a question, which originally answered each student alone. Then, students are asked to work in groups trying to convince each other of the correctness of his/her own answer. After this interaction between them, the students answer the same question again. A discussion followed and the revelation of the correct answer from the teacher and the justification (Pierratos, 2013).

viii) Information and Communication Technologies (ICTs). With combining ICTs skills with UDL-based innovations in pedagogy, curriculum, and institutional organization we want to improve our teach-

11. Science Technology Engineering Mathematics

ing and to collaborate with colleagues (not necessary in the same school). The overall objective is not only to improve our classroom practice, but also to raise awareness of the European educational community on the need for UDL based teaching and learning practices (Riviou, 2015).

ix) Outdoor activities (Quay et Seaman 2013 and Wattchow et al. 2014). Outdoor education promotes learning at informal contexts and can make an important contribution to learning Braund et Reiss, 2004). Moreover, it is the best opportunity for our students to increase connections as a group, to build a culture of cooperation & support and to develop positive feelings and memories around school & our activities (Becker, 2016). Outdoor activities has a straightforward connection with environmental education and the School Activities Programmes implementing to Greek schools

x) Online repositories and International practices. The design of innovative educational proposal is a process that has been facilitated with the participation in networks, online communities of repositories and practices (Staver 2007), the participation in teachers' contests, in workshops and summer schools and teachers' exchange of resources, practices and experience (i.e. Inspiring Science Education (iSe), UDLnet and GoLab). All the above are objectives were developed with use of open access scholarships and open educational resources (UN, 2014).

Solutions *(I am teacher: What taught?)*

Here we will present, in short, a few didactic proposals implemented in the context of Secondary Education Schools, having in our hands as a powerful tool the UDL Guidelines[12]. UDL Guidelines offer, in a robust way, insight into specific kinds of systematic learners' variability and specific ways to develop didactic proposals for that variability. Moreover, UDL Guidelines call for the integration of emotion, as a key factor for students' active engagement (Meyer et. Al., 2014: 32). We tend many of our activities to be "hands-off" for the teacher(s) since "hands-off teaching cultivates metacognition" (Maats et O'Brien 2016). We want to emphasize that the educational activities presented are targeting students of *typical development* as well students *with any kind of difficulties*.

A didactic proposal to introduce the concepts of "energy flow", "wave", "oscillation" and "disorder".

The didactical proposal was awarded with the 3rd prize at IEP's / PATHWAY's "The Pathway to Inquiry Based Science Teaching" contest on IBSE (266624/SiS-CT-2010)[13]. The didactic proposal consists of three (3) worksheets – one for every didactical hour. The scenario includes the "water cycle ≈ DC electrical circuit" and "matter ≈ energy" analogies, energy chains (Nerantzis, 2014b and Tiberghien et al., 1999), experimental inquiries on flow(s), wave(s), oscillation(s) with 1D, 2D and 3D pendulums, posters, ICTs, etc. The activities can be found here, http://wp.me/p3oRiZ-1R, here (Nerantzis, 2015 and Riviou, 2015) and also on UDLnet inventory.

On simple DC circuits

The didactical proposal was awarded with the 1st prize to 2014's GoLab's national teacher contest. The scenario includes the educational use of comics (Kakalios, 2009), the Electrical circuit lab (the

12. UDL Guidelines can be found here http://www.udlcenter.org/aboutudl/udlguidelines_theorypractice - last updated: 11/12/2014.

13. see http://pathway-event.ea.gr/ & http://pathway-event.ea.gr/pathway-resources, It is the result of the collaboration and support on such initiatives from the Serres' Consultant for Science, Aik Mpezergiannidou, and the responsible of the Serres' Laboratory Center of Science (LCS), S. Mandiliotis.

former Electricity lab)[14] , the use of smart-phone and/or tablet for initial and final wireless recording students' responses (Pierratos, 2013 and Pierratos et al., 2014), etc. Our idea was to emphasize the "dialogue" between reality (hands-on experiments) and models (virtual laboratories – Ginnis et al., 2010). Finally, there is a third – optional – lesson plan using the "electrical circuit ≈ traffic road" analogy. The activities proposal can be found here http://wp.me/p3oRiZ-80, here (Nerantzis, 2015 and Riviou, 2015) and also on UDLnet inventory.

Experimental (open) inquiry with low-cost materials, on the simultaneous freefall of two different bodies from the same height.

The implementation of this didactical proposal[15] was awarded with the 1st prize of the 2015 GoLab national contest. The present, open inquiry base science education (IBSE), educational proposal also includes the educational use of comics (Kakalios, 2009), experiments with "low cost" materials, the use of smart-phone and/or tablet for wireless recording of students' responses (Pierratos, 2013 and Pierratos et al., 2014), posters, interactive whiteboard (IWB), photo and video editing software via a GoLab Inquiry Learning Space (ILS). The activities proposal can be found here http://wp.me/p3oRiZ-bY, here (Nerantzis, 2015) and also on UDLnet inventory.

