What does Multiple Intelligences theory and practice have to offer universal design for learning?

Background paper to complement plenary session on Multiple Intelligences and Universal Design for Learning, Tuesday 12th March, 1 pm.

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This paper looks at Multiple Intelligences theory as a valuable informant to pedagogical reform in the classroom and highlights its benefits in helping to create different entry points to learning for all students. It outlines, in particular, its use in creating a more inclusive classroom for students with disabilities by encouraging a learning environment that adheres to the principles of universal design for learning. When the tools and entry points of Multiple Intelligences (MI) theory are implemented via the pedagogical framework of Teaching for Understanding (TfU), a learning environment conducive to Universal Design for Learning (UDL) is created.

What is Universal Design for Learning?

The seven principles of Universal Design were originally drawn up by a group of architects, environmental engineers and product designers to promote access to buildings, to the environment, and to everyday products and technology, by the widest number of people at a reasonable cost. The principles would promote a design mentality to address all needs from the design stage, avoiding ‘retrofitting’. Such principles can be used to evaluate existing structures and products, to review the design stage and educate both designer and user. Many third level institutions have looked to the seven principles of universal design in an effort to reach out to the growing diversity of student learning in and beyond the classroom. Changing demographics, developments in technology, social attitudes, new equality and disability legislation, as well as up to date pedagogical perspectives, are creating pressures that insist that
diversity be addressed in the classroom. The principles of universal design are viewed by many as a key solution to addressing such challenges.

Teaching Support Services at the University of Guelph began a study in 2002 to establish how teaching and learning in third level could benefit from Universal Instructional Design (UID). The team then began work with faculty to help bring about changes in curriculum to help establish universal design in the classroom (Yuval et al., 2004; Zeff, 2007). Around the same time, a team of faculty at the University of Connecticut was also working on the application of universal design to higher education (McGuire, Scott and Shaw, 2003) and have attempted to take a theoretical approach in the application of universal design to instruction in the classroom, coining the term universal design for instruction (UDI). This involved the implementation of instructional methods that created an inclusive learning environment for all students, including students with disabilities. Sheryl Burgsthaler (2013) and her team at the Adaptive Technology Lab of the University of Washington have also done much work on the role of technology in the classroom and have provided a range of on-line resources to inform faculty about how to address the needs of students with disabilities from a universal design perspective.

This paper will focus more, however, on the work of Anne Meyer and David Rose of the Centre for Applied Special Technology (CAST) at Wakefield. CAST is a non-profit research and development organisation dedicated to the promotion of inclusive education through the framework of universal design for learning. CAST view the principles of UDL as different to the principles of other domains of universal design and do not work from the original seven principles applied to the environment, architecture and product design. Based upon detailed research, three basic principles of UDL have instead been drawn up by CAST. These three principles reflect a strong focus on learning and are required to address the dynamic processes of teaching and learning and not the fixed structures of buildings. (Rose et al., 2006, 13).

**The Three Principles of Universal Design for Learning.**
The first principle is *multiple means of representation*. There is no one way of presenting knowledge that will be suitable for all students. Teaching a student with a
print disability, such as visual impairment or dyslexia, is an obvious example; but all students have individual ways in which they perceive and comprehend knowledge and therefore have individual preferences in the ways in which they like knowledge to be presented. Multiple means of representation is, therefore, key to ensuring that all students can recognise the knowledge being presented to them. This principle has a large impact on teaching methods and materials and emphasises the forms in which knowledge is presented to the learner. Accessing information is not, however, enough. The essence of learning is in how the learner realises how to use knowledge and how to make knowledge work. Bringing the learner to this place is the central challenge of teaching and learning.

The second principle is *multiple means of expression*. Students like to express knowledge in a range of different ways. Some students express knowledge much more easily and coherently through one medium rather than through another. It is also important for a teacher to realise that different students work better when using one mentoring style over another. Some will prefer regular feedback on their work, while others prefer group review sessions. Others will require more background reading on a topic, while others may wish additional reading material. A variety of scaffolding and support strategies is therefore required to encourage students to express themselves in a way that brings their individual learning forward.

