

## **Applying Universal Design for Learning to Instructional Lesson Planning**

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## **Abstract**

Universal Design for Learning is a framework for developing inclusive instructional lesson plans. The effects of introducing Universal Design for Learning Principles and Guidelines in a university teacher education program with pre-service and practicing teachers were explored in a mixed methods approach. The results indicate that the study participants made significant changes to their lesson plans to optimally include all students. The participants expressed profound changes in understanding inclusion and instructional roles and responsibilities.

*Keywords:* Universal Design for Learning, inclusion, teacher education, instructional lesson planning

## Introduction

Walk into any Canadian elementary, middle, or secondary level classroom today and you will no doubt encounter a rich mosaic of students who exhibit a diverse range of capabilities, learning profiles, and interests. In Canadian schools the majority of students with special needs are educated in inclusive classrooms in their neighborhood schools where the general education classroom teacher takes responsibility for the learning of all students. Inclusion is the recommended teaching practice in Canadian schools and is supported by provincial educational policy. In British Columbia, inclusion describes the principle that ‘all students are entitled to equitable access to learning, achievement and the pursuit of excellence in all aspects of their educational programs’ (British Columbia Ministry of Education, 2011, p. 2). While inclusion in the province is ‘not necessarily synonymous with full integration in regular classrooms’ (British Columbia Ministry of Education, 2011, p. 2), legislation emphasizes educating students with special needs in neighborhood schools with same age and grade peers to the fullest extent possible.

The Special Education Services: A Manual of Policies, Procedures and Guidelines (British Columbia Ministry of Education, 2011) outlines policies, procedures, and guidelines for the delivery of special education services in British Columbia schools. Key student planning policies that are intended to facilitate inclusion of students who have special needs are included. Use of both instructional modifications and adaptations are clearly defined.

Modifications are instructional and assessment-related decisions made to accommodate a student’s educational needs that consist of individualized learning goals and outcomes which are different than learning outcomes of a course or subject. Modifications should be considered for those students whose special needs are such that they are unable to access the curriculum (i.e., students with limited awareness of their surroundings, students with fragile mental/physical health, students medically and cognitively/multiply challenged.) Using the strategy of modifications for students not identified as special needs should be a rare practice (British Columbia Ministry of Education, 2011, p. VI).

Adaptations are teaching and assessment strategies especially designed to accommodate a student’s needs so he or she can achieve the learning outcomes of the subject or course and to demonstrate mastery of concepts. Essentially, adaptations are “best practice” in teaching. A student working on learning outcomes may be supported through use of adaptations. Adaptations do not represent unfair advantages to students. In fact, the opposite could be true. If appropriate adaptations are not used, students could be unfairly penalized for having learning differences, creating serious negative impacts to their achievement and self-concept (British Columbia Ministry of Education, 2011, p. V).

Modifications and adaptations are mandated for inclusive education in British Columbia. Yet, the two policies appear to be fundamentally divergent. Modifications emphasize special education practices that are typically beyond the regular grade level curriculum of the general classroom environment. Limiting the strategy to students with special needs, modifications

create a dichotomy within the inclusive classroom to accommodate for students with special needs, but not for others. On the other hand, adaptations emphasize practices within the regular classroom so that *all* students may achieve. Accommodating for diverse learning needs, adaptations encourage and unify a common community of classroom learners.

Meo (2008) argues that the traditional categorization of students as either ‘regular’ or ‘special’ is erroneous and oversimplifies and inaccurately represents the diversity present in today’s classrooms. Indeed, a global shift in understanding disability is occurring, as evident in the World Health Organization’s (2006) revised definition of disability:

Disability results from the interaction between persons with impairments and attitudinal and environmental barriers that hinder their full and effective participation in society on an equal basis with others (Convention on the Rights of Persons with Disabilities:

<http://www.un.org/disabilities/convention/conventionfull.shtml>)

The inclusive paradigm shift reconstructs disability away from individual pathology and into a lens of social construction. The new definition recognizes the interaction between student, learning environment, and curriculum. Inclusion “relates not just to access but to active and productive involvement” of students with special needs in general education classrooms (Bennett, 2009, p. 2). Yet, within this reconceptualization lays challenges. Even when placed in regular education classrooms, many students with special needs do not fully participate in the academic or social life of the classroom. They frequently experience a separate space and a special program; reinforced by working solely with an educational assistant (Giangreco, 2010).