Environment & STEM Education

Participating in GreeNET's competition, launched via Facebook[16], we[17] implemented a didactical proposal consists of three (3) GoLab Inquiry Learning Spaces (ILSs) on Waste (http://goo.gl/IIm3z5), Wetlands (http://goo.gl/ZlBm4U) and Watershed (http://goo.gl/DCRbgz). We provided teaching tools and good teaching practices (e.g. posters, video, GoLab/Graasp, metamnemonic questions, activities "outside the classroom") based on STEM education, while integrating principles of inquiry learning and ICTs. The activities proposal can be found here, http://wp.me/p3oRiZ-fo and here (Nerantzis, 2015).

The Eratosthenes Experiment

Since 2014, we constantly implement the Eratosthenes Experiment. It is a 'simple', outdoor activity that is communicated (poster, schools' website, national cooperation) and gives the opportunity for everybody (students *and* teachers) to participle and to be playful. Our activities can be found here, http://wp.me/p4jO5C-r and here http://wp.me/p4jO5C-r.

Lasers & Bubbles

The didactical proposal was a top 5 finalist 2015 at the ISE Contest "Learning with light"[18]. Educational activities were carried out on exploring light's behaviour passing through different media (air, oil). This open inquiry IBSE didactical scenario has four (4) phases: pre-activities, main activity, post-activities and discussion – conclusion(s) – extend that can be found here http://wp.me/p3oRiZ-h9, here (Nerantzis, 2015 and Riviou, 2015) and also on UDLnet inventory.

How light ...Jumps

This activity is part from "Lasers & Bubbles" didactic proposal. Students as photons, had to make

14. www.golabz.eu/lab/electrical-circuit-lab
15. The present proposal took shape with the support of S. Mandiliotis (Serres' LCS), Aik. Bezergiannidou (Consultant for Science Teachers), K. Pileidou (Special Educational Consultant), Suzana Delic (Primary subject teacher & ICT teacher, Primary school Horvati, Zagreb, Croatia).
16. www.facebook.com/GreeNETproject
17. The present proposal took shape with the support of S. Mandiliotis (Serres' LCS), Aik. Bezergiannidou (Consultant for Science Teachers), A. Tozakidis (Special Educational Consultant).
18. www.inspiring-science-education.net/competition.

decision on the materials separating line about where to turn: left or right and so they undergo the changes in their path via two different materials. This dramatization it turned to be a very joyful activity and it was presented with a poster at CREAT-IT 2015 "Inquiry Based Learning and Creativity In Science Education". Our activities can be found here http://wp.me/p6Hte2-14.

Interdisciplinary Astronomy Activities

Five (5) teachers joined their "forces" and our students were engaged a) in a unique images presentation of the Cosmos in the mobile planetarium STARLAB (http://www.planitario.gr/tholos-starlab-classic-standard.html), b) in a video session on solar system, space missions and Universe, in our school's library. and c) in tactile activities such as Meet our home and Meet our neighbors (http://nuclio.org/astroneighbours/resources) and the creation of planets' 3D models. With the above hands-on activities we had the pleasure to join the Cosmic Light Edu Kit / International Year of Light 2015 program and the activities were presented with a poster at EGU General Assembly; 2016 (Nerantzis et al., 2016). See http://wp.me/p6Hte2-1I.

Volcano Eruption & Big Ideas

An activity for Geology Class, using poster in order to connect a 'real life' phenomenon with the Big Ideas. The poster was the winning entry for the graphic category for the Scientix's competition "Media in STEM Award"[19]. Our students had to inquiry about volcanoes and to match volcano phases with as many Big Ideas as possible.

Science Theatre

This school year (2015-16), under the School Activities Programme "School Garden - Recycling / Environment and STEM education", we[20] implement a theatrical performance based on Yio Somei's book "Jake in the Sea"[21]. Through this science theatre we highlighted the values of biodiversity and the environment. The theatre was presented throughout the school with great success and we also participate in "Learning science through theatre" (see here: http://lstt2.weebly.com) and honorary awarded with the best presentation award. We succeed to integrate the emotion component in learning (Hinton et al., 2008) in a multimodal learning environment (Vrioni 2016) and engaged our students with embodied learning (Riopel et Smyrnaiou, (2016): 168 and Smyrnaiou et al., 2016). For the activity see (Nerantzis, 2016).

Conclusions (I am teacher: How taught?)