The third principle is *multiple means of engagement*. Students differ greatly in the ways in which they are motivated to learn. Teachers are free to draw upon a range of teaching methods to encourage a student to engage with the knowledge being presented. It is in personalising knowledge and in being able to relate knowledge to one’s own place and experience in time that one will develop an appetite for knowledge. A teacher can encourage this in a range of different ways. Some students will like spontaneity in a teaching session, while some may feel uncomfortable with it. Other students like a social aspect to learning and react very positively to an interpersonal approach. The ways in which learning is rewarded can also impact on how well a student will engage with the learning (Rose *et al.*, 2006, 14-15).
The neuroscience behind the principles
The three principles are based upon the evidence of neuroscience and relate to the brain’s use of three separate areas during the learning process (Rose et al., 2006, 11). These three areas of the brain are important to memory, language processing, problem solving and thinking in general. The first area is the back part of the brain and this is used to recognise patterns or events in the world around us. It draws upon information provided through the senses, such as visual, tactile, auditory, etc. It is in this part of the brain, for example, that we recognise the words and sentences in a book. If damage or underdevelopment has taken place in the posterior cortex an individual will display one or more recognition difficulties. Examples of such challenges are difficulty with letters, such as dyslexia; or difficulty with numbers, such as dyscalculia. Imaging on the brains of people with recognition difficulties, such as these and others, have shown atypical patterns of activity in the posterior cortex (Shaywitz, 2005; Rose et al., 15).

The second principle is based upon strategic networks in the brain, which are located in the anterior part of the brain otherwise known as the frontal lobes (16). This area of the brain is where an individual plans, conducts and monitors their actions. Because the anterior section of the brain is crucial to all our plans and actions, it is important in actively reading, writing and planning written exercises. This type of brain activity is highly patterned and works in concert with the recognition patterns of the posterior cortex. If the ability to generate patterns is affected in this frontal area of the brain a person’s ability to plan and complete specific actions becomes compromised. Difficulties in this area can interfere with a person’s ability to actively study a piece of text and may also interfere with the ability to organize, plan and write up an assignment. (Rose et al., 2006,16; Fuster, 2002; Goldberg, 2002).

The third principle of UDL is based upon the affective networks operating at the core or extended limbic system of the brain. These networks do not generate patterns, but are responsible for emotion and affect and determine what patterns we perceive which matter to us. They help us decide what actions we wish to follow. They do not help us recognise an object or piece of text, but they do help us decide whether an object or piece of text is important to our needs. The affective networks are central to
learning and determine why one item or piece of information is important to one person, while another is important to someone else (Damasio, 1994; Lane and Nadel, 2000). This can be easily demonstrated in the many different ways in which each individual looks at a piece of art, such as a picture or a sculpture. The affective networks are important in the selection and prioritizing of data and play an important role in the learning process. Each individual has their own personal history and many do not share the same social and cultural background. These facts can have a great impact on affective networks working in the brain (Rose et al., 2006; Chita-Tegmark et al., 2011).

All three networks play an essential part in learning. The important point in identifying this process is that it is a constant reminder of what needs to be done if accessible learning is going to take place. It is not just enough to make classrooms and text books accessible, effective learning environments need to address three main issues. They need to provide information and informational supports that are accessible to all students, provide ways of acting on information that are accessible to all students and provide ways of engaging and motivating learning that are accessible to all students. The UDL principles reflect those 3 aspects in the design of learning environments (Rose et al., 2006, 17).

The principles of UDL impact on the design of course goals and objectives and on how the teacher works to bring these about. A broader understanding of goals is required to inform curriculum design and variety in teaching materials, teaching methods and assessment methods. It is not just enough that students acquire information, but they will also need to express what they know. Students need to be seen to perform with their newly acquired knowledge, for it is in the expression and application of knowledge that it begins to become useful. It is, therefore, important that goals and objectives have an expressive component, since it is in such expression that knowledge becomes useful for application in the future. The second principle of UDL, therefore, is a reminder to us that there must be multiple means of expressing knowledge and that there must be multiple means for learning the skills required to support that expression. The third principle of UDL is equally as important to course goals and objectives. No student will use or apply knowledge that they are not
interested in, or for which they have no value. An important goal of the course must be to empower students to want to learn and to enable them to develop and make use of this knowledge when they leave the course. The teacher needs to constantly evaluate engagement and work to improve motivation within the class. This can be assisted by teacher observation and class feedback (Rose *et al.*, 2006, 18).