### **Universal Design for Learning Framework**

Universal Design for Learning (Meyer & Rose, 2000; Rose & Meyer, 2002) holds promise for proactively planning curriculum and instruction that actively engages all students collectively. Universal Design for Learning arose from the concept of Universal Design within the field of architecture (Centre for Applied Special Technology; CAST, 1998). The term was applied to the idea of designing and creating new structures and public places in a way that was accessible to all from the beginning (Mace, 1998). Examples of Universal Design that have become commonplace and a benefit to all include curb cuts, automatic doors, and building ramps (Bernacchio & Mullen, 2007; Gargiulo & Metcalf, 2013; Pisha & Coyne, 2001). Universal Design holds that everyday items are designed to be useful to a variety of users. Other examples include word processing software, closed captioning on video displays, and symbols representing washrooms and other common facilities that provide access to the widest range of users possible.

Adopted by education, Universal Design for Learning extends to the development of curriculum and instruction. Universal Design for Learning is a “blueprint for creating flexible goals, methods, materials, and assessments that work for everyone (CAST, 1998, paragraph 2). The concept of Universal Design for Learning is based on research in the learning sciences (e.g., education, developmental psychology, cognitive neuroscience) and extends the notion of Universal Design in architecture by providing a framework that guides the design of flexible educational environments, materials, and instruction, to ensure that all students can access the curriculum (Rose, Gravel, & Domings, 2010; Rose, Meyer, & Hitchcock, 2005). As Meyer & Rose (2000) contend, educators who design their learning methods for the “divergent needs of

‘special’ populations increase usability for everyone” (p. 39). In addition to increased access and usability, embedding Universal Design for Learning into curricula and materials can be expected to improve outcomes for all learners (Pisha & Coyne, 2001).

As displayed in Figure 1, several principles and guidelines underpin the Universal Design for Learning educational framework. These principles and guidelines acknowledge that learner diversity is to be expected in the classroom and support teachers to proactively plan for this diversity at the development stage of instructional unit and lesson planning. Moving away from a one-size-fits-all curriculum and instruction model towards a diverse and inclusive model, Universal Design for Learning provides a framework for developing “best practice” instructional adaptations as defined by the British Columbia Ministry of Education (2011). With principles and guidelines that operationalize instructional planning for the benefit of *all* students, Universal Design for Learning is garnering increased attention in British Columbia school districts and some teacher education programs.

Teacher education programs are key players in preparing prospective teachers to teach in diverse classrooms. In British Columbia all pre-service teachers are required to undertake a course in special education as part of their qualification for a Bachelor of Education degree. The instructional focus of this overview course is typically on the provincial policies, procedures, and instructional approaches, strategies and materials that support students in inclusive classrooms. Universal Design for Learning may or may not be a focus of the course.

While some studies suggest experienced teachers are unable to retrofit instruction for students with special needs due to lack of training, time constraints, classroom management, and student levels (Cawley et al., 2004; Schumm & Vaughn, 1995); one study from a teacher education program suggests pre-service teachers can develop lesson plans accessible to all diverse learners when they are trained in Universal Design for Learning (Spooner, Baker, Harris, Ahlgrim-Delzell, & Browder, 2007). The participants in the Spooner et al. (2007) study included graduate and undergraduate students enrolled in education classes. Those in the intervention group received intensive one hour-long instruction in Universal Design for Learning and were provided with 20 minutes to draft a classroom lesson plan that would address the learning needs of a student with an identified special need who was presented in a case study format. Those in the control group completed the lesson plan activity without Universal Design for Learning instruction. Utilizing a scoring rubric designed by the authors, significant pre-post differences in applying Universal Design for Learning principles were found between the intervention and control groups. The Spooner et al. (2007) results highlight that a simple introduction to Universal Design can go a long way in helping teachers design lesson plans that include a range of learners from the very start. Yet, participants in the Spooner et al. (2007) study expressed that additional time was needed to develop more detailed lesson plans. The researchers suggested future studies should examine the effects of allowing more time on Universal Design for Learning lesson plan development.