Many argue that the biggest misconception in the 'core' of many reform efforts is, probably, treating individual learners as separate from their contexts or their environments (Meyer et al., 2014: 129). Safe learning environments are crucial for learning (Mellanby et Theobald, 2014: 259, 262, 268). Moreover, active engagement is gained through social processes and every student need alternative models of how to achieve a goal, and a sense that the steps to get there are achievable (Meyer et al., 2014: 29-30). We, us teachers, give great importance...

a) ...to the motives of our students for engaging science class: they like the teacher, the like hands-on activities, they laugh, they see "new" thinks, they see their work being communicated and (s few of them) they do like science,

19 see here http://goo.gl/kIcmmm and this Facebook post https://goo.gl/2bQ7qs.
20 with the help of Dr. Eleftheria Mpaka (Teacher of Drama & Author)
21 Shomei Yoh, Jake In The Sea, (Ο Τζέικ Στη Θάλασσα) Σύγχρονοι Ορίζοντες (http://s-orizontes.blogspot.gr/p/blog-page_4729.html), ISBN 960-7984-28-5, ISBN-13 2005 978-960-7984-28-9; [book in Greek]

b) ...to build 'bonds', to be sincerer / genuine, to share our true thoughts, to answer to any of their questions, to support emotionally, to be playful, to accept any ideas,

in order to promote active engagement with our learning task and educational activities. The first pillar is to offer students educational activities in order to facilitate their learning, cultivate their creativity and to provide them the necessary experiences for life. The second pillar has been the design of medium-term & long-term innovative educational activities with objectives to an effort for an inclusive education. There is also a third pillar: to engage as many teachers as possible and to support them in innovative science teaching, by all mean. Finally, science education, on our point of view, also establishes a wider framework of individual completion through the development of critical thinking and the urge to act, locally & globally, aiming to raise the awareness on human rights, world peace and safeguard human dignity building, ultimately, a culture of peace.

References

Aubusson P.J., Harrison A.G., Ritchie S.M., (2006). *Metaphor and Analogy In Science Education*, ISBN-13 978-1-4020-3830-3, Springer.

Becker M., (2016). *5 Benefits of Outdoor Education*, http://www.edutopia.org/blog/5-benefits-of-outdoor-education-michael-becker, APRIL 19, 2016 (visited 18 Aug. 2016)

Braund N M., Reiss M., (2004). *Learning Science Outside the Classroom*, Routledge Falme, ISBN 0-203-47629-8.

Eisenkraft A., (2003). *Expanding the 5E model, The Science Teacher*, Sep. 2003; 70, 6; Research Library pg. 56.

Flavell J.H., (1979). *Metacognition and cognitive monitoring: A new area of cognitive developmental inquiry*. American Psychologist, 34 (10), 906-911.

Ge X., Ifenthaler D., Spector J. M., (2015). *Emerging Technologies for STEAM Education Full STEAM Ahead*, ISBN 978-3-319-02573-5, DOI 10.1007/978-3-319-02573-5, Springer.

Ginnis A.I., Kostas K.V., Politis C.G., Kaklis P.D., (2010). *VELOS: A VR platform for ship-evacuation analysis*. Computer-Aided Design, 4*2,* pp. 1045-1058.

Goldstein S. Naglieri J. A., (2013). *Interventions for Autism Spectrum Disorders Translating Science into Practice*, ISBN 978-1-4614-5301-7, Springer; 2013. p. 87.

Heywood D., Parker J. 2010, *The Pedagogy of Physical Science*, ISBN 978-1-4020-5270-5 Springer, pg.12

Hinton C.; Miyamoto K.; Della–Chiesa B., (2008). *Brain Research, Learning and Emotions: implications for education research, policy and practice*. In European Journal of Education, ; 200843(1), Volume 43, Issue 1 March 2008 Pages 87–103

Hornby G. (2014). *Inclusive Special Education – Evidence-Based Practices for Children with Special Needs and Disabilities*, ISBN 978-1-4939-1483-8, DOI 10.1007/978-1-4939-1483-8, Springer, pg. 95-96.

Kakalios J., (2009). *The Physics of Superheroes.* ISBN 978-1-592-40508-4, Gotham Books.

Karably K., Zabrucky K.M., (2009). *Children's metamemory: A review of the literature and implications for the classroom*, International Electronic Journal of Elementary Education, Vol. 2, Issue 1, October, 2009

King-Sears, M. (2009). *Universal Design for Learning: Technology and Pedagogy*. Learning Disability Quarterly, 32, pg. 199–201.