The importance of a curriculum based upon variety and flexibility cannot be underestimated. If the curriculum provides one means of representation, expression and engagement many students may be prevented from successfully completing the learning outcomes of the course. The achieving of a learning outcome can be made difficult for a student not because of the learning goal required by the course, but simply due to the limited means of expressing the skill provided to the student. You can make almost any goal inaccessible by unnecessarily limiting the means for reaching it (Hitchcock *et al.*, 2002, 4). Students with disabilities, in particular, can find a learning outcome insurmountable simply because the teacher has been unable to separate the goal from the means of achieving it. Similar to Howard Gardner’s Multiple Intelligences theory, the principles of UDL reject the concept of one general intelligence, as such principles are based upon a neuroscience that proves that each brain learns differently.

**What is Multiple Intelligences theory?**

Howard Gardner developed multiple intelligences theory in a move which both challenged and rejected the accepted assumption that intelligence consisted of a single general intelligence which could be measured in an IQ test. The theory also challenged the assumption that a person was born with a certain level of intelligence which remained static throughout their lives (Gardner, 1983; Gardner 1999a; Gardner 1999b; McCarthy, 2011, 103). At a time when Howard Gardner was working with brain damaged adults and gifted children, he became acutely aware that people have a wide range of capacities and that a person’s ability in one area does not ensure an ability in other areas. Some students may be very capable in one area of study, such as music, and may have difficulties in another area, such as technical drawing. Gardner, therefore, perceived the brain not as an instrument having one general ability, but as
having a whole range of individual capacities working in unison and interacting together in a non predictable way (Gardner, 2009, 3-5; McCarthy, 2011, 106-7).

In defining intelligence Gardner moved away from the assumption of a general intelligence and instead asked what are the mental abilities that support the wide range of adult roles found over time and across cultures? This definition looked at the culture of a people and the everyday skills and demands from the society that created this culture, and defined intelligence in these terms. This looked at the intelligence of everyday life and, unlike conventional opinions on intelligence, did not look at problem solving skills alone, but also the skills required to build and create. Gardner's final definition of intelligence is as follows: “The bio-psychological potential to process information that can be activated in a cultural setting to solve a problem or fashion a product that is valued in one or more community or cultural settings” (Gardner, 1999b, 33-34; Gardner, 2006; McCarthy, 2011, 108-9).

In setting criteria to identify the intelligences, Gardner turned to several disciplines including psychology, neurology, biology, sociology, anthropology and the arts and humanities. Before attempting to identify the intelligences, Gardner was stringent to set clear empirical criteria by drawing on these disciplines, the details of which will not be discussed here. The eight intelligences finally identified by Gardner are as follows: linguistic, logical/mathematical, visual/spatial, bodily/kinaesthetic, musical, interpersonal, intrapersonal and naturalist. A ninth intelligence, described as existential intelligence, is currently being considered as being a separate intelligence also (Gardner, 2009, 5-6; McCarthy, 2011, 110-117).