### **Purpose**

No further study has examined the effects of introducing Universal Design for Learning in a teacher education program. An opportunity to do so arose from analyzing assignments completed by pre-service and practicing teachers participating in inclusive education courses instructed by the first author. The present study expands on the Spooner et al. (2007) research by providing pre service teachers with an extended opportunity to redesign instructional lesson plans according to Universal Design for Learning. Lesson plans were redesigned following a

brief introduction to Universal Design for Learning. As researchers, we wished to explore Universal Design for Learning as a framework for developing instructional adaptations that optimally support all students in inclusive education classes. The revised lesson plans and reflections were analyzed using the following research questions as a guide:

1. What were the types of changes made to previously taught lesson plans after applying Universal Design for Learning?
2. What connections did the participants make between the process of applying Universal Design for Learning to lesson planning and what they learned as a result?
- 3.

## **Method**

### **Participants**

The study took place in the Faculty of Education at a mid-size university in Western Canada. The study participants comprised two groups: pre-service teachers and practicing teachers. Pre-service teachers were sixteen undergraduate students studying to become secondary level (i.e., grades 9-12) teachers. Pre-service participants were enrolled in a 36-hour introductory course focused on assistive technology applications in diverse and inclusive classrooms. The course was one of four in a summer institute students were undertaking for credit towards their Bachelor of Education degree. All pre-service teachers had some, albeit limited, prior teaching experience in an earlier teaching practicum.

Ten practicing teachers were undertaking a four-course, online post-degree certificate program in Special Education. These participants were enrolled in the first course of the program, focused on instructional approaches, strategies, and issues relative to teaching students with special needs in inclusive classrooms. The practicing teachers had broad ranging professional experiences, teaching across grade levels from K-11 and in a variety of rural, urban and international school settings.

### **Procedure**

As part of their coursework, the participants undertook an assignment where they reviewed and revised a previously taught lesson plan through the lens of Universal Design for Learning. The assignment supported several course learning outcomes: (1) recognizing diversity in the classroom, (2) understanding barriers that are experienced by students who have learning differences and needs, and (3) addressing barriers to student participation by applying Universal Design for Learning principles to instructional planning. The participants received a brief introduction to Universal Design principles and guidelines. The assignment was carefully designed by the instructor to support students' independent discovery of how Universal Design for Learning principles might be applied to lesson planning. The participants were asked to first consider the range of students in their classroom who have different learning needs according to an instructor-prepared 'Wheel of Human Ability and Disability'. The wheel (see Figure 2) illustrates the following human dimensions that can impact learning: cognitive/intellectual, behavioral, hearing, physical/health, physical/motor, communication, vision, and emotional. The participants then reviewed a YouTube video introducing them to the Universal Design for Learning principles of multiple means of representation, engagement, and expression (<http://www.youtube.com/user/UDLCAST>). The participants were directed to explore the National Center on Universal Design for Learning

(<http://www.udlcenter.org/implementation/examples>) for additional lesson plan templates. They were directed to sample lesson plans that follow a Universal Design for Learning framework (Rose, Gravel, & Domings, 2010). The center's website provides multiple insights, considerations, and examples of how each Universal Design for Learning principle and guideline is considered and incorporated into lesson planning to ensure all students are able to access and participate in the regular curriculum.

The participants selected their own previously taught lesson plans from their curriculum areas of expertise (i.e., language arts, math, science, social studies). Referring to the Universal Design for Learning principles and guidelines, the participants critiqued their prior lesson plans and re-developed new ones to include wide ranging learning needs of all students in the classroom. A Universal Design for Learning document outlining each principle and guideline was provided (see Appendix A). Included on this document was space for participants to write notes, critique, and provide evidence for considering diverse learning needs (according to the Wheel of Ability and Disability) and each Universal Design for Learning principle and guideline. The participants were asked to provide a brief (i.e., 1-2 page) reflection on the critique process and their learning relative to the learning outcomes of the assignment. The following components were submitted in their completed assignments:

1. Original lesson
2. Revised Lesson including
  - a. Recognition of diverse student learning needs through consideration of the Wheel of Ability and Disability;
  - b. Identification of lesson plan components that were added / deleted; and
  - c. Evidence for utilizing each Universal Design for Learning Principle as applicable
3. Brief, 1-2 page reflection on the lesson plan redesign. Participants were required to:
  - a. articulate changes made in lesson plans in light of Universal Design for Learning training;
  - b. describe how they learned to apply Universal Design for Learning; and
  - c. reflect on any connections they made between the lesson plan critique process and what they learned as a result.
  - d.