Levy P., Lameras P. , McKinney P., Ford N., (2002). *PATHWAY, D2.1 The Features of Inquiry Learning: theory, research and practice*, http://www.pathwayuk.org.uk/what-is-ibse.html or http://wp.me/p3oRiZ-1R

Maats H., O'Brien K., (2016) *Hands-Off Teaching Cultivates Metacognition*, http://goo.gl/JoxQF3; 2015 (retrieved 20-Mar-2016).

MacLellan P., (2016). *Why don't teachers use education research in teaching?,* Education in Chemistry blog, http://goo.gl/8mBtyR (retrieved 15 Aug. 2016).
Mellanby J., Theobald K., (2014). *Education and Learning- An Evidence-Based Approach*, ISBN 9781118483619, Wiley,
Meyer A., Rose D.H., Gordon D., (2014). *UDL, theory and practice*, E-book ISBN: 978-0-9898674-1-2, CAST, Inc., http://udltheorypractice.cast.org.
Nerantzis N., (2014a) *Posters as educational material for science education* [*Secondary Special Education (Greece)*] , 2nd Scientix Conference which took place on24 – 26 October 2014 in Brussels, Belgium http://wp.me/p3oRiZ-cc.
Nerantzis, N. (2014b). *Energy Chains.* "Stared" Worksheet at Physics Education
Technology (PhET) repository. http://phet.colorado.edu/en/contributions/view/3841.
Nerantzis N., Riviou K., (2015). *Science Teaching In Secondary Special Education*, Proceedings of the European Distance and E-Learning Network 2015 Open Classroom Conference, Athens, 18-21 Sept. 2015, ISBN 978-615-5511-06-6, pg. 19-31, (https://issuu.com/edensecretariat/docs/occ_2015_athens_proceedings_web).
Nerantzis N., (2016). *Integrating Innovative Practices in Secondary Special Education in Greece*, Proceedings of Inspiring Science Education Conference, April 22-24 2016, Pallini, Greece, ISBN 978-960-473-696-6, pg. 159-167.
Nerantzis N., Mitrouda Aik., Reizopoulou I., Sidiropoulou Eir., Hatzidimitriou A., 2016. *Interdisciplinary Astronomy Activities*, Geophysical Research Abstracts, Vol. 18, EGU2016-3115-1, 2016, EGU General Assembly.
Padeliadou, S. & Botsas G.. (2007). *Learning disabilities – basic terms and characteristics* [book in Greek]. Thessaloniki, Grafima.
Padeliadou S., Chideridou A., (2013). *Being a Parent and not a Teacher: the Case of Specific Learning Disabilities*, European Network about Parents in Education 2013, Vol. 7, No. 2, 91-99 ISSN: 1973 – 3518.
Paynter C.A. , Reder L.M. , Kieffaber P.D., (2009) *Knowing we know before we know: ERP correlates of initial feeling-of-knowing*, Neuropsychologia 47, pg. 796–803.
Pombo O., Torres J.M., Symons J., Rahman S., (2012). *Special Sciences and the Unity of Science*, e-ISBN 978-94-007-2030-5, DOI 10.1007/978-94-007-2030-5, Springer.
Quay J., Seaman J., (2013). *John Dewey and Education Outdoors - Making Sense of the 'Educational Situation' through more than a Century of Progressive Reforms*, ISBN: 978-94-6209-215-0, Sense Publishers.
Paynter C.A., Reder L.M., Kieffaber P.D., (2008). *Knowing we know b efore we know: ERP correlates of initial feeling-of-knowing*, Neuropsychologia 47 (20 09) 796–803. Elsevier.
Pierratos Th., (2013). Design instructional activities for teaching physics through recording and evaluation, PhD Thesis, http://invenio.lib.auth.gr/record/131146.
Pierratos Th., Tsakmaki P., Polatoglou H., (2014) Use and evaluation of interactive educational technology in teaching model of electricity in Physics, C'Class at Junior High Gymnasium, 3rd Educational Panhellenic Conference at Imathia, http://hmathia14.ekped.gr/praktika14/fys_epist.html [in Greek]
Riopel M., Smyrnaiou Z., (2016). New Developments in Science and Technology Education, ISSN 2213-2236, ISBN 978-3-319-22933-1, DOI 10.1007/978-3-319-22933-1. Springer
Riviou K., Nerantzis N., (2015). *A Network of Peers and Practices for Addressing Learner Variability: UDLnet – The Case of Science Teaching*, Proceedings of the European Distance and E-Learning Network 2015 Open Classroom Conference, Athens, 18-21 Sept.2015, ISBN 978-615-5511-06-6, pg. 318-331, https://issuu.com/edensecretariat/docs/occ_2015_athens_proceedings_web.
Rodrıguez-Triana M. J., Vozniuk A., Gillet D., (2016). *Using Learning Analytics at School: a Go-Lab Study*, REACT Group, Ecole Polytechnique Fed´ erale de Lausanne, Lausanne, Switzerland, http://repositorio.