MI and teaching

When Gardner published his *Frames of Mind* (Gardner, 1983) and first shared his theory with the world it began to attract great attention from educationalists. Though published as a psychological theory, its impact upon education was to be far greater than its impact upon psychology (Gardner, 2009, 6-7). The MI *meme* – a meme is a unit of meaning created at a certain place and time that has spread widely- began to work its way into many educational cultures and has impacted educational policy in a variety of
ways, in a variety of settings (Kornhaber, 2009). Different educational cultures and settings approached the MI *meme* according to their background and readiness to accept new ways of thinking (Chen, 2009, 386-96). However, Gardner did feel it was important to dispel common misunderstandings taking place in education with regard to MI theory by pointing out that an intelligence is not a learning style. Styles are the ways in which an individual student may approach different tasks, whereas an intelligence is a computational capacity whose strength varies across individuals; it refers to the way we process information, rather than how we take it in, which is a matter of style (Viens and Kallenbach, 2004, 19). Various intelligences can be employed in a number of disciplines and strength in a particular intelligence does not determine what discipline it will be used in. Neither does a level of strength in an intelligence remain static, but can be developed depending on the person and the character of the learning environment. A person should never be described in terms of a particular intelligence. We all share the whole spectrum of intelligences and intellectual strengths change over time, depending on experience and practice (Gardner, 2009, 7-8).

After twenty years of studying the educational impact of MI theory upon education, Howard Gardner felt that two impacts were of the greatest importance (Gardner, 2009, 9). Firstly, teachers should take differences in students seriously and craft their teaching to ensure optimal learning opportunity for each student. It is also worth noting that Gardner also points out that technology can play an important role in making this challenge possible. Secondly, any skill or concept of significance should be thought in a variety of ways. Such teaching methods should address different intelligences or combinations of intelligences. This has the positive impact of ensuring that a variety of approaches will reach a variety of students and also provides for a deeper more rounded understanding of a topic. Also, if a student can think of a topic in several ways s/he demonstrates a true understanding of that topic. As witnessed above, these concepts are shared with the principles of UDL, which acknowledge the individuality of each learner and the need for variety in materials, teaching methods and assessment methods. This ensures multiple opportunities for the representation, expression and assessment of learning and understanding.
MI and students with disabilities

Kornhaber (2009, 375) has claimed that as an instrument of policy, when soundly implemented, MI acts as an agent of cognitive equity enabling diverse groups to use their minds well. It ensures the development and expression of ideas by groups that otherwise may not be heard. In educating children with disabilities, teachers who have adopted an MI approach to teaching have moved away from a deficit approach to their students and become more positive in recognising a wider range of learning potentials. This has been confirmed in evidence relating to teaching children with disabilities in Australian schools (Vialle, 2009). Teachers who have adopted an MI approach have claimed that they examine their students more closely and look for the student’s strengths rather than responding automatically to a student’s deficits.

Multiple Intelligences theory is a descriptive, cognitive theory of intelligence, and, as such, does not provide a pedagogical framework, but is rather a set of tools or a mindset that a teacher can draw upon. These tools provide several entry points to learning for the teacher in which a curriculum and its delivery can better reach a wider range of students in the classroom. The entry points suggested by Howard Gardner are: narrational, quantitative/numerical, logical, existential, aesthetic, experiential/ hands on, and social. Different students learn in different ways and a teacher is required to adopt a variety of entry points to learning if the widest range of students is to be reached. A pedagogical framework is, however, required to provide a structure in which to employ the various entry points to learning. Teaching for Understanding (TfU) provides a pedagogical framework with both the structure and flexibility to employ the entry points to learning in a manner in which a wide range of learning preferences can be addressed.

What is Teaching for Understanding (TfU)?

A performance view of understanding

*Project Zero*, at the Harvard Graduate School of Education, has set up many research projects to help inform understanding and enhance learning at all levels of the education system. These projects include a strand of research called Teaching for Understanding.
The TfU framework was developed from research at Harvard and took place between 1988 and 1995, in collaboration with a group of researchers and several teachers and their settings outside the university. Understanding a topic, in this context, is defined in terms of being able to perform flexibly with the topic and being able to explain, relate and apply the knowledge concerned in a new situation. (Perkins, 1998; McCarthy, 2011, 52).

Perkins highlighted the lack of real understanding taking place in teaching and learning in both the Humanities and the Sciences (Perkins, 1993, 30). He promoted a performance view of understanding which reflects the general spirit of a constructivist approach to learning, which posits that knowledge is a construct built by the student and not a product given to the student. By defining the idea of performance in constructivist terms, Perkins claimed that to understand knowledge fully cannot mean that the learner understands the knowledge in a representational way, implying that s/he has an image or mental model of the knowledge only, but that the learner must also be able to perform or play with the knowledge freely and easily. Perkins describes this active learning process as an understanding performance or a performance of understanding (Perkins, 32, 33). Perkins claims that most classroom activities are too routine to be understanding performances and that though these activities have their own role to play, they are not performances of understanding. They do not enhance understanding in the student and take the learner beyond what he already knows.