### **Data Analysis**

#### **The Researchers**

Community-based researchers note advantages of conducting research as insiders within the community (Brodsky & Faryal, 2006; Dalton, Elias, & Wandersman, 2001). Both authors are career educators with extensive experience in classrooms. The first author has thirty years experience as: a special education teacher and consultant working with children and youth with significant and complex disabilities, a teacher educator, and a researcher. The second author has seven years experience as a special education teacher supporting students with autism and is currently working towards a Ph.D in Educational Psychology. Insider knowledge of the everyday classroom context and challenges faced by teachers is key to the mixed methods analysis of this Universal Design for Learning case study.

## Data Analysis Procedures

The authors conducted an initial review of the participant assignments. Overall, the participants demonstrated the ability to redesign lesson plans incorporating Universal Design for Learning principles and guidelines. From these initial observations, a systematic process incorporating quantitative and qualitative analyses was developed.

### Quantitative Analysis

Changes that were made to the lessons were identified and categorized. Elements of Universal Design for Learning in the original lessons were not examined. Rather, only those changes arising from the assignment were analyzed. A codebook was created using *Microsoft Excel* and a deductive method was used for categorizing the Universal Design for Learning changes. Universal Design for Learning revisions were systematically quantified and categorized; first into themes and then subthemes guided by the existing Universal Design for Learning principles and guidelines. The following questions guided the coding process. “Does this change represent the theme of multiple means of representation, perception, or expression?” And then, “given the deduced Universal Design for Learning theme, which corresponding Universal Design subtheme does this change best reflect? (i.e., given the theme multiple means of representation, does the change reflect increased perception, language, or comprehension)?” The data analysis codebook was analyzed comparing pre-service (n = 16) to practicing teacher (n = 10) participants. Clustered bar charts were created using *Predictive Analytics SoftWare (PASW), Version 18*.

### Qualitative Analysis

Connections made between the process of applying Universal Design for Learning and what was learned were identified and coded. The participants’ assignment reflections were analyzed. A codebook was created using *Microsoft Excel* and an inductive method was adopted for thematic analysis. Coding was based on knowledge of Universal Design for Learning as insider members of the education community. First, each participant reflection was read in its entirety. Then, connections were identified between the process of applying Universal Design and what the participants learned as a result. Connections were coded to optimally capture meaning. The coding approach was a cyclical process. Codes were identified, changed and evolved over time (Saldaña, 2009). Both authors examined a number of reflections together and thought aloud to reach agreement. “*What does this mean?*” The critical task was to best interpret what the participants were trying to convey.

## Results

### Quantitative Results

The total number of changes made to previously taught lesson plans by Universal Design for Learning themes and subthemes are displayed in Figure 3. Pre-service teachers made a noticeably greater number of changes than the practicing teachers in the Universal Design for Learning principle, multiple means of expression (under the guideline, provide options for comprehension). However, no overall trend of group differences was observed. It is important to

note that due to unequal sized groups, interpretation from comparing the total number of changes made by pre-service versus practicing teachers is limited.

These results initiated further interest in determining the total number of teachers who had made such changes. A second clustered bar chart was created using *PASW* software. Figure 4 displays the number of pre-service and practicing teachers who made changes to lesson plans according to Universal Design for Learning principles and guidelines. Most practicing teachers made changes to their lessons according to each principle and guideline. Pre-service teachers revised lessons in each principle and guideline as well. It was notable that fewer pre-service teachers made changes in the Universal Design for Learning principle, multiple means of representation (under the guideline, provide options for language, mathematical expressions, and symbols). As well, pre-service teachers made fewer revisions than practicing teachers in the Universal Design for Learning principle, multiple means of engagement (under the guideline, provide options for self-regulation).

## Qualitative Results

The teacher reflections from the assignment revealed two main themes; *learning for all* and *transformative practice*. The themes capture the impact and effect of Universal Design on participants' learning.

*Learning for all*. This theme is fundamentally student driven. It describes teachers using Universal Design for Learning to respond to the full range of student diversity in the classroom. One participant summed it up as follows:

I must say that I have learned a great deal in the last week and am now aware of how to create instructional goals, methods, materials, and assessments that work for an enormously broader group of students compared to my original planning (Pre-Service Teacher 10).

*Learning for all* is an umbrella theme describing teacher efforts to reduce student barriers, focus on strengths, and consider learner preferences/characteristics. Consider the following reflection in which the participant recognized the limitations of the curriculum itself in terms of narrowly defining students' learning outcomes:

So I began to think of ways students could create/compose a story without handwriting. My thoughts developed like this – *tell it orally and have someone scribe it (possibly, if there are enough people to scribe), have the students type it on the computer (but what if they physically could not use the keypad or don't have the typing skills?), then possibly acquire the software for speech-to-text or a mouse camera. There are so many possibilities! Didn't Jean-Dominique Bauby compose his book with a blink of an eye? I am sure he applied all of the 6 traits of writing in his novel.* I immediately made my first change to the lesson plan – 'writing' became 'composing' (Practicing Teacher 2).

*Learning for all* inspires passion for inclusion as evident in the following reflection:

I want to think of absolutely everything, every child, every possibility. Hmm, as weird as it is, tears just came to my eyes as I wrote that – I want education to be accessible and possible for every student; I want to give them as many tools as I can for their learning to come in different ways; and I want to allow them many possibilities of how to work with and show what they are learning (Pre-Service Teacher 14).

*Learning for all* encourages best practice instructional adaptations that can benefit *all* students, rather than instructional modifications that solely address students with special needs. Through the process of applying Universal Design for Learning principles and guidelines, one participant articulated that the framework provides “a base foundation that is intended for all students” (Pre-Service Teacher 9). More students spoke to the instructional enrichment gained through a Universal Design lesson plan approach:

The end result is an opportunity for students to grapple with concepts that are far more meaningful, abstract and challenging than any that were touched upon by the original lesson (Practicing Teacher 8).

Thus, we learn from teachers themselves that Universal Design extends beyond lesson planning for inclusive criteria – it creates curriculum and instruction that is far more challenging and meaningful - *learning for all*:

The most surprising thing I have learned... is that teachers who are effective at including students with special needs in their classrooms are likely to be superior teachers for all their students (Practicing Teacher 5).

*Transformative practice*. This second theme is fundamentally teacher focused. It is about teachers embracing Universal Design for Learning to improve their professional practice. One participant described new personal value in applying Universal Design in the classroom.

It was a great learning experience and I hope that this skill of applying Universal Design for Learning to my lesson will be one that will eventually become second nature to me. There seems to be an endless amount of value in addressing all needs of all students in the class (Pre-Service Teacher 15)!

Another participant reflected on the significance of adapting Universal Design for Learning into teaching practice as below:

In the beginning it can be more work for the teacher, but as it becomes a natural process, Universal Design lesson planning will be the best thing that ever happened, and you won't even remember any other way (Practicing Teacher 10).

*Transformative practice* through the adoption of Universal Design for Learning challenges prior teaching and learning assumptions. For example, one participant was open and honest in sharing her previous assessment philosophy:

[Previously] I believed that it was necessary for students to adapt to my teaching—I saw my job as providing them with an option for meeting the learning outcomes. If they couldn't do it, then I should mark them accordingly—fair and square. If someone had told me I could make the lesson “universal,” I'm not sure I would have, or even could have, believed that person. I was teaching almost unconsciously—despite the best intentions, and a huge commitment to providing my students with what they needed, more than anything else, my instruction was informed by the way I myself had been taught (Practicing Teacher 8).

*Transformative practice* through Universal Design for Learning has broad implications for teacher roles and responsibilities in the context of fostering inclusive classrooms. Consider the connection made by one participant:

I have learned that Universal Design requires constant reflection and review by educators through collaboration, student feedback and individual assessment of one's own teaching practices (Practicing Teacher 3).

As concluded by this participant, ‘Universal Design for Learning [as transformative practice] can be understood as *a way of thinking about teaching and learning* rather than a set of specific instructional strategies that, if followed correctly, would establish an inclusive classroom’ (Pre-Service Teacher 1).

## Discussion

The quantitative changes that participants made to their instructional lessons suggest that Universal Design for Learning provides teachers with a useful framework for developing adaptations for all learners. Both pre-service and practicing teachers made substantial changes in each of the Universal Design for Learning Principles and Guidelines. From Figure 4, it is interesting that when compared to practicing teachers, fewer pre-service teachers made lesson plan changes according to two critical Universal Design for Learning principles: multiple means of representation and multiple means of engagement; under the guidelines of: provide options for language, mathematical expressions, and symbols, and provide options for self regulation. Perhaps due to relative inexperience, they are less aware of the multitude of learning processes fundamental to teaching and learning success. Yet, for both pre-service and practicing teachers, the Universal Design for Learning framework supported them to develop numerous adaptations that were beneficial for *all* students in the classroom. Perception, expression, and comprehension - all critical learning processes - were operationalized to a greater extent throughout the revised lesson plans. The study reveals that when provided with an opportunity, teachers are able to proactively make adaptations in their lesson plans that support learning for all.

The qualitative themes that emerged in this study, *learning for all* and *transformative practice*, indicate that Universal Design for Learning provides teachers with a useful model for achieving inclusion. Indeed, several principles of whole schooling are revealed in this study. Universal Design for Learning proactively creates learning spaces for *all* students in the classroom - regardless of ability or disability. Universal Design for Learning facilitates instructional adaptations that bring students together as a community of common learners. Through multilevel instruction, students are challenged at their own level; not at predetermined

levels based on misconceptions of ability and disability. This study highlights Universal Design for Learning as a framework for supporting teachers to achieve successful adaptations-based inclusion where traditional categorization of learning abled and disabled students is irrelevant. Emphasizing best practices through instructional adaptations, Universal Design for Learning supports teachers to provide **inclusive learning opportunities for all**. By proactively considering a wide range of student learning preferences, needs, and interests, Universal Design for Learning limits the need for extensive modification of instructional lesson plans year after year as teachers encounter new students with diverse needs. The Universal Design for Learning framework can strengthen the capacity of teachers to meet the needs of a wider range of students in the general education classroom, **thereby** facilitating successful classroom inclusion.

### **Implications for Teacher Education Programs**

Pre-service teachers have been traditionally challenged to embrace student diversity while experiencing little to no prior immersion in diverse, inclusive classroom environments. Teacher education programs play a critical role at a time when education and disability is being re-conceptualized. This study found that Universal Design for Learning inspires beginning pre-service teachers to include all learners:

Once you begin to see how many traditional teaching practices exclude certain types of learners, it becomes simply impossible not to consider ways in which to provide multiple means of representation, action/expression, and engagement for students (Pre-Service Teacher 1).

Given the quantitative and qualitative findings of this study, both pre-service and practicing teachers adopted inclusive changes so readily following a relatively simple introduction to Universal Design. Their enthusiasm holds promise for teacher education programs that Universal Design for Learning is a vehicle for promoting effective inclusive teaching practices.

### **Future Research**

One limitation of the current study is that the redesigned lesson plans were not carried out in the classroom. Future research should explore the enactment of instructional lessons that follow a Universal Design for Learning framework. In addition, this study focused on pre-service teachers towards the end of their formal educational studies. Future research could explore the impact of introducing the Universal Design for Learning framework earlier in their teacher education program. For example, what would be the impact of infusing Universal Design into all curriculum and instruction courses (i.e., math, science, English)? Finally, longitudinal studies are required that examine whether *transformative practice* following Universal Design for Learning intervention continues over time. What are the factors that predict long-term *transformative practice*? Exploring Universal Design for Learning as an avenue for re-conceptualizing disability and inclusive practice is compelling, essential and urgent.

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## Universal Design for Learning

### Principle 1 - Use multiple means of representation:

Guideline 1, Provide options for perception.

Guideline 2, Provide options for language, mathematical expressions, and symbols.

Guideline 3, Provide options for comprehension.

### Principle 2 - Use multiple means of expression:

Guideline 4, Provide options for physical action.

Guideline 5, Provide options for expression and communication.

Guideline 6, Provide options for executive functions.

### Principle 3 - Use multiple means of engagement:

Guideline 7, Provide options for recruiting interest.

Guideline 8, Provide options for sustaining effort and persistence.

Guideline 9, Provide options for self-regulation.

Figure 1. Universal Design for Learning principles and guidelines. Source: (<http://www.udlcenter.org/implementation/examples>).

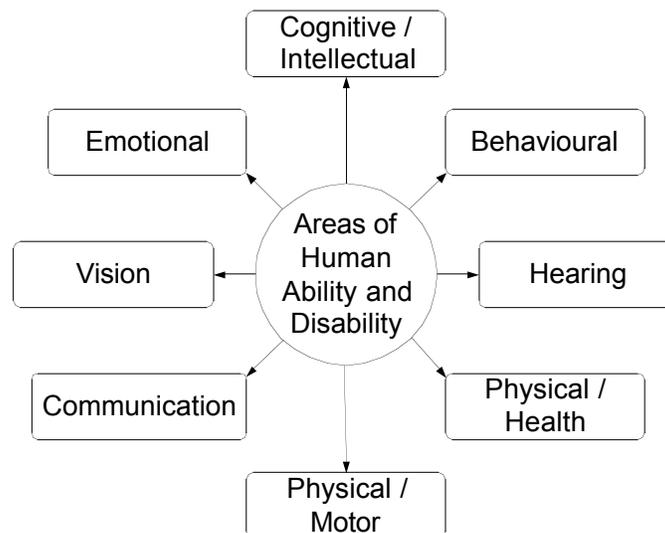




Figure 2. Wheel of human ability and disability.

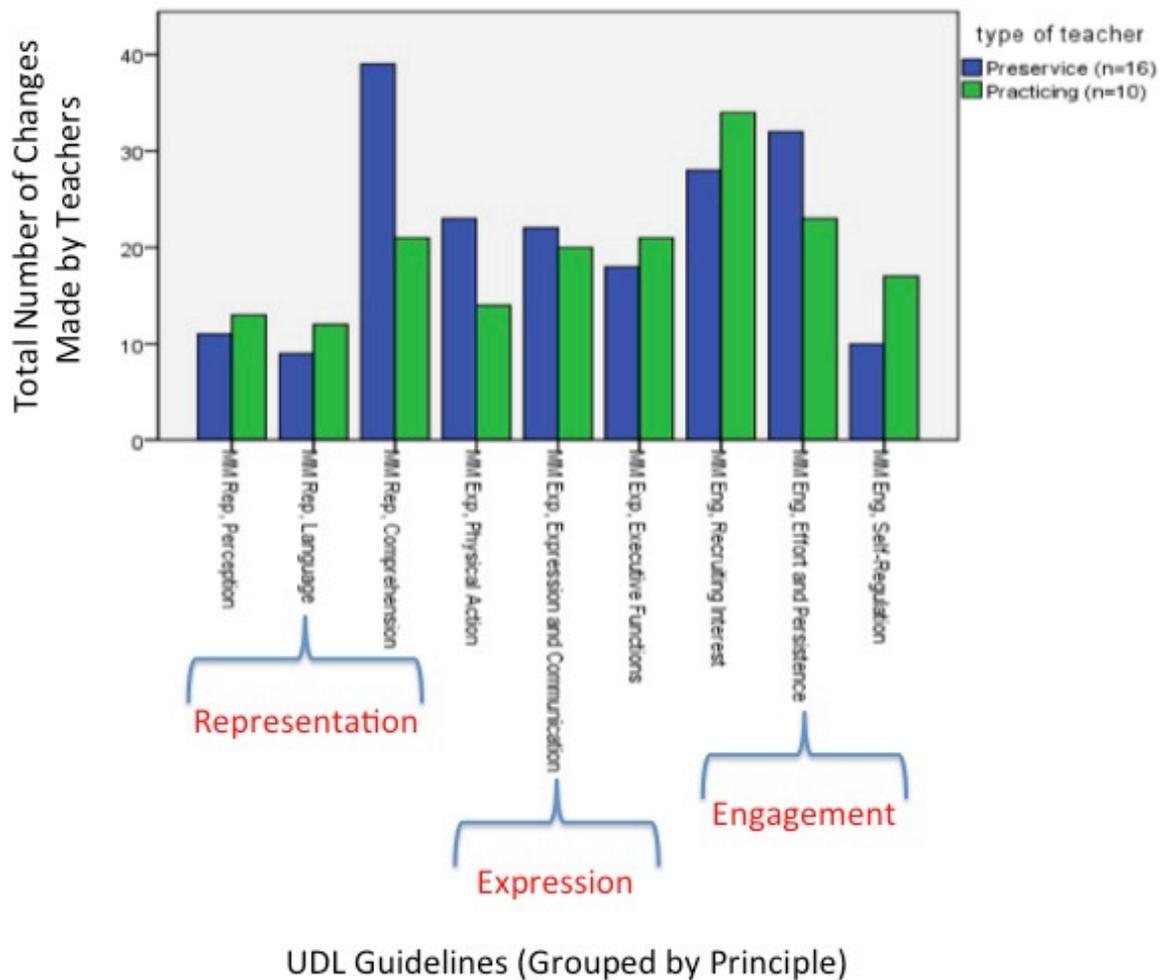


Figure 3. Total number of changes made by Universal Design for Learning themes (principles) and subthemes (guidelines)

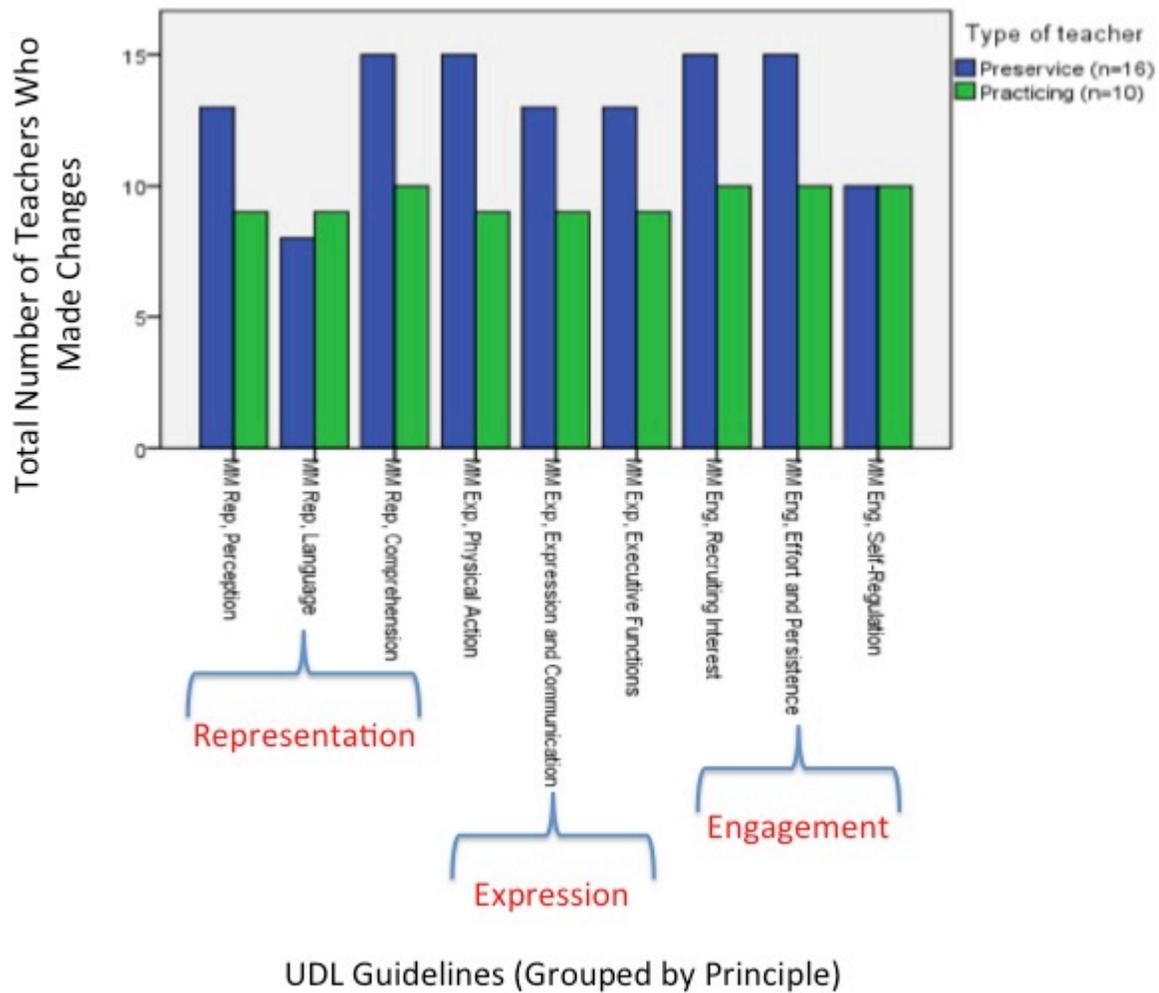


Figure 4. Number of teachers who made changes by Universal Design for Learning themes and subthemes.