grial.eu/bitstream/grial/621/1/2016_LASI_Using_Learning_Analytics_at_School_a_Go_Lab_Study.pdf (retrieved 15 Aug. 2016).
Rose D.H., Hasselbring T.S., Stahl S., Zabala J., (2005). *Assistive Technology and Universal Design for Learning: Two Sides of the Same Coin Two Roles for Technology:*
Assistive Technology and Universal Design for Learning, Handbook of Special Education Technology Research and Practice / 26, pg. 507-518. (from www.researchgate.net , see here https://goo.gl/Qff311).
Rose, D.H., Meyer, A., Strangman N., Rappolt G., (2002*). Teaching every student in the digital age: Universal Design for Learning*. Association for Supervision and Curriculum Development (ASCD). See here http://www.ascd.org/publications/books/101042.aspx.
Smyrnaiou Z., Sotiriou M., Georgakopoulou E., Papadopoulou O., (2016).Connecting Embodied Learning in educational practice to the realisation of science educational scenarios through performing arts, Conference Paper · April 2016, https://www.researchgate.net/publication/301645918_Connecting_Embodied_Learning_in_educational_practice_to_the_realisation_of_science_educational_scenarios_through_per orming_arts, (retrieved 18 Aug. 2016)
Staver, J.R. (2007). *Teaching science*, Educational Practices Series–17. www.ibe.unesco.org, (http://www.ibe.unesco.org/fileadmin/user_upload/archive/publications/EducationalPracti cesSeriesPdf/Practice_17.pdf).
Tiberghien A., Baker M., Brna P., (1996). *Modelling students' construction of energy models in physics*. http://ses.telecomparistech.fr/baker/publications/ArticlesBakerPDF/1996/1996EtAl-d.pdf, (retrieved 29 July 2015)
United Nations (UN), (2007). UN General Assembly, *Convention on the Rights of Persons with Disabilities: resolution, adopted by the General Assembly*, 24 Jan. 2007, A/RES/61/106, available at: http://www.refworld.org/docid/45f973632 or htmlhttp://www.un.org/disabilities/documents/convention/convoptprot-e.pdf
United Nations (UN) (2014). *Report of the Special Rapporteur in the field of cultural rights – Copyright policy and the right to science and culture.* Farida Shaheed General Assembly, A/HRC/28/57, 24 December 2014.
United Nations Educational, Scientific and Cultural Organization (UNESCO), (1994). The Salamanca Statement and Framework for Action on Special Needs Education Adopted by the World Conference on Special Needs Education: Access and Quality Salamanca, Spain, 7-10 June 1994, http://www.unesco.org/education/pdf/SALAMA_E.PDF.
Vayanos D., Gourinhas P.-O., Phillipon T., (2016). *5 charts that explain Greece's economic crisis*, www.weforum.org World Economic Forum (WEF)/Regional Agenda/Europe/Finance/Global Economic Imbalances, (retrieved, 18 Aug. 2016).
Vrioni A., *Challenges in Formal and Informal Learning Environments: Empower Learning in Multimodal and Simulated Learning Settings with Student-teacher Assisted Design*, Frederick University, Cyprus, CREAT-IT 2015 "Inquiry Based Learning and Creativity In Science Education" 9-10/Oct/2015, in Athens, Greece; 2015 http://goo.gl/DR5Z1W, (visited 20-Mar-2016).
Wattchow B., Jeanes R., Alfrey L., Brown T., Cutter-MackenzieA., O'Connor J., (2014). *The Socioecological Educator - A 21st Century Renewal of Physical, Health, Environment and Outdoor Education*, ISBN 978-94-007-7167-3, Springer.
Zisimopoulos G., Kafetzopoulos *K.*, Mountzouri-Manousou *E.*, Papastamatiou N., (2002). Topics for didactic lessons of Natural Sciences, Patakis, Athens, ISBN 960-16-0602-5 [book in Greek].

Our Way to innovative Teaching and Learning (UDL)

A Report from the Lindenschule in Blankenhain Thuringia

At a school in Blankenhain, a small town in Thuringina I was greeted with a smile by the head of the school, Mrs. Fökel. I was invited to conduct an interview with the school community on the topic of innovative learning and teaching. As the interviews progressed and details pertaining to their innovative teaching practices emerged I began to whole heartedly admire and respect what this school had mastered in the past and their continued work.

Here is their story:

Discussions about necessary changes in teaching first began in early 2015. Facing nearly 30 pupils starting school and seeing the existing capacity of the staff it was evident that effective teaching and successful learning could not take place without some direct change taking place. It became evident that traditional teaching methods and approaches could no longer meet the specific needs of the pupils.

Several methods were examined very carefully paying attention to competencies of the staff and to the framework conditions. It soon became apparent that one approach was best, lessons including different age groups. This required groups consisting of learners from class 1 to class 4 to connect with well-designed group building processes. Starting with new learners from the class 1 there would be six core groups, which could be taught by the existing teachers.

Working in mixed groups required new pedagogical approaches to teaching that were flexible in nature. These new approaches focused on the individual learner and his competencies. So far, so good. Ideas were available but colleagues had to be attracted, parents had to be integrated and the education authorities had to be convinced. All this was connected with a process of rethinking, redesign and a high percentage of openness to innovation. Fear and prejudices were also seen in response to prospected innovative changes. Furthermore the teachers asked themselves: Will I be able to teach in that style? Will there be a lot of additional efforts? Debating these issues was an important task.

First of all the teachers discussed the advantages and convincing arguments in favor of the changes. Their view was that younger children could learn from the older ones, and the older children could learn a positive social behavior helping and supporting the younger children. In addition, they thought talented children could be stimulated further by learning with older children. Classes could be smaller so that a more effective and efficient learner-teacher-relationship could be realised.

Next a discussion regarding counterarguments took place. Their view was that maybe the older children may learn less because the younger pupils may slow them down? Or the younger students will not have reached a suitable level of development. Perhaps, the groups would be too mixed. This thought raised a question in relation to diversity in the classroom.

Further to the above, a connected feeling of uncertainty and the fear of not being good enough became apparent amongst the teaching community. What do we do next? A lot of energy was invested in working with teachers, parents and organisational structures. The advantages and disadvantages were discussed objectively. It was a difficult task to convince all school stakeholders to commit to the processes of innovation. However, with every discussion the contours of the concrete processes were sharpened. As a result, the staff of the school voted and agreed to follow the new pedagogical approach. The parents developed a new awareness for the learning perspective of their children. Permission was granted by educational authorities to embed the processes of innovative teaching and learning in the school practices.

The new school year started and thus the next steps began. Building the core groups was the first

challenging task and all teachers participated actively. Consideration had to be given in the composition of each group in relation to the following; place of residence, behaviour, appropriate development level, weaknesses, close friendships and gender.
In an effort to make the choice for the groups emotionally and socially acceptable to the children the school took inspiration from the 'sorting' selection processes in the movie and book 'Harry Potter'. On the first day of school a relevant excerpt from the Harry Potter movie was presented, and a purpose-built Lindenschule hat assumed the task of selection for the core groups. This procedure was received excellently by the children. It was the responsibility of the children to choose an appropriate name for each core group. The names picked derived from the animal life around a lime tree inspired from the name of the school – Linden School. Examples of names utilised are as follows squirrel, owl, falcon, hedgehog and fox, this list is not exhaustive.
This story so far has focused on the organisational side of the process, the next part of the story will examine the pedagogical elements. In the beginning, weekly schedules were developed for all students. All pupils kept a learning diary. Each child was set the same goals that had the same requirements corresponding to the class level. It became apparent almost immediately that this strategy did not work as expected. Some teachers began to identify that individual weekly schedules would be more beneficial to the learners. This resulted in the concept being revised and each child receiving their own learning goals that were derived from the national educational goals. Each pupil took note of their individual goals in their own learning diary. For children that were inexperienced and unfamiliar with writing pictograms were provided.
The figure 1 below shows a weekly schedule for first grader.

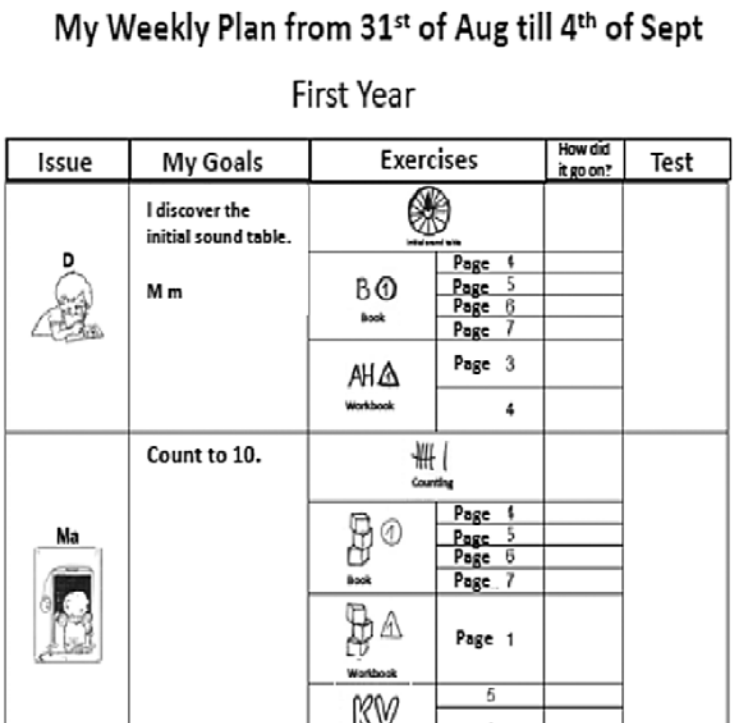


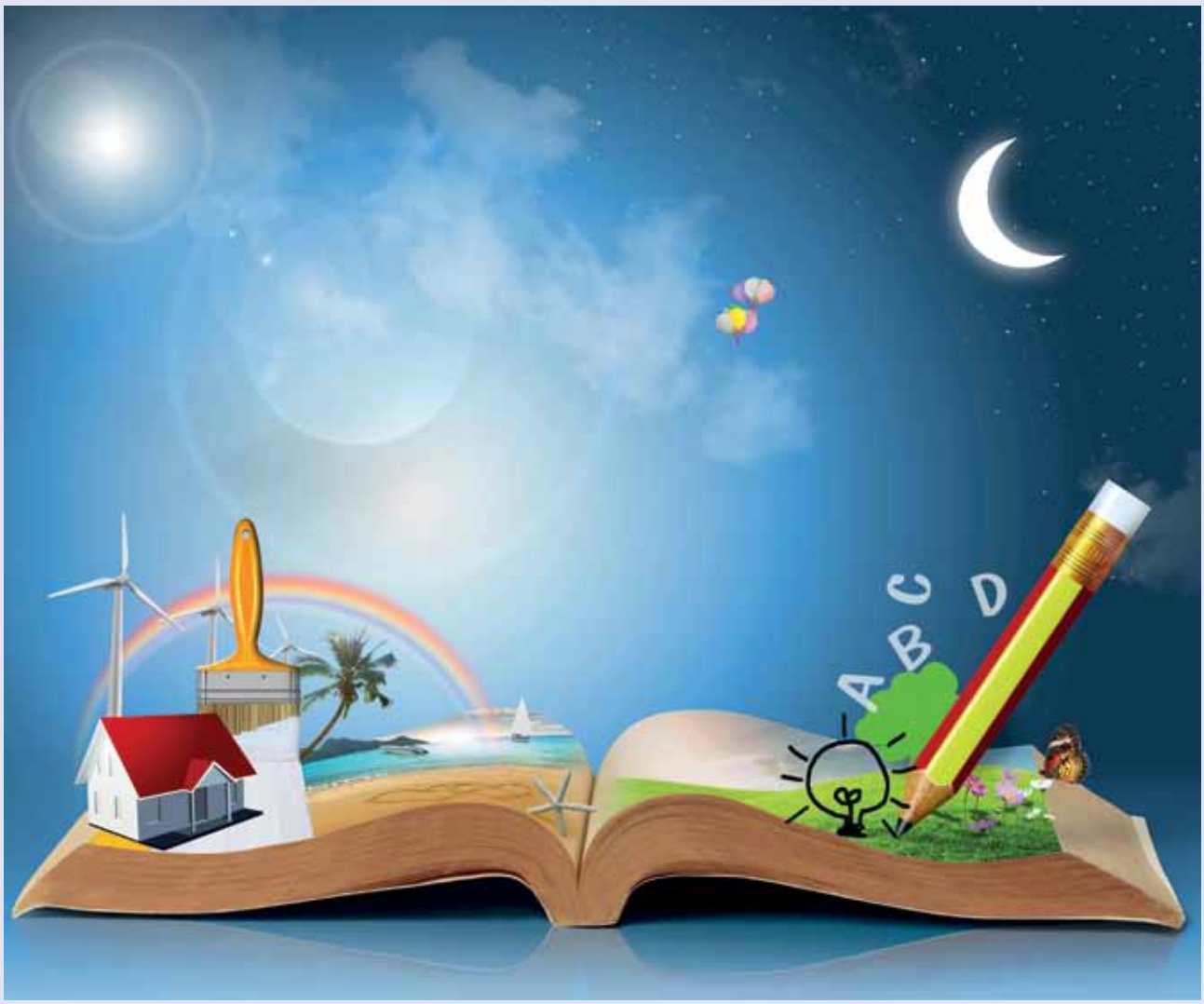
Fig. 1 Weekly schedule of a first grader

As shown on the schedule above goals and exercises were identified. The exercises illustrate the 'how' to meet the learning goals. In order to ensure goals the teacher provides different ways to achieve the goals. The pupil had the opportunity to choose an exercise that corresponded to their

learning skills. Different materials, tools and equipment were made available.
To learn and have fun, learning through play gets literal meaning. The group rooms are adapted in order to maximise potential using various materials, tools and equipment. A desk was supplied for subgroups to work with and to listen to different issues. Learning outcomes are presented in a suitable way. Various forms of assessment of course, act as a control.
Personally, I liked the example of learning centred on the theme of weight. The youngest learned about weight, they can touch them and recognise different sizes and what weight indication is for (e.g. when shopping). The older children performed computational tasks with weights and their calculation and conversion. For those that cannot master the tasks designed for fourth class, there is the option to repeat and complete the third class level so they have the opportunity to complete in full and complete more complicated ones later on.
This process involves pupils understanding their knowledge and abilities and equips nearly all children for the transition from Primary School to Secondary school.

What did the external observer find striking?
In the learning diary you read 'My goals' which exemplifies that the children are aware of their own individualised goals. By promoting creativity in the classroom and enabling students to make their own decisions regarding their education in order to achieve required learning outcomes denotes positive steps were taken that enabled the UDL approach to be embedded in the school and as a result increased student motivation.

What about the teachers' motivation?
It is important to recognise that such a transformative process does not happen overnight. The leading role of the school management is immensely important. All stakeholders must be completely behind this new concept and open to useful and reasonable adaptations and optimisations. The school management has to lead and develop visions and recognise it is a learning process for all stakeholders. It is imperative in order for this process to succeed, that all stakeholders and participants recognise or start to recognise the potential of this school.
For a visitor like me entering this school I feel like learning is fun here, that teachers teach with dedication and hard work. I see that the school management takes pride in their leadership role for this process and the pathway they have created leads to success and satisfaction for all including pupils, teachers, parents and last but not least the educational authorities too.


A B C D

UDL, where to from here

Differential access and learning

The last two decades have produced ample evidence of the extent to which ICT permeates social structures, economy and generation of knowledge itself. Social change is shaping our understanding of the role and potential of ICT – which can affect an emerging emancipatory dialectic. Historically, the teacher played a major part in this framework, given that these were the people who taught those that did not know. This 'banking conception' of education was one in which the student was an empty container that had to be filled with content, opposed to a candle to be lit (Freire, 1970). Traditional economic systems and market driven learning policies have undergone a fundamental challenge in terms of relevance and ability to meet the needs of individuals and communities. The current crisis puts a new focus on innovation – this has a direct impact on learning for those working in inclusive education, in particular disability. One of the central questions in international contexts is how to work with the needs of specific communities to create a new matrix of opportunities for inclusion. This affects learning specialists and educators in terms of professional training, best practice and standards in community diversity. Social inclusion and educational provision can provide a dynamic synergy of perspectives and possibilities.

Universal Design for Learning

The roots of UDL (*Universal Design for Learning*) are in the early civil rights legislation that emphasized rights of all students to a free, appropriate public education in the least restrictive environment. The UDL framework was conceived in the United States by those who later established the *Center for Applied Special Technologies* (CAST) in the late 1980s using three conceptual shifts: Advancements in architectural design; Developments in education technology; Discoveries from brain research and neuropsychology. CAST defines *UDL* as "a set of principles for curriculum development that gives all individuals equal opportunities to learn". The existence of advanced technologies created a powerful synergy of creativity and innovation that began to question traditional curriculum design itself as being potentially discriminatory. UDL provides a blueprint for creating instructional goals, methods, materials, and assessments that work for everyone - not a single, one-size-fits-all solution but flexible approaches that can be customized for individual needs. One key idea of UDL is that new materials and technologies should be designed *from the beginning* to be flexible enough to accommodate the unique learning styles of a wide range of individuals. Examples of UDL include: accessible web pages; captioned and/or narrated videos; word prediction; speaking spell checkers; talking dialogue boxes; voice recognition; picture menus. In UDL diversity originates in disabilities – sensory (visual and auditory), physical, neurological, developmental/intellectual and psychiatric. But diversity also includes those other dimensions: gender, ethnic origin, religious belief, migrant status, sexual orientation. UDL aims to create barrier-free environments that enable today's teachers to apply universal design concepts in ways that support the needs of the widest range of learners. UDL considers ways of developing course content in a manner that is proactively accessible to as wide of an audience as possible.

In Europe the UDL Network (*UDLnet*) aimed to collect and create best 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.

The implementation of a UDL framework has the potential to open doors in education to all students, especially those not effectively served by current systems and structures. This embeds inclusion as both a method and valued outcome, a critical resource in times of significant structural transformation.