The mainstay of learning must, therefore, be actively engaging with the topic, in a way that involves reflective thought and feedback. It is important to be able to think in different ways with the knowledge and be able to apply the knowledge to different situations. Perkins highlights that this does not happen on its own, but takes careful planning and thought. Engagement with the knowledge must involve guided performances with regular feedback to ensure real understanding can take place. It also implies that the teacher must scaffold and facilitate the learning, using multiple ways of representing the knowledge, through a variety of entry points, analogies and metaphors, providing the student with multiple ways of expressing the knowledge, through a variety of assessment processes.
The elements of TfU

How does a college teacher ensure that teaching for understanding is taking place in his/her classroom? Research at Harvard has demonstrated that it is important that a TfU approach contains four key elements: generative topics, understanding goals, performances of understanding and continuous assessment (Wiske, 1998; McCarthy, 2011, 76-89).

Firstly, the teacher must decide what topics are worth understanding. Generative Topics are topics which generate knowledge about the course or module. These consist of concepts and themes that help students acquire a significant understanding of a selected topic. It is important that generative topics be central to the discipline, interesting to students, accessible to students via a variety of entry points and suitable for multiple connections with other topics on the course.

Secondly, the learning must take place over an extended period of time in which it is possible to set specific goals. It is good that these goals be centered around carefully drawn questions, which can help retain focus if repeated occasionally throughout the learning period. Goals need also be explained or presented to students in an unambiguous fashion and in a way in which the variety of entry points to learning is considered.

Thirdly, it is key that the teacher employs teaching methods that promote a performance view of understanding in the classroom. This ensures that students are given opportunities to perform with and apply their newly acquired knowledge. In turn, this provides opportunities to allow students to demonstrate and develop their understanding of the subject. By considering a variety of entry points to the learning, the actions of doing and thinking can ensure a solid grounding and clear understanding of the knowledge concerned. This will require multiple forms of expressing knowledge as each student will shine in his/her learning when given the opportunity to do so.

The fourth element demands that assessment take place throughout the learning period and not just at the end of the module or course. Formative as well as summative assessment is essential to inform the teacher of a student’s progress and also to
provide students with an opportunity to reflect upon their learning. Formative assessment is where performances of understanding can be measured and provides the opportunity for intervention should it be necessary. Drawing on Howard Gardner’s entry points to learning creates a variety of opportunities in which a student’s expression of knowledge can be nurtured and assessed. Variety and flexibility in assessment practice helps address a wide spectrum of learners and gathers valuable feedback data to help address any issues learners may have. Also, peer and self-assessment can be used, once clear criteria of assessment are laid down, and this helps take undue pressure off the teacher. In summary, Multiple Intelligences theory becomes part of the learning environment when a variety of entry points are applied to mediate what is to be understood.

**Drawing it all together**

Teaching for Understanding facilitates a flexible but effective pedagogical framework through which the tools or entry points of learning can be employed, and encourages a wide spectrum of performances of learning. The variety of entry points to learning and the flexibility of the structure also help to ensure that the principles of Universal Design for Learning are adhered to. Multiple forms of representation are created through the multiple entry points to the generative topics of the course and by the variety of ways in which these topics are presented to the class. Multiple forms of expression are employed in the variety of performances both during the learning and assessment period. It is during a student’s performing of learning goals that they come to see their own development and grow in confidence. Through performance and expression, formative and summative assessment take place and a student receives the feedback required to grow in learning. Opportunities for multiple forms of engagement are presented by stimulating students via learning goals that facilitate multiple entry points to learning. By acknowledging the individuality of each student through their academic, personal, social and cultural strengths, the variety and flexibility made possible through MI and TFU can accommodate the principles of UDL.
Bibliography